

154

The Flora of Rawalpindi District,

WEST PAKISTAN

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INDEX

| <i>Order and Generic Names</i> | <i>Page</i> | <i>Order and Generic Names</i> | <i>Page</i> |
|--------------------------------|-------------|--------------------------------|-------------|
| Abelia | .. 62 | Ammania | .. 53 |
| Abies | .. 138 | Amomum | .. 123 |
| Abutilon | .. 20 | AMPELIDAE | .. 28 |
| Acacia | .. 45 | Ampelopteris | .. 158 |
| Acalypha | .. 114 | Amphicome | .. 95 |
| ACANTHACEAE | .. 96 | ANACARDIACEAE | .. 31 |
| Acantholimon | .. 51 | Anagallis | .. 79 |
| Acer | .. 29 | Anaphalis | .. 69 |
| Achillea | .. 71 | Andrachne | .. 113 |
| Achyranthes | .. 106 | ANDROPOGONEAE | .. 152 |
| Aconitum | .. 6 | Andropogon | .. 154 |
| Acroglochin | .. 107 | Androsace | .. 78 |
| Actaea | .. 7 | Anemone | .. 4 |
| Actinopteris | .. 161 | Anisomeles | .. 102 |
| Adenostemma | .. 66 | Anthemis | .. 71 |
| Adenostylis | .. 122 | Antigonon | .. 109 |
| Adhatoda | .. 97 | Antirrhinum | .. 92 |
| Adiantum | .. 160 | Apluda | .. 153 |
| Adonis | .. 5 | APOCYNACEAE | .. 81 |
| Aechmanthera | .. 96 | Aquilegia | .. 6 |
| Aeginetia | .. 94 | Arabidopsis | .. 10 |
| Aeluropus | .. 141 | Arabis | .. 10 |
| Aerua | .. 106 | ARACEAE | .. 128 |
| Aeschynomene | .. 35 | Arachis | .. 38 |
| Aesculus | .. 30 | ARALIACEAE | .. 61 |
| Agave | .. 124 | Aralia | .. 61 |
| Ageratum | .. 66 | Arenaria | .. 18 |
| Agrimonia | .. 49 | Argemone | .. 9 |
| Agropyron | .. 142 | Arisaema | .. 128 |
| AGROSTIDEAE | .. 144 | Aristida | .. 146 |
| Agrostis | .. 144 | Argyrobium | .. 32 |
| Ailanthus | .. 26 | ARISTOLOCHIACEAE | .. 109 |
| Ainsliaea | .. 74 | Aristolochia | .. 109 |
| AIZOACEAE | .. 56 | Arnebia | .. 87 |
| Ajuga | .. 104 | Artemisia | .. 71 |
| ALANGIACEAE | .. 62 | Arthraxon | .. 153 |
| Alangium | .. 62 | Arundinella | .. 149 |
| Albizzia | .. 46 | Arundo | .. 142 |
| Alhagi | .. 37 | ASCLEPIADACEAE | .. 82 |
| ALISMACEAE | .. 130 | Asclepias | .. 83 |
| Alisma | .. 130 | Asparagus | .. 125 |
| Allium | .. 126 | Asperugo | .. 86 |
| Alnus | .. 119 | Asphodelus | .. 125 |
| Alopecurus | .. 144 | Asplenium | .. 158 |
| Alternanthera | .. 106 | Aster | .. 67 |
| Alysicarpus | .. 39 | Astilbe | .. 51 |
| Alyssum | .. 11 | Astragalus | .. 36 |
| AMARANTHACEAE | .. 105 | Athyrium | .. 158 |
| Amaranthus | .. 105 | Atriplex | .. 107 |
| AMARYLLIDACEAE | .. 124 | Atropa | .. 90 |
| Amesia | .. 121 | Atylosia | .. 42 |

(ii)

INDEX (*contd.*)

| <i>Order and Generic Names</i> | <i>Page</i> | <i>Order and Generic Names</i> | <i>Page</i> |
|--------------------------------|-------------|--------------------------------|-------------|
| AVENEAE .. | 143 | Calendula .. | 72 |
| Avena .. | 144 | Callianthemum .. | 6 |
| Bacopa .. | 93 | Callicarpa .. | 98 |
| BAMBUSEAE .. | 139 | Callistemon .. | 53 |
| Barleria .. | 96 | CALLITRICHACEAE .. | 163 |
| Bauhinia .. | 44 | Callitriche .. | 163 |
| BEGONIACEAE .. | 56 | Caltha .. | 6 |
| Begonia .. | 56 | CAMPANULACEAE .. | 77 |
| Bellis .. | 67 | Campanula .. | 77 |
| BERBERIDACEAE .. | 7 | Canna .. | 123 |
| Berberis .. | 7 | Cannabis .. | 115 |
| Berchemia .. | 28 | Capillipedium .. | 154 |
| Berula .. | 58 | CAPPARIDACEAE .. | 14 |
| Beta .. | 107 | Capparis .. | 15 |
| Bidens .. | 71 | CAPRIFOLIACEAE .. | 62 |
| BIGNONIACEAE .. | 95 | Capsella .. | 13 |
| Bignonia .. | 95 | Capsicum .. | 91 |
| BIXACEAE .. | 16 | Caralluma .. | 84 |
| Blainvillea .. | 70 | Cardamine .. | 11 |
| Blepharis .. | 96 | Cardiospermum .. | 29 |
| Blumea .. | 68 | Carduus .. | 73 |
| Boenninghausenia .. | 25 | Carex .. | 136 |
| Boerhaavia .. | 104 | Carissa .. | 81 |
| Bombax .. | 21 | Carpesium .. | 70 |
| Bongardia .. | 7 | Carthamus .. | 74 |
| BORAGINACEAE .. | 85 | Carum .. | 58 |
| Bothriochloa .. | 154 | CARYOPHYLLACEAE .. | 16 |
| Boucerosia .. | 84 | Caryopteris .. | 98 |
| Bougainvillea .. | 104 | Casearia .. | 16 |
| Bowlesia .. | 57 | Cassia .. | 44 |
| Brachiaria .. | 149 | Castanea .. | 119 |
| Brachyactis .. | 68 | Castella .. | 148 |
| Brachypodium .. | 140 | <i>Catapodium</i> .. | 148 |
| Bramia .. | 93 | Caucalis .. | 60 |
| Brassica .. | 13 | Cedrela .. | 26 |
| Breweria .. | 89 | Cedrus .. | 139 |
| Bridelia .. | 112 | CELASTRACEAE .. | 27 |
| Bromus .. | 140 | Celosia .. | 105 |
| Broussonetia .. | 115 | Celsia .. | 92 |
| Brunella .. | 102 | Celtis .. | 115 |
| Buddleia .. | 84 | Cenchrus .. | 152 |
| Bupleurum .. | 57 | Centaurea .. | 74 |
| Butea .. | 41 | Centella .. | 56 |
| BUXACEAE .. | 114 | Cephalanthera .. | 121 |
| Buxus .. | 114 | Cerastium .. | 18 |
| CACTACEAE .. | 54 | Ceropegia .. | 163 |
| CAESALPINOIDEAE .. | 43 | Cestrum .. | 91 |
| Caesalpinia .. | 43 | Ceterach .. | 159 |
| Cajanus .. | 42 | Chaerophyllum .. | 58 |
| Calamintha .. | 100 | Cheilanthes .. | 159 |
| Calatropis .. | 82 | Cheiranthus .. | 13 |

INDEX (*contd.*)

| <i>Order and Generic Names</i> | <i>Page</i> | <i>Order and Generic Names</i> | <i>Page</i> |
|--------------------------------|-------------|--------------------------------|-------------|
| CHENOPODIACEAE .. | 106 | Craniotome .. | 102 |
| Chenopodium .. | 106 | CRASSULACEAE .. | 51 |
| Chionachne .. | 157 | Crataegus .. | 50 |
| CHLORIDEAE .. | 147 | Crepis .. | 75 |
| Chloris .. | 148 | Cressa .. | 89 |
| Chorispora .. | 14 | Crotolaria .. | 32 |
| Chrozophora .. | 113 | Croton .. | 114 |
| Chrysanthemum .. | 71 | CRUCIFERAE .. | 9 |
| Chrysopogon .. | 155 | Cryptolepis .. | 82 |
| Cicer .. | 39 | Cucubalus .. | 17 |
| Cichorium .. | 75 | Cucumis .. | 55 |
| Circaea .. | 54 | CUCURBITACEAE .. | 55 |
| Cissampelos .. | 7 | Cucurbita .. | 55 |
| Cistanche .. | 95 | Cupressus .. | 139 |
| Citrullus .. | 55 | CUPULIFERAE .. | 119 |
| Citrus .. | 26 | Curcuma .. | 123 |
| Clematis .. | 4 | Cuscuta .. | 89 |
| Cleome .. | 14 | Cyamopsis .. | 34 |
| Clerodendron .. | 98 | Cyathocline .. | 67 |
| Cnicus .. | 73 | Cycas .. | 139 |
| Cocculus .. | 7 | Cymbidium .. | 122 |
| Coix .. | 157 | Cymbopogon .. | 155 |
| Colchicum .. | 127 | Cynanchum .. | 83 |
| Colebrookea .. | 100 | Cynodon .. | 148 |
| Colocasia .. | 129 | Cynoglossum .. | 86 |
| COMBRETACEAE .. | 52 | CYPERACEAE .. | 131 |
| Combretum .. | 52 | Cyperus .. | 132 |
| COMMELINACEAE .. | 127 | Cypripedium .. | 121 |
| Commelina .. | 127 | Cystopteris .. | 157 |
| Compositae .. | 66 | Dactylis .. | 142 |
| Coniferae .. | 138 | Dactyloctenium .. | 147 |
| Coniogramme .. | 159 | Daedalacanthus .. | 96 |
| Conium .. | 59 | Dalbergia .. | 43 |
| CONVOLVULACEAE .. | 88 | Daphne .. | 110 |
| Convolvulus .. | 88 | Datura .. | 90 |
| Conyza .. | 67 | Daucus .. | 60 |
| Corallocarpus .. | 56 | Debregeasia .. | 118 |
| Coralluma .. | 84 | Delphinium .. | 6 |
| Corchorus .. | 23 | Dendrocalamus .. | 139 |
| Cordia .. | 85 | Descurainaea .. | 12 |
| Coriandrum .. | 60 | Desmodium .. | 38 |
| Coriaria .. | 31 | Desmostachya .. | 141 |
| CORNACEAE .. | 61 | Deutzia .. | 51 |
| Cornus .. | 61 | Dianthus .. | 16 |
| Coronopus .. | 13 | Diarthron .. | 110 |
| Cortusa .. | 78 | Dichanthium .. | 154 |
| Corydalis .. | 9 | Dicliptera .. | 97 |
| Corylus .. | 119 | Digera .. | 105 |
| Cotoneaster .. | 50 | Digitaria .. | 149 |
| Cotula .. | 71 | DIOSCOREACEAE .. | 124 |
| Cousinia .. | 73 | Dioscorea .. | 124 |

INDEX (contd.)

| <i>Order and Generic Names</i> | <i>Page</i> | <i>Order and Generic Names</i> | <i>Page</i> |
|--------------------------------|-------------|--------------------------------|-------------|
| Diospyros .. | 79 | Erythrina .. | 41 |
| Dipcadi .. | 126 | ESCALLONIACEAE .. | 51 |
| Diplazium .. | 159 | Eschscholtzia .. | 9 |
| Diplotaxis .. | 12 | Eucalyptus .. | 53 |
| DIPSACEAE .. | 66 | Euclidium .. | 14 |
| Dipsacus .. | 66 | Eugenia .. | 52 |
| Dodonaea .. | 30 | <i>Eulalia</i> .. | 153 |
| Dolichos .. | 41 | Eulaliopsis .. | 153 |
| Doronicum .. | 72 | Euonymus .. | 27 |
| Douepia .. | 12 | EUPHORBIACEAE .. | 111 |
| Dregea .. | 83 | Euphorbia .. | 111 |
| Dryopteris .. | 157 | Euphrasia .. | 94 |
| Dubyaea .. | 75 | Evolvulus .. | 88 |
| Dumasia .. | 40 | Fagonia .. | 24 |
| Duranta .. | 99 | FERN ALLIES .. | 161 |
| EBENACEAE .. | 79 | Ferula .. | 59 |
| Echinochloa .. | 151 | Festuca .. | 140 |
| Echinops .. | 73 | Ficoideae .. | 56 |
| Eclipta .. | 71 | Ficus .. | 116 |
| Ehretia .. | 85 | Filago .. | 69 |
| Eichornia .. | 127 | Fimbristylis .. | 134 |
| ELAEAGNACEAE .. | 111 | Flacourtia .. | 16 |
| Elaeagnus .. | 111 | Flemingia .. | 42 |
| Elaeodendron .. | 27 | <i>Flueggea</i> .. | 113 |
| Eleocharis .. | 134 | Foeniculum .. | 59 |
| Eleusine .. | 147 | Forskohlea .. | 118 |
| Elsholtzia .. | 100 | Fragaria .. | 48 |
| Embelia .. | 79 | Frankenia .. | 163 |
| Engelhardtia .. | 118 | Fraxinus .. | 80 |
| Enneapogon .. | 142 | FUMARIACEAE .. | 9 |
| Ephedra .. | 137 | Fumaria .. | 9 |
| Epilasia .. | 77 | Gagea .. | 127 |
| Epilobium .. | 54 | Gaillonia .. | 64 |
| Epipactis .. | 121 | Galinsoga .. | 71 |
| Epipogum .. | 122 | Galium .. | 65 |
| Equisetum .. | 161 | Gastrocotyle .. | 86 |
| Eragrostis .. | 141 | Gastrodia .. | 121 |
| Eremopogon .. | 154 | GENTIANACEAE .. | 84 |
| Eremostachys .. | 103 | Gentiana .. | 84 |
| Eremurus .. | 126 | GERANIACEAE .. | 24 |
| Erianthus .. | 152 | Geranium .. | 24 |
| ERICACEAE .. | 77 | Gerbera .. | 74 |
| Erigeron .. | 67 | Geum .. | 48 |
| Eriobotrya .. | 51 | Girardinia .. | 117 |
| Eriocyclus .. | 58 | Glochidion .. | 113 |
| Eriophorum .. | 136 | Gloriosa .. | 127 |
| Erodium .. | 24 | Glycine .. | 41 |
| Eruca .. | 13 | Gnaphalium .. | 69 |
| Eryngium .. | 57 | GNÉTACEAE .. | 137 |
| Erysimum .. | 12 | Goldbachia .. | 14 |
| Erythraea .. | 84 | Gonostegia .. | 118 |

INDEX (contd.)

| <i>Order and Generic Names</i> | <i>Page</i> | <i>Order and Generic Names</i> | <i>Page</i> |
|--------------------------------|-------------|--------------------------------|-------------|
| Goodyera .. | 121 | Ifloga .. | 69 |
| Gossypium .. | 21 | Ilex .. | 26 |
| GRAMINACEAE .. | 139 | Illicaceae .. | 26 |
| Grevillea .. | 110 | ILLECEBRACEAE .. | 105 |
| Grewia .. | 22 | Impatiens .. | 25 |
| Guldenstaedtia .. | 36 | Imperata .. | 152 |
| Gymnosporia .. | 27 | Incarvillea .. | 95 |
| Gynandropsis .. | 15 | Indigofera .. | 34 |
| Gypsophila .. | 17 | Inula .. | 70 |
| Habenaria .. | 122 | Iphigenia .. | 127 |
| Hackelia .. | 86 | Ipomoea .. | 88 |
| Hackelochloa .. | 156 | IRIDACEAE .. | 124 |
| HAEMADORACEAE .. | 123 | Iris .. | 124 |
| Haloxylon .. | 107 | Isachne .. | 150 |
| HAMAMELIDACEAE .. | 52 | Ischaemum .. | 153 |
| Hamiltonia .. | 63 | <i>Iseilema</i> .. | 154 |
| Hartmannia .. | 54 | Itea .. | 51 |
| Hedera .. | 61 | Jacaranda .. | 95 |
| Helianthus .. | 73 | Jaeschkea .. | 85 |
| Helicteres .. | 22 | Jasminum .. | 80 |
| Helictotrichon .. | 144 | JUGLANDACEAE .. | 118 |
| Helinus .. | 28 | Juglans .. | 118 |
| Heliotropium .. | 85 | JUNCACEAE .. | 128 |
| Hemarthria .. | 156 | Juncellus .. | 132 |
| Hemerocallis .. | 124 | Juncus .. | 128 |
| Hemigraphis .. | 96 | Jurinea .. | 73 |
| Heptapleurum .. | 61 | Justicia .. | 97 |
| Heracleum .. | 60 | Kickxia .. | 91 |
| Herminium .. | 122 | Kochia .. | 107 |
| Herniaria .. | 105 | Koeleria .. | 143 |
| Herpestis .. | 93 | Koelpinia .. | 75 |
| Heterocaryum .. | 86 | Korthalsella .. | 111 |
| Heteropogon .. | 156 | Kydia .. | 21 |
| Hibiscus .. | 21 | Kyllinga .. | 131 |
| Hieracium .. | 75 | LABIATAE .. | 99 |
| HIPPOCASTANACEAE .. | 30 | Lactuca .. | 76 |
| Hiptage .. | 23 | Lagenaria .. | 55 |
| Holarrhena .. | 82 | Lagerstroemia .. | 53 |
| Holboellia .. | 8 | Laggera .. | 68 |
| Holmskioldia .. | 99 | Lallemantia .. | 102 |
| Holostemma .. | 82 | Lamarckia .. | 142 |
| HORDEAE .. | 142 | Lamium .. | 103 |
| Hordeum .. | 143 | Lannea .. | 31 |
| Hydrilla .. | 120 | Lantana .. | 99 |
| HYDROCHARIDACEAE .. | 120 | Lapsana .. | 75 |
| <i>Hydrocotyle</i> .. | 56 | LARDAZIBALACEAE .. | 8 |
| Hyparrhenia .. | 154 | Lasiurus .. | 156 |
| Hypocoum .. | 9 | Lathraea .. | 94 |
| HYPERICACEAE .. | 19 | Lathyrus .. | 40 |
| Hypericum .. | 19 | Launaea .. | 76 |
| Hypoxis .. | 124 | LAURACEAE .. | 109 |

INDEX (contd.)

| <i>Order and Generic Names</i> | <i>Page</i> | <i>Order and Generic Names</i> | <i>Page</i> |
|--------------------------------|-------------|--------------------------------|-------------|
| Lavatera .. | 20 | Malcolmia .. | 11 |
| Lawsonia .. | 53 | Mallotus .. | 114 |
| Lecanthus .. | 118 | MALPIGHIACEAE .. | 23 |
| Leea .. | 29 | Malus .. | 50 |
| LEGUMINOSAE .. | 32 | MALVACEAE .. | 20 |
| LEMNACEAE .. | 129 | Malva .. | 20 |
| Lemna .. | 129 | Malvastrum .. | 20 |
| Lens .. | 39 | Mangifera .. | 31 |
| LENTIBULARIACEAE .. | 95 | Mariscus .. | 135 |
| Leontopodium .. | 69 | <i>Marlea</i> .. | 62 |
| Leonurus .. | 102 | Marsdenia .. | 83 |
| Lepidagathis .. | 97 | Marrubium .. | 103 |
| Lepidium .. | 13 | MARSILIACEAE .. | 162 |
| Leptaleum .. | 13 | Marsilia .. | 162 |
| Leptochloa .. | 147 | Matricaria .. | 71 |
| Leptodermis .. | 63 | Mazus .. | 92 |
| Leptorhabdos .. | 94 | Medicago .. | 34 |
| Lespedeza .. | 37 | Melanocenchris .. | 148 |
| Leucas .. | 103 | Melhania .. | 22 |
| Leycesteria .. | 63 | MELIACEAE .. | 26 |
| LILIACEAE .. | 125 | Melia .. | 26 |
| Lilium .. | 126 | Melica .. | 142 |
| LINACEAE .. | 23 | Melilotus .. | 33 |
| Linaria .. | 91 | Meliosma .. | 30 |
| Lindenbergia .. | 92 | Melissa .. | 99 |
| Lindernia .. | 94 | Melothria .. | 55 |
| Linum .. | 23 | MENISPERMACEAE .. | 7 |
| Liparis .. | 120 | Mentha .. | 100 |
| Lippia .. | 98 | Merendera .. | 127 |
| Liriope .. | 123 | Mertensia .. | 87 |
| Lithospermum .. | 87 | Micromeria .. | 100 |
| Litsaea .. | 110 | Microrhynchus .. | 76 |
| Livistona .. | 128 | Microsisymbrium .. | 10 |
| LOGANACEAE .. | 84 | Microstegium .. | 153 |
| Lolium .. | 143 | Microstylis .. | 120 |
| Lonicera .. | 62 | Milium .. | 145 |
| Lophochloa .. | 143 | Mimosa .. | 45 |
| LORANTHACEAE .. | 111 | MIMOSOIDEAE .. | 45 |
| Loranthus .. | 111 | Mimulus .. | 92 |
| Lotononis .. | 32 | Mirabilis .. | 105 |
| Lotus .. | 34 | Mnesithea .. | 156 |
| Ludwigia .. | 54 | Mollugo .. | 56 |
| Luffa .. | 55 | Moltkia .. | 87 |
| Lychnis .. | 17 | Momordica .. | 55 |
| Lycium .. | 91 | MONOCOTYLEDONAE .. | 120 |
| Lycopersicum .. | 90 | <i>Monothecha</i> .. | 79 |
| Lycopus .. | 100 | Monotropa .. | 77 |
| Lysimachia .. | 79 | <i>Moricandia</i> .. | 12 |
| LYTHRACEAE .. | 53 | Morina .. | 66 |
| Machilus .. | 109 | MORINGACEAE .. | 32 |
| Maerua .. | 15 | Moringa .. | 32 |

INDEX (contd.)

| <i>Order and Generic Names</i> | <i>Page</i> | <i>Order and Generic Names</i> | <i>Page</i> |
|--------------------------------|-------------|--------------------------------|-------------|
| Morus .. | 116 | OROBANCHACEAE .. | 94 |
| Muehlenbeckia .. | 109 | Orobanche .. | 94 |
| Muehlenbergia .. | 145 | Orthosiphon .. | 99 |
| Murraya .. | 26 | Orygia .. | 56 |
| MUSACEAE .. | 123 | Oryza .. | 148 |
| Musa .. | 123 | Oryzopsis .. | 146 |
| Myriactis .. | 67 | Osmunda .. | 161 |
| MYRSINACEAE .. | 79 | Ostostegia .. | 103 |
| Myrsine .. | 79 | Oxalis .. | 24 |
| MYRTACEAE .. | 52 | Paeonia .. | 7 |
| Myrtus .. | 53 | PALMACEAE .. | 128 |
| NAIADACEAE .. | 130 | PANICEAE .. | 149 |
| Naias .. | 131 | Panicum .. | 150 |
| Nannorhops .. | 128 | PAPAVERACEAE .. | 8 |
| Narcissus .. | 124 | Papaver .. | 8 |
| Nasturtium .. | 9 | PAPILIONATAE .. | 32 |
| Nelumbium .. | 8 | <i>Pappophorum</i> .. | 142 |
| <i>Neolitsaea</i> .. | 110 | Parapholis .. | 143 |
| Neottia .. | 121 | Parietaria .. | 118 |
| Nepeta .. | 101 | Parkinsonia .. | 43 |
| Nerium .. | 81 | Parnassia .. | 51 |
| Neslia .. | 14 | Parrotia .. | 52 |
| Neyraudia .. | 142 | Paspalidium .. | 150 |
| Nicotiana .. | 91 | Paspalum .. | 150 |
| Nonnea .. | 87 | Passiflora .. | 109 |
| Notholirion .. | 126 | Pavetta .. | 64 |
| Notoceras .. | 11 | PEDALINEAE .. | 95 |
| NYCTAGINACEAE .. | 104 | Pedicularis .. | 94 |
| Nyctanthes .. | 80 | Peganum .. | 24 |
| NYMPHAEACEAE .. | 8 | Pellaea .. | 159 |
| Nymphaea .. | 8 | Pennisetum .. | 151 |
| Ocimum .. | 99 | Pentatropis .. | 82 |
| <i>Odina</i> .. | 31 | Pergularia .. | 82 |
| Oenanthe .. | 59 | Perilla .. | 100 |
| Oenothera .. | 54 | Periploca .. | 82 |
| Oldenlandia .. | 63 | Peristrophe .. | 97 |
| OLEACEAE .. | 80 | Peucedanum .. | 59 |
| Olea .. | 81 | Phacelurus .. | 156 |
| Oligomeris .. | 15 | Phagnalon .. | 69 |
| ONAGRACEAE .. | 54 | Phalaris .. | 148 |
| Onobrychis .. | 37 | Phaseolus .. | 41 |
| Onosma .. | 87 | Phleum .. | 145 |
| Onychium .. | 160 | Phlomis .. | 103 |
| Ophioglossum .. | 161 | Phoenix .. | 128 |
| Ophiopogon .. | 123 | Phragmites .. | 142 |
| Opismenus .. | 150 | Phryma .. | 97 |
| Opuntia .. | 54 | Phyllanthus .. | 113 |
| ORCHIDACEAE .. | 120 | Physalis .. | 90 |
| Orchis .. | 121 | PHYTOLACCACEAE .. | 108 |
| Oreocnide .. | 115 | Phytolacca .. | 108 |
| Origanum .. | 100 | Picea .. | 138 |

INDEX (*contd.*)

| <i>Order and Generic Names</i> | <i>Page</i> | <i>Order and Generic Names</i> | <i>Page</i> |
|--------------------------------|-------------|--------------------------------|-------------|
| <i>Picridium</i> | .. 76 | <i>Pterospermum</i> | .. 22 |
| <i>Picris</i> | .. 75 | <i>Pueraria</i> | .. 41 |
| <i>Pieris</i> | .. 78 | <i>Pulicaria</i> | .. 70 |
| <i>Pilea</i> | .. 117 | <i>Punica</i> | .. 53 |
| <i>Pimpinella</i> | .. 58 | <i>Pupalia</i> | .. 105 |
| <i>Pinus</i> | .. 138 | <i>Pycnus</i> | .. 132 |
| <i>Pistacia</i> | .. 31 | <i>Pyrus</i> | .. 50 |
| <i>Pisum</i> | .. 40 | <i>Quercus</i> | .. 119 |
| PITTOSPORACEAE | .. 16 | <i>Quisqualis</i> | .. 52 |
| <i>Pittosporum</i> | .. 16 | <i>Randia</i> | .. 63 |
| <i>Plantaginaceae</i> | .. 104 | RANUNCULACEAE | .. 4 |
| <i>Plantago</i> | .. 104 | <i>Ranunculus</i> | .. 5 |
| <i>Platanaceae</i> | .. 118 | <i>Raphanus</i> | .. 14 |
| <i>Platanus</i> | .. 118 | <i>Reichardia</i> | .. 76 |
| <i>Plectranthus</i> | .. 99 | <i>Reinwardtia</i> | .. 23 |
| <i>Pleurospermum</i> | .. 59 | <i>Reptonia</i> | .. 79 |
| <i>Pluchea</i> | .. 68 | RESEDACEAE | .. 15 |
| PLUMBAGINACEAE | .. 78 | <i>Ribes</i> | .. 51 |
| <i>Plumbago</i> | .. 78 | <i>Richardia</i> | .. 129 |
| <i>Poa</i> | .. 141 | <i>Ricinus</i> | .. 114 |
| <i>Podophyllum</i> | .. 7 | RHAMNACEAE | .. 27 |
| <i>Pogonatherum</i> | .. 153 | <i>Rhamnus</i> | .. 27 |
| <i>Pollinia</i> | .. 153 | <i>Rhazya</i> | .. 81 |
| POLYGALACEAE | .. 16 | <i>Rhododendron</i> | .. 77 |
| <i>Polygala</i> | .. 16 | <i>Rhus</i> | .. 31 |
| POLYGONACEAE | .. 108 | <i>Rhynchosia</i> | .. 42 |
| <i>Polygonatum</i> | .. 125 | <i>Robinia</i> | .. 36 |
| <i>Polygonum</i> | .. 108 | <i>Rochelia</i> | .. 86 |
| <i>Polypogon</i> | .. 145 | ROSACEAE | .. 47 |
| <i>Polystichum</i> | .. 158 | <i>Rosa</i> | .. 49 |
| <i>Pongamia</i> | .. 43 | <i>Roscoea</i> | .. 123 |
| PONTERIACEAE | .. 127 | <i>Rottboellia</i> | .. 156 |
| <i>Populus</i> | .. 120 | RUBIACEAE | .. 63 |
| <i>Porana</i> | .. 89 | <i>Rubia</i> | .. 64 |
| PORTULACACEAE | .. 19 | <i>Rubus</i> | .. 48 |
| <i>Portulaca</i> | .. 19 | <i>Ruellia</i> | .. 96 |
| <i>Potamogeton</i> | .. 130 | <i>Rumex</i> | .. 108 |
| <i>Potentilla</i> | .. 49 | <i>Ruppia</i> | .. 131 |
| <i>Premna</i> | .. 98 | RUTACEAE | .. 25 |
| PRIMULACEAE | .. 78 | SABIACEAE | .. 30 |
| <i>Primula</i> | .. 78 | <i>Saccharum</i> | .. 152 |
| <i>Prinsepia</i> | .. 47 | <i>Sageretia</i> | .. 28 |
| <i>Prosopis</i> | .. 46 | <i>Sagina</i> | .. 18 |
| PROTEACEAE | .. 110 | <i>Sagittaria</i> | .. 130 |
| <i>Prunus</i> | .. 47 | SALICACEAE | .. 119 |
| <i>Psammogeton</i> | .. 61 | <i>Salix</i> | .. 119 |
| <i>Psidium</i> | .. 53 | <i>Salmalia</i> | .. 21 |
| <i>Pterachaenia</i> | .. 77 | <i>Salsola</i> | .. 107 |
| <i>Pteridium</i> | .. 161 | SALVADORACEAE | .. 81 |
| PTERIDOPHYTA | .. 157 | <i>Salvadora</i> | .. 81 |
| <i>Pteris</i> | .. 161 | <i>Salvia</i> | .. 101 |

INDEX (contd.)

| <i>Order and Generic Names</i> | <i>Page</i> | <i>Order and Generic Names</i> | <i>Page</i> |
|--------------------------------|-------------|--------------------------------|-------------|
| Somolus .. | 79 | Sonchus .. | 76 |
| Sanicula .. | 57 | Sophora .. | 43 |
| SANTALACEAE .. | 111 | Sorbaria .. | 47 |
| SAPINDACEAE .. | 29 | Sorghum .. | 155 |
| Sapium .. | 114 | SPARGANIACEAE .. | 129 |
| Saponaria .. | 17 | Sparganium .. | 129 |
| Sarcococca .. | 114 | Spergula .. | 18 |
| Satyrium .. | 122 | Spergularia .. | 19 |
| Sauromatum .. | 129 | Spinacia .. | 107 |
| Saussurea .. | 73 | Sphaeranthus .. | 69 |
| SAXIFRAGACEAE .. | 51 | Spiraea .. | 47 |
| Saxifraga .. | 51 | Spiranthes .. | 121 |
| Scabiosa .. | 66 | Sporobolus .. | 145 |
| Scaligeria .. | 58 | Stachys .. | 102 |
| Scandix .. | 58 | STAPHYLEACEAE .. | 30 |
| Schefflera .. | 61 | Staphylea .. | 30 |
| Schinus .. | 31 | Statice .. | 78 |
| Schismus .. | 143 | Stellaria .. | 18 |
| Scilla .. | 126 | STERCULIACEAE .. | 22 |
| Scirpus .. | 135 | Sterculia .. | 22 |
| Scitamineae .. | 123 | Stereospermum .. | 95 |
| Sclerochloa .. | 140 | Stipa .. | 146 |
| Scorzonera .. | 77 | Striga .. | 94 |
| SCROPHULARIACEAE .. | 91 | Strobilanthes .. | 96 |
| Scrophularia .. | 92 | STYRACEAE .. | 80 |
| Scutellaria .. | 102 | Suaeda .. | 107 |
| Securinega .. | 113 | Swertia .. | 84 |
| Sedum .. | 52 | Symplocos .. | 80 |
| Selaginella .. | 162 | Syringa .. | 80 |
| Selinum .. | 59 | Tabernaemontana .. | 82 |
| Senebiera .. | 13 | TAMARICACEAE .. | 19 |
| Senecio .. | 72 | Tamarix .. | 19 |
| Serratula .. | 74 | Taraxacum .. | 75 |
| Sesamum .. | 95 | Taverniera .. | 37 |
| Sesbania .. | 35 | Taxus .. | 139 |
| Seseli .. | 59 | Tecoma .. | 95 |
| Setaria .. | 151 | Tecomella .. | 95 |
| Sida .. | 20 | Telosma .. | 83 |
| Siegesbeckia .. | 70 | Tephrosia .. | 35 |
| Silene .. | 17 | Terminalia .. | 52 |
| Silybum .. | 73 | Tetrapogon .. | 148 |
| SIMARUBACEAE .. | 26 | Teucrium .. | 104 |
| Sinapis .. | 13 | Thalictrum .. | 5 |
| Sisymbrium .. | 12 | Themeda .. | 154 |
| Sium .. | 58 | Thesium .. | 111 |
| Skimmia .. | 26 | Thevetia .. | 81 |
| Smilax .. | 125 | Thlaspi .. | 14 |
| Soja .. | 41 | Thuja .. | 139 |
| SOLANACEAE .. | 89 | THYMELEACEAE .. | 110 |
| Solanum .. | 89 | Thymelaea .. | 110 |
| Solidago .. | 66 | TILIACEAE .. | 22 |

(x)

INDEX (contd)

| <i>Order and Generic Names</i> | <i>Page</i> | <i>Order and Generic Name</i> | <i>Page</i> |
|--------------------------------|-------------|-------------------------------|-------------|
| Tillaea .. | 51 | Vernonia .. | 66 |
| Tinospora .. | 7 | Veronica .. | 93 |
| Torilis .. | 60 | Vetiveria .. | 155 |
| Trachelospermum .. | 82 | Viburnum .. | 62 |
| Trachyspermum .. | 58 | Vicia .. | 39 |
| Tragapogon .. | 77 | Vigna .. | 41 |
| Tragus .. | 147 | Villebrunea .. | 115 |
| Trema .. | 115 | Vinca .. | 81 |
| Trianthema .. | 56 | Viola .. | 15 |
| Tribulus .. | 23 | Viscum .. | 111 |
| Trichodesma .. | 86 | VITACEAE .. | 28 |
| Tricholaena .. | 151 | Vitex .. | 98 |
| Tricholepis .. | 74 | Vitis .. | 28 |
| Trichosanthes .. | 55 | Volutarella .. | 74 |
| Trifolium .. | 33 | Wendlandia .. | 63 |
| Trigonella .. | 33 | Wikstroemia .. | 110 |
| Trillium .. | 127 | Wistaria .. | 43 |
| Tripogon .. | 147 | Withania .. | 90 |
| Triticum .. | 143 | Wolffia .. | 130 |
| Triumfetta .. | 23 | Woodfordia .. | 53 |
| Tulipa .. | 126 | Wulfenia .. | 93 |
| Tussilago .. | 72 | | |
| Tylophora .. | 83 | X | |
| TYPHACEAE .. | 128 | | |
| Typha .. | 128 | Xanthium .. | 70 |
| ULMACEAE .. | 115 | Xylosma .. | 16 |
| Ulmus .. | 115 | | |
| UMBELLIFERAE .. | 56 | Y | |
| Urochloa .. | 150 | | |
| URTICACEAE .. | 115 | Youngia .. | 75 |
| Urtica .. | 117 | | |
| Utricularia .. | 95 | Z | |
| VALERIANACEAE .. | 65 | | |
| Valeriana .. | 65 | Zannichellia .. | 130 |
| Valerianella .. | 66 | Zanthoxylum .. | 25 |
| Vallisneria .. | 81 | Zea .. | 157 |
| Vallisneria .. | 120 | Zephyranthes .. | 124 |
| Velezia .. | 17 | Zeuxine .. | 122 |
| Verbascum .. | 91 | Zingiber .. | 123 |
| VERBENACEAE .. | 98 | Ziziphus .. | 27 |
| Verbena .. | 98 | ZYGOPHYLLACEAE .. | 23 |

THE FLORA OF RAWALPINDI DISTRICT, WEST PAKISTAN.

Rawalpindi district constitutes the northwest corner of the former Punjab. It lies between 33' and 34' north latitude and 72' and 74' east longitude. It is bounded on the north by Hazara district, on the east by Poonch, on the south by Jhelum district and on the west by Attock district. The area is 2051 sq. miles of which 926 are cultivated. It is a country of broken plains and denuded hills; its elevation rising from 1,500' at Gujar Khan and 1,750 at Rawalpindi to 7,500' in the Hill Station of Murree.

The plains which once were flat loess land are badly cut up by ravines and are subject to active erosion. The wind blown soil is poorly consolidated as there is little vegetation and hill torrents in the monsoon are cutting deeper and deeper and in some places have left little but bare rock. The worst damage is in the lower foothills where deforestation and overgrazing have brought about sheet erosion and little but rocks or raw mineral soil remains. Cultivation is confined to the flat lands between the ravines. The only irrigation is where there is a well. Most of the area is much too irregular to permit any other kind of irrigation even if water were available.

The hills form part of the outer Himalayan ranges and include Murree, the most important summer resort of West Pakistan. Many of the hills have been deforested to the top and are well terraced and cultivated but in other places steep slopes are cultivated without proper terracing and erosion carries away many tons of soil in every heavy rain. The hills are overpopulated and there is insufficient fuel and fodder. The result is that most trees are badly lopped and, the nearer trees are to villages, the worse they are mutilated. The pines are left with a rounded tuft of branches at the top and the oaks, maples, horse chestnut, and other broad leaved trees are lopped for fodder even in areas which are supposed to be protected.

The rainfall of the district varies greatly from year to year both in total volume and in its distribution throughout the year. For example the Rawalpindi rainfall varies from 17 to 55 inches per annum with an average of 36 inches; the rainfall of Kahuta has varied from 23 to 62 inches with an average of 41.75" and Murree has varied from 45 to 100 inches with an average of 66.51". Some years almost all of the rain falls during the monsoon, leaving a very long dry season. Usually there are two dry seasons; from the close of the monsoon in September until the winter rains, and then a long and hot dry season from March to July. This year, 1956-57, the rainfall was well distributed throughout the year keeping Rawalpindi lawns green up to June. This is very unusual. Snowfall on the plains is very uncommon, perhaps once every twenty years. Murree, on the other hand, has a very heavy snowfall some years, and snow often falls as late as the first week of April. The Kashmir road is blocked from time to time by heavy snows. The maximum temperatures in the plains vary from 108' to 119' and the minimum from 26' to 32'.

Because of the long dry seasons the flora of the plains is distinctly arid and it is an extension of the dry Mediterranean type of flora. There are in fact a good many species, including ferns and grasses, that are found in North Africa and clear across to Rawal-

pindi district and even ascend into the Indus Valley beyond the Gilgit Agency. The flora of the plains portion of the district is practically the same as that of Jhelum district including the Salt Range and also that of Attock district so that if a plant has been found in these districts and not in Rawalpindi it has been included in this list as there are no barriers to prevent plant migration so that if a plant grows in Jhelum district it probably grows in the other two as well except that the plants of the Murree Hills are not to be expected in Attock or Jhelum because of their lower altitude.

There are few places in the district where the flora has not been disturbed by man or his animals. There is therefore much disturbed soil and there are a good many annual weeds in fields and along their borders, about houses and along roadsides. Grasses are also very numerous, no less than 185 having been collected so far. In the plains, ferns, mosses, lichens and liverworts are not common because of the long dry seasons but these groups are better represented in the hills as the rainfall increases. Occasional reserves or graveyards in the plains give some idea of what the plant cover of the district would be like if it were given a fair chance. *Acacia modesta* (*phulahi*), is the commonest tree and *kao*, (*Olea cuspidata*), is commonly associated with it. The Topi Rakh in Rawalpindi shows the type of scrub forest that must have covered most of the country in prehistoric times. In addition to the trees already mentioned there is *Ziziphus*, several *Grewias*, a *Rhamnus* and *Ehretia aspera*. As undergrowth, underneath, or between the small trees there are a number of common shrubs, *Dodonaea viscosa* (*sanatha*), dwarf *Ziziphus* (*beri*), *Gymnosporia royleana* (*pataki*), *Adhatoda vasica* (*bhekar*), *Otostegia limbata* and *Carissa opaca* (*garna*) being among the most common. *Capparis decidua* (*C. aphylla*) and *Periploca aphylla* (*bata*) are occasional in very dry places. One or more large *Ficus bengalensis* (*bor*) trees shade almost every village pond and can be seen from a long distance. *Salix acmophylla* is the common wild willow found beside water. *Dalbergia sissoo* (*shisham* or *tali*) is the most valuable tree for furniture and is common both wild and cultivated. By roadsides *Peganum harmala* (*harmal*) and *Calatropis* (*ak*) are very common, being avoided by animals.

As one goes by road from Rawalpindi to Murree he can see an excellent cross section of the flora of the district. Up to the 13th mile at Barakao most of the land is cultivated and there is not much of interest to the botanist. Beyond this point most of the land is too rough for cultivation and scrub vegetation begins. At first there are small xerophytic bushes and then they become gradually larger until by the time one reaches Tret there are many large trees where the soil is deeper in the valleys. Up to 5,000': *phulahi* and *kao* are the most abundant trees on the left hand side of the road except in a few places where the *chir* pine, *Pinus roxburghii* (*P. longifolia*), is gregarious. On the steep slopes on the right side of the road from about 3,000' the pine becomes dominant. At first it appears in sheltered places and then it covers the ridges and steep slopes almost up to Murree. The *chir* is tapped for its resin which is collected for the turpentine factory in Jallo. This pine is very hardy and its thick bark resists forest fires well. In some places it ascends to 6,000' where it is replaced by the blue pine, *Pinus excelsa* (*kail*) or by *Quercus incana*, the *ban* oak.

The foothill zone extends roughly from 2 to 5,000 ft. Where *chir* is dominant little else grows but where *phulahi* and *kao* are the commonest trees there is a great deal of variety. About a hundred years ago the *khair*, *Acacia catechu*, formed an important part of the scrub forest in the Tret area but few trees are now left. When the *amaltas* (*Cassia fistula*), is in bloom, the trees, scattered through the forest can be seen from afar.

Above 5,000' a more temperate flora begins with a much greater variety of plant life. Two oaks become important, first the *Ban Oak* (*Quercus incana*) with leaves white below and then *Q. dilatata* with leaves green below. On deep soils and in more level places and in valleys there are many kinds of broad leaved trees belonging to genera which are found clear across the northern hemisphere so that a European botanist soon finds himself feeling at home in this temperate flora while the trees and shrubs of the foothill zone have tropical affinities and are largely unfamiliar. Among the more important deciduous trees are the horse chestnut (*ban khor*), the two maples, *Acer caesium* and *A. pictum*, *Populus ciliata* and *P. alba*, *Salix* sp., *Morus serrata*, *Prunus cornuta*, *Euonymus* sp., *Rhamnus* sp. *Rhus* sp. and a *Fraxinus* (ash). On shady slopes above Sunnybank onward to Gharial, largely above 7,000', the Himalayan fir, *Abies pindrow* and the yew, *Taxus baccata*, become common in the mixed forest and the Himalayan ivy, *Hedera nepalensis*, is common, ascending the tallest trees and covering cliffs and banks. Murree is not quite high enough for the fir to come into its own but looking from Murree to Changla in Hazara district the firs can be seen all along the sky line at nearly 9,000'.

The deodar trees which are found about Murree have all been planted by individuals or by the Forestry Department. There are wild trees, however, not far away near Dunga Gali where they can be seen from the pipe line carrying the Murree water supply on the east side of the ridge or from the motor road on the west side of the mountain.

Since the Hazara *Galis* are so close to Murree and are visited by most botanists and others interested in the Murree flora I have included in the attached list the plants I have noticed in the *Galis*, from Barian and Changla to Thandiani which I have not seen in the Murree Hills. Furthermore since any wild plant growing in Abbottabad is likely to be found somewhere in adjacent parts of Rawalpindi district, I have similarly added some Abbottabad records.

I have not tried to add all of the cultivated plants of the district but have mentioned some of the commoner ones especially those which sometimes are found self sown or which a visitor might not recognise as being introduced. The catalogue is arranged according to the sequence of families in J. D. Hooker's seven volume Flora of British India. It is unfortunate that as yet there is little in the way of literature which can be put in the hands of anyone wanting to learn something about the flora of West Pakistan. Only Lahore has a District Flora and this has been published by the Punjab University. The first part is by Prof. S. R. Kashyap and the grasses and sedges have been added by Dr. Sultan Ahmad. Burkill published a catalogue of Baluchistan plants many years ago which has just been republished by the Forestry Department there and J. F. Duthie published in 1898 a list of the Chitral plants which were known at that period. Aside from these publications R. N. Parker's Forest Flora of the Punjab with Hazara and Delhi, republished in 1956 by the Forest Department is by far the most valuable. Other useful books are Collett's Flora Simlensis (Thacker and Spink 1902); C. J. Bamber's Plants of the Punjab (Supdt. of Gov't Printing, Lahore, 1916); J. L. Stewart's Punjab Plants (1869) and J. F. Duthie's Flora of the Upper Gangetic Plain and Sub-Himalayan Tracts (1913). Unfortunately most of these works are out of print and can only occasionally be found in second hand shops.

The non professional student will be troubled by changes in scientific names which are supposed to be unvarying. From time to time systematic botanists hold a world conference and frame rules of botanical nomenclature. When Sir Joseph Hooker was

preparing his monumental flora, which is still used by all people working on the flora of this sub-continent, there were few agreed rules. The most important rules deal with the subject of 'priority.' If a plant in this country has been called *Rosa alba*, for example, for 100 years the name must be changed if it is discovered that this plant was published as *Rosa indica* 101 years ago in Austria. Many familiar names are being replaced by older names and monographers are finding that plants which Hooker considered to be the same as those in Europe are really somewhat different and so they are given new names. As a result some of the names in this catalogue differ from those entered in the First Edition. Some misidentifications have also been corrected. There is no National Herbarium in this country to which specimens can be sent for accurate naming. It is still necessary to send many specimens abroad for the opinion of experts. If any one finds omissions in this list I would appreciate it if the specimen found is sent in to the Gordon College Herbarium in Rawalpindi where dried specimens of the plants in this list are mounted and preserved. It is hoped that in time this list will grow into a proper flora with 'keys' to the genera and species here listed.

Acknowledgments.—Most of the keys used owe a great deal to Parker's Forest Flora. Many references to localities have been taken from Bamber's Punjab Plants. A great deal of the collecting on which this work is based has been done by former and present members of the Department of Botany of this College and their discoveries are preserved in the Gordon College Herbarium. Dr N. L. Bor, Assistant Director of the Royal Botanic Gardens at Kew has checked most of the grass determinations, Dr. S. M. H. Jafri of Khairpur Mirs the capers and crucifers, and Prof. E. Nasir of this College the umbels. Prof. Nasir has accompanied me on most of my collecting expeditions for many years and has helped me in many ways. Mr. M. A. Siddiqui of our Botany Department has also done a good deal of collecting.

RANUNCULACEAE

Clematis

Clematis montana Buch-Ham. A handsome climber common above 6,000' with large white flowers, blooming from April to June. The plumose achenes hang on all winter.

Clematis gouriana Roxb. A plant of the foothills from 2-4,000' with small flos. up to $\frac{1}{4}$ ", leaflets usually glabrous and entire. Nurpur, Saidpur, Chattar Bagh etc.

Clematis grata Wall. Very common from 2-8,000' ; flos. up to 1" in diam, leaflets toothed and white hoary below. Flos. Aug.-Sept., cream coloured.

Clematis graveolens Lindl. From 3-7,000' with pale yellow flos. blooming in late Aug. and Sept., Plants often prostrate on banks and walls or in herbage.

Clematis connata D. C. Fairly common above 4,000' beginning to bloom in Aug. Flos. yellowish white, bell shaped with recurved tips.

Anemone

Anemone falconeri T.T. A small, early flowering forest species growing on cliffs or steep slopes. Dunga Gali ; Thandiani.

Anemone vitifolia Ham. A tall, autumn species, usually found above 7,000' with leaves white woolly below.

Anemone obtusiloba D. Don. A spring species, often very common on open meadows with sepals white within and bluish without ; blooming in spring and summer. Common in the Galis.

Anemone tetrasepala Royle. A tall handsome white flowered species growing above 7,000', often gregarious ; common in the Galis on shady banks in the forest.

Thalictrum

Thalictrum pedunculatum Edgew. A spring forest species with handsome white flos., usually above 6,000' April, May.

Thalictrum foetidum L. (*T. vaginatum* Royle). Reported only from Nathia Gali by Deane. Flos. small, greenish ; plants evil scented.

Thalictrum foliolosum D. C. Changla Gali and the Pipe Line, leaves much divided ; flos. usually green or purplish ; 5-8,000'.

Thalictrum sp. There is a species which may be undescribed growing on cliffs on the Pipe Line and in Thandiani, often in inaccessible places. Flos. white, leaves coriaceous in texture, achenes small.

Adonis

Adonis aestivalis L. An early spring annual with straw coloured flos. with a scarlet centre found from the plains to 5,000'.

Ranunculus

Ranunculus trichophyllus Chaix, (*R. aquatilis* var. *trichophyllus* H. & T.). The white flowered water buttercup with filiform leaves has been found at Kahuta, Wahi, Haripur, Abbottabad etc.

Ranunculus falcatus L. This early dwarf, annual species has been found from 2 to 7,000'. It is easily recognised by its very small flos. and long beaked achenes.

Ranunculus hirtellus Royle is often common from 6,500' to the alpine zone. It is a perennial with bright yellow flos. somewhat smaller than those of *R. laetus*.

Ranunculus laetus Wall. Common in wet soil above 4,000' is perennial and the largest buttercup in the area. Flos. all summer.

Ranunculus sceleratus L. An erect buttercup usually growing in shallow water. The leaves are glossy and the thalamus bearing the achenes is conical. Plains and hills, common.

Ranunculus diffusus DC. is not common but has been found in woods at Murree. The leaves are hairy and three lobed. Found from Hazara eastward.

Ranunculus muricatus L. A common annual, spring weed throughout the district but commonest in damp ground but not in water. The achenes have small outgrowths.

Ranunculus arvensis L. is also a spring annual weed of grain fields and is often abundant from the plains to 7,000'. The lobes of the leaves are deeper and narrower than in the last.

Callianthemum

Callianthemum pimpinelloides Don has only been found in the Galis at Nathia and on Miranjani and Mokhshpuri. The plants are small, perennial, bearing pretty white flos. in April. The leaves are much divided.

Caltha

Caltha palustris L. var. *alba* H. & T., the white Marsh Marigold grows at Changla, Dunga and Nathia Galis in stream beds.

Aquilegia

Aquilegia pubiflora Wall., var. *missooriensis* Royle. The columbine is very common in Murree and the Galis from 6,000' upward in the forest and along woodland paths. It blooms from April through August. The flos. are usually purple but there is a yellow form in Changla and Dunga Galis and a white one in the Dunga Gali catchment area.

Delphinium

Delphinium saniculaefolium Boiss. is a plant of the dry hills west of the Jhelum with pale blue flos. $\frac{1}{2}$ " long with a straight awl shaped spur, Margalla, Hasan Abdal.

Delphinium uncinatum H. & T. Flos more purple, spur blunt and hooked, 2-7,000', Hasan Abdal, Kuldanna, March to May.

Delphinium vestitum Wall ex Royle, is a large, bluish purple flowered larkspur blooming in Aug. and Sept. in and around Dunga Gali.

Delphinium ajacis L. The common cultivated spring annual.

Aconitum

Aconitum heterophyllum Wall. *Atis*, tall, with greenish flos. with purple veins is found at Changla and Dunga Galis at about 8,000' in the summer.

Aconitum laeve Royle. A larger plant with very large stem leaves and purple flos. grows at Dunga Gali.

Actaea

Actaea spicata L. with a spike of small white flos. is found in forest shade at Upper Topa, Murree and the Galis from April to May.

Paeonia

Paeonia emodi Wall., *mamekh* is found at Kund and Thandiani in Hazara bearing large white flos. in May and June.

Menispermaceae

Cocculus

Cocculus laevis DC. A common climbing shrub growing in the plains, scrambling over trees and hanging from cliffs, flowering after the monsoon.

Cissampelos

Cissampelos pareira L. Another vine growing on cliffs and scrambling over bushes from the plains to 6,000'. Called 'ghore sum' or 'buttlar.'

Tinospora

Tinospora cordifolia (DC.) Miers, "Glo" is a large creeper cultivated because of the speed with which it will make a screen of leaves. The flos. are inconspicuous, developing on old wood.

BERBERIDACEAE

Berberis

Berberis petiolaris Wall. Common above 6,000' in Murree and the Galis growing in shady woods with comparatively large, elliptical leaves. Flos. in a simple raceme.

Berberis ceratophylla G. Don, (*B. lycium* Royle) is a very common shrub from 3-7,000' which is covered with yellow flos. in May. The blue black berries are edible. It is a good soil binder. This plant is the source of 'rasaunt.'

Berberis kunawurensis Royle. This is a dwarf, gregarious shrub which is common on rocks and ridges in exposed places. It is common in the Galis above 7,000'.

Podophyllum

Podophyllum hexandrum Royle, (*P. emodi* Wall.) The May Apple (*ban kakri*) is common in forest undergrowth, usually above 7,000', the white, solitary flos. appearing soon after the snow melts.

Bongardia

Bongardia margalla n. sp. This is an undescribed species growing on limestone at Margalla and the hill behind Wah. A branching inflorescence of pretty yellow flos.

rises from a corm which is difficult to extract. There is usually only one compound leaf per corm. The leaves are mottled with purple and the flos. appear in March.

LARDAZIBALACEAE

Holboellia

Holboellia latifolia Wall. This large vine with digitately compound leaves grows on a cliff on the cart road between Jhicca Gali and the Murree Bazaar. Rare in our area but has also been reported near Thandiani at Kalapani, at Baghnotar etc. Parker lists under Berberidaceae.

NYMPHAEACEAE

Nymphaea

Nymphaea nouchali Burm. f. (*N. lotus* of F.B.I.). The leaves are sharply serrate and pubescent beneath. Kontrila, Jhelum district.

Nymphaea alba L. (*N. candida* Presl) ; Abbottabad (N. Ali).

Nelumbium

Nelumbium nelumbo (L.) Druce ; (*N. speciosum* Willd.) The lotus with its large pink flos. grows in ponds in Topi Park, Rawalpindi and near Sohawa.

PAPAVERACEAE

Papaver

Papaver hybridum L. Common from Feb. to April about cultivation with small brick red flos. and hispid capsules.

Papaver pavoninum Schrenk ex F. and M. has larger salmon coloured flos. with a dark centre. The capsules are prickly ; locally common in grain fields in the spring.

Papaver dubium L. var. *glabrum* Koch, (*P. laevigatum* M. Bieb). Common in the plains and up to 5,000' with smooth capsules and salmon coloured flos. with a dark purple spot on each petal.

Papaver somniferum L. The opium poppy with large flos. of different colours and large smooth capsules is sometimes cultivated.

Papaver macrostomum Boiss. and Huet. (*P. turbinatum* D. C.) Flos. large and red Abbottabad, Domel.

Papaver rhoeas L. The Shirley Poppy with both single and double forms is commonly cultivated and may be found selfsown.

Argemone

Argemone mexicana L. This noxious weed with pretty yellow flos. is adventive from America and is occasionally found in waste places in the plains. Prickly Poppy.

Eschscholtzia

Eschscholtzia californica Cham. California Poppy, with horned fruits, and yellow flos. is commonly cultivated in the spring.

FUMARIACEAE

Hypocoum

Hypocoum parviflorum K. & K. A small, annual, yellow flowered field weed with horned fruits is found in Attock and Peshawar districts.

Hypocoum trilobum Trautv. is very similar but the flowers are a little larger ; the outer petals are three lobed and the stigma deeply bi-lobed. Found in grain fields in Rawalpindi and Attock districts in the spring.

Corydalis

Corydalis stewartii Fedde. *Mamiri*. Found by shady roadsides and in forests at Murree and the Galis during the monsoon. The flos. are rather small, yellow and spurred. The pods are linear and the plants are erect with very angular stems.

Corydalis ramosa Wall. Much like the last but more or less prostrate, growing in the open and with ovate pods with shiny seeds has been found between Nathia Gali and Miranjani.

Corydalis diphylla Wall. ex D. Don (*C. rutaefolia* Sibth.) An early spring forest flower usually found in the Murree Hills above 6,000'. The flos. are pinkish purple.

Fumaria

Fumaria indica (Hausk.) Pugsley. "Pit papra" with tiny spurred pink flos. is ubiquitous in the plains and lower hills from Feb. to April.

CRUCIFERAE

Nasturtium

Nasturtium officinale Br. Water Cress with white flos. is common, growing in springs or slowly moving water in both plains and hills.

Nasturtium palustre (Leyss.) D. C. ; (*Roripa islandica* (Oed.) Borbas. is an erect, yellow flowered plant of wet ground with pods round in cross section and up to $\frac{1}{4}$ " long. The plants are 6"-12" tall, perennial.

Nasturtium indicum (L.) D.C. Much like the last but annual, taller and with slender pods $\frac{1}{2}$ " to $\frac{3}{4}$ " long. Plains to 6,000'.

Nasturtium montanum Wall. ex H. & T. [*Roripa montana* (Wall.) Small]. Very like the last species but smaller, leaves less divided, pods longer, up to $1\frac{1}{2}$ ", seeds oblong, flattened, not wrinkled as in *N. indicum*.

Arabidopsis

(A genus included in *Sisymbrium* in the Flora of British India. The flowers are usually small, white or pink).

Arabidopsis wallichii (H. & T.) Busch. Fairly common in April and May in rocky places from 2-7,000'. There is a rosette of basal, pinnatisect, pubescent leaves and an erect flowering stalk.

Arabidopsis thaliana Heynh. A tiny spring white flowered perennial found from the plains to Ladak in Kashmir. There is a basal rosette of almost entire leaves.

Arabidopsis stricta (H. & T.) Busch. Very common in Murree and the Galis during the monsoon in rocky places from 5-10,000'. Hairs stellate. Flos. white, pink or pale lavender.

Arabidopsis campestris O. E. Schulz. My 9,585 from Barian, Hazara, near Murree was identified by Schulz.

Arabidopsis lasiocarpa (H. & T.) O.E.S. My 12,598, April, 1928 from the same place was also identified by Schulz.

Arabidopsis mollissima (C.A.M.) O.E.S. is a plant which is common on alpine meadows above 8,000'. It is an erect, branching biennial or perennial with oblong, stem clasping, cauline leaves ; upper flos. without bracts. Changla Gali in July.

Microsisymbrium

Microsisymbrium angustifolium Jafri which has been found at Tret, Wah and Abbottabad belongs to a new species described by Prof. Jafri of Khairpur Mirs. from the *Arabidopsis wallichii* complex.

Arabis

Arabis taraxifolia Anders. Margalla and Hasan Abdal (Pir's Mt.) in rocky places in the spring. The rosette of basal leaves is something like that of *Arabidopsis wallichii*. The basal leaves are less pubescent, more coriaceous and interruptedly pinnatipartite. Plants 6-9" tall, annual.

Arabis amplexicaulis Edgew., the largest of the genus in our area, is a forest species, a perennial with fine white flos. growing in forest shade from 4-8,000'. Like most species of crucifer it flowers before the rains.

Arabis auriculata Lam. A small annual covered with stellate hairs, up to 12" tall. The stem leaves have blunt basal lobes, flos. white, pods up to 1-1.2" long Margalla, Pindi Gheb and Abbottabad.

Arabis bijuga Watt. is another perennial *Arabis* near *A. amplexicaulis* but lacking the amplexicaul stem leaves. Murree, Poonch.

Arabis pterosperma Edgew. from the *Arabis alpina* complex in the Flora of British India grows in Poonch and the Pipe Line, Hazara. Plants det. by Jafri.

Arabis pterosperma var. *macrantha* Jafri. Several of my specimens from the Murree Hills have been referred to this new variety by Dr. Jafri. I have not yet seen his description of this or of his other new species and varieties. He is making a special study of this family and is happy to determine specimens sent to him at the Gov't College, Khairpur Mirs.

Arabis glabra (L.) Crantz, (*Turritis glabra* L.) Tall, slender, erect glabrous. Easily recognised by the numerous erect, slender pods parallel to the main stem. Flos. white.

Cardamine

Cardamine impatiens L. Very common in the Murree Hills and Galis in forest shade from 4-9,000'. Note the auricles at the base of the compound leaves as there are none in the next species. The small flos. are white and the pods are nearly erect.

Cardamine flexuosa With. subsp. *debilis* O.E.S. Abbottabad, wet soil.

Cardamine hirsuta L. Abbottabad. Bitter cress is much like the last, the racemed flos. are small, 1/10" in diam. leaves pinnate with 7 lobes, pods erect, 1/2" to 1".

Cardamine macrophylla Willd. with much larger flos. 1/2" in diameter, white to lavender, in wet places is usually found in stream beds in the forest from 7-12,000'. It is reported from Murree by Bamber; Thandiani.

Notoceras

Notoceras bicorne (Ait.) Amoy, (*N. canariense* Br.) is an occasional spring weed belonging to the Mediterranean flora. It somewhat resembles *Euclidium* but this has erect pods about 1/3" long instead of ovate, sharp pointed ones. Fateh Jang, Hasan Abdal, Peshawar.

Alyssum

Alyssum desertorum Stapf. (*A. minimum* of F.B.I.) is a common spring ruderal with tiny yellow flos. growing in both plains and hills.

Malcolmia

Malcolmia africana (L.) Br. Another common Mediterranean ruderal. It has small pink flos. and is found from the plains to Gilgit and Ladak.

Malcolmia cabulica Boiss. (*M. strigosa* Boiss.) Much prettier than the last with pretty pink flos. with crinkly petals. The plants frequently carpet dry, gravelly desert places in the plains in March. Rawalpindi, Attock, Gilgit etc.

Descurainaea

Descurainaea sophia (L.) Webb. (*Sisymbrium sophia* L.) Another very common spring ruderal with finely divided leaves and small yellow flos. Plains and hills.

Sisymbrium

Sisymbrium irio L. A widely distributed spring weed from the Canaries to Kashmir, Rawalpindi, Abbottabad etc. Seeds are called "khubkallan." Pods erect.

Sisymbrium erysimoides Desf. Jafri has referred a specimen from Jhalar, Attock district with shorter pods to this species.

Sisymbrium officinale (L.) Scop. Resembling a *Brassica* with short, erect pubescent fruits. April. Abbottabad ; Ghora Gali (Asghar Ali).

Sisymbrium brassiciforme C.A.M. (*S. columnae* Jacq.) with large mustard like flos. and long slender curving pods up to 4" long has been reported from Rawalpindi by Aitchison. No one else seems to have found it. I have always found it above 7,000' in the inner valleys.

Sisymbrium alliaria Scop. (*Alliaria officinalis* Andrz.). The flos. are white and the plant smells like an onion. It is found in the spring in Abbottabad, Murree and along the Pipe Line.

Sisymbrium loeselii L. Flos. yellow. More branched than *S. brassiciforme*, siliques shorter, stigma 2 lobed.

Erysimum

Erysimum sisymbrioides C.A.M. A small, erect annual, occasionally found in Rawalpindi in dry soil in March. Flos. small, yellow.

Erysimum repandum L. Annual, flos. pale yellow, $\frac{1}{4}$ to $\frac{1}{3}$ in diam. capsules $1\frac{1}{2}$ " to 2" long, linear, nearly square, horizontal, nearly sessile, Nurpur, Abbottabad, flowering in April.

Erysimum hieraciifolium L. An erect perennial found during the rains above 6,000' with orange-yellow flos. in Murree and the Galis by roadsides and forest openings.

Douepia

Douepia tortuosa Camb. (*Moricandia tortuosa* H. & T.) A glabrous, xerophytic perennial with thick fleshy, elliptic leaves ; pods, erect ; flos. large, pink, Jhelum and Attock districts . Sakesar, Khewra etc.

Diplotaxis

Diplotaxis griffithii (H. & T.) Boiss. A small or large desert annual with pretty pink flos. "Barani muli." Attock, Mianwali, Daud Khel, Kohat etc. Often abundant.

Leptaleum

Leptaleum filifolium D.C. A dwarf pink flowered spring ephemeral with filiform leaflets. Attock, Peshawar.

Cheiranthus

Cheiranthus cheiri L. the cultivated " wall flower " is found throughout the area.

Brassica

Brassica nigra (L.) Koch, Black mustard is a large annual with capsules $\frac{1}{2}$ '- $\frac{1}{3}$ "', slender, pressed against the stem, cells 3-5 seeded, beak slender. Abbottabad, Poonch.

Brassica campestris L. The Swedish turnip is commonly cult.

B. campestris L. var. *sarson* Prain. *Sarson* is a very common spring crop in the plains.

B. napus L. (*B. campestris* var *napus*). The *shalgam*. Turnip is a common crop.

B. oleracea L. and its derivatives are commonly cultivated. (1) *ghobi*, the cabbage, (2) *phul ghobi*, the cauliflower (3) *gand ghobi*, Brussels Sprouts.

B. juncea H. & T. is rare in Rawalpindi. The pods are four sided with a slender beak, pedicels long and slender.

Sinapis

Sinapis alba L. (*Brassica alba* H. & T.) Reported from Rawalpindi by Aitchison. The siliques are peculiar with seven ridges on each valve and a flat beak.

Eruca

Eruca sativa Garsault, *Taramira* is widely cult. in poor soils on the plains. The pods are prominently beaked.

Capsella

Capsella bursa pastoris (L.) Medik. A ubiquitous spring weed in the plains and hills. Shepherds Purse.

Coronopus (Senebiera)

Coronopus didymus (L.) Sm., [*Senebiera didyma* (L.) Pers.] A common, prostrate, spring weed in the plains with much smaller silicles than in *Capsella*.

Lepidium

Lepidium sativum L. *Haleon* (Garden Cress) is found cult. and as an escape throughout the area.

L. repens Boiss. (*L. draba* of the F.B.I. fide Jafri). A common gregarious weed in waste places from the plains to 7,000'. Flos. white.

L. pinnatifidum Ledeb. (*L. ruderalis* F.B.I.) Another ruderal found in Abbottabad and Murree like a reduced edition of *Capsella*.

Thlaspi

Thlaspi arvense L. Penny Cress is a weed found from the plains to 10,000'. The siliques are flat and rounded and up to $\frac{3}{4}$ " in diam. Common in Murree.

T. alpestre L. Alpine Penny Cress is common in forest above 7,000' in Murree and the Galis. This is perennial while *T. arvense* is an annual. Schulz seems to call this *T. cochleariforme* D. C.

Neslia

Neslia paniculata Desv. [*Vogelia paniculata* (L.) Hornem.] This is a spring field weed with small yellow flos. and small round siliculas ; from the plains to 7,000'.

Euclidium

Euclidium syriacum R. Br. A spring field weed growing from Central Europe to Kashmir. The flos. are very small and white. The fruits are nearly round, small, erect with a sharp beak.

Raphanus

Raphanus sativus L. *Muli*, the radish, in various forms is commonly cult.

Goldbachia

Goldbachia laevigata (M. Bieb.) D. C. Another common spring field and garden weed with small pink flos. and short terete pods about $\frac{1}{3}$ " long which become deflexed when ripe, Rawalpindi, Attock district, Peshawar.

Chorispora

Chorispora tenella D. C. Another common spring weed in the plains with small but pretty pink flos resembling *Malcolmia* but the pods are beaded, curved and with a long tapering beak. Rawalpindi and the former N. W. F. P.

CAPPARIDACEAE

Cleome

Cleome scaposa D. C. (*C. papillosa* Steud.) A dwarf, plains annual with simple leaves appearing toward the close of the monsoon. The leaves are cordate and scented. The pods are slender and about $1\frac{1}{2}$ " long. Rawalpindi and the former N.W.F.P.

C. brachycarpa Vahl. Another summer annual, leaves with 3-5 leaflets, plants musky, pods short up to $\frac{1}{2}$ ". Plains of Rawalpindi, Attock and the former N.W.F.P.

C. viscosa L. Much larger, leaflets 3-5, flos. yellow, fruits 2-3' long, linear. This is another monsoon annual found from the plains to 7,000'.

Gynandropsis

Gynandropsis gynandra (L.) Briq. (*G. pentaphylla* D. C.) A summer annual, sometimes found during the monsoon with pretty pinky white flos.

Maerua

Maerua ovalifolia Camb. Reported from Topi Park, Rawalpindi by Bamber but I have never found the shrub in this district and Parker does not list it as growing here.

Capparis

Capparis decidua (Forsk.) Edgew. (*C. aphylla* Roth), *Karir*, *karil*, the red flowered, shrub or tree caper is found in the drier desert parts of Rawalpindi, Jhelum, Attock and the former N.W.F.P.

C. spinosa L. unlike the last species is a prostrate species with white flos. which often hangs down from cliffs. The flos. turn pink or red with age. Rawalpindi, Jhelum Attock and the former N. W.F.P. etc.

RESEDACEAE

Oligomeris

Oligomeris glaucescens Camb. A spring, desert annual, erect with linear leaves and a spike of minute greenish white flos. and very small 4 lobed membranous capsules. Found in the plains of Rawalpindi and adjacent districts.

VIOLACEAE

Viola

Viola caespitosa D. Don, (*V. patrinii* of F.B.I.). This purple violet is common in the spring from 4 to 9,000', usually in sunny places. The leaves are longer, often several times longer than they are wide. Abbottabad, Murree Hills and the Galis.

V. serpens Wall. is a common spring forest species with runners which elongate during the summer. It is much like the next species but this species is practically glabrous and the flowers tend to be larger and darker in colour. Usually above 6,000' in Murree and the Galis.

V. canescens Wall. This is much like the last but starts at lower altitudes and grows in drier places from 4,000' up. The leaves are pubescent and the flos. paler.

V. stocksii Boiss. is a plains species with smaller flos. streaked with white, flowering in March. Rocky desert places in Rawalpindi and adjacent districts.

V. odorata L. and *V. tricolor* L. the pansy, are widely cult.

BIXINEAE

Flacourtia

Flacourtia indica (Burm. f.) Merrill, (*F. ramontchi* L' Herit.), *kakoh* or *kakoa*, is a small thorny tree in the sub-Himalayan zone from 2-4,000' blooming in April from the Indus eastwards. Not rare.

Xylosma

Xylosma longifolium Clos. *Batti* is a tree of moist ravines of the foothill zone to 5,000'. The leaves dry black. Saidpur, Nurpur, Kahuta etc.

Casearia (under Samydaceae in Parker)

Casearia tomentosa Roxb. *Cheela* or *bhilla* is another foothill plant found to about 3,500'. The leaves are poisonous. Saidpur, Chattar.

PITTOSPORACEAE

Pittosporum

Pittosporum nepaulensis (D.C.) Wilson & Rehder, (*P. floribundum* W. & A.), Kulthea Reserve (Parker).

POLYGALACEAE

Polygala

Polygala abyssinica R. Br. ex Fresen. (*P. gerardiana* Wall.) This pink flowered species is found on dry, steep banks from April to autumn and from 2-8,000'.

P. hohenackeriana F. & M. is a spring, desert species found from Armenia and the Caucasus to the former Punjab. The flos. are white and green.

P. erioptera var. *vahliana* D. C. is a small erect hot weather annual with variable leaves, often very narrow, flos. small, seeds very hairy. Plains.

P. chinensis L. Much like the last but prostrate or leaning, racemes axillary, yellowish green. Plains to 5,000' ; Abbottabad.

P. monopetala Camb. (*P. sibirica* of F. B. I.) with bright blue flos. is usually found above 7,000'. Changla Gali, Poonch, Sakesar in the Salt Range.

CARYOPHYLLACEAE

Dianthus

Dianthus caryophyllus L. The clove pink with white flos. grows at Attock in dry gravelly soil.

D. crinitus Sm. is another xerophytic species flowering in April. Flos. white and petals deeply fimbriate. Rawalpindi, former N.W.F.P.

Velezia

Velezia rigida L. A dwarf spring plant, erect, suggesting an attenuated *Dianthus* with the calyx long, and narrow for its width. Attock district; former N.W.F.P., Swat.

Gypsophila

Gypsophila cerastioides D. Don with white flos. and veins streaked with pink grows in rock crevices or gravel soil, usually above 8,000'. Mokhshpuri, Miranjani, Thandiani.

Saponaria

Saponaria vaccaria L. Much branched with pretty pink flos. is a field weed in the plains and hills and is also cultivated in gardens.

Silene

Silene inflata Sm. ; (*S. cucubalus* Wib.); *S. venosa* (Gilib). Aschers.) This common temperate perennial with white flos. and glaucous inflated calyx is usually found from 4-11,000'. Murree, Abbottabad and the Galis.

S. conoidea L. is a common spring annual of grain fields in both the plains and the hills. The flos. are pink and the calyx is long and conical.

S. araneosa C. Koch. A dwarf much branched, sticky annual growing in the plains in stream bed sand and mineral soil. Armenia to the former Punjab, Rawalpindi, Attock etc.

S. rubella L. is reported by Aitchison, (April 1871) but I have not found it.

Cucubalus

Cucubalus baccifer L. A forest plant with greenish white flos. and bearing dry black berries is found from 5-8,000'. Plants prostrate, Murree, Changla, Upper Topa etc.

Lychnis

Lychnis cachemiriana Royle. Murree, Changla Gali. Flos. white, leaves usually linear-lanceolate.

L. coronaria (L.) Desr. Plants white hoary all over and bearing large reddish pink flos. Abbottabad (N. Ali).

L. indica var. *fimbriata* (Royle) Edgew. Flos creamy white inside and purplish outside, leaves broader than in *L. cachemiriana*. Petals longer than the calyx, segments two lobed and deeply fimbriate. Changla (Douie), Thandiani.

Lychnis nutans Bth. is reported from Murree by Duthie. It is much like the last but the petals about equal the calyx, the segments entire with very little fringe.

Cerastium

Cerastium triviale Link, (Under *C. vulgatum* in F. B. I.) Murree and the Galis. Common along forest paths and open places.

C. viscosum L. (*C. vulgatum* var. *glomeratum* Thuill.), Abbottabad, Murree, Thandiani. Close to the last but leaves shorter and more ovate and more glandular.

C. dichotomum L. A spring annual, erect, branched and hairy. Abbottabad; former N.W.F.P.

Stellaria

Stellaria aquatica (L.) Scop. Large, perennial, prostrate up to 36" long, Murree.

S. media (L.) Cyr. Chickweed, a much smaller plant, is a common weed in shady places from the plains to 12,000'.

S. davidi var. *himalaica* Franch. (*S. bulbosa* of F.B.I.) is an interesting early flowering forest plant in April and May. There are small tubers on the roots. After flowering the plants increase much in size. Murree, Changla.

Arenaria

Arenaria serpyllifolia L. is a small, usually prostrate, branching annual, very common in both plains and hills. A smaller, more xerophytic, more erect form has been separated out as *A. leptoclados* Guss.

A. meyeri Boiss. This has only been found at Jhalar, Attock district by Nasir. It is an erect, spring desert weed with a strongly veined calyx; former N.W.F.P.

A. holosteoides Edgew. [*Leptodictis holosteoides* (Edgew.) Fenzl.] is a long, prostrate, tangled white flowered weed which grows in grain fields in the spring. The leaves are linear and the calyx very glandular hairy. Tret, Poonch, Swat etc.

Sagina

Sagina apetala L. A tiny ephemeral spring annual of the plains and lower hills.

S. saginoides (L.) Karst. Thandiani. A small prostrate perennial 2-6" long, flos. white, 1/8" ; leaves 1/4 to 1/3", cylindrical, united at base into thin sheath.

Spargula

Spargula arvensis L. This is a spring weed about cultivation in the plains and hills with half cylindrical leaves in opposite clusters. Leaves grooved below. Flos. white.

S. pentandra L. Like the last but styles 3 not 5; leaves not grooved below, seeds broadly winged instead of keeled or narrowly winged.

Spergularia

Spergularia rubra (L.) Pers. (*Spergula rubra* L.) Like the last two but the linear leaves are in pairs, not numerous at each node, flos. pink or white, seeds not winged. Rawalpindi, Attock, Peshawar.

PORTULACACEAE

Portulaca

Portulaca oleracea L. *Kulfa*, lunak, is a common yellow flowered succulent leaved plant with yellow flos. in hills and plains.

P. quadrifida L. Another succulent, confined to dry places in the plains and lower hills with much smaller succulent leaves and with a conspicuous ring of long white hairs as stipules. Rawalpindi, Attock, Abbottabad, Margalla etc.

TAMARICACEAE

Tamarix

Tamarix articulata Vahl. *Pharwan* or *farash* is one of the few trees which will grow on saline or alkaline soil. Occasional in Rawalpindi and Attock districts.

T. dioica Roxb. *Pilchi*, *lei*, *jhau* is a dwarf tamarisk which grows on the banks of the Jhelum, Ravi etc., to 2,500'. 6-7' tall.

T. troupii Hole, (*T. gallica* of F.B.I.) Much larger; up to 30' tall, bracts shorter than the flos.; longer in the last sp. Dhok Pathan on the Soan River, Attock district.

HYPERICACEAE

Hypericum

Hypericum cernuum Roxb. A small shrub on steep rocky banks from 3-7,000' with fine yellow flos. 2" in diam. Abbottabad, Murree, Sakesar.

H. dyeri Rehder, (*H. lysimachioides* F. B. I.). This is also a small shrub growing on cliffs. The flos. and capsules are smaller and the calyx lobes are nearly linear, not ovate. Changla Gali to Dunga Gali.

H. perforatum L. Common perennial herb with pretty yellow flos, 3-10,000', in open places.

H. elodeoides Choisy, is another perennial herb but it is not common in our area. It is a forest species easily distinguished by the fringe of glands on the calyx. Thandiani, 8,000'.

MALVACEAE

Lavatera

Lavatera kashmiriana Camb. Wild hollyhock with handsome pink flos. blooms in August, Changla Gali, Dunga, Nathia, Thandiani etc.

Malva

Malva verticillata L. A common weed about cultivation in plains and hills with small pink flos. in nearly sessile, dense axillary clusters.

M. neglecta Wallr. (*M. rotundifolia* of F.B.I.). *Saunchal* is a common prostrate herb with a similar distribution. The flos. are larger.

M. parviflora L. *Saunchal*. Common in the plains and Abbottabad. The petals scarcely exceed the sepals ; calyx spreading in fruit.

M. sylvestris L. An erect plant with larger pink flos. 1½" in diam. is planted in gardens. Aitchison reported it as growing in cotton fields.

Malvastrum

Malvastrum coromandelianum (L.) Garcke, (*M. tricuspidatum* A. Gray). A common tropical weed in the plains often abundant in shady places. Flos. yellow.

Sida

Sida veronicaefolia Lamk. Another tropical weed of the plains and lower hills. The leaves are ovate, base heart shaped ; hairy. Carpels 5.

S. rhombifolia L. Plains and lower hills, carpels 7-10. A small erect undershrub, rough with stellate hairs, producing a good fibre.

S. rhombifolia L. var. *obovata* (Wall.) Masters. Plains and hills to 6,000'. Leaves broadly obovate. Peduncles usually less than half the length of the leaves. This also yields a good fibre.

S. grewoides Guill. and Perr., is an erect grey-tomentose undershrub with variable leaves, obtuse, crenate, downy on both sides, base 5 nerved growing in very dry places in the plains, Jhelum, Rawalpindi and Attock districts.

Abutilon (See key in Parker)

Abutilon indicum (L.) G. Don. Carpels 15-20, pointed. Ripe carpels .3-.5 inches long is common in weedy places in the plains and lower hills. Yields a good fibre.

A. bidentatum Hochst. Has a similar distribution. The stems are green, carpels smaller, .25-.3" long.

A. ramosum Guill. Carpels, 8-10 ; .3" long, hairy with spreading beaks .1" long. Another plains plant. Rawalpindi. Leaves green, membranous, glabrescent.

A. fruticosum Guill. Carpels 8-10 ; leaves hoary, carpels not beaked or awned. Fairly common in Jhelum and Attock districts.

Abutilon molle Sweet. Easily recognised by its coat of long spreading hairs and leaves up to 7" long, ovate and deeply cordate, is cult. in the plains and also is self sown. Rawalpindi, Lahore.

Hibiscus

Hibiscus trionum L. is a weed of cultivation found up to 6,000' with pretty yellow flos. with a dark purple centre. Murree, Gharial etc.

H. gibsoni Stocks is a perennial scrambler in the dry plains and low hills with many slightly prickly branches, 3-7 lobed leaves and handsome flos., like the last but larger ; 2½" in diam., Sakesar, Margalla, Kala Chitta Hills, Khairi Murat etc.

H. esculentus L., *bindi tori* or Lady's Fingers is commonly cult.

H. cannabinus L. *Sanukra* is a tall prickly plant with large creamy yellow flos. and dark centres is often planted along field borders in the plains. It is useful as a fibre plant.

H. micranthus L. f. is a small xerophytic shrub with broadly ovate leaves, unlobed. Flos. .6" white, fading to pink. Hasan Abdal, Khairi Murat etc.

H. solandra L. is an annual of the plains and lower hills with rather small flos. ; white, yellow or pink up to ¾", solitary in a loose terminal raceme. Rawalpindi, Sakesar at 4,000'.

H. ficulneus L. A large, prickly branched annual with white flos. and a pink centre was reported by Aitchison but I have seen no specimen.

In addition to the above *H. rosa sinensis* L., the Shoe Flower ; *H. mutabilis* L. a large shrub with handsome, double rose like flos. and *H. syriacus* L. are very commonly cult. in gardens.

Gossypium

Gossypium herbaceum L. Cotton is not an important crop in Rawalpindi district.

Kydia

Kydia calycina Roxb.—*Pulla, pullian* is a fairly common tree along the foothill zone. Saidpur, Nurpur, Tret etc.

Salmalia (**Bombax** in F.B.I. and Parker).

Salmalia malabarica (D.C.) Schott and Endlicher ; *sumbal, simul*, is occasionally cultivated in the plains and is wild in the foothills from Hazara eastward. Large red flos. in Feb. and March. Placed in Bombacaceae by some botanists.

STERCULIACEAE

Sterculia

Sterculia villosa Roxb. A small tree with leaves shaped like a maple is occasional in the lower hills. Saidpur Hills.

S. diversifolia G. Don is cult. on the Mall etc. in Rawalpindi.

Helicteres

Helicteres isora L. *Maror phali*, a plant which furnishes a good fibre grows in the Saidpur Hills and Aitchison found it at Barakao. Recognised by the twisted fruit.

Pterospermum

Pterospermum acerifolium Willd. Cult. in Rawalpindi.

Melhania

Melhania futteyporensis Munro.—A hoary pubescent undershrub growing in the driest rocky hills bears pretty yellow flos. in March and at the end of the monsoon; Margalla Tret, Saidpur Hills, Kala Chitta Hills, Salt Range.

TILIACEAE

Grewia (See key in Parker)

Grewia optiva J. R. Drum. ex Burret, (*G. oppositifolia* Ham.) *Dhaman, salat* is a foothill tree with three lobed leaves, ovate, thick, pubescent. Rawalpindi, Murree road.

G. elastica Royle, is a small tree, 5-7 nerved leaves, rounded or slightly cordate at the base, Indus east to 3,500' (Parker). Rawalpindi. Not common.

G. hainesiana Hole, Indus east to 3,000' (Parker) Leaves usually deeply cordate.

G. hirsuta Vahl var. *helicterifolia* (Wall.) Indus East to 4,500', Salt Range. I have not seen any in Rawalpindi.

G. damine Gaertn. (*G. salvifolia* Heyne ex Roth) is a xerophytic shrub, up to 12' tall with hoary grey tomentum below, dark green above and twice or more times as long as broad. Rawalpindi, Saidpur Hills, Sakesar.

G. tenax (Forsk). Aschers, and Schweinf.), (*G. populifolia* Vahl.) is another xerophytic shrub found from tropical Africa and Arabia to Rawalpindi and Hazara. The leaves are nearly as broad as long, glabrous or nearly so when mature, petioles slender. Attock, Topi Park, Rawalpindi, Saidpur Hills etc.

G. villosa Willd. is another small xerophytic shrub up to 6' high, leaves orbicular up to 3" long with tufts of hairs at the tips of the teeth in young leaves. Salt Range, Kala Chitta Hills, Attock district.

G. sapida Roxb. Indus east to 3,500', Pindi and Hazara (Parker) in the *chir* zone.

G. asiatica L. *Phalsa* is occasionally cult. in the plains.

Triumfetta

Triumfetta bartramia L. (*T. neglecta* W. and A.) is an annual monsoon weed in the plains bearing small fruits .2" long ovoid, covered with hooked spines.

Corchorus

Corchorus olitorius L. is a wild form of one of the cult. jute plants with capsules 2" long, beaked, 10 ribbed. Fairly common after the rains in plains and lower hills.

C. trilocularis L. with a similar range has pods up to 3" long, more slender, beak short, undivided. Ditto, resembling the last but the leaves are more linear, capsule with three spreading points.

C. acutangulus Lam. Ditto but ascends the hills to 4,000'. Leaves broader and capsules bearing three wings. Topi Park, Rawalpindi, Abbottabad.

LINACEAE

Linum

Linum usitatissimum L. *Alsi*, flax, with pretty blue flos. is commonly cult.

L. strictum L. var. *corymbulosum* Planch is a plant of dry gravelly soil in the spring with small yellow flos. Rawalpindi, Wah, Margalla, Attock district, Gilgit etc.

Reinwardtia

Reinwardtia trigyna Planch, *Basanti* is a common spring flower in the plains and sub-Himalayan zone in rock crevices and stony places. Pretty yellow flos. Feb. to Apr.

MALPIGHIACEAE

Hiptage

Hiptage madablota Gaertn.—[*H. benghalense* (L.) Kurz] is a large climbing shrub with handsome white and yellow flos. in April in the sub-Himalayan zone. Nurpur, Chhattar Bagh.

ZYGOPHYLLACEAE

Tribulus

Tribulus terrestris L. *Bhakhra*, puncture vine, a noxious yellow flowered, prostrate weed with sharp angled fruits is common in some places. The plains, Gilgit, Skardu.

T. alata Delile is much like the last but grows in more arid areas. The fruit is not spiny but bears toothed wings. Jhalar, Attock district ; former N.W.F.P.

Fagonia

Fagonia cretica L. A small, very spiny desert plant with pretty pink flos. from the Mediterranean to N. W. Pakistan ; Jhelum, Attock, Rawalpindi districts ; former N.W.F.P. etc.

Peganum

Peganum harmala L. *Harmal* is very common in waste places and roadsides with pretty white flos. in April. Distribution much the same as *Fagonia* and *Tribulus terrestris*.

GERANIACEAE

Geranium

Geranium wallichianum D. Don, *Rattan jot* is very common in thin forest in the Murree Hills and Galis, usually above 5,000' It has fine large purple flos. and is easily recognised by its large ovate stipules.

G. nepalense Sw. is a very common, prostrate perennial with flos. about $\frac{1}{2}$ " in diam. pink and growing from 4 to 9,000' in the Murree Hills and the Galis.

G. rotundifolium L. is an inconspicuous annual with small flos. found in the plains in the spring, ascending to 9,000'. The carpels are wrinkled and the seeds reticulately pitted.

G. robertianum L., including *G. lindleyanum* Royle, is a strongly scented, succulent herb with swollen nodes and small pink flos. growing in the shade, Murree, Changla.

G. lucidum L. a similar species but much more common, bearing small pink flos. with an angled calyx. The carpels are transversely rugose, falling off with the smooth seeds inside. Murree Hills, Changla, Poonch, 6-9,000'.

G. ocellatum Camb. var. *himalaicum* R. Knuth is easily recognised by the scarlet flos. with a dark centre and long hairs on the calyx, 2-7,000'.

Oxalis

Oxalis corniculata L. *Kat mat* is a common herb on dry banks and roadsides from 2 to 9,000'.

O. latifolia H. B. K., with pink flos. is an escape in Murree.

O. pes caprae L. with yellow flos. and *O. corymbosa* DC. with pink flos. are becoming naturalised in shady places in the plains.

Erodium

Erodium malacoides (L.) Willd. is a common prostrate herb growing in the plains in March, Rawalpindi and Attock districts, Abbottabad.

E. cicutarium (L.) L'Herit. with leaves divided into filiform leaflets and with small pink flos. is found from the plains to 9,000' in the Galis.

E. stipaceum Edgew. with leaves lobed, or pinnately divided and round toothed, with fruits 3-4" long, beaked and with yellow hairs grows at Dhok Pathan in Attock district and in the former N.W.F.P.

Impatiens

Impatiens balsamina L. Balsam or Touch-me-not is found from 3-6,000' bearing pink flos. which are borne singly and blooms at the close of the monsoon. Murree road, Poonch.

I. glandulifera Royle, (*I. Roylei* Walp.) with leaves arranged in whorls and bearing large red flos. is gregarious on steep hillsides in the Galis in Changla, Dunga, Nathia.

I. gigantea Edgew., (*I. sulcata* Wall.). Nepal to Marri (F.B.I.) has fine large flos. like the last but the leaves are not in whorls. The leaves are more connate and the capsules longer, narrower and more inclined. Some consider this to be a form of the last. Changla Gali.

I. edgeworthii Hk. f. This common yellow species with the lower petals somewhat paler is very common in Murree and the Galis during the rains. Gregarious.

I. bicolor Royle, (*I. amphorata* Edgew.), grows in Murree and Changla Gali on shady banks with pretty rose and yellow flos.

I. parviflora D. C. (Previously identified as *I. micranthemum* Edgew.) In the Galis there is a large balsam with small nearly white flos. often with a tinge of pink and a spur about $\frac{1}{4}$ " long, usually in partial shade. Douie identified it as *I. micranthemum*.

I. brachycentra K. and K. This is the smallest flowered balsam and the commonest in most places from 6-9,000'. The flos. are white and it is almost spurless.

I. flemingii Hk.f. Flowers pretty pink and white with a long spur up to $1\frac{1}{2}$ " and leaves with sharp teeth. Changla Gali; Kalapani, Hazara by stream.

RUTACEAE

Boenninghausenia

Boenninghausenia albiflora Hk., *Pissu mar* is a white flowered perennial, blooming in late August. It grows in forest shade from 6-9,000' and has a strong unpleasant smell. Hazara to the Philippines.

Zanthoxylum

Zanthoxylum alatum Roxb. *Timbar* is a xerophytic thorny shrub of the foothill zone with greenish yellow flos. in April. The twigs are used as tooth sticks.

Skimmia

Skimmia laureola Sieb. and Zucc. *Ner* is a gregarious shrub growing as undergrowth in forest and usually above 7,000' with *Viburnum*. Common in the Gali. It bears white flos. in April and May and red berries in the autumn.

Murraya

Murraya paniculata (L.) Jack, (*M. exotica* L.) *Kamini*, bearing sweet scented white flos. in the spring is cult. in Rawalpindi and less commonly *M. koenigii* Spreng, Curry Leaf.

Citrus

Citrus acida Roxb., the *khatta* ; *C. grandis* Osbeck, (*C. decumana* Murr), the pomelo and *C. sinensis* Osbeck, the Malta, are planted in a few places in the plains and lower hills but except for some orchards near Taxila there is not much citrus cultivated in Rawalpindi.

MELIACEAE

Melia

Melia azedarach L. The *drek* or *bakain*, Persian Lilac, is cult. in most villages in the plains and is common as a roadside tree up to 4,000'.

Cedrela

Cedrela toona Roxb. The *toon* tree is planted in Rawalpindi and Abbottabad.

C. serrata Royle, *Drawa* or *drawi*, the Hill *Toon* is usually found in shady ravines between 4 and 8,000'. It has very large pinnate leaves and the huge drooping inflorescence is up to 5' long. Abbottabad, Murree.

SIMARUBACEAE

Ailanthus

Ailanthus altissima (Mill.) Swingle, (*A. glandulosa* Desf.) This Chinese tree is cult. Abbottabad and is spreading in Nathia Gali.

ILICACEAE

Ilex

Ilex diphyrena Wall. *Kanderu*, Holly, is found occasionally in damp shady ravines in the forest from 5-8,000'. Lower Topa, Gharial etc.

CELASTRACEAE

Euonymus

Euonymus pendulus Wall., Murree Hills, 3-8,000'. A tree with leathery, evergreen leaves and sharp teeth. The seeds have a scarlet aril. Patriata, Ghora Gali etc.

E. hamiltonianus Wall. *Siki*, growing from 4-9,000' is the commonest of the spindle-woods. The leaves are deciduous, the bark is corky and pale grey, the capsules are lobed. Murree Hills and the Galis, fairly common.

E. lacerus Buch Ham. Leaves deciduous and more ovate with sharply doubly serrate teeth. The capsules are winged. Murree, Gharial and the Galis. 7-10,000'.

Gymnosporia

Gymnosporia royleana Wall. *Pataki* is one of the commonest shrubs about Rawalpindi and in the lower hills. Like dwarf *Ziziphus* it is much nibbled by animals.

Elaeodendron

Elaeodendron glaucum Pers. *Morindu* is found occasionally in the *chir* zone, Panjar.

RHAMNACEAE

Rhamnus (See key in Parker).

Rhamnus pentapomica Parker is a shrub or small tree, branches often ending in a thorn, flos. 4 parted, leaves and branches alternate, 2-5,000', Salt Range, Attock and Rawalpindi districts in dry rocky places.

R. virgata Roxb. is like the last but the leaves and branches are opposite or sub-opposite. Common in mixed forest in the Murree Hills and Galis from 5-8,000'.

R. triquetra Wall. A small tree, unarmed and flos. pentamerous; leaves subcoriaceous, shoots tomentose, cymes racemed. Sometimes ascends to 6,000'. Tret, Abbottabad. When dried the lower side of the leaves has a peculiar yellowish tinge.

R. purpurea Edgew. Another forest shrub like the last but the leaves are membranous, shoots purple, cymes sessile. 6-10,000' in damp shady places. Murree and the Galis. Common in Dunga.

Ziziphus

Ziziphus mauritiana Lam. (*Z. jujuba* Lamk. non Mill.) The tree 'ber' is cult. in every village in the plains. The leaves are glabrous above and velvety tomentose below. Parker, p. 83, describes varieties.

Z. mauritiana var. *fruticosa* Haines. Thin stemmed, growing in patches in grassy places in the plains.

Z. mauritiana var. *spontanea* Edgew. is wild, growing in the sub-Himalayan scrub forests with yellow or orange fruits $\frac{1}{2}$ " in diam.

Z. nummularia W. and A. *Beri, jhari* is very common and very xerophytic. The leaves are pubescent above and below and the fruits are .3" in diam., red or black. The branches are used for fencing and the leaves for fodder.

Z. oxyphylla Edgew. *Phitni, amlai* has leaves glabrous or nearly so, acuminate, spines slender; a shrub. Flos. June to September, 2-6,000' Indus eastward. Tilla, Tret, Saidpur Hills, Abb. etc.

Z. sativa Gaertn. (*Z. vulgaris* Lamk.) *Unab, baryan* is a glabrous leaved shrub or tree with ovate lanceolate, obtuse leaves, usually spiny. 2-6,000'. Fruits .8" long.

Z. hysudrica Hole. *Seo ber*. This is a large tree with leaves glabrous below. It is commonly grafted. Plains to 4,000'.

Berchemia

Berchemia floribunda (Wall.) Brongn. is a large shrub with flos. in axillary panicles from the Indus east to 4,500' (Parker). I have found it in Poonch.

B. lineata (L.) DC. is a small shrub with flos. in axillary fascicles, 4,500-9,000' in shady places on rocks. Not rare in the Galis and on the Pipe Line, Poonch, Hazara.

Sageretia

Sageretia filiformis (Roth) G. Don, (*S. oppositifolia* Brongn.) A large scrambling shrub with lateral nerves prominent, 5-8 pairs, leaves 1.5-4" long. Tret, Garhi, Poonch Indus east to 6,000' (Parker).

S. theezans Brongn. var. *brandrethiana* (sp.) Aitch. *Gangher* is common about Rawalpindi and the sub-Himalayan tract and west to Arabia. The leaves are white below, lateral nerves not prominent, 3-4 pairs, leaves .3-2" long.

S. theezans (L.) Brongn. is less common than the variety, with leaves green below. There are intermediates. Poonch, Abbottabad, Swat.

Helinus

Helinus lanceolatus (Wall.) Brandis. A large, glabrous climber with terminal tendrils, leaves alternate, lanceolate, entire, base rounded, three nerved. Flos greenish yellow small; in April. Sakesar, Saidpur, Nurpur, Chattar Bagh, Poonch, etc.

Vitaceae (Ampelidae) Key after Parker

Vitis

Leaves Simple

Leaves 2-3" long, plant with tendrils

V. parvifolia

Leaves 2-4" long, plant without tendrils

V. persica

Leaves 3-7" long

Petals cohering ; leaves with deciduous tomentum below

V. vinifera

Petals free or cohering, leaves with dense tomentum below

V. lanata
(*V. Jacquemontii*)

Leaves palmately trifoliate, stems woody

Inflorescence terminal, rarely leaf opposed, without tendrils

V. semicordata

Leaves pinnately trifoliate, stems herbaceous, flattened

V. trifolia

Leaves pedately trifoliate

V. capreolata

Vitis parvifolia Roxb. 4-7,000' from Swat eastward. Abbottabad, Ghora Gali, Poonch etc.

V. persica Boiss. *Gidhar dhak* is common in Hazara, Baghnotar, Jhelum Vy. Road, Poonch.

V. vinifera L. Cultivated sparingly throughout the area.

V. Jacquemontii Parker (*V. lanata* F.B.I.). The abundant tomentum on the leaves becomes rust coloured with age. Baghnotar, Murree, Uri, Poonch 4-8,000'.

V. semicordata Wall. 6-10,000' is fairly common in Murree, along the Pipe Line and in the Galis, climbing on cliffs in shady places.

V. trifolia L. *Rattan bel* is common in the plains and lower hills growing from a tuberous base and scrambling over trees. Common in hedges. Rawalpindi, Tret, Saidpur Hills, Poonch, Abbottabad.

V. capreolata D. Don. 3-7,000' ; Indus east (Parker).

Leea

Leea aspera Wall. ex. Roxb. A large perennial herb or undershrub with black, grape like berries .3-.4" in diam. To 6,000' Indus east (Parker) I have specimens from Poonch but none from Rawalpindi.

SAPINDACEAE

Cardiospermum

Cardiospermum microcarpum Kunth. A sub-tropical annual with winged capsules climbing among bushes, fruiting at the close of the monsoon. Mt. Tilla, Sakesar, Rawalpindi, Poonch etc.

Acer Maple (Key after Parker)

Leaves undivided, entire

A. oblongum

Leaves 3-(5) lobed, bluntly toothed

A. pentapomicum

Leaves usually five lobed, pale beneath, margins serrate

A. caesium

Leaves 5-7 lobed, margins entire

A. pictum

A. oblongum Wall. Indus east to 6,000' (Parker) is cult. in Rawalpindi and Poonch. It is a plant of moist ravines.

A. pentapomicum J.L.S. is the most xerophytic of our maples. Fairly common in the Jhelum Vy. from Kohala to 5,000'. Reported from Gainthal at 2,500' by Jerram. It is also found in Poonch.

A. caesium Wall. is common in Murree and the Galis from 6-10,000' and the trees are sometimes of great size. *Tarkhan, trekhana, till patthar.*

A. pictum Thunb. (*A. cultratum* Wall.). According to Rehder the correct name for this tree is *A. cappadocicum* Gled. var. *indicum* (Pax) Rehder. It grows from Trans-Indus to Japan and is common in Murree and the Galis.

Dodonaea

Dodonaea viscosa (L.) Jacq. *Sanatha* is very common in the sub-Himalayan tract and will grow on denuded soils where little else can survive. It is much appreciated as firewood and is used for hedges in Rawalpindi where there is little water.

HIPPOCASTANACEAE

Aesculus

Aesculus indica Colebr.—*Ban khor*, the horse chestnut, is a fine tree which is common in temperate forest in the Murree Hills and the Galis with Acer, Prunus and other broad leaved trees. It is much lopped for fodder.

STAPHYLEACEAE

Staphylea

Staphylea emodi Wall.—*Chitra, nagdaun* is a large deciduous shrub with pale whitish reticulations on the bark and bearing large inflated bladder like capsules 2 to 2½" long. The Snake Stick. It is found in forest undergrowth from 6-9,000' in Murree and the Galis and Thandiani.

SABIACEAE

Meliosma

Meliosma pungens Wall. An uncommon tree in the W. Himalayas with large oblanceolate leaves, lateral nerves curved, teeth few, distant, young shoots rusty pubescent. 3-7,000' Indus eastward (Parker). Kahuta; Nawal Nadi, Poonch; Siran Vy. Hazara.

ANACARDIACEAE

Rhus, Sumac (Key after Parker)

| | |
|--|---|
| Leaves simple | <i>R. cotinus</i> |
| Leaves pinnate | |
| Rachis winged, at least near tip, leaflets toothed | <i>R. chinensis</i> (<i>R. semialata</i>) |
| Rachis not winged, leaflets mostly entire, panicles terminal | <i>R. punjabensis</i> |

Rhus cotinus L. (*R. coggyria* Scop.) *Bhan, tung*, Smoke Bush is common, growing in the open in sunny places from 3-6,000'. Murree, Poonch, Hazara.

R. chinensis Miller (*R. semialata* Murr.). Indus east, 3-7,000' (Parker) Murree Hills, Gharial, Kuldana etc., Poonch, Hazara.

R. punjabensis Stewart ex Brandis. *Tatri*, Indus east 4-8,000' Murree, Gharial, Poonch. A plant of moist ravines with a corrosive juice.

Mangifera

Mangifera indica L. The mango is occasionally planted in the plains of the district.

Lannea (Odina)

Lannea coromandelica (Houtt.) Merrill.—(*L. grandis* Engl.) ; (*Odina woodier* Roxb.). Fairly common in the foothill zone from 2-4,000'. The twigs are thick and the leaves are large and pinnate but the leaves do not develop until well into the warm weather. The small flos. appear while the tree is leafless. Punjab, 17th mile Murree Road, Saidpur Hills.

Pistacia

Pistacia integerrima Stewart ex Brandis, *Kakkar, kakkar singi* is a common and handsome tree from the plains to 5,000'. The pinnate leaves are red when new and the trees can be picked out on the hillside from a distance. Large galls often form on the inflorescence which are considered to be medicinal.

Schinus, False Pepper Tree.

Schinus molle L. This tree, adventive from Mexico to Chile is very hardy and is often cult. in the plains in Rawalpindi, Taxila etc.

CORIARIACEAE

Coriaria

Coriaria nepalensis Wall., *Kalan, balel* is a dwarf, pioneer shrub about Murree and the Galis growing in rocky places 3-8,000'. The blue berries are purgative and harmful if too many are eaten.

MORINGACEAE

Moringa

Moringa pterygosperma Gaertn (*M. oleifera* Lam) the *soanjna* or Horse Radish tree is sometimes cult. in the plains.

LEGUMINOSAE

Papilionatae

Argyrolobium

Argyrolobium flaccidum Jaub. and Spach. A prostrate herb (listed as a shrub by Bamber) with three leaflets and yellow flos., in grass from the plains to Murree. The form growing in gravelly places about Pindi, Margalla and Wah with narrower leaflets, whiter and more silky, might well be called var. *lanceolata*.

A. roseum J. and S. This is a prostrate pioneer on gravel slides, or dry places in the plains and lower hills with red flos. Riwat, Saidpur, Murree road; above Kohala, Abbottabad etc.

Lotononis

Lotononis lebordea Bth. A dwarf prostrate annual of the arid zone with small, pale yellow flos. and small fruits. Jhelum and Attock districts; Peshawar.

Crotolaria

Crotolaria burhia Ham. A small sand and desert shrub with yellow flos. Campbellpur, Salt Range, Pabbi Hills, former N.W.F.P.

C. mysorensis Roth. A densely silky annual; 6-9 flos. in a raceme, Wah, Ghora Gali, Poonch.

C. albida Heyne is hardly a shrub as listed by Bamber; leaves 1-2", gland dotted, flos. 1/3" yellow, in terminal racemes, pod 1/2 to 5/8", twice as long as the calyx, from the plains to 7,000' Jhelum Vy. Rd., Sakesar, Hazara, Poonch.

C. ferruginea Grah. Manshra in Hazara. Stipules lanceolate, spreading, racemes laxly 2-8 flowered, bracts small, linear, pods glabrous 1 to 1 1/4" long, plants finely silky or shaggy.

C. sessiliflora L. Ghora Gali in Oct. An annual from the plains to 6,000; leaves 2-6" linear or lanceolate; flos. 1/3", blue; racemes 6-9" bracts and bracteoles bristle like, flos. not projecting beyond the calyx, pods short deflexed, 1/2".

C. prostrata Roxb. Perennial, trailing covered with silky brown hairs, lvs. oblong ovate; flos. 1/5" in 2-4 flowered racemes; pods 1/2" oblong; plains to 6,000', Garhi Habibullah, Hazara.

C. sericea Retz. (*C. retzii* Hitchcock) Aitchison's 297, Rawalpindi. A large perennial, leaves 2-6 by 1 to 3" ; flos. $\frac{3}{4}$ to 1", in long terminal racemes of 20-40 yellow flos. ; pods $1\frac{1}{2}$ to 2" long.

C. juncea L., the *sunm* hemp, used for cordage is cult. here and there in the plains.

C. medicaginea Lamk. with 3 leaflets, not simple leaflets as in the other *Crotolarias*, is a common, weedy spring perennial. A vigorous form has been called var. *luxurians*. Pods small, globose, $1/7$ " long ; plains to 5,000'.

Trifolium

Trifolium resupinatum L. *Shaftal*, *shatal*, with pink flos is cult. for fodder here and there in the foothill zone.

T. alexandrinum L., *Berseem*, Egyptian clover is sometimes cult. The flos. are white and the heads are longer than broad. Rawalpindi, Khanna.

T. repens L. is the common wild clover from 4 to 9,000'. Flos. white.

T. pratense L., Red clover, with much larger heads, is sometimes found at Murree.

T. minus Sm. Small pink heads. (Asghar Ali). 6-7,000'.

Trigonella

Trigonella emodi Bth. var. *medicaginea* Sirj. Erect, 3 leaflets, smooth, pods straight, $\frac{1}{2}$ - $\frac{3}{4}$ by $1/6$ - $1/5$ ", 4-11,000' Murree.

T. foenum-graecum L. *Methi*, *fenugreek*, is cult. in the plains and lower hills. It is strongly scented when dry.

T. incisa Bth. (*T. polycerata* F.B.I.) is a common, prostrate spring annual about cultivation in the plains. The pods are long, slender and veined.

T. gracilis Bth. 4-9,000'. The 2-3 small, yellow flos. are on filiform pedicels and the peduncle has an awnlike tip. Murree, Thandiani, Poonch etc.

T. pubescens Edgew. and Baker ; 4-9,000', recognised by its hoary pubescence. The flos. are few and umbellate. Murree and the Galis, Poonch etc.

Melilotus

Melilotus indica (L.) All. (*M. parviflora* Desf.) *Sinji* is common in the plains both wild and cult. Flos. March to May. Yellow.

M. alba Lamk. *Daksinja*. White Sweet Clover, is occasional in Rawalpindi. It is found both in the plains and hills.

M. corylifolia L. Reported by Aitchison from Rawalpindi. Probably a stray.

Medicago

Medicago lupulina L. Black Medic with short pods 1/12" in length, turning black when mature is common throughout the area.

M. aschersoniana Urban (*M. laciniata* All.) A very common prostrate spring weed from the former Punjab to Ethiopia. The stems are glabrous. The legumes are round spiny balls.

M. hispida Gaertn. (*M. denticulata* Willd.) *Maina*, Devil's ears, is one of the earliest and most abundant weeds about cultivation in the plains. It is gathered for greens. Ascends to 5,000' ; prostrate.

M. minima Lamk. Much like the last but smaller, stems less than 6" ; pods 1/2" broad, forming rounded balls covered with hooked prickles ; 2-6,000', Kohala, Murree road, Abbottabad, Kashmir.

M. falcata L. Yellow lucerne was reported from Pindi by Aitchison. Probably a stray.

Lotus

Lotus corniculatus L. A widely distributed and useful fodder plant with yellow to orange flos., 2-10,000' ; pods 1-1 1/2" long, straight, cylindrical. Murree, Salt Range, Poonch etc.

Cyamopsis

Cyamopsis tetragonolobus (L.) (*C. psoralioides* L.). *Gwara*, with three leaflets and sessile axillary pods is cult. in the plains.

Cajanus

Cajanus cajan (L.) Millsp. (*C. indicus* Spreng.) *Arhar* is also cult.

Indigofera

Key to the shrubby species after Parker.

| | |
|--|----------------------|
| Leaves 3 foliate, pods deflexed or at least spreading | <i>I. trita</i> |
| Leaves pinnate | |
| Bracts minute, shorter than the calyx | <i>I. gerardiana</i> |
| Bracts as long as or longer than flower buds, bracts boat shaped | |
| Leaflets 1-2.5" long | <i>I. hebeptala</i> |
| Leaflets not exceeding 1" long ; flos. cir .5" long | <i>I. pulchella</i> |

I. trita L. Coventry reported finding this at Tret ; an undershrub.

I. gerardiana Wall. One of the commonest shrubs in the mts. from 5-12,000' ; very variable. Flos. a pretty pink. *Kainthi*.

I. gerardiana Wall. var. *heterantha* Baker. This variety, probably due to ecological reasons is smaller in all its parts. The pods are only .6" long and the plants only 1-2' tall, growing in hot dry places.

I. pulchella Roxb. *sensu lat.* Bears handsome pale lilac or pink flos. in March and April before the new leaves appear ; 3-5,000'. Saidpur and Abbottabad Hills, Poonch, Swat etc.

I. linifolia (L.f.) Retz. is a small, prostrate, tropical weed with red flos, simple, linear leaves and minute, globose, one seeded pods. A plains plant.

I. cordifolia Heyne. Another tropical plant of the plains with small, simple, ovate, heart shaped leaves 1/4-3/4" long ; flos. red 1/8" long and 4-8 in a sessile cluster. Topi Park, Rawalpindi in Sept. Poonch ; Kahuta (Douie).

I. echinata Willd. Reported by Aitchison from Gujar Khan in June.

I. hirsuta L. Erect, flos. red, leaflets 5-11, annual or biennial and densely hairy has been found in Haripur, Hazara.

I. anabaptista Steud. Another tropical weed of the plains with white, laterally, attached hairs and 3-7 leaflets and an umbel of flat, reflexed pods grows in Topi Park Rawalpindi.

Tephrosia

Tephrosia tenuis Wall. A slender, tropical herb with simple, alternate leaves 1-2" long ; flos. 1/6", red or purple ; pods linear 1/2-1' long with a few flat lying hairs. Topi Park, Rawalpindi ; Sakesar ; Karachi.

T. hamiltonii J. R. Drum. An erect undershrub up to 2" tall ; leaflets 7-15 oblanceolate, flos. rose or scarlet on leaf opposed racemes ; pods 1-1/2" long, somewhat upcurved near the tip . Former Punjab plains from the Indus eastward (Parker) ; Sakesar, Khewra, Lawrencepur in Attock district, Pabbi Hills.

Sesbania

Sesbania aegyptiaca Poir. (*S. sesban* (L.) Merrill) is a soft wooded shrub, cult.; rarely self sown. There are two varieties, one yellow, the other with maroon and red flos. Joint.

S. aculeata Pers. var. *elatior* Prain. *Jaint, jantri* is a large herb up to 10' tall looking like a shrub. The pods are long and slender, round in cross section. Sometimes cult. for its excellent fibre. Jhelum, Hasan Abdal.

Aeschynomene

Aeschynomene indica L. An erect, annual weed of wet places from the plains to 5,000' growing at the edges of rice fields with 41-61 tiny sensitive leaflets which quickly fold together, pods 1-1 1/2" long jointed.

Robinia

Robinia pseudacacia L. This native of the U. S. is being cult. and naturalised in various places from the plains to 10,000'. The racemes of pretty, white flos. in axillary racemes bloom in the spring. Does best above 4-5,000', common about Abbottabad.

Guldenstaedtia

Guldenstaedtia mirpurensis Benth. A little known, *Astragalus* like, perennial herb with a rosette of pinnate leaves (3-7 pinnae) and 1-3 blue purple flos. on a stalk as long as the leaves, pods 1.2" long, linear, finely silky. Rawalpindi, Saidpur, Choa Saidan Shah, Abbottabad, Poonch. March-April.

Astragalus

Astragalus punjubicus Sirj. ined. The plains species which I have been calling *A. subumbellatus* Kl. was given to Prof. Sirjaev, the Czech expert, who described this and several other species as new. The manuscript was lost in the mail and he died before his work could be done over again. His types are in the N. Y. Botanical Garden and in Gordon College. The plants are prostrate with pink flos. darkening with age and are larger than those of Kashmir *A. subumbellatus*. Rawalpindi, Attock districts, Poonch in March and April.

A. punjubicus var. *rawalpindinus* Sirj. A dwarf form collected in Topi Park, Rawalpindi.

A. amherstianus Benth. Something like the last, trailing and covered with shining white hairs, leaflets 13-17; flos. $\frac{1}{2}$ ", pale yellow or pink; pods $\frac{1}{2}$ ", sessile. The petals are little longer than the calyx. 4-7,000', Murree, Burbhan, Pipe Line, Poonch, Swat.

A. ophiocarpus Benth. (I called *A. aitchisoni* Baker). It should be ascertained at Kew which is the proper name and whether these names are synonyms or not. The plant is a spring desert annual, leaves $1\frac{1}{2}$ to $2\frac{1}{2}$ " long and with 17-25 leaflets, flos. $\frac{1}{3}$ " white with a purple tip and slender, curving pods $1\frac{1}{2}$ " long. Dry places in Attock, Jhelum and Rawalpindi districts.

A. tribuloides Del. Another spring, desert weed, prostrate, with flos. in dense sessile heads, pods $\frac{3}{8}$ " long, projecting like spokes from a wheel; flos. pale yellow or cream with a little blue. From the former Punjab to the Canaries; in the plains.

A. hosackioides Bth., with 2-3 yellow flos. is found occasionally in *chir* forest; Bani and Charehan (Coventry); Ghora Gali (Hamid); Balakot; Poonch.

A. leucocephalus Grah. A small, xerophytic species from the plains to 7,000' covered with white silky hairs and with flos. in dense heads on stalks 2-6" long; flos. pale yellow; pods $\frac{1}{6}$ " long. Swat, Sakesar, Murree Hills, Poonch, April-May.

A. chlorostachys Lindl. A tall, perennial herb, leaves 3-6", 13-17 leaflets; flos. greenish yellow tinged with lilac, racemes 3-6"; 5-14,000'. Murree Hills, the Galis, Abbottabad, Poonch.

A. graveolens Ham. is a tall, branched glabrous species with yellow flos. and large stipules which blooms in April and May in Abbottabad and below Murree ; Swat.

A. pyrrhotrichus B. & P. A yellow flowered perennial from a short thick rootstock ; leaves 6-12" long ; leaflets 41-51 ; flos. 6-12 on a long stalk. Plains to 6,000' ; Thai near Abbottabad, Hazro, Peshawar, Chitral, Kohat Pass.

A. psilocentrus Fisch. A thorny, xerophytic undershrub with yellow flos. in the plains to 7,000'.

Taverniera

Taverniera nummularia Baker—Locally common as a small undershrub in dry rocky places ; leaflets typically three, sometimes fewer, corolla purple, pods with 1-3 joints, rounded, indehiscent ; hairy and echinate. Chakwal, Mankiala, Murree road 18th mile ; Rawalpindi. Attock district.

Onobrychis

Onobrychis ralphii Sirjaev, near *O. stewartii* Baker. Still unpublished due to the death of Prof. Sirjaev. A spring perennial with pink flos. with darker streaks, growing in long racemes. The pods are peculiar with faces honeycombed and edges bearing short spines. Rawalpindi and Attock districts in the plains.

Alhagi

Alhagi camelorum Fisch. A thorny undershrub with 3-8 red flos. growing on the thorns and pods 1" long with contractions between the seeds. Poonch, Jhelum, Salt Range Peshawar etc.

Lespedeza

Note. The *Lespedezas* are very difficult but potentially valuable for fodder and restoring fertility to depleted soils. Ricker who has studied the genus for the U. S. Dept. of Agriculture recognises more species for our area than does Parker. Our forms require further study.

Lespedeza elegans Camb. Gharial, Murree Hills. This dwarf shrub closely resembles *L. variegata* but the leaves are more obovate and the pubescence is more velvety or villous and less appressed ; the ribs on the calyx are lacking and the leaves are larger.

L. variegata Camb. A small undershrub on rocky banks. It is much like *L. sericea* but has appressed stem hairs, not spreading. Murree and the Galis.

L. sericea (Thunb). Miq. Very common in exposed situations in grassy forest undergrowth from 2-8,000'. Leaves cuneate.

L. sericea Miq. var. *hispidula* Franch. Jhicca Gali, 7,000' ; more pubescent, stem hairs spreading.

L. falconeri Prain ; (*L. eriocarpa* var. *falconeri* Prain ; *L. dubia* Schindler). A pretty, prostrate shrub on cliffs and steep banks with mottled leaves. Corolla blue purple, flo. in lax, peduncled racemes, 4-8,000' Murree and the Galis.

L. floribunda Bunge. Reported by Fleming from the Murree Hills, 30th Aug. 1851. I have collected it several times on the Jhelum Vy. road between Domel and Uri and this may have been where Fleming collected the plant.

Arachis

Arachis hypogaea L., the *mung phali*. Cultivation of this useful plant is increasing in the plains, Khanna, Riwayat etc.

Desmodium

Plants herbaceous

- (a) Tall, erect, bracts concealing flower buds, leaflets exhibit spontaneous movements in sunshine *D. motorium* (*gyrans*)
(b) Prostrate, leaflets 3, $\frac{1}{2}$ " long, joints 5-10 *D. triflorum*

Plants shrubby

A. Leaves trifoliate

I. Pods not bent at rt. angles to its stalk, usually sessile.

- (a) Flos...5" long or nearly so, pale lilac *D. tiliaefolium*
(b) Flos...3" long or less, leaves adpressed silky above *D. concinnum*

II. Pods stalked and bent at rt. angles to its stalk *D. podocarpum*

B. Leaves simple, leaves entire, glabrescent above *D. gangeticum*

Desmodium motorium (Houtt.) Merrill, (*D. gyrans* D.C.) Ghora Gali, Murree Hills Hazara, Poonch.

D. triflorum (L.) DC. Morga near Rawalpindi at the close of the rains, Jaba, Hazara.

D. tiliaefolium G. Don, A common shrub in forest or shrubby places from 4-9,000' Murree, the Galis, Poonch etc.

D. concinnum DC. Batrasi, Hazara, Jhelum Vy. road, Poonch, Base of Himalaya to 5,000'.

D. podocarpum DC. Murree near Lawrence College. 2-9,000 ft., not common.

D. gangeticum (L.) DC. Plains to 6,000'; there are two types which Parker thinks may be due to ecological conditions. The large leaved type grows at Saidpur ; Poonch, Ghora Gali, Murree Hills.

Alysicarpus

Alysicarpus vaginalis (L.) DC. Rawalpindi and Abbottabad in Sept. Pods jointed.

A. bupleurifolius DC. Also found in Rawalpindi after the rains. Leaves longer, linear and with fewer joints in the fruits.

Lens

Lens esculenta Moench. *Masar, masoor*, is commonly cult. and sometimes is self sown.

Cicer

Cicer arietinum L. *Chana* or *gram*, a larger more erect plant with pinky purple flos.

Vicia

Climbers

Flos. white, tinged with lilac, pods $\frac{1}{2}$ - $\frac{1}{4}$ " , hairy, black when mature

V. hirsuta

Flos lilac

V. pallida

Erect or leaning, slender, pods narrow.

Perennial, flos. 3-4, pods 1 $\frac{1}{2}$ " long, flos. lilac

V. griffithii

Annual

Flos. pale blue, leaflets 6-12, pods $\frac{1}{2}$ " , 3-4 seeds

V. tetrasperma

Flos. reddish blue, single, pods erect, 1-2"

V. sativa

Flos. red purple, solitary, pods 1-1 $\frac{1}{2}$ " , abruptly turned down, rather curved

V. peregrina

Erect, stems stout, pods $\frac{1}{2}$ " broad or more.

Bakla, a cult. plant with purple and white flos.

V. faba

A wild plant, similar but smaller.

V. narbonensis

Vicia hirsuta (L.) Koch is an early spring field weed from the plains to Murree, Swat, Domel, Poonch etc.

V. pallida Turcz. Murree fide Drummond , Poonch, Kashmir.

V. griffithii Baker. A small spring weed in the plains. Rawalpindi, Fatch Jang (Bamber).

V. tetrasperma (L.) Moench. Murree, 6,000'.

V. sativa L. The commonest of the genus, common in grain fields in the plains and hills in the spring.

V. sativa var. *angustifolia* (Roth) Baker. The variety is more slender with narrower leaflets, the lower being emarginate at the tip. Rawalpindi, Hasan Abdal, Abbottabad.

V. peregrina L. Rawalpindi ; Swat, a plant of the plains.

V. faba L. *Bakla*, the Broad Bean is commonly cult. in the plains and hills.

V. narbonensis L. A spring weed in the plains and lower hills. Supposed to be the ancestor of the broad bean. Rawalpindi, Wah, Domel, Poonch.

Lathyrus

Flos. yellow.

Leafless, large stipules take the place of leaves

L. aphaca

Leaflets two, perennial

L. pratensis

Flos. red or vermilion

L. sphaericus

Flos. lilac or purple

Stems winged, leaves ending in a three fid tendril

L. sativus

Stems wingless, leaves ending in a bristle

L. inconspicuus

Lathyrus aphaca L. A common spring weed in the plains and lower hills. Rawalpindi, Poonch, former N.W.F.P.

L. sativus L. *Kesari dal* is a wide spread annual weed from the plains to 4,000'. Eating too much of this pulse is supposed to cause lathyrism.

L. pratensis L. Murree Hills, Dunga Gali, Poonch, Gilgit etc.

L. sphaericus Retz. Plains and hills, Rawalpindi, Murree, Abbottabad, Poonch etc.

L. inconspicuus L. Plains and hills, Rawalpindi, Murree, Poonch, Domel etc.

L. odoratus L. The sweet pea with many colours is widely cult.

Pisum

Pisum arvense L. *Desi mattar* with 2-4 leaflets and compressed, marbled seeds is planted.

P. sativum L. The common cult. pea has 4-6 leaflets and round seeds, uniform in colour.

Dumasia

Dumasia villosa DC. *Karang buti* is a vine densely clothed with grey or rusty hairs, corolla yellow or purplish. Ghora Gali, Abbottabad, Poonch.

Glycine

Glycine max (L.) Merrill, (*G. soya* Sieb. and Zucc.), (*Soja max* Piper). The soy bean is cult. but not as much as the plant deserves. The peoples of the Far East consider it to be a crop of first class importance.

Erythrina

Erythrina suberosa Roxb.—*Dhauldak*, the coral tree, is rare in the foothill zone, flowering in April. Saidpur Hills, Murree road.

E. blakei Hort. Cult. in Rawalpindi.

Butea

Butea monosperma (Lam.) Kuntze, (*B. frondosa* Roxb.) *Dhak*, *palas* with handsome orange flos. blooms in March and April and is occasional only in our area.

Pueraria

Pueraria tuberosa DC. This large vine bearing racemes of blue flos. was found on a cliff above Saidpur at about 2,500' on Apr. 7, 1934. An extension of range. The tubers are very large. Ravi eastward (Parker).

Phaseolus

Various species of *Phaseolus* are cult.; *P. lunatus* L., the lima bean; *P. vulgaris* L. the French bean, *P. multiflorus* Willd., the Scarlet Runner; *P. aureus* Roxb. *urd* or black gram and *P. radiatus* L., *mung*.

Phaseolus aconitifolius Jacq.—*Moth* with its peculiarly lobed leaves is commonly cult. for fodder in the plains.

Vigna

Vigna sinensis (L.) Savi., (*V. catieng*. Endl.) *Lobia*, bearing its pods on a long peduncle with linear fruits at the top is cult. in plains and hills.

V. vexillata (L.) Benth. *Ud salib* is a vine in the *chir* zone with sweet pea like flos., pink when young, changing to purple with age. Above Tret, Abbottabad, Poonch etc.

Dolichos

Dolichos lablab L. *Sem*, with flat pods 1½-2" long with 3-5 seeds is cult.

Atylosia

Shrubby

Flos. racemose, petals wither without falling off, leaflets stipellate *A. mollis*.

Flos. clustered, petals deciduous, leaflets exstipellate *A. scarabaeoides*

Herbaceous, like the last but more slender, leaflets circular. *A. platycarpa*.

Atylosia mollis Bth. including *A. crassa* Prain (*Cantharospermum molle* Taub.)
From Rawalpindi district east (Parker), Garhi Habibullah, Hazara; Haripur, Haz.
(Collett).

A. scarabaeoides Bth. (*Cantharospermum scarabioides* (L.) Baill.), Mt. Tilla. Jhelum district, Poonch, Jamu.

A. platycarpa Bth. A summer weed in *chari* fields near Rawalpindi; Poonch.

Cajanus

Cajanus indicus Spreng.—(*C. cajan* (L.) Millsp.) *Arhar Dal*, the pigeon pea, is a small shrub which is occasionally cult.

Rhynchosia

Shrubby, erect

R. pseudo-cajan

Herbaceous

Prostrate, trailing, pods flat, 2 seeded, corolla hardly projecting *R. capitata*

Climbing

Flos. yellow, corolla exerted, leaflets circular *R. minima*

Flos. yellow with purple veins, surface sticky, leaflets long,
pointed *R. himalensis*

Rhynchosia pseudo-cajan Camb. A small, erect hoary shrub in *chir* forest or on grassy hillsides, Tret, Abbottabad, Swat, Poonch etc.

R. capitata DC.—(*R. aurea* F.B.I.), Rawalpindi, Fateh Jang.

R. minima DC. Very common during the rains in plains and lower hills, Rawalpindi, Abbottabad, Swat, Poonch, Domel etc.

R. himalensis Bth. Murree, fide Bamber. Usually found further east.

Flemingia

Flemingia fruticulosa Wall. (*F. strobilifera* var. *fruticulosa* in Bamber) Foothill zone to 9,000' in pine forest, forest blanks and grassy undergrowth. Easily recognised by the persistent bracts which cover flos. and fruit. Indus eastward (Parker). Poonch.

F. semialata Roxb.—(*F. congesta* F.B.I.) Rawalpindi east to the Philippines (Parker) Poonch, Mirpur.

Dalbergia

Dalbergia sissoo Roxb. *Shisham* or *tali* the Indian rosewood is the most useful tree of the former Punjab plains and is both cult. and wild to 4,000'. It colonises ravines in the loess if given an opportunity. It is an excellent roadside tree, gives good shade and makes excellent furniture. It is often damaged by *Fomes lucidus*.

Pongamia

Pongamia glabra Vent. (*P. pinnata* (L.) Merrill.), *Sukh chain* is cult. east to Rawalpindi (Parker), Mirpur, Peshawar.

Sophora

| | |
|---|------------------------|
| Mature leaflets sparsely downy, mature pod glabrous | <i>S. mollis</i> |
| Mature leaflets silky velvety beneath, pod persistently silky | <i>S. griffithii</i> . |

Sophora mollis Grah. Trans Indus-to Nepal, sub-Himalayan tract to 6,000'. Flos. appear just before the leaves in fine axillary racemes, yellow, in April. Parachinar, Swat, Abbottabad, Jhelum Vy. Road, Poonch etc.

S. griffithii Stocks, Salt Range, former N.W.F.P. ; Grand Trunk Road, between Taxila and Hasan Abdal. The colony seems to have been destroyed in building Wah Cantt.

Wistaria

Wistaria sinensis DC. This large and beautiful climber with magnificent bunches of mauve flos. is occasionally cult. in Rawalpindi, Murree and Abbottabad.

CAESALPINOIDEAE

Caesalpinia

Caesalpinia decapetala (Roth) Merrill,—*C. sepiaria* Roxb.), *Ur, urni* is a large prickly vine with handsome yellow flos., sometimes making impenetrable thickets in the foothill zone. It is distributed to China and Japan. It is sometimes used for hedges. Murree Road, Swat, Poonch etc.

Parkinsonia

Parkinsonia aculeata L. This thorny, yellow flowered tree has been introduced from tropical America. The leaves are peculiar in having a very large number of tiny lobes and a wing to the rachis. Planted where little else will grow in the plains, sometimes along roads.

Cassia

A tree. pods 1-2' long, 1" in diam.

C. fistula

Shrubs or undershrubs, pods, much smaller

Leaves with a solitary gland near the base of the petiole

Leaflets 3-5 pairs, pod nearly flat, somewhat curved, margins thickened.

C. occidentalis

Leaflets 6-10 pairs, pods turgid or sub-terete, straight

C. sophera

Leaves with glands on rachis or obscure

C. didymobotrya

Herbs

Large, erect, shrub like, leaflets at least $\frac{1}{2}$ " wide stamens 10

C. obtusifolia

Small, perennial, hairy, leaflets 40-100, prostrate

C. mimosoides

Small, annual, stamens 4-5, a sessile gland near lower pair of leaflets.

C. dimidiata

Small, annual, stamens

gland of petiole stipitate

C. pumila

Cassia fistula L. *Amaltas* is common from the Indus east up to 4,000', wild in the foothills and cult. in the plains. Very decorative. Animals leave the leaves alone and the seeds are purgative.

C. occidentalis L. An undershrub up to 6' high, growing in waste places about Rawalpindi.

C. sophera L. and a closely related form with purple twigs and rachises (*C. purpurea* Roxb. or *C. sophera* var. *purpurea* of Baker) are garden plants cult. in Rawalpindi.

C. didymobotrya Fresen. is another cult. shrub with pretty yellow flos. blooming in the winter.

C. obtusifolia L. or *C. tora* L. A widespread tropical weed grows at Hasan Abdal, Poonch and probably in other places during the rains.

C. mimosoides L. Barakao (Aitchison) ; Garhi Habib Ullah and Jaba (Hazara)

C. dimidiata Roxb. smaller ; Ghora Gali, Murree Hills, Poonch.

C. pumila Lamk. Found only once, prostrate by a pond on the Murree road at about 2,500'.

Bauhinia (Adapted from Parker).

Tree

Fertile stamens 3-5 ; pod dehiscent

Leaves entire or notched at the apex

B. retusa

Leaves deeply cleft

Leaves cleft half way down, calyx tube shorter than the limb.

B. purpurea

Leaves cleft $\frac{1}{3}$ of the way down, calyx tube longer than the limb.

B. variegata

B. vahlii

A shrubby climber

Bauhinia retusa Roxb. Found only in the Jowlan Reserve, Rawalpindi district. Usually found much further east (Parker).

Bauhinia purpurea L. Indus east to 4,000' (Parker). Flos. Sept-Nov. Cult. in Rawalpindi.

B. variegata L. *Kachnar, kaliar* is an excellent flowering tree, covered in the spring with purple and white flos. Cult. and wild in the foothill zone. The flower buds are cooked and eaten.

B. vahlii Wight and Arn. Seen only once at Tret 40 years ago. Mirpur.

MIMOSOIDEAE

Mimosa

Mimosa pudica L. The Sensitive Plant is sometimes planted as a curiosity.

M. himalayana Gamble, (*M. rubicaulis* of F.B.I.). This prickly shrub with pretty balls of pink flos. is found in the foothill zone from Afghanistan to Assam. Rawalpindi. Saidpur Hills, Abbottabad, Domel-Kohala.

Acacia (Adapted from Parker)

Erect trees or shrubs

I Spines subulate, straight, flos. in globose heads

Heads axillary, pedunculate

A tree, pod moniliform, tomentose

A. arabica

Shrubs, pods not moniliform, glabrous

Pods cylindrical, turgid, pulpy within

A. farnesiana

Pod flattened, dry 4-6 by .2-.3"

A. hydaspica

II Prickles compressed or recurved, flos. in spikes

Pinnae, ten pairs or more

A. catechu

Pinnae 2-3 pairs, prickles in pairs

A. modesta

Acacia arabica Willd. An older name may be *A. nilotica* (L.) Del. The *kikar* is not indigenous in Rawalpindi. Usually about villages or along roads. It stands alkali better than most trees.

A. farnesiana Willd. *Kabuli kikar*. A large shrub or small tree, commonly planted in hedges. The flos. are strongly scented and bloom in the cold weather.

A. hydaspica J. R. Drum. A shrub, sometimes quite small, common on the dry, rocky hills, fruiting in April and ascending to 3 or 4,000'. Salt Range, Margalla, Murree Road, Saidpur Hills, Attock etc.

A. catechu Willd. *Khair*, the source of *katha* grows in the foothill zone to perhaps 4,000'. Nearly 100 years ago J. L. Stewart wrote that it is the chief tree near Tret for miles. There are few left; Domel, below Abbottabad etc.

A. modesta Wall. *Phulahi* is the commonest tree in the scrub jungles of the district, standing a great deal of lopping. It makes a strong hedge and is much used for firewood.

Prosopis

Prosopis spicigera L. *Jand*. I have not noticed this xerophytic tree in Rawalpindi but it grows near by at Fateh Jang in Attock district. Parker says that it grows where the rainfall is less than 30" annually.

P. juliflora DC. and *P. glandulosa* Torr., two American species of 'mesquite' have been introduced into the district and planted along roadsides etc. The first has shorter leaflets, .25 to .4" long while the second has leaflets .7 to 1.5" long. Excellent for clothing bare ground in arid regions.

Albizzia

Pinnae 6-20 pairs, leaflets with midrib close to the upper edge, acute

Leaflets scarcely .1" broad *A. chinensis* (*A. stipulata*)

Leaflets broader, .15 to .3" wide

Leaflets acute, flos. pink, calyx teeth distinct *A. julibrissin*

Leaflets usually obtuse, flos. yellow, calyx teeth sub-obsolete. *A. odoratissima*

Pinnae 2-6 pairs, leaflets usually with the midrib near the centre, mostly obtuse.

Leaflets not exceeding .5" wide, calyx teeth obsolete *A. odoratissima*

Leaflets broader, calyx teeth distinct

Flos. pedicellate, pods 6-12 by 1-2" broad, pale straw coloured. *A. lebbek*

Flos. sessile, pods brown *A. procera*

Albizzia chinensis (Osbeck) Merrill, (*A. stipulata* Boiv.), *Ohi* grows from the Indus east to 4,000' (Parker). Flos. yellowish white. *Batراسي* (Haz.), *Domel-Garhi*, *Poonch*.

A. julibrissin Dur. Indus east to 6,000' (Parker), *Muzaffarabad*, *Poonch*.

A. odoratissima Bth. Indus east to 3,000'. Cliffs on *Murree road* at about 2,500' *Poonch*.

A. lebbek Bth. *Shirin, siris* is very commonly planted in villages and by roadsides in the plains and lower hills. The large pods hang on for months.

A. procera Bth. The white *siris* is occasionally planted in the former Punjab as far west as the Indus (Parker) *Hasan Abdal, Mirpur*.

ROSACEAE

Prunus

Prunus cerasioides D. Don, *Seta paja* with pink flos. in the autumn or early winter is rare but was collected in Murree by Asghar Ali ; Poonch. 2-6,000' (Parker).

P. cornuta Wall., *Kalakat* is a large tree common in deciduous forest with *Acer* and *Aesculus*, 4-10,000'. In Murree in the summer the leaves are spotted reddish yellow by a fungus.

P. persica Stokes, the peach, *aru*, with pink flos. is one of the first trees to bloom in plains and hills.

P. armeniaca L. *Khurmani, hari*, the apricot, with beautiful pinky white flos. is cultivated from the plains to 12,000' on the Upper Indus.

P. bokhariensis Royle ex. Schn.—(*P. cerasifera* Ehr.), *aloocha* or *alu bokhara*. Several kinds of plums are cult. in both plains and hills.

P. amygdalus Batsch. *Badam*, the almond, is occasionally planted.

Prinsepia

Prinsepia utilis Royle, 2-9,000' Indus east (Parker). *Bekhal* or *bakal*, a thorny bush, with white flos. in April and May is common in Abbottabad and in Poonch but I have not noticed it in Rawalpindi. It is called *phulwara* at Kakul.

Sorbaria

Sorbaria tomentosa (Lindl.) Rehder, (*Spiraea lindleyana* Wall.) 4-11,000' is common on the Pipe Line and in the Galis, Swat, Kagan, Poonch etc. The leaves are pinnate, not simple as in *Spiraea* proper.

Spiraea

Spiraea vacciniifolia D. Don., very common in the Murree Hills and Galis on steep banks and cliffs from 4-9,000'. Plants in bloom all summer.

S. hypericifolia L. Sarban Cave, near Abbottabad at about 5,000'. Leaves small, oblanceolate, The *S. hypericifolia* of Parker's Flora is *S. affinis* Parker *Indian Forester* 56 : 105, 1930.

S. canescens D. Don, Himalaya, 5-9,000' from Hazara eastwards (Parker). I have not noticed any in Rawalpindi.

S. cantoniensis Lour. This Chinese species is often found in gardens.

S. vestita Wall. Meadow Sweet, an herb with a fine panicle of white flos. is not rare at Dunga Gali at 8-9,000'.

Rubus

Leaves simple

R. paniculatus

Leaves compound

I. Leaflets usually 3

A Flower white

1 Leaves green beneath

Stems tomentose, bristly

R. ellipticus

Stems glabrous, no bristles, prickles flattened

R. macilentus

2 Leaflets white beneath, stems not bristly but with a waxy bloom.

R. biflorus

B. Flowers pink

Leaflets grey or white beneath, twigs tomentose, fruit black.

R. fruticosus

Leaflets green or white beneath, twigs usually glabrous, fruit red.

R. gracilis

II. Leaflets usually 5-7, grey or white tomentose below

R. niveus

Rubus paniculatus Sm. Rawalpindi (Parker), Poonch, Jamu

R. ellipticus Sm. Common in the sub-Himalayan tract Fruit yellow and excellent. Usually 3-6,000'.

R. macilentus Camb. 5-9,000'. The orange fruit is edible; a plant of moist forest undergrowth. Murree and the Galis, Poonch.

R. biflorus Ham. 7-9000', Indus east (Parker).

R. fruticosus L. is found at lower altitudes than its relatives ; plains to 6,000'. Common in hedges, Saidpur, Wah, Hasan Abdal, Abbottabad etc.

R. gracilis Roxb. (*R. niveus* Wall.) 6-10,000' Murree and the Galis.

Rubus niveus Thunb. (*R. lasiocarpus* Sm.) 4-10,000'. The fruits of *Rubus* sp. are often called *anchu* or *dhak*.

Geum

Geum urbanum L. An erect herb, common in the hills from 4-9,000' with yellow flos. and distinctive hooks on the persistent styles.

Fragaria

Fragaria indica Andr. (*Duchesnea indica* (Andr.) Focke. The yellow flowered strawberry with prostrate stems is common in shady places above 4,000'. The attractive red berries are tasteless.

F. vesca L., Wild and occasionally cult. Murree and the Galis where it is very common above 8,000'. Called *mewa* in Changla. Flos. white, fruit edible.

Potentilla

| | |
|---|------------------------|
| Shrubby, on cliffs, 1 ft. high, flos. white | <i>P. sericophylla</i> |
| Herbaceous, or base only shrubby | |
| Receptacle flat, hairy, stamens, 5, base often shrubby | <i>P. sibbaldi</i> |
| Not as above | |
| Plants perennial | |
| Flos. red, leaflets 5, palmately compound | <i>P. nepalensis</i> |
| Flos. yellow, leaflets 5-7, pinnately divided | <i>P. gerardiana</i> |
| Plants annual. Leaves pinnately divided, plants prostrate | <i>P. supina</i> |
| Leaves digitately compound, 3-5 leaflets | <i>P. wallichiana</i> |

Potentilla sericophylla Parker. A dwarf shrub in masses on cliffs and rocky places in the Galis, Thandiani and Poonch.

P. sibbaldi Hk. f. non Haller. This plant is now usually placed in the genus *Sibbaldia* and called *Sibbaldia cuneata* Kze. It is usually found on alpine meadows and passes. Mokhshpuri at 9,000'.

P. gerardiana Lindl. (*P. fragarioides* F.B.I.). A plant of dry open hillsides and rather small yellow flos. Abbottabad, Poonch, Swat.

P. supina L. A small annual growing in ditches and damp soil in the spring from the plains to 8,000', Haripur Tehsil (Haz.), Rawalpindi, Attock district, Poonch etc.

P. wallichiana Del. Havelian to Abbottabad, Poonch, Murree ?

Agrimonia

Agrimonia eupatoria L. Murree and the Galis, erect with small yellow flos. and interesting interruptedly pinnate leaves.

Rosa

Rosa macrophylla Lindl. including *R. saundersiae* Rolfe, *Ban gulab* is very common in Murree and the Galis in forest undergrowth from 6-11,000', pale, nearly white to pink. Bushes erect.

Rosa moschata J. Herrm. is a very large climbing rose with white flos. which ascends into high trees. 4-8,000', Murree and the Galis. (Note. In addition to these two wild roses there are many cultivated roses in the district.

Malus

Malus pumila Mill. (*Pyrus malus* auctt.) *Seb* or *seo*, the apple, is commonly cult. and some very good apples are produced in the Murree Hills.

Pyrus

Pyrus sinensis Lindl. (*P. lindleyi* Rehder). The *nak* or sand pear is cult.

P. communis L. The *nashpati* or common pear does not do well on the plains but does well in the Murree Hills where several kinds are cult.

P. pashia Ham. The *batangi* or Medlar is common in the Murree Hills and is found down to about 3,000'. According to Schneider our form is var. *himalaica*.

P. lanata D. Don. *Doda*, with leaves white below is sometimes found in shady mixed forest in Murree and is fairly common in the Galis and Thandiani.

Crataegus

Crataegus monogyna Jacq. (*C. oxyacantha* F.B.I.) *Bat sangli*, the hawthorn, is fairly common in the Murree Hills from 4-9,000'. When ripe the red fruits are decorative.

Cotoneaster

Orthopetalum.—Corolla erect in flower, flos. not opening widely, usually pink.

Cymes loose, 3-many flowered, leaves glabrous or nearly so *C. rosea*

Cymes 1-5 flowered, lvs. more or less tomentose beneath,
mostly rounded at both ends. *C. integerrima*

Chaenopetalum.—Corolla spreading, flos. opening widely, usually white.

Leaves thick, evergreen, margins more or less recurved *C. microphylla*

Leaves deciduous, flat.

Mature leaves up to 1.5", nearly glabrous beneath, cymes
5-10 flowered *C. lindleyi*

Mature leaves 1.5-3" long, cymes many flowered,
usually branched. *C. bacillaris*

Cotoneaster rosea Edgew. Dunga Gali and Thandiani. Poonch, Muzaffarabad.

C. integerrima Medik. Nathia Gali (Parker). A plant usually found from 8-12,000'

C. microphylla Wall. Prostrate, making a dense network over rocks, Barian, Murree Hills, Dunga Gali, Changla. Our form is var. *thymifolia* (Baker) Koehne.

C. bacillaris Wall. *Luni* or *rauns* is the commonest and largest of the genus. The wood is strong and makes good walking sticks, 4-10,000'

C. lindleyi Steud. 4,500-11,000' Abbottabad Jhelum Vy., Poonch, Sakesar.

Eriobotrya

Eriobotrya japonica, the loquat, is much cult. in the plains and lower hills.

SAXIFRAGACEAE

Astilbe

Astilbe rivularis Ham. A large perennial herb with twice pinnate lvs. up to 18". Flos. small, greenish yellow in a large terminal branching raceme, Rocky banks in forest. Changla and Dunga Galis. 4-9,000' Poonch.

Saxifraga

Saxifraga ciliata Royle (*Bergenia ligulata* var. *ciliata* Engler). *Zakhm hayat*, the pink saxifrage, is often mistakenly called Rock Begonia. Gregarious on cliffs with *Gerbera*, *Wulfenia* and *Aster molliusculus*. Usually above 5,000'. After flowering the leaves often become very large. Murree Hills and Galis.

Parnassia

Parnassia affinis H. and T. The white flowered 'Grass of Parnassus' is common in late August on the Pipe Line and the Galis.

Deutzia

Deutzia staminea R. Br. A *Spiraea* like shrub with handsome white flos. in April in the open or the edge of forest, 4-9,000', Murree Hills, Hazara, Poonch.

Ribes

Ribes rubrum L. *forma nigrum* Parker. The wild currant is not rare in forest undergrowth in the Galis, Changla, Dunga etc. 8-12,000'.

ESCALLONIACEAE

Itea

Itea nutans Royle. A tree, sometimes found in damp places in the sub-Himalayan zone to 6,000'. Tret, Charra Pani, Poonch, Mirpur. Flos. greenish white in May.

CRASSULACEAE

Tillaea

Tillaea pentandra Royle. A small, annual herb, stems 2-4" growing on walls and banks with linear sessile leaves $\frac{1}{4}$ " long; flos minute, axillary, sessile. 3-7,000' Murree, Thandiani, Poonch, Swat.

T. pharnaceoides Hochst. Like the last but even smaller, flos. densely clustered, petals shorter than calyx segments, seeds blunt, not pointed. Kahuta, former N.W.F.P. Muzaffarabad.

Sedum

Sedum hispanicum Jusl. (*S. pallidum* F.B.I.) A spring ephemeral with white flos., usually on limestone, Wah, Hasan Abdal, Abbottabad, Swat.

S. multicaule Wall. ex Lindl. Erect yellow flowered form ; annual. Thandiani, Mokhshpuri (Hewitt).

S. adenotrichum Edgew. A common perennial growing in rock crevices 4-8,000' with glandular, pointed pinkish petals. Murree and the Galis, Poonch, Abbottabad etc.

S. ewersii Ledeb. Common on the Pipe Line and the Galis on rocks with thick, broadly elliptic leaves and pink flos. beginning in late August. Swat, Gilgit, Kashmir etc.

HAMAMELIDACEAE

Parrotia

Parrotia jacquemontiana Dcne. (*Parrotiopsis jacquemontiana* Dcne.). *Paser* is a gregarious shrub without petals but the small greenish white flos. are subtended by yellowish white bracts, $\frac{3}{4}$ " long. Lower Forest Road, Murree, Poonch, Swat etc.

COMBRETACEAE

Terminalia

Terminalia belerica Roxb. *Bahera* is a large, handsome tropical tree with large elliptic leaves and an almond like fruit. Panjar, near Kahuta.

T. arjuna W. and A. *Arjan*, a native of Central India, is planted in Rawalpindi. The bark is light coloured. The angled fruits are striate with ascending veins.

Combretum

Combretum nanum Ham. Massar Reserve, Hazara only (Parker). A dwarf plant in *chir* undergrowth and on fire lines.

Quisqualis

Quisqualis indica L. A large handsome creeper with pink flos. cult. in the plains.

MYRTACEAE

Eugenia

Eugenia cumini (L.) Druce (*E. jambolana* Lamk.). The *jaman* is cult. in the plains.

Myrtus

Myrtus communis L. *Wilayati mehndi* is a cult. shrub with opposite leaves and fine white flos. Strongly scented. Sakesar, Rawalpindi, Kurram.

Psidium

Psidium guajava (or *guyava*) L., the *amrud* or *guava* which is indigenous to Mexico is cult. in the plains, Rawalpindi, Haripur, Poonch.

Callistemon

Callistemon viminalis Cheel. The "bottle brush," with handsome spikes of red flos. is also cult.

Eucalyptus

Eucalyptus citriodora Hk. and *E. tereticornis* Sm. and possibly other eucalypts are planted in the plains and lower hills.

LYTHRACEAE

Punica

Punica granatum L. *Anar*, *daruna*, *daruni*, the pomegranate, is cult. in the plains and grows wild in the hills up to 7,000' in Murree bearing beautiful reddish flos.

Woodfordia

Woodfordia fruticosa (L.) S. Kurz, (*W. floribunda* Salisb.) *Dhavi*. A common shrub in the sub-Himalayan zone, often on cliffs, has striking brick red flos. in the spring which yield a red dye. Widespread in the tropics as far away as Malaya, Sumatra and Tropical Africa. Havelian, Poonch.

Lagerstroemia

Lagerstroemia indica L. The Crepe Myrtle is cult. in Rawalpindi and Abbottabad, blooming in the hot weather.

Lawsonia

Lawsonia inermis L. *Mehndi*, *henna* is also cult.

Ammania

Ammania baccifera L. A small, erect annual which grows in the plains in wet places bearing flos. in dense clusters on the stem. Jhelum, Lahore, Poonch.

ONAGRACEAE

Epilobium

Epilobium hirsutum L. A tall "Willow herb" with rosy flos. growing in wet soil such as rice field borders, Swat, Wah, Abbottabad, Poonch.

E. royleanum Haussk. Ghora Gali and the Galis. Smaller, erect with paler pink flos. in forest undergrowth.

E. brevifolium Don, with shorter leaves. Murree. (Note) The *Epilobium*s are inadequately treated in Hooker and there are many forms which need discrimination through a critical study of the group.

Circaea

Circaea cordata Royle—A shade plant with tiny flos. blooming in late August on the Pipe Line and in the Galis. Leaves more than 2" long.

C. alpina L. var. *himalaica* Clarke, with smaller plants and leaves $\frac{1}{2}$ to 1" long grows in the same places.

Hartmannia

Hartmannia rosea G. Don (*Oenothera rosea* Ait.) with pretty red flos. is very common throughout the district from 3-9,000'. It is often mistakenly identified as an *Epilobium*.

Oenothera

Oenothera biennis L. The Evening Primrose with large yellow flos. opening in the afternoon is commonly cult. in Murree. It is sometimes self sown.

Ludwigia

Ludwigia parviflora Roxb. The fruit opens by four valves, making it look like a flower. Wet places, Mansehra (N. Ali).

CACTACEAE

Opuntia

Opuntia dillenii Haw. This is the cactus which is commonly cult, as a hedge plant in the plains with large phylloclades with a pale glaucous tinge. Flos. yellow.

O. monacantha Haw. Much like the last species but the phylloclades are grass green in colour. Saidpur, Hassan Abdal, Kohala, Poonch.

CUCURBITACEAE

Trichosanthes

Trichosanthes dioica Roxb. Flos. white, 1½-3" long and fruits 2-3½" long, orange red, is sometimes cult. Saidpur at 2,000'.

Lagenaria

Lagenaria vulgaris Ser. (*L. alba* L.) *Toomba*, *al*, or *tori*, the Calabash or bottle gourd is often cult. in Rawalpindi, Swat, Poonch etc.

Luffa

Luffa cylindrica (L.) Roem.—*Ghia tori* or Sponge gourd. Cult. in the summer. The young fruits are eaten. Rawalpindi, Poonch, Swat, Gilgit.

Momordica

Momordica charantia L. The *karela* is cult. in the plains and hills.

M. dioica Roxb. A wild vine in the plains with small, orange, spiny fruits.
Jangli karela. Rawalpindi, Poonch, Abbottabad etc.

Cucumis

Cucumis trigonus Roxb. A wild prickly vine with small yellow flos.; fruits 1½" long ovoid, striped when ripe. Hasan Abdal, Rawalpindi, Swat etc.

C. melo L. *Kharbuza*, the musk melon and *C. sativus* L., the cucumber, are cult.

Citrullus

Citrullus colocynthis Schrader.—*Tumba*, *Kaur tumba* is a desert vine with a woody root and a distribution from Pakistan to Arabia. Used in medicine.

C. vulgaris Schrader, the *tarbuz* or water melon and *C. vulgaris* var. *fistulosus*, *tinde* or *dil pasand* are widely cult.

Cucurbita

Cucurbita pepo DC. the pumpkin ; *C. moschata* Duchesne, and *C. maxima* Duchesne, the common gourd or *halva kaddoo* may be found in gardens.

Melothria

Melothria heterophylla Cogn. (*Zehneria umbellata* Thw.) is the only wild cucurbit common in the Murree Hills from 4-7,000'. The leaves are variable. Abbottabad, Poonch, Swat etc.

Corallocarpus

Corallocarpus epigaea Hook. is a small, annual, monsoon climber in the plains with a small, orange beaked fruit about 3/8" long. Poonch, Sakesar.

BEGONIACEAE

Begonia

I have found no Begonias in Rawalpindi but Mr. Coventry told me that he found one below Murree. I have specimens of *Begonia picta* Sm. and *B. amoena* Wall. from the Kotli area of Azad Kashmir.

FICOIDEAE (AIZOACEAE)

Trianthema

Trianthema monogyna L. (*T. portulacastrum* L.) *Itsit*, is a prostrate, weedy plant of the plains with ovate leaves, 15 stamens and 3-5 seeds growing in the hot weather.

T. govindia Ham. (*T. pentandra* F.B.I.) with a woody root, lanceolate leaves, flos. in sessile clusters, five stamens and beak of the fruit mitre shaped and separating into two one seeded parts. Another tropical plains plant Rawalpindi, Sarai Saleh (Haz.) Poonch.

T. triquetra Rott. (*T. crystallina* of F.B.I.). Another plains plant with narrowly lanceolate leaves. Capsule with a beak, a circular corky flat disc with a central depression. Seeds 2. Rawalpindi, Hazro, Thal.

Orygia

Orygia decumbens Forsk. A desert herb among rocks, prostrate. The capsule is 1/5" in diam. round, papery, enclosed in the persistent sepals. Attock, Sangla and Kirana Hill; former N.W.F.P.

Mollugo

Mollugo cerviana Ser. A minute herb suggesting Spergula, leaves linear. Jhelum, Swat, Salt Range, Abbottabad.

M. nudicaulis Lamk. Similar but has basal leaves only. Rawalpindi, Abbottabad, Poonch. A summer annual.

M. pentaphylla L. Abbottabad, Swat, Poonch, in the summer.

UMBELLIFERAE

Centella

Centella asiatica (L.) Urb. (*Hydrocotyle asiatica* L.) *Brahmi buti* is a prostrate herb growing in damp soil. Rawalpindi, Poonch, Hazara.

Bowlesia

Bowlesia asiatica Nasir was formerly referred to *Hydrocotyle*. Prof. Nasir has described it as a genus and species new to this continent. It resembles *Centella* but has stellate pubescence. Poorly drained soil, Topi Park etc., Rawalpindi.

Eryngium

Eryngium coeruleam M.Bieb. The only prickly umbellifer of our area. The foliage has a bluish tinge. Poonch, Jhelum Vy. Road, Haripur, Abbottabad, and Mansehra.

Sanicula

Sanicula elata Ham. (*S. europea* of F.B.I.). A small fruited forest species ; fruits 1/10", covered with hooked bristles. Poonch, Murree, common in the Galis.

Bupleurum

Bupleurum lanceolatum Wall. A large monsoon species with the basal and cauline leaves long petioled, oval to broadly oval. Murree, Kuldana, Gharial etc.

B. candollei Wall. ex DC. Leaves less elliptic than in the last, slightly amplexicaul, thin, with veins distinct. Flower and fruit pedicels short. Poonch, Changla Gali.

B. jucundum Kurz. In this species the leaves become progressively broader from base to inflorescence, bases of upper leaves deeply cordate, fruit disc, light yellow to light brown, ridges slightly winged. Abbottabad, Changla Gali.

B. falcatum L. A common perennial with leaves longer for their width than in the first three species. Bractlets usually foliaceous, fruit ridges winged, urrows 3 vittate. 4-9,000' Murree, Hazara, Swat etc.

B. tenue Don, Stems erect or decumbent, leaves linear to oblong, rays filiform, flos. subsessile ; fruit ridges unwinged. Ghora Gali, Murree, the Galis, Poonch, Swat.

B. subuniflorum Boiss. (*B. setaceum* auctt.) An erect annual weed in dry places and roadsides. Umbels compound but uniradiate, branching dichotomous, branches numerous and slender. Leaves small, very narrow. Below Murree toward Kohala, Barsala, Uri, Balakot, Swat etc.

B. croceum Fenzl. A remarkable species with perfoliate leaves. Rare, found in a Rawalpindi graveyard, Kotli ; former N.W.F.P.

B. hazarica Nasir. A species differing from the preceding in having the petals and the stylopodia almost black. Miranjani and Mokhshpuri, Hazara district.

Eriocycla

Eriocycla stewartii (Dunn) Wolff. A scented species with small white flos. growing on rocky banks. The leaf segments are linear to lanceolate, rays slender up to 9, style as long as or longer than the ovary. Bracteoles present. Fruit 1.5 mm. long, 2-7,000'. Gharial, Murree, Kohala, Abbottabad, Poonch.

Scaligeria

Scaligeria aitchisonii Wolff. A spring species with similar leaves and flos. but the fruits are almost round 2 mm. long and ridges obscure. There is a basal corm. 2-7,000' Margalla, on limestone. Swat.

S. aitchisonii var. *multiradiata* O.E.S. with 18 or more rays is common about Abbottabad.

Trachyspermum (Carum in F.B.I.)

Trachyspermum copticum (L.) Link, (*Carum aromaticum* Druce), (*C. copticum* Bth.). This genus is very similar to *Carum* but lacks the tuberous corms. *Ajowain* is cult. in the plains. The leaf segments are nearly filiform, flos. white and seeds pubescent, (verruculose). Salt Range. Source of thymol.

Berula

Berula erecta (Huds.) Cav. ; (*Sium angustifolium* L.), Peshawar and Hasan Abdal in wet places.

Pimpinella

Pimpinella acuminata (Edgew.) C.B.C. Fairly common in rich forest undergrowth from 6-9,000'. Large plants with twice pinnate leaves, pedicels very slender, fruits smooth, rounded. Murree, Gharial, Changla, Poonch etc.

P. diversifolia DC. The basal leaves are undivided while the stem leaves are divided into three or five lanceolate to ovate lobes. Fruit ovate 2 mm. long. No bracteoles. The form growing in rich forest in the Galis from Changla to Thandiani is taller ; the leaves are thinner in texture and a deeper green than plants growing in the open and may be different.

Chaerophyllum

Chaerophyllum villosum Wall. Common on Mokshpuri ; Thandiani. Roots tuberous or spindle shaped, stems hairy, deflexed toward the base, leaves twice or thrice pinnate, finely divided, fruits more than three times as long as wide, smooth. 5-10,000'.

Scandix

Scandix pecten veneris L. var. *brevirostris* Boiss. A common spring annual in ditches and about cultivation, plains to 6,000'. Fruits longer than any others in the family 1 to 2" long. Rawalpindi, Saidpur, Murree, Abbottabad, Poonch etc.

Seseli

Seseli indicum W. and A. *Ban joan*, Kahuta fide Bamber.

Foeniculum

Foeniculum vulgare Gaertn. *Saunf* is cult. from the plains to 7,000'. The leaves are eaten and the seeds are carminative.

Oenanthe

Oenanthe stolonifera Wall. A water plant from the plains to 5,500'. Calyx teeth prominent, rays up to 20 ; leaves 1-2 pinnate, leaflets oval to ovate. Wah, Maqsd (Haz.) Poonch, Swat.

Conium

Conium maculatum L. *Morkach*, hemlock, is a very large poisonous weed about cult. The fruit ridges are prominent, wavy, striate between the ridges. No vittae. Abbottabad, Jhicca Gali, Kashmir.

Selinum

Selinum tenuifolium Wall. var. *elata* (Edgew). Clarke, is a tall white flowered perennial species flowering in late August and September. Fibers of old leaves cling to the stem bases. Murree, Ghora Gali, the Galis, Poonch etc. 6-9,000'.

Pleurospermum

Pleurospermum govianum (DC.) Bth. (*P. stellatum* Bth). A species with large bractlets and umbellets is reported from Changla Gali at 9,000'.

P. stylosum C.B.C. Plants tall, bractlets lanceolate, flos. white, fruit epicarp lax, is common on a ridge of Mokshpuri above Dunga Gali at nearly 9,000'. Poonch, Swat.

Ferula

Ferula jaeschkeana Vtke. var. *parkeriana* (Wolff.) O.E.S. Common on the hills above Abbottabad in March and April. It is a large plant with yellow flos., hollow stems and large fruits. Poonch, Kishenganga Vy.

F. stewartiana O.E. Schulz. Discovered in limestone crevices on the mt. above Hasan Abdal and also grows near Abbottabad. Rare. Ripe fruit not yet seen. Much smaller.

Peucedanum

Peucedanum graveolens Bth. *Soe* is sometimes confused with *saunf*. This is an annual with much shorter leaf segments and flattened fruit. Commonly planted.

Heracleum

Heracleum cachemiricum Clarke is common before the rains from 3-9,000'. The leaf segments are 1-2 cm. long, lanceolate to oval, margin entire. Murree and the Galis; Poonch, Swat etc.

H. candicans Wall. A much larger plant is common from 4-9,000' flowering in the spring and again in late August. Leaves white below. Murree Hills, Galis, Swat, Kashmir etc.

H. canescens Lindl. Much smaller; is rare in our area. Rays up to 15 only, plants very hairy, fruit 1 cm. long. Murree, Abbottabad 4,500-9,000'.

Coriandrum

Coriandrum sativum L. *Dhanya* or coriander is commonly cult. in plains and hills and is sometimes self sown.

Daucus

Daucus carota L. *Gajar*, the carrot, is similarly cult.

Caucalis

Caucalis stocksiana Boiss. (*Torilis stocksiana* (Boiss). Koso-Polj. Murree, Khaira Gali, Changla, has white flos. and leaf segments narrow, while the next sp. has pinkish flos. and broad leaf segments.

C. latifolia L. Patriata, Murree Hills, Swat, Kashmir etc.

Torilis

Note. *Torilis* has been separated from *Caucalis* by some botanists. The differences are small but are as follows.

Fruit oblong, secondary ridges concealed by numerous bristles occupying the whole interval

Torilis

Fruit linear to oblong, secondary ridges concealed by 1-3 rows of bristles

Caucalis

Torilis leptophylla (L.) Reich. has bristles on the fruit, long slender, straight and shining, while the next species has bristles shorter, thicker, curved, almost hooked. Common as a weed in the plains in the spring and sometimes up to 7,000' in Murree, Jhelmu district, Poonch, Swat.

T. japonicus DC., (*T. anthriscus* (L.) Gmel. A taller plant 4-9,000' ; common in the Murree Hills and Galis flowering toward the end of the rains. Poonch, Swat etc.

Psammogeton

Psammogeton biternatum Edgew. A desert plant of the plains in March and April in sandy stream beds and gravelly places. Rawalpindi, Hasan Abdal, Attock district etc., Ridges of fruit white, hairy. Flos., white or pink.

ARALIACEAE

Hedera

Hedera nepalensis K. Koch (*H. helix* F.B.I.), *Banbatkari*, *harbanbal*. The ivy is perhaps the commonest vine in the Murree Hills and Galis. It climbs the tallest trees with stems as thick as an arm and also climbs on cliffs.

Heptapleurum

Heptapleurum venulosum Seem (*Schefflera venulosa* (Seem) Harms. This evergreen, climbing shrub is as rare as *Hedera* is common. The only plant I knew grew on a great boulder above Tret but it has recently disappeared. It also grew near Kotli, Mirpur district. A cliff plant.

Aralia

Aralia cachemirica Dcne. On steep hillsides or forest blanks from 8-12,000'. It is a large, shrub like, herbaceous perennial with many small white flos. in round umbels in simple or branching racemes. Poonch, Changla Gali ; common in Dunga Gali Catchment area with *Delphinium vestitum*, *Aconitum laeve* and *Campanula latifolia*.

CORNACEAE

Cornus

Cornus macrophylla Wall. *Kandar* is very common in the temperate forest throughout the Murree Hills and Galis. The leaves are 2-3" broad and the fruit globose while in the next species the leaves are 1-1½" broad, fruit ovoid.

Cornus oblonga Wall. Rawalpindi east, 3,500-7,000' (Parker) There are tumid spots in the leaf angles below. Dhirkot, Poonch (Jerram).

ALANGIACEAE

Alangium (Marlea)

Alangium chinense (Lour). Rehder, (*Marlea begoniaefolia* Roxb.) Indus east to China. 3,500-8,000' (Parker). Roxburgh's specific name was given because like *Begonia* leaves those of this small tree are usually very oblique and asymmetrical. A plant of moist ravines, Maqsd, and Abbottabad, Hazara, Kagan, Jhelum Vy. Rd.

CAPRIFOLIACEAE

Viburnum

Leaves entire or crenate

Leaves ovate or orbicular, tomentose beneath, calyx limb 5
toothed. *V. cotinifolium*

Leaves oblong, glabrous ; calyx limb obsolete *V. cylindricum*

Leaves sharply toothed

Flos. after the leaves ; corolla rotate *V. mullaha*

Flos. with or before leaves, corolla tubular-funnel shaped *V. nervosum*

V. cotinifolium D. Don, very common in forest undergrowth from 4-9,000'. The ripe fruits are black ; reddish when immature. Trans Indus to Bhutan.

V. cylindricum Ham. (*V. coriaceum* Blume), 3,500-8,000' from Rawalpindi district eastward. Jerram found it between 3,500 and 4,500'. Commoner further east.

V. mullaha D. Don, (*V. stellatum* Wall.). A large deciduous shrub bearing corymbose cymes of small white flos. growing from 6-8,000' from the Indus eastward. Murree, Jhicca Gali, Nathia to Baghotar, Poonch.

V. nervosum D. Don, (*V. foetens* Dcne.) 5-12,000'. Often the commonest shrub in forest undergrowth and on lower alpine meadows, Swat eastwards. Murree Hills and Galis. Guch.

Abelia

Abelia triflora R. Br. A shrub with fibrous bark and with calyx lobes elongate and feathery ; flos. white or tinged with pink. Leaves usually entire but sometimes lobed. Indus east 5-10,000'. The Pipe Line and Galis, Poonch Kishenganga Vy.

Lonicera

Corolla regular or nearly so, a dwarf shrub, leaves up to $\frac{1}{4}$ " long *L. parvifolia*
Corolla two lipped, twigs with pith, peduncle more or less conspicuous

Peduncle .5-1.2" long, ovaries united *L. discolor*

Peduncle 1-2" long, ovaries free *L. webbiana* (*L. alpigena*)

Twigs hollow, peduncle O or minute *L. quinquelocularis*

Lonicera parvifolia H. and T. Common and gregarious in sunny rocky places in the Galis above 8,000', Mokshpuri top, Thandiani, Poonch 8-12,000'.

L. webbiana Wall. ex DC. (*L. alpigena* F.B.I.) Very common in forest undergrowth 6-11,000'. Murree, Jhicca Gali, the Galis, Thandiani, Poonch etc.

L. quinquelocularis Hardw. The commonest and largest species, sometimes becoming a small tree. Grows in sunny places, 4-12,000' Phut (Haz.)

Leycesteria

Leycesteria formosa Wall. An erect undershrub up to 6' tall. The stems are fistular and the ovary 5 celled. Berries .5" long, dark purple. 5-10,000' in moist undergrowth. Patriata, Pipe Line near Khanspur. Kotli; Lower Forest Road, Murree.

RUBIACEAE

Wendlandia

Stipules recurved, lateral nerves 12-20 pairs, capsules tomentose *W. exserta*

Stipules erect, lateral nerves 10-12 pairs, capsules nearly glabrous *W. puberula*

Wendlandia exserta DC. Local in Hazara and Rawalpindi (Parker), "Ukan." Panjar, Kahuta Tahsil, Lehtrar etc.

Wendlandia puberula DC. Rawalpindi to Nepal (Parker) to 4,500', Mirpur, Kangra

Oldenlandia

Oldenlandia corymbosa L. A small, erect opposite leaved, stipulate herb with small white flos. Murree Hills (Douie) ; Sirari, Poonch; Kotli. Plains to 6,000'.

O. gracilis DC. Mansehra, Hazara with brown flos. 4-5,000'

Randia

A small shrub, calyx lobes narrow, berries .3" long *R. tetrasperma*

A large shrub, calyx lobes broad, berries up to 1.5" long *R. dumetorum*

Randia tetrasperma Bth. A dwarf rigid shrub up to 3' tall with white starry flos. Swat to Sikkim. Saidpur Hills, Hasan Abdal, Sakesar, Poonch, Kishenganga Vy. 2-6,000'

R. dumetorum Lamk. Rawalpindi district eastwards (Parker). I have seen no specimens.

Hamiltonia

Hamiltonia suaveolens Roxb. A shrub with deep lilac or purple flos. growing in steep places in the *chir* zone and blooming from Sept. to Dec. Tret, Hasan Abdal, Abbottabad, Domel, Poonch. 2-6,500', Indus East.

Leptodermis

Leptodermis virgata Edgew. A small shrub with lilac flos. from Hazara east in the outer Himalaya and up to Murree, Abbottabad, Muzaffarabad, Jhelum Vy. Road, Poonch.

Gaillonia

Gaillonia calycoptera J. and S. Attock in April; former N.W.F.P. A rigid, desert plant up to 1' tall; fruit dry, tipped by the much enlarged calyx limb.

Rubia

Rubia purpurea DC. Possibly a colour form of the next, *R. cordifolia*. A prickly climber with blackish purple flos. during the rains, Ghora Gali, Murree, Changla Gali.

R. cordifolia L. Flos. small white, Abbottabad, Swat, Poonch.

R. infundibularis Hems. and Lace. A prostrate or trailing undershrub, older stems whitish with papery bark. Leaves linear in twos or fours, Murree-Kohala Road, Swat, Salt Range, Baghnatar (Haz.)

Pavetta

Pavetta tomentosa Roxb. [*P. indica* var. *tomentosa* (Roxb.) Hk. f.]; Rawalpindi east (Parker); Mirpur.

Galium

Galium elegans Wall. (*G. rotundifolium* of Fl. Brit. Ind.), A common trailer in Abbottabad and the Murree Hills. Flos. white to yellowish green and the elliptic leaves are three veined.

G. boreale L. The plants are erect, the flos. white, veins three ; fruitlets hairy. Murree, the Pipe Line, Changla Gali etc.

G. asperifolium Wall. (*G. mollugo* of Fl. Brit. Ind.), This is another trailer, much branched, often tangled and the leaves very small. It is very common from 3 to 8,000'.

G. asperuloides Edgew., (*G. triflorum* of Fl. Brit. Ind.). This is an erect plant in forest shade with a branched, terminal inflorescence. Sometimes there are smaller groups of flowers in the upper axils. Murree, Gharial, Changla.

G. tenuissimum Bieb. A dwarf, erect branching form, sometimes bushy in appearance growing in dry places in the plains and lower hills in Rawalpindi and Attock district .

G. setaceum Lamk. Another dwarf form ; stems weak, leaning. Wah, Hasan Abdal and a specimen from Abbottabad seems to belong here.

G. tricorne With. This is a creeping form much like *G. aparine* but the small, twin fruitlets are large for the genus and warted, not pubescent. Plains and lower hills.

G. aparine L. The commonest, weediest species, sometimes tying vegetation together as a bindweed does. Throughout the area in plains and hills.

G. gratum Wall. (*G. triflorum* var. *hoffmeisteri* of Fl. Brit. Ind.) Fruit covered with hooked hairs ; basal leaves petioled, obovate, spatulate, one venied. Rawalpindi, Jhalar, Abbottabad.

VALERIANACEAE

Valeriana

Valeriana stracheyi Clarke. Unlike the next two valerians this is a rock species with finely pubescent leaves and the terminal leaflets two or three times longer than the others. Ghora Gali, The Pipe Line, Dunga Gali etc.

V. jatamansi Jones, (*V. wallichii* DC.) *Mushk baja*. One of the commonest and earliest of the spring flowers, in the hills from 4-9,000'. The roots are medicinal and their peculiar scent remains in the herbarium cabinet for years.

V. pyrolaefolia Dcne. Grows usually at 8,000' or above, Changla Gali, Dunga Gali etc. Much like the last species but smaller and the leaves are obtuse or rounded at the tip.

Valerianella

Valerianella szovitziana F. and M. A dwarf spring annual with tiny flos. and with the calyx limb reticulately nerved and with one long horizontal linear tooth about the length of the capsule. Abbottabad, Mansera.

V. dentata Pall. is much like the last but the calyx limb is obliquely truncate, toothed and much shorter than the fruit ; bracts small. Abbottabad, Domel, Mirpur.

DIPSACEAE

Morina

Morina persica L. A handsome, prickly leaved perennial with pink and white flos. which grows on cliffs and steep banks ; often growing with *Gerbera* and *Serratula* and flowering in May. Murree.

Dipsacus

Dipsacus inermis Wall. *Uppalhak*, the teasel, is a tall perennial with a compact head of creamy white flos. Changla, Dunga etc.

Scabiosa

Scabiosa olivieri Coult. A common short lived spring annual of the plains growing in dry places from the former Punjab to the Mediterranean.

S. candolleana Wall. is a perennial with a basal rosette of linear lanceolate leaves in the dry foothill zone. Mansera, Abbottabad, Kurram.

COMPOSITAE

Vernonia

Vernonia cinerea (L.) Less. A variable tropical weed, blooming throughout the year with pinkish purple flos. Plains to 6,000'. Abbottabad, Poonch.

V. anthelmintica Willd. *Kalijiri* is a medicinal plant which is sometimes cult. I have found it at Saidpur, Mansera, Poonch etc. Widespread in the tropics.

Adenostemma

Adenostemma lavenia (L.) O. Kze. (*A. viscosum* Forst.) is a vigorous monsoon weed growing up to 6' tall in rich soil. It resembles *Siegesbeckia* but lacks the involucre glands. Poonch, Hasan Abdal, Sarae Saleh.

Ageratum

Ageratum conyzoides L. Occasionally cult. and also self sown.

Solidago

Solidago virgaurea L. The only wild golden rod in the Himalayas is usually found above, 8,000'. Changla, Dunga, Thandiani etc.

Cyathocline

Cyathocline lyrata Cass. This widespread tropical weed has become established around Rawalpindi in damp places. Leaves pinnately divided ; flos., rose purple.

Myriactis

Myriactis wallichii Less. This summer, perennial herb resembles some small flowered Erigerons. It is common in Murree and the Galis above 6,000' and is often a pioneer on landslips from June to Oct. *M. nepalensis* is a larger, coarser plant with larger heads and is to be expected.

Aster

Aster molliusculus Wall. is a handsome cliff plant with white or lavender flos. and blooming before the monsoon ; 6-8,000'.

Bellis

Bellis perennis L., the English daisy has become established in Murree near St. Dennys School and probably in other places.

Erigeron

Erigeron bellidioides Benth. with narrowly linear stem leaves is common on rocky banks from 6-8,000'.

E. kumaonensis Vier. with narrow, white ligules is similar but the root is woody ; the leaves largely basal with few teeth. It is one of the forms related to *E. multicaule* Wall.

E. ellisii Hk.f. Another form from the *E. multicaule* complex. The upper stem leaves are broad and stem clasping. The rays are numerous and white. Changla and the Galis.

E. multicaule Wall. A variety of *E. alpinus* in Hooker. When the *Erigerons* are monographed several types may be segregated from those which are now placed here. I have a good many specimens of which I am not certain. Some of the rougher, weedier ones may well be *E. acris* L. This group needs more study.

Conyza

Conyza canadensis (L.) Cronquist, (*Erigeron canadensis* L.). According to Conquist the weedy, short rayed forms formerly placed in *Erigeron* should be transferred to *Conyza*. This erect, weedy form with many tiny capitula without coloured rays is very common about cultivation throughout the area.

C. japonica Less. Much smaller and with larger, pubescent heads is common on banks and roadsides in the foothills to 7,000'. Erect, villous, annual, 6-20" tall, leaves sessile, obovate spatulate.

C. ambigua DC. is a common plains weed with toothed leaves and capitula about $\frac{1}{2}$ " in diam.

C. crispus Pourr. (*Erigeron bonariensis* L. at Kew), (*E. linifolius* Willd.) is still another erect, weedy form resembling *C. canadensis* but with larger heads and with linear leaves usually without teeth. A pioneer about cultivation.

C. stricta Willd. This is the best looking of the genus with small yellow heads flowering in the autum. The leaves may be undivided or lobed ; 3-7,000. Common.

C. aegyptiaca Ait. Another weed of the plains has been collected in Lahore and Khewra. Leaves more deeply cut and heads larger than in *C. japonica*.

Brachyactis

Brachyactis robusta Bth. Mokhshpuri. A stout, erect glandular pubescent annual with heads $\frac{1}{2}$ " in diam. Ligules minute.

Blumea

Blumea amplexans DC. Leaves half amplexicaul ; inner phyllaries with caudate tips (Clarke). Heads $\frac{1}{2}$ "— $\frac{1}{4}$ " ; Corolla yellow.

B. bifoliata DC. Charehan and Bhurban (Coventry). The two upper leaves of each branch are usually opposite. Differs from the last in having serrate, not dentate leaves and involucre bracts, not hair pointed. Heads few, subumbellate, yellow.

B. lacera DC. A tropical weed smelling of turpentine ; found in the plains and lower hills.

B. membranacea DC. Another erect, weedy form with many heads $\frac{1}{4}$ to $\frac{1}{2}$ " in diam, peduncled in open corymbs. Rawalpindi, Saidpur, Kotli. Branches of panicle glandular.

Laggera

Laggera aurita (L.) Shultz-Bip. (*Coryza aurita*) L.) Only reported from Nurpurseti in the Salt Range by Iftikhar Ahmad. The stems are winged.

Pluchea

Pluchea lanceolata (Walt.) Clarke. A small shrub with narrowly elliptic fleshy leaves is found in flower or fruit throughout the year. It is often found on the bare soil of loess cliffs . Gregarious.

P. arguta Boiss. Another xerophytic shrub with deeply toothed leaves. Dhamsal ; Khewra, Hirnpur etc. in Jhelum district.

Pluchea ovalis DC. with winged branches and *P. wallichiana* DC. which is glandular pubescent and scabrid are reported from the Salt Range by Parker, p. 293 but I have not seen any specimens.

Filago

Filago spathulata Presl. A small erect spring weed. Hoary. Rawalpindi, Kohala Jhelum District.

F. spathulata var. *prostrata* Parl. (*F. germanica* L. sens. lat.) is very common in the plains and lower hills. Branches spreading from the base.

Ifloga

Ifloga fontanessii Cass. An erect, spicate form. Attock District, Jhelum District Peshawar and west to the Canaries. March and April.

Leontopodium

Leontopodium alpinum Cass. A form of the alpine *Edelweiss* is found in Muree and the Galis in spring and early summer.

Anaphalis

Anaphalis cinnamomea (Wall.) Clarke, grows at Ghora Gali in Oct. ; also in Poonch. The leaves are acuminate and often cinnamon coloured below, especially when dried.

A. adnata DC. is a large perennial herb with cottony leaves and stems, the leaves being much broader than in the last. It grows among rocks on steep slopes from 6-8,000'.

A. araneosa DC. is a smaller plant which is very common toward the end of the rains at from 6-10,000'. The plants are cottony or almost green. The small white flos. are often tinged with pink when young. Leaf bases decurrent.

A. contorta (Don) Hk. f. is sometimes found in the Galis. The stem leaves are numerous, short, and are often twisted. Stems whiter than in the last.

Sphaeranthus

Sphaeranthus indicus L. is a tropical weed with round, red heads $\frac{1}{2}$ " in diam. Stems winged. Campbellpur, Sialkot.

Phagnalon

Phagnalon niveum Edgew. is a dwarf shrub growing on rocks and cliffs from 4-9,000'. The leaves are snowy white below.

Gnaphalium

Gnaphalium luteo-album L. Common in spring with cottony leaves and growing in damp places from the plains to 7,000'. There are two varieties. The one with golden coloured heads is var. *multiceps* Hk. f. and the one with pale heads is var. *pallidum* Hk. f.

G. indicum L. This also grows in damp soil in March and April in the plains. The leaves are narrowly ovate and obtuse and the capitula are in a spike. Rawalpindi, Mansera.

G. spatulatum Lam. (*G. purpureum* L.) Another spring annual of the plains, larger than the last and with the pappus hairs cohering by their bases.

G. pulvinatum Del. Campbellpur (Nasir), Peshawar. This spring, desert annual is the smallest of the genus and it can be recognized by the inflorescences consisting of small white balls.

Inula

Inula cappa DC. A shrub growing in the sub-Himalayan zone up to 6,000'. The flos. are without rays and the leaves are white below.

I. cuspidata Clarke. Another shrub, leaves green below and flos. with rays. Kalapani and Thandiani. Jhelum Vy. Road. Usually 4-7000'.

I. vestita Wall. (*Vicoa vestita* Bth.) A hairy, field and roadside weed of the plains sometimes growing near drying mud. April and May.

I. indica L. (*Vicoa indica* DC.) ; (*Vicoa auriculata* Cass.) A small, pretty, yellow flowered form with varnished leaves having amplexicaul bases.

I. royleana DC.. A tall perennial with large heads 3-4" across grows at Thandiani.

Blainvillea

Blainvillea latifolia (L.f.) DC., (*B. rhomboidea* Cass.) A tropical annual of the plains with white flos. about $\frac{1}{2}$ " in diam.

Pulicaria

Pulicaria crispa Bth. and Hk. f. A spring weed with stems and leaves covered with whitish wool is found from the Punjab plains westward to the Canaries.

Carpesium

Carpesium cernuum L. This is a forest plant with yellow flos. found from 4-9,000. Recognized by the nodding capitula.

C. abrotanoides L. This has much smaller yellow flos. borne on stiff lateral branches. The capitula are sessile. Abbottabad, Sarai Saleh (Haz.), Poonch.

Xanthium

Xanthium strumarium L. The *cocklebur* is fortunately not very common. It is found in weedy places in both plains and hills from June to Oct.

Siegesbeckia

Siegesbeckia orientalis L. Another vigorous cosmopolitan tropical weed, with small yellow flos. and a characteristic involucre covered with sticky glands. Plains and Hills during the hot weather.

Eclipta

Eclipta alba (L.) Hasskn. A cosmopolitan weed flowering most of the year. It is a prostrate plant which grows besides water in the plains with small, white, rayed flos. about 1" in diam.

Bidens

Bidens biternata (Lour). Merrill and Scherff, (*B. wallichii* DC.) *Bidens* is easily recognised by its small yellow flos. and pitchfork like achenes. Very common in both plains and hills after the rains.

Galinsoga

Galinsoga parviflora Cav. An American weed of cultivation with tiny white flos. which has spread widely in the Himalayas. Murree and the Galis.

Achillea

Achillea millefolium L. Yarrow or *akarkara* is a strongly scented, perennial herb with small white flowers which is easily recognized by its leaves which are much divided with many filiform segments. It is supposed to be good for toothache. 4-9,000'.

Anthemis

Anthemis cotula L. A pretty annual with daisy like flos. is sometimes found about cultivation. Rawalpindi, Changa.

Matricaria

Matricaria chamomilla L. Much like the last, bearing bracts with white margins. Not common. Rawalpindi, Peshawar. The conic receptacle elongates during fruiting.

M. praecox DC. Much like the last two species but the bracts have reddish scarious margins and there is a white cup at the top of the angled achenes; thalamus conical. Peshawar and along the frontier.

Chrysanthemum

Chrysanthemum leucanthemum L. This pretty daisy has run wild in grassy places about Murree and other hill stations.

Cotula

Cotula aurea L. A diminutive spring ephemeral in the plains and up to 4,000'. The small conical heads lack rays.

Artemisia

Artemisia parviflora Roxb. (*A. japonica* Thunb. var. *parviflora* (Roxb.) Pamp.), is common. 4-9,000', in sunny places. The lower leaves are simple, obovate, oblong with a dentate apex.

A. scoparia W. and K. This species has the smallest heads of any of our worm-woods. It is found from the plains to 7,000'. The leaves are glabrous, pinnatipartite, segments linear. Flowers at the end of the rains.

A. tournfortiana Reichb. A stout erect, glabrous annual ; spicate with numerous tiny heads in congested panicles. Gharial, Changla etc.

A. mvriantha var. hypoleuca (Edgew) Pamp., (*A. roxburghiana* Besser), Flos. at the close of the rains and the under/surfaces of the leaves are snow white. Ghorā Gali, Changla, Dunga etc.

A. vestita Wall. is somewhat like the last but is smaller, more xerophytic. The leaves are pale green above and ashy coloured below. Sakesar (Iftikhar Ahmad).

A. vulgaris L. As listed by Hooker this is a composite species and the Himalayan forms need to be collected and studied. One form which may be *A. incisa* Pamp. is not rare in the temperate zone at Thandiani etc.

Tussilago

Tussilago farfara L. Coltsfoot is a dandelion like plant which flowers early in the spring before there are any leaves. It grows in patches on steep banks above streams or near water. Murree, Poonch, Hazara.

Doronicum

Doronicum roylei DC. A tall, large leaved, forest plant with yellow flos. about an inch in diam. Dunga Gali, Poonch.

Senecio

Senecio chrysanthemoides DC. var. *analogus* Hk.f. Common at the close of the rains in the Galis with pretty yellow flos. and the lower surface of the leaves snow white.

S. nudicaulis Ham. is a much smaller perennial growing in dry gravelly places from 4-7,000'. The leaves are reddish below and basal, leaving the peduncle naked.

S. coronopifolius Desf. A smaller, desert type with pretty yellow flos. about $\frac{1}{2}$ " in diam. From the plains to Tibetan Kashmir.

S. rufinervis DC. A large leaved forest species with rather small flos. blooming at the close of the rains with leaves white cottony below and veins reddish below. 6-9,000'.

Calendula

Calendula arvensis L. is a very abundant spring annual in the plains by roadsides and about cultivation. The flos. are yellow and the outer achenes are beaked.

C. officinalis L. is commonly cultivated. It has similar flos. which are larger.

Helianthus

Helianthus annuus L., the sunflower, *suraj mukhi*, is commonly planted.

Echinops

Echinops echinatus DC., the Globe thistle, is a very spiny, xerophytic weed growing in desert places in the plains.

E. niveus Wall. with larger white flowered heads grows in small patches in grassy places in the hills from 6-9,000'.

Cousinia

Cousinia minuta Boiss. is a common, xerophytic spiny weed with cobwebby leaves growing in the plains and along the frontier in April and May.

Carduus

Carduus nutans L. including *C. acanthoides* L. A thistle with pretty pink flos. and leaf bases which run down the stems as prickly wings, 4-9,000'.

Cnicus

Cnicus benedictus L. is an annual thistle with large heads. Campbellpur, Trans Indus.

C. arvensis Hoffm. is a very common thistle growing in heavy, damp soil near water courses or in poorly drained clay. The leaves are cobwebby and decurrent. *Pohli*.

C. wallichii DC. This is the common thistle of roadsides and waste places in the hills from 4,000' upward. The flos. are white or somewhat pink and the inner involucre bracts have dilated tips. There is a basal rosette and the stems are leafy.

Silybum

Silybum marianum Gaertn. is a vigorous spring weed of the plains and lower hills growing on rubbish heaps and by roadsides. It is easily recognized by the broad white veins on the leaves and by the large rosy pink heads. Prickly.

Jurinea

Jurinea modesta Boiss. Occasionally found in the plains with pretty pink heads. An annual. Campbellpur, Peshawar, in April.

Saussurea

Saussurea candidans Clarke is a tall, erect herb with cottony leaves and reddish flowers which is found in the plains and up to 7,000'.

S. albescens H. and T is another large perennial with smaller flowers growing in the hills on grassy slopes. 5-9000'. Leaves white below, heads erect, receptacle narrow.

Serratula

Serratula pallida DC. A handsome, scapose plant with pink or purple heads growing on steep banks or cliffs with *Gerbera* and *Morina* ; 5-8,000'.

Tricholepis

Tricholepis furcata DC. is a tall, white flowered perennial with handsome white heads growing in grassy places from 7-9,000'. The very numerous narrow involucre bracts are distinctive.

T. stewartii Clarke also has fine white heads but this is a cliff plant and is some times locally abundant along the Pipe Line, Murree, Chang'la, Dunga etc. Flos. at the close of the rains.

Volutarella

Volutarella divaricata Bth. with numerous prickly involucre bracts is a xerophytic spring weed of the plains. Campbellpur, Poonch, Trans-Indus. Flowers purple.

Centaurea

Centaurea cyanus L. The corn flower or corn cockle is commonly planted in gardens and is sometimes self sown. *C. moschata* L., the Sweet Sultana, is also cult.

C. iberica Stev. I previously identified this plant as *C. calcitrapa* L. but that species is supposed to be without a pappus and our specimens have a short pappus. This is a thistle with strong yellow spines on its involucre and with pretty pink flos. Plains to 6,000'. Radicle leaves pinnate or pinnatifid.

Carthamus

C. oxycantha M. Bieb. *Pohli* or *kandiari* is a noxious spiny weed which often covers grain fields after the harvest. Flos. yellow.

Ainsliaea

Ainsliaea aptera DC. Aarons Rod is fairly common in hill forests from 7-9,000'. The pretty star like white flos. are borne in early spring on tall, leafless stalks. The orbicular, cordate leaves appear later.

A. pteropoda DC. is rare in the Murree Hills. The leaves are very different with the leaf pedicel winged. I have only found it at Charehan at 5,000'. Poonch.

Gerbera

Gerbera gossypina (Royle) Beauv. (*G. lanuginosa* of Fl. Brit. Ind.) A common perennial of steep banks, 4-9,000', bearing pink flos. The lower side of the leaves bears a coat of white cotton which used to be collected for tinder.

Cichorium

Cichorium intybus L. *Kashni* or chicory with pretty blue flos. is common in open places from 4-8,000'.

C. endivia L. Endive is occasionally found as an escape. The branches of the inflorescence grow out at right angles from the main stem and are often thickened. The lower leaves are sinuate not runcinate.

Lapsana

Lapsana communis L. is a forest plant with small yellow flos. growing at from 5-9,000'. The achenes are without a pappus.

Koelpinia

Koelpinia linearis Pall. is a common, spring, desert annual with peculiar narrow, clawed fruits and yellow flos. Like *Capparis spinosa*, the yellow *Linum*, *Tribulus* and *Peganum* it ascends the Indus to Baltistan.

Picris

Picris hieracioides L. An erect, yellow flowered weed with prickly stems, 5-10,000'

Crepis

Crepis thomsonii Babcock, (*C. foetida* of Fl. Brit. Ind.), Plains and Trans Indus in weedy places.

C. sancta ssp. *bifida* Babcock, (*Pterotheca falconeri* Hk.f.). Common from 4-9,000' before the rains. Flos. yellow.

Dubyaea

Dubyaea oligocephala (Schult. Bip.) Babc. and Stebbins (Under *Crepis* in Fl. Brit. Ind.) A dandelion like perennial growing rarely on cliffs or steep banks. Khaira Gali, Nathia.

Youngia

Youngia japonica (L.) DC. (*Crepis japonica* L.) is an herb of wide distribution with a large number of very small yellow flos. Plains to 7,000' and from Afghanistan to Japan.

Hieracium

Hieracium vulgatum Koch. Another dandelion like plant, perennial, radical leaves persistent, grows on dry banks in the forest from 6-10,000'. Jhikka Gali, Murree, Hazara.

Taraxacum

Taraxacum officinale Wigg. Several forms of this polymorphic "species" are found from the plains to the alpine zone. Common throughout.

Lactuca

Lactuca scariola L. According to Stebbins the name *L. serriola* L. has precedence. This wild lettuce is found in both plains and hills as is var. *sativa*, the cult. lettuce, commonly used for salad. Flos. yellow.

L. dissecta D. Don. A small spring annual with lavender flos. and deeply cut leaves is found throughout.

L. polycephala Bth. Another small herb with small yellow flos. growing at the edge of water in Topi Park, Rawalpindi. The subumbellate character of the inflorescence is exceptional in the genus. Afghanistan to Burma, 1-4,000'.

L. brunoniana (Wall.) Stebbins, (*Prenanthes brunoniana* (Wall.) Clarke.) Common on banks throughout the Murree Hills from 6-9,000'. The flos. are pale lavender in colour and the leaves are most variable in shape. Ligules few.

L. longifolia DC. A pretty lavender flowered hill species, tall, erect. Kalapani (Haz.)

Reichardia (Picridium)

Reichardia picroides (L.) Roth (*Picridium tingitanum* Desf.) A dwarf spring annual of dry places in the plains from the Punjab to the Canaries. The corky four edged lumpy achenes are peculiar.

Sonchus

Sonchus asper (L.) Hill. Common from the plains to 9,000' in waste places. The leaves are usually more spiny than in the next two species. The achenes are obscurely muricate and the leaf auricles are rounded.

S. oleraceus L. This is also common throughout. The leaf auricles are acute and the faces of the achenes are three ribbed and muricate between the ribs.

S. arvensis L. Another cosmopolitan weed but perennial and prettier than the two previous species which are annuals. Banks and roadsides from the plains to 9,000'.

Launaea

Launaea secunda Clarke. Common in rocky, dry places in the chir zone with a tall peduncle of small yellow flos. The leaves are in a basal rosette.

L. nudicaulis (L.) Hk.f. A common plains weed from the Atlantic to the plains of India. The flowering branches are long and prostrate.

Microrhynchus

Microrhynchus chondrilloides Clarke, (*Launaea* in Fl. Brit. Ind.) An erect branching species with rather large dandelion like flos. growing in stony places from Rawalpindi to Egypt.

Tragapogon

Tragapogon pratense L. A large, vigorous herb with broad based grass like leaves and yellow flos. Murree. Goats beard.

T. gracile D. Don, Hazara to Nepal, 2-12,000'. Mt. above Hasan Abdal. The leaves are narrowly linear and undivided.

Pterachaenia (Scorzonera in Fl. Brit. Ind.)

Pterachaenia stewartii (Hk. f.) Lips. A xerophytic plains species with narrowly linear leaves and remarkable achenes with white wings and echinate ribs. Rawalpindi, Attock Dist., Peshawar.

Epilasia

Epilasia ammophila Bunge. Another spring desert annual with lavender flos. The pappus is dark brown and the narrow leaves are cottony.

CAMPANULACEAE

Campanula

Campanula canescens Wall. A plant of the plains and foothills in rather damp soil. The flos. are small and pink and bloom in March and April. Rawalpindi, Attock, Abbottabad etc.

C. colorata Wall. Very common from 4-9,000'. Pretty purple, bell shaped flos.

C. latifolia L. Large bell shaped flos. more than an inch in diam. Dunga, Thandiani.

C. tenuissima Dunn. A pretty form with small white flos. with pink veins is common on rocks during the summer. Jhelum Vy. Road, Pipe Line, Kalapani, Khanspur etc. 3-9,000'.

MONOTROPACEAE

Monotropa

Monotropa uniflora L. The one flowered Indian Pipe grows in forest humus on Upper Topa and at Thandiani. The leaves are reduced to scales.

M. hypopithys L. This is also a humus plant of damp, shady, forest undergrowth bearing several flos.. Usually 6-9,000'. Commoner than the last.

ERICACEAE

Rhododendron

Rhododendron arboreum Smith, *Ikri, kikari*, is rare in our area. Murree, Changla, Dadar. Poonch. A very handsome tree with reddish pink flos.

Pieris

Pieris ovalifolia D. Don. *Rattankat* is also rare about Murree. The leaves are poisonous and can be used as an insecticide. 3-8,000', Indus east (Parker). More common in Poonch. Flos. small, .3 to .4" long in racemes.

PLUMBAGINACEAE

Plumbago

Plumbago zeylanica L. A sub-Himalayan plant from the Indus east up to 5,000'. The flos. are white and the calyx glands are distinctive. Called 'chitra' in Poonch.

P. capensis Thunb. This south African species is often planted in gardens in the plains. The flos. are pale blue.

Statice

Statice griffithii Aitch. and Hemsl. A scapose perennial of gravelly places in the sun. The peduncle rises from a rosette of xerophytic leaves. Abbottabad, Mansera, Swat etc.

PRIMULACEAE

Primula

Primula denticulata Sm. The only *Primula* in our area bears a pretty umbellate head of purple flos. in early spring, soon after the snow has melted. Murree, Changla, Dunga etc. Above 6,000'.

Androsace

Androsace umbellata (Lour.) Merrill, (*A. saxifragiaefolia* Bunge). Not common but is occasionally found near water from the plains to 4,000'. Near Rawalpindi, Poonch, near Abbottabad. Flos. small and white.

A. rotundifolia Hard. is common from 4-9,000' on banks in thin forest. The flos. are pink fading to nearly white. Sakesar in the Salt Range.

A. foliosa Duby. A handsome species with pink or pale lavender flos. growing in patches in the forest from June to Aug. Murree, Changla, Pipe Line etc. Leaves much broader than in the next.

A. himalaica (R. Kn.) Hand. Maz. A much rarer plant with linear leaves and handsome pink flos. It grows on the Pipe Line in June and July. More common in Thandiani.

Cortusa

Cortusa matthioli L. A shade plant in rather damp soil with pretty pink flos. and rounded leaves. Mokshpuri, Miranjani, Kagan.

Lysimachia

Lysimachia chenopodioides Watt. A spicate plant with small flos. in the leaf axils. Ghora Gai Chenari, Dunga.

L. debilis Wall. (*L. japonica* of Fl. Brit. Ind.) is a prostrate herb with yellow flos. creeping on the forest floor. Fairly common about Murree, Poonch.

Anagallis

Anagallis arvensis L. var. *coerulea* Gren. and Godr., the Blue Pimpernel is common in the plains in the spring, ascending in the lower hills.

A. arvensis L. var. *phoenicea* Gren. and Godr., the Scarlet Pimpernel is often found above 4,000' but it also grows at Margalla at 2,000'.

Samolus

Samolus valerandi L. is a small white flowered herb growing in damp soil from the plains to 4,000'. Hasan Abdal, Haripur, Poonch. Leaves obovate or spatulate.

MYRSINACEAE

Myrsine

Myrsine africana L. *Khokhal, kukar, baybring*, is a common forest undershrub from 4-9000'. It bears many small blue berries which are anthelmintic.

M. semiserrata Wall. is a small tree of moist ravines, Trans-Indus to Burma ; 3-6,000' (Parker). Charehan, Haiira in Poonch.

Embelia

Embelia robusta Roxb. Punjab near Kahuta ; sparing in *Pinus longifolia* undergrowth. (Parker), Mirpur.

Reptonia (Monotheca)

Reptonia buxifolia Dcne. This is a very xerophytic, olive like tree of frontier regions often growing with *Olea*, *Sageretia* and *Acacia modesta*. The leaves are thick and the stems are spiny. Salt Range ; Kala Chitta Hills. *Gurgura*.

EBENACEAE

Diospyros

Diospyros lotus L. *Amlok*. This tree is probably an old introduction as it is usually found near villages; 2,500-6,000'. The fruit is eaten fresh and also when dried.

STYRACEAE

Symplocos

Symplocos paniculata (Thunb.) Miq., (*S. crataegioides* Ha n. *Lodar, lojh.* Hazara east, 3-8,000' (Parker). I have not collected it in Murree but it is found at several places in Poonch.

OLEACEAE

Fraxinus

Fraxinus excelsior L., (*F. hookeri* Wenzig). *Sum*, the Himalayan Ash, is rare about Abbottabad and Murree. Poonch, Hazara, Swat etc.

F. xanthoxyloides Wall. is a much smaller and more xerophytic tree which I have seen at Barsala near Kohala. Rare on the outer ranges. Poonch, Muzaffarabad, Kagan.

Jasminum

Jasminum arborescens Roxb. A tropical plant usually found from Kangra east and below 3,000'. Kerl (Coventry). The leaves are simple, opposite and cordate.

J. grandiflorum L. Parker thinks that this form is indigenous in the Salt Range and the low hills of Rawalpindi Dist. It is common in gardens. Kobuksi considers it to be a variety of the next species. Chambeli ; 2-4,000'.

J. officinale L. This is the common white jasmine vine of the hills. It has 3-7 leaflets and the terminal lobe is much the largest. Wild and cult from 3-9,000'.

J. humile L. This erect, glabrous, yellow flowered shrub is also found both wild and cult. from 4-10,000'.

J. pubigerum D. Don is like the last species but pubescent. Kobuksi does not think that it is different enough for specific rank. Hazara, 4-7,000'. Pipe Line.

J. bifarium Wall. (*J. sambac* Ait.) *Motia* or *chambeli* is a sweet scented plains species with white flos.. ; much used for garlands. Cult. in the tropics of both hemispheres.

Nyctanthes

Nyctanthes arbor-tristis L. *Harsingar* is a sub-Himalayan shrub ; rare in our area. I have only found it by a Pir's grave near Rawalpindi and Parker found it in the Jowlian Reserve near Taxila. Possibly introduced.

Syringa

Syringa emodi Wall. This temperate or sub-alpine shrub with a panicle of white or pinkish flos is found from 7-12,000'. Changla, Dunga, Mokhshpuri etc.

Olea

Olea cuspidata Wall. *Kuo*, the wild Indian olive is one of the commonest trees from the plains to 5,000', the only rival being *Acacia modesta*.

O. glandulifera Wall. *Barkao* with much larger glabrous leaves and glandular nerve axils is sometimes found in moist ravines in the sub-Himalayan zone and is sometimes cult.

O. europaea L. Efforts have been made for many years to introduce the olive of commerce but without much success. Gardens have been started at several places on the Murree Road.

SALVADORACEAE

Salvadora

Salvadora oleoides Dcne. *Jhal* or *wan*, the desert shrub or small tree so common in Sind grows at Khewra, Jhelum Dist. and Trans-Indus.

APOCYNACEAE

Rhazya

Rhazya stricta Dcne. *Vena* is a gregarious, dwarf, erect shrub which is very common in stony places in the Kala Chitta Hills, Attock and Trans-Indus. The flos. are pale lavender, the foliage a yellowish green and the pods are erect.

Thevetia

Thevetia nerifolia Juss. According to Merrill the correct name is *T. peruviana* (Pers.) Merr: *Zard ganira*, the yellow or 'Exile' Oleander is a small, soft wooded tree with handsome yellow flos. The leaves are poisonous for animals.

Carissa

Carissa opaca Stapf ex Parker, (*C. spinarum* A. DC.), *garna* or *garaunda* is very common in the foothill scrub forests. The bluish black fruits are edible and the pretty white flos. scent the region where they grow in May.

Vinca

Vinca major L. The pretty blue flowered, creeping periwinkle has become naturalized in Abbottabad and Murree.

Nerium

Nerium indicum Mill. (*N. odorum* Soland.), *Kaner*, *ganira*, the oleander, is common in stony stream beds to 5,000'. The flos. are a beautiful pink and the shrub is cult. in the plains. The leaves are very poisonous.

Vallaris

Vallaris solanacea (Roth) O. Kze. (*V. heynei* Spreng.). A tall, evergreen, twining shrub with white flos., 7" across, is cult. in Rawalpindi.

Holarrhena

Holarrhena antidysenterica Wall. *Kurchi*, an indigenous drug used in dysentery grows near Nurpur at 2,000'. An extension of range.

Tabernaemontana

Tabernaemontana divaricata R. Br. ex R. and S. (*T. coronaria* Willd.). An erect shrub with handsome jasmine like flos. is cult. in Rawalpindi.

Trachelospermum

Trachelospermum lucidum (D. Don) K. Schum. (*T. fragrans* Hk. f.). A large climber on cliffs or bushes from 2-6,000' (Parker). Chenari, Jhelum Valley Road ; Poonch ; Hazara ; Swat.

ASCLEPIADACEAE

Cryptolepis

Cryptolepis buchanani R. and S. A fine large climber of the foothill zone with opposite, glaucous leaves and greenish yellow flos.; blooming in May and June. Tret, Nurpur, Kohala, Poonch.

Periploca

Periploca aphylla Dcne. *Bata* is a leafless switch plant growing in rocky places in the plains and foothills. The branches are thick and stiff and the dark reddish flos. bear long hairs on the petals.

Calatropis

Calatropis procera R. Br. *Ak* or *mudar* is one of the commonest perennials in the plains in waste places. It ascends sometimes to 5,000'.

Pergularia

Pergularia extensa (R. Br.) N. E. Brown, (*Daemia extensa* R. Br.). A monsoon climber of the plains and up to 3,000' which is easily recognized by its reflexed follicles bearing many soft prickles. Flos. greenish white. Rawalpindi, Sakesar, Poonch.

Pentatropis

Pentatropis spiralis Dcne. An extensive, slender twining shrub with thick fleshy leaves. Flos. green and .6" across, blooming in Feb. Topi Park, Rawalpindi, Trans-Indus and westward to North Africa.

Holostemma

Holostemma rheedianum Spreng. Falconer reported this from Kali ki Sarai on 4-8-1837 Parker reports it as growing from the Sutlej east. Was this an error ?

Tylophora.

Tylophora hirsuta Wight.. A tropical vine creeping over rocks in the foothill zone and covered densely with yellowish hair. Flos. in May, small ; white or pale green. Saidpur, Poonch.

T. tenerrima Wight. A herbaceous vine among herbage with narrow grass like leaves is occasional in the foothill zone. Mansera, Swat, Poonch.

Cynanchum

Cynanchum dalhousiae Wight. A herbaceous climber with narrow leaves four or five times as long as wide, flowering in July and Aug.; 4-8,000'. Abbottabad, Ghora Gali, Swat.

C. auriculatum Royle. A common climber from 4-8,000' with heart shaped leaves. The follicles hang on the vine through the winter.

C. arnottianum Wight. A small erect shrub with small dark purple, almost black flos. Abbottabad, Murree, Poonch, Swat.

C. vintetoxicum Pers. A similar erect undershrub with yellowish, glabrous flos. and leaves ovate, 2 by 1½". Changla, Poonch, Swat.

C. glaucum Wall. Sakesar, Chitral. Similar to the last but with corolla hairy within and leaves 3 by 1½".

Marsdenia

Marsdenia roylei Wight. 3-7,000' from the Indus eastward ; flos. orange on open hill sides. Rare in our area, less so in Poonch ; Chenari.

Dregea

Dregea volubilis (L.f.) Benth. Plains to 5,000'. A strong twining shrub with ovate or suborbicular leaves up to 6 by 4.5" ; flos. green or yellowish green and blunt pointed follicles, 3 to 4 by .7" thick, longitudinally ribbed or winged. Specimens referred to this species were probably the next.

Telosma

Telosma cordata (Burm.) Merrill, (*Pergularia pallida* W. and A.) Indus east ascending to 5,000' (Parker). Rawalpindi, Hazara, Attock Dist. In this species the corolla is .7" long as opposed to .25" in *Dregea*. The fruits have similar dimensions but this has smooth, turgid, unribbed follicles.

Asclepias

Asclepias curassavica L. is an erect species with orange flos. introduced from the West Indies. It is cult. and occasionally self sown in Rawalpindi. Milk weed.

Boucerosia

Boucerosia aucheriana Dcne. I have been considering *Caralluma edulis* to be the "chaunga" which is brought into the market in the spring as a *sag* but I have never seen the plant in flower or fruit and it should be watched for. In *Caralluma* the flos. are solitary or in pairs at the upper nodes. In this species they are capitate and terminal. Salt Range, Saidpur Hills, Attock Dist.

LOGANACEAE

Buddleia

Buddleia neemda Ham. (*B. asiatica* Lour.) *Bhatti* is a small shrub of the plains and lower hills growing from the Indus to China. The flos. are white and the leaves lanceolate, while in the next species the flos. are blue and the leaves oblong or ovate and coarsely sinuate dentate.

B. crispa Bth., (*B. paniculata* Wall.). A larger shrub of hot dry places from 2,500 to 8,000' ; Trans Indus to Sikkim. Parachinar, Kohat, Swat, Kagan etc.

GENTIANACEAE

Erythraea

Erythraea ramosissima Pers. A small spring herb of the plains growing in damp soil with numerous small pink flos. on short pedicels. Basal leaves few. Rawalpindi, Hasan Abdal, Peshawar, Swat.

E. roxburghii G. Don. A similar plant but with basal leaves persistent, pedicels long. Flos. in April and May. Rawalpindi.

Gentiana

Gentiana argentea Royle. A tiny blue flowered plant which often carpets the ground in open places in Murree and the Galis. Feb. to June.

G. contorta Royle (*Gentianella contorta* (Royle) H. Sm.). A small annual with greenish yellow flos. Bhurbhan, Aug. 1952.

G. capitata Ham. Lower Forest Road, Murree in Oct., Dhuli, Poonch.

G. kurrooa Royle. The largest flowered and most handsome of the genus in this area. *Nil kanthi* is found amongst grass in Sept. and Oct. Murree and the Galis.

G. decemfida Ham. var. *aprica* Dcne. Annual, strict, erect with a rosette of basal leaves. Kahuta in March (M. Nath) Gorraha in Poonch.

Swertia

Swertia purpurascens Wall. This annual form of *chirayetta* blooms in late Aug. and Sept. from 6-9,000'. The petals are reflexed and there is a dark purple ring at the base of the petals. Changla, Mokhshpuri, Thandiani etc.

S. paniculata Wall. Similar, but has five white petals which are not reflexed. There are 2 purple blotches at the base of each petal. Leaves linear, glaucous below. Barian, Ghora Gali, Changla etc.

S. cordata Wall. is easily recognized by the shape of the leaves which are nearly as broad as long. Common, 6-9,000', with white flos. often with bluish veins. Murree and Hazara Hills.

S. angustifolia Ham. This resembles *S. paniculata* but has four petals. Poonch, Murree, Dunga.

S. alata Royle. Ghora Gali in Oct. Poonch. Easily recognized by the winged stems and greenish flos. with dark purple spots.

Jaeschkea

Clarke reported *Jaeschkea latifolia* as growing in Murree. I suspect that this is an error.

BORAGINACEAE

Cordia

Cordia obliqua Willd. *Lasoor* is cult. in Rawalpindi.

Ehretia

Ehretia acuminata R. Br. var. *serrata* (Roxb.) I.M.J. *Puna* or *punna* is a tree of the sub-Himalayan zone to 5,000'. Above Tret, Poonch, Kagan, Swat. Leaves serrate.

E. aspera Roxb. Leaves entire, not exceeding 3" in length, hairy beneath when mature, a shrub. Common in dry places in the foothill zone.

E. laevis Roxb. *Chamror*, *sakar* is found locally in the plains in damper places. Leaves are larger, glabrous beneath when mature, a small tree. Kala Chitta Hills, Muzaffarabad, Mirpur.

Heliotropium

Heliotropium europaeum L. (*H. eichwaldi* Steud.) A plant of field borders and cult. soil in the plains, flowering in May. The flos. are white or tinged with lavender and the leaves are broad for their length. Rawalpindi, Swat, Gilgit, Mirpur etc.

H. undulatum Vahl. A weedy desert perennial with elliptic leaves having wavy margins. Common in the plains, Rawalpindi, Jhelum and Attock Dists. Trans-Indus.

H. strigosum Willd. Much smaller than the last two with linear leaves and prostrate branches and small white flos. Common in the plains in April and after the rains.

H. strigosum var. *brevifolia* Clarke. Rawalpindi. Leaves $\frac{1}{4}'' \times 1/10''$.

Trichodesma

Trichodesma indicum Br. A common plains and foothill plant with pretty pink or lavender flos. growing in dry places such as steep banks of earth. Plains to 4,000'.

Cynoglossum

Cynoglossum lanceolatum Forsk. (*C. micranthum* Desf.). A common weed from the plains to 7,000' with small white flos. and with the four small nutlets covered with glochidia on all sides.

C. zeylanicum (Vahl.) Thunb.), (*C. furcatum* Wall.). Rare. Rawalpindi (Aitch.) The flos. are white and much larger as are the nutlets and leaves. Fruiting branches widely spreading.

C. wallichii G. Don. Common during the hot weather from 4-11,000'. The flos. are a pretty blue and the glochidia are chiefly marginal.

C. nervosum Bth. ex Clarke. The largest of the genus in our area with pretty dark blue flos. and white hoary calyx lobes. In forest below Changla Gali ; Mokhshpuri ; June and July.

Hackelia

Hackelia macrophylla (Brand) Johnston. Another forest form with pretty flos. nearly white in colour, very large ovate leaves and plants often 4' tall. Glochidia long. Swat, Kaghan, Changla.

Heterocaryum

Heterocaryum echinophorum var. *minimum* Brand. (*Echinosperrum minimum* Lehm.), Hurroo (Aitch.) ; Peshawar (N. Ali) ; Swat. More common Trans-Indus.

Rochelia

Rochelia stylaris Boiss. A delicate, erect, branched annual growing in desert soil in March and April bearing small white flos. Trans-Indus, Swat, Rawalpindi.

Asperugo

Asperugo procumbens L. The only climber or scrambler in the family. Found in hedgerows and ditches in the plains in spring and occasionally to 10,000'. Flos. purple. The plants are prickly and the calyx is persistent, enlarging with age. Rawalpindi, Swat, Poonch etc.

Gastrocotyle

Gastrocotyle hispida Bunge. A prickly desert weed of the hot plains suggesting *Lycopsis arvensis* but lacks the terminal inflorescence, the flos. being chiefly axillary. Procumbent. Mirpur, Kohala, Mianwali Dist., Trans-Indus.

Nonnea

Nonnea picta F. and M. Flos. very small and very dark purple. Rawalpindi, Swat, near Quetta.

N. pulla L. var. *sordida* O. Kze. The common *Nonnea* about Rawalpindi in the spring has white or greenish white flos. Another plant of waste places. Dhok Pathan, Attock Dist., Trans-Indus. The proper name for this may be *N. edgeworthii*.

Mertensia

Mertensia exserta I. M. Johnston, (*Moltkia parviflora* (Dcne.) Clarke. A pretty spring forest flower with delicate pale flos. with stamens exserted. Perennial and decumbent. 5-7,000' Murree, Hazara, Swat, Poonch.

Lithospermum

Lithospermum arvense L. A very common erect weed of grain fields in the spring from the plains to 6,000'. The small flos. are white, rarely blue, corolla tube not longer than the calyx, nutlets hard, tuberculate, brown. Rawalpindi, Abbottabad, Swat, etc.

L. tenuiflorum L.f. Closely resembles the last but the flos. are usually blue, the corolla tube longer than the calyx and the nutlets suddenly not gradually narrowed upwards; usually decumbent. Abbottabad, Salt Range Poonch, Swat etc.

Arnebia

Arnebia hispidissima (Sieb.) DC. Drier parts of N. India, W. Asia, N. Africa. A prickly, erect, branching annual herb with pretty yellow flos. Rawalpindi, Campbellpur, Karachi etc.

A. griffithii Boiss. The Prophet's Flower is similar but is easily recognized by being sweetly scented and by the yellow petals each having one dark spot on each petal which fades with age. Less prickly; March and April. Attock, Campbellpur, Kohat Pass etc.

Onosma

Onosma thomsoni Clarke. A pretty cliff plant. with flos. white when fresh; prickly hairs. 4-9,000'. Murree Hills, Hazara, Muzaffarabad.

O. hypoleucum I. M. J. closely resembles the last but the fresh flos. are bluish. Changla, Thandiani.

O. griffithii Vatke, with large yellow flos. 25-30 mm. long has been reported from Sakesar, Jhelum Dist.

CONVOLVULACEAE

Ipomoea

Ipomoea nil Roth, (*I. hederacea* Jacq.), Plains to 7,000' with pretty pink flos. cir 2" in diam. and three lobed leaves. Sept.—Oct.

I. purpurea Lamk. This is a typical morning glory with leaves ovate cordate and handsome white, pink or purple flos. Cult. and naturalized in plains and hills to 7,000'.

I. pentaphylla Jacq. A white flowered species growing in the plains at the close of the monsoon. Leaves five lobed. The buds and stems are covered by long, rusty hairs.

I. pes-tigridis L. Another autumn species of the plains with large, 5-9 lobed leaves. Rawalpindi, Poonch.

I. pilbsa Sw. Blooms at the same season but the flos. are small and pink and the heart shaped ovate leaves have a distinctive white coloration below. Rawalpindi.

I. hispida (Vahl) R. and S. (*I. eriocarpa* Br.) with small, pinky white flos. is common in the plains and lower hills often climbing the stalks of cult. plants.

I. muricatum L. (*Calonyction muricatum* (L.) G. Don.) with pretty mauve or lavender flos. can be distinguished by the prickly outgrowths on the climbing stems. Rawalpindi.

I. palmata Forsk. with blue flos. is commonly cult. at R. R. stations. Perennial.

I. carnea Jacq. is the only erect shrubby member of the genus in our range. It is commonly used as a hedge plant in the plains and as it has a milky juice it is sometimes called *wilayati ak*. It has numerous large purple flos.

Convolvulus

Convolvulus aitchisoni Clarke, is a dwarf perennial with a woody root found in Jhelum Dist. and the Salt Range on gravel plains (Bamber) ; Sakesar (Iftikhar Ahmad).

C. pluricaulis Choisy var. *macra* Clarke. A common prostrate perennial with many flowering stems spreading out in a rosette. Flos. white or pale in the spring. A plant of the plains.

C. arvensis L. is the common, cosmopolitan bindweed called 'leli' growing in hills and plains. Leaves hastate.

C. glomeratus Choisy is a desert form growing at Sakesar; Karachi. A climber. The heads are peduncled and bractesate ; 6-10 flos. per head.

Evolvulus

Evolvulus alsinoides L. A slender prostrate or climbing perennial with pretty blue flos. which are not tubular but wide open. Common in desert areas of the plains and foothills.

Breweria

Breweria latifolia Bth. A dwarf shrub with tiny leaves up to $\frac{1}{2}$ " in diam. and with many branches. Salt Range (Iftikhar Ahmad).

Porana

Porana paniculata Roxb., Bridal Wreath is a large and handsome creeper easily recognized when it is in bloom from Nov. to Dec. in the scrub forests of the foothills. Flos. white, sometimes planted. Below Tret on the Murree Road.

Cuscuta

Cuscuta reflexa Roxb. *Mila tar* or dodder is often very common covering *ber* and other trees with great masses of yellow threads. A leafless parasite. Common in both plains and hills. Var. *brachystigma* Engelm., with short stigmas seems to grow in Murree.

Cressa

Cressa cretica L. A dwarf undershrub, hoary; many branches. Leaves small, sessile, narrowly ovate, acute. Flos. white or rose, sessile in upper axils. Salt Range.

SOLANACEAE

Solanum

Solanum nigrum L. *Kach mach* is one of the commonest weeds of the area growing in both the plains and the hills.

S. dulcamara L. Woody Nightshade. A scrambler with pretty purple flos. is not rare from 6-8,000'. Murree, Dunga, Thandiani, Poonch etc.

S. verbascifolium L. An erect shrub with large *Verbascum* like leaves is found from the Indus to Indo-China and Samoa ascending to 5,000'. *Kala Mewa*. Tret, Nurpur Hills, Poonch etc.

S. incanum L. (*S. coagulans* Forsk.) A smaller shrub, prickly, with berries .7 to 1" in diam. Plains and lower hills. Jhelum, Salt Range, etc.

S. indicum L. A prickly shrub resembling the last but the flos. are racemose and the berries .3" in diam. Murree Road. Sub-Himalayan tract and plains (Parker).

S. melongena L. *Brinjal*, the egg plant, is much. cult.

S. jasminoides Paxt. A handsome woody climber with white flos. is cult. in Abbottabad.

S. surattense Burm. f. (*S. xanthocarpum* Schrad. and Wend.) *Kandiali* is a very common, very thorny prostrate *Solanum* with pretty purple flos. yellow prickles and yellow fruits when ripe. Common to about 3,000'.

S. gracilipes Dcne. A very xerophytic prickly scrambling shrub with long slender branches growing frequently in the protection of other shrubs. Leaves small, up to 1½' long. Attock, Jhelum and Rawalpindi Dists. in rocky places.

S. tuberosum L. The potato is much cult. in the hills.

S. pseudocapsicum L. is a small, erect shrub without prickles bearing small bright red berries .5" in diam. Naturalized in many places. Abbottabad, Jhelum Vy. Road, Poonch. Jerusalem Cherry.

Lycopersicum

Lycopersicum esculentum Miller. The tomato is commonly cult.

Physalis

Physalis minima L. A field weed during the rains in both plains and hills. In this genus the large, persistent calyx hides and protects the fruits.

P. minima var. *indica* Clarke, (*P. angulata* L.). This has larger and more angled fruits. Rawalpindi.

P. peruviana L. *Ras berry*, the Cape Gooseberry is cult. It makes excellent jam.

Withania

Withania somnifera (L.) Dunal. *Aksan*, *agsand* is a weed of the plains with a wide distribution; *W. coagulans* Dunal, *panir band*, is very glaucous and very xerophytic. Jhelum, Rawalpindi, rare, commoner in Attock and Trans-Indus.

Atropa

Atropa acuminata Royle ex Lindl. The source of a valuable drug, belladonna. A tall plant up to 5' with handsome yellow, bell shaped flos. and nearly black berries. Changla, Dunga, Thandiani.

Datura

Datura stramonium L. The source of a well known poison. The large white flos. are trumpet shaped and the plant is a nitrophile growing about villages. Abbottabad, Swat, Murree, Poonch etc.

D. innoxia Mill. (*D. metel* Sims non L.). Usually below 3,000'. The fruiting pedicel is not erect but turned to one side. The plant is softly pubescent, the corolla white, ten toothed. Rawalpindi, Tret, Poonch, Kohala etc.

D. meteloides Dunal. Corolla usually suffused with purple, five toothed. Rawalpindi. Poonch, Peshawar.

Nicotiana

Nicotiana tabacum L. with pink flos. and *N. rustica* L. with yellow flos. are cult. but not in large amounts.

N. plumbaginifolia Viv. Apparently a recent introduction in weedy places in the plains. Flos. white like a very small petunia ; tube narrow.

Capsicum

Capsicum minimum Roxb. Pedicels usually 2-3 ; berry small. Cult. *chilli*.
C. annum L. Pedicels solitary, erect or not, *Mirch*, Red pepper.

Lycium

Lycium europaeum L. A spiny shrub; is cult. in Abbottabad. Twigs white or pale grey, shining; flos. white or pale purplish ; berries bright red.

Cestrum

Cestrum nocturnum L. *Rat ki rani*, with greenish flos. and a very strong scent at night is found in gardens in the plains.

SCROPHULARIACEAE

Verbascum

Verbascum thapsus L. *Gidhar tambaku* with stems and leaves covered with a dense tomentum is found from the plains to 9,000'.

V. coromandelianum (Vahl.) O. Kze. (*Celsia* auctt.). A coarse weedy plant of the plains with pretty yellow flos.

V. erianthum Benth. Tall and branched, with numerous, smaller flos. Batrasi Pass (Haz.), Domel, Mirpur.

Kickxia (*Linaria* in part)

Kickxia ramosissima (Wall.) Janchen. Common among rocks and on cliffs in the plains and lower hills with racemes of small, spurred yellow flos.

K. incana (Wall.) Pennell, (*Linaria cabulica* Bth.). Much like the last but the leaves are pubescent and less acuminate. Rocky places to 3,500'. Kotli, Rawalpindi District, Attock district.

Linaria

Linaria johnstonii (Stapf) Penn., (*L. minus* L.) A small, erect, annual, spring weed in dry places in the plains. Rawalpindi and Attock Dists. Trans-Indus. Haz. Flos. blue.

Antirrhinum

Antirrhinum orontium L. Another erect spring ephemeral found about grain fields but with flos. nearly white. Rawalpindi, Attock and Jhelum Dists., Malakand.

Scrophularia

Scrophularia polyantha Royle ex Bth. A tall, roadside weed with a large inflorescence of small greenish flos. with long exserted stamens. June and July. Poonch, Changla, Dunga, Thandiani.

S. decomposita latifolia (Bth.) Pennell, (*S. scopolii* Fl. Brit. Ind.) Common in forest undergrowth in the Murree Hills and the Galis above 6,000'. Flos. dark purple, or crimson.

S. stewartii Pennell, A cliff plant of Jhelum and Attock Dists. Mt. Tilla, Sakesar etc. The leaves are chiefly basal and the flos. are red and white.

S. striata Boiss. Very xerophytic with a large number of stems rising from a thick root. Flos. crimson and white. Rawalpindi, Kala Chitta Hills, Havelian, Trans-Indus.

S. scabiosaefolia Bth., Lahul to Afghanistan, 3-500 to 11,000'. Fruits and leaves small, flos. white, stamens exserted. Chitral, Swat, Hazara, Muzaffarabad etc.

Mimulus

Mimulus stricta Bth., (*M. gracilis* Br.) A plant of wet places in the plains and lower hills. Poonch, Rawalpindi, Muzaffarabad, Swat etc.

Mazus

Mazus goodenifolius (Horn.) Pennell. A tiny plains species with yellow and white flos. in well watered, shady places.

M. delavayi Bonati. Plains to 8,000', annual, growing on the edges of ponds. Flos. secund. Attock and Hazara to China. Thandiani, Poonch. More pubescent, pedicels shorter.

M. surculosus Don. Differs by having prostrate runners. Thandiani, Poonch.

Lindenbergia

L. macrostachya Bth. Tall and weedy with yellow flos. From the plains to 5,000'. Rawalpindi, Abbottabad, Muzaffarabad.

L. ruderalis (Retz.) Voigt. A smaller herb with small yellow flos. Near Choia Saidaan Shah, Barsala, Poonch, Kotli.

Bramia

Bramia monnieri (L.) Pennell, (Bacopa or *Herpestis* in some books). A prostrate herb by streams or marshes with flos. lavender to white. Widespread in the tropics. Rawalpindi, Poonch, Muzaffarabad etc.

Wulfenia

Wulfenia amherstiana (Wall.) Bth. Gregarious in shady places especially cliffs and steep banks with spikes of pretty purple flos. from 4-9,000' in August. Murree and the Galis.

Veronica

Veronica serpyllifolia L. A perennial herb, common by paths and in forest openings in Poonch, Murree and Hazara.

V. arvensis L. A common spring annual, 2-10" tall, usually erect flos. in spikes, blue. Abbottabad, Poonch, Kashmir.

V. persica Poir. Much larger than the last two species with prostrate stems and pretty mauve flos. on rather long pedicels ; flowering on walls as early as March. Murree, Hazara, Poonch etc., 4-9,000'.

V. biloba L. A very common dwarf weed in fields in the spring from about 2000' to 8,000'. Erect. Domel, Abbottabad, Ghora Gali, Poonch etc.

V. stewartii Pennell, A creeping spring ephemeral with oval or elliptic leaves, broader than long. Abbottabad, Uri, Srinagar. Not common.

V. melissaefolia Poir, (*V. laxa* Bth.) The largest and prettiest of the genus in our area. It is an erect perennial in forest shade with pretty violet flos., 6,500-10,000'. Murree Hills, Hazara, Poonch etc.

V. didyma Tenore, (*V. polita* Fries). A spring weed in the plains and hills. Prostrate. Flos. pale violet.

V. anagallis-aquatica L. The water speedwell is common at the edge of streams and ditches. The plants are erect and the stems and leaves are glabrous. Plains to 7,000'.

V. undulata Wall. Much like the last but glandular and the leaves more toothed ; often undulate. Plains to Murree, Peshawar, Abbottabad, Poonch etc.

V. salina Schur. Much like the last two. Style longer ; leaves more entire. Murree to Kohala ; Poonch, Gilgit etc.

Lindernia

L. nummulariaefolia (Don) Wett. A dwarf, monsoon annual growing in gravelly soil or on banks and walls. Leaf blades ovate to nearly orbicular, margins serrate. 5 cm. tall.

Euphrasia

Euphrasia aristulata Pennell, Mokshpuri in grass. Changla, Miranjani top.

Leptorhabdos

Leptorhabdos parviflora (Bth.) Benth. A tall slender, erect plant with a long spike bearing small lavender flos. with bright yellow anthers. 4,500-10,000', Murree and the Galis towards the close of the rains.

Pedicularis

Pedicularis gracilis Wall. ex Bth. A coarse erect annual species with reddish flos. in August. Usually much branched. Changla, Mokshpuri, Murree, Ghora Gali.

P. pectinata Wall. var. *palans* Prain. A handsome perennial with pretty pink and white flos. is common on cliffs along the Pipe Line in Aug. ; Mokshpuri, Ghora Gali etc.

Striga

Striga euphrasioides (Vahl.) Bth. This small, white flowered root parasite has been found only once on millet after the rains in Rawalpindi.

S. asiatica (L.) O. Kze. Another root parasite with white or purple flos. The leaves are covered with the scabrous tubercular bases of the hairs. Sakesar, Kotli.

OROBANCHACEAE

Lathraea (Under *Scrophulariaceae* in Fl. Brit. Ind.)

Lathraea squamaria L. A fleshy stemmed, parasite on the roots of forest trees with purplish flos. Stems scaly, white, when fresh, drying black. April and May. Murree, Dunga, Changla, Poonch.

Aeginetia

Aeginetia pedunculata Wall. Reported from Murree in the Fl. Brit. Ind. but I have never found the plant in this area. 3-6", scape stout, fleshy, flos. yellow and blue.

Orobanche

Orobanche borealis Turcz. Also reported from Murree in Hooker but I have seen no specimens.

O. indica Ham. is a parasite on Petunia and tobacco in April and May. Flos. blue. Sohawa, Hazro, Campbellpur, Durgai ; common on brinjals.

Cistanche

Cistanche tubulosa Wight. A very large, erect parasite growing on the roots of various shrubs. Common on the roots of *ak* at Kalabagh ; Mianwali. Flos. yellowish white.

LENTIBULARIACEAE

Utricularia

Utricularia sp. Topi Park, Rawalpindi ; Peshawar. When the water hyacinth was removed from the pond in which it was growing in Rawalpindi it disappeared.

BIGNONIACEAE

Tecoma

Tecoma undulata G. Don, (*Tecomella undulata* Seem). A very fine xerophytic shrub flowering in March to May, called *lahura*. Soan near Rawalpindi, Barakao etc.; on the Murree Road below Tret, Mirpur.

T. stans Juss. an erect shrub is cult. *T. capensis* Lindl. and *T. radicans* Juss. are handsome climbers which are also cult. in the plains. The flos. of *T. radicans* are the larger.

Amphicome

Amphicome (Incarvillea) emodi Lindl. *Kaur* is a very handsome rock plant with large pink, tubular flos. with a yellow throat. Worth cultivating as it is probably the finest wild flower in our area. Often on limestone cliffs. Swat, Abbottabad, Margalla, Saidpur Hills etc.

Jacaranda

Jacaranda ovalifolia R. Br. One of the finest of flowering trees with beautiful lavender flowers in April. Cult. in the plains. Introduced from South America.

Bignonia

Bignonia tweediana Lindl. with large yellow flos. and *B. speciosa* R. Grah. with lilac flos. are cult. in Rawalpindi and climb to the top of the tallest trees.

Stereospermum

Stereospermum suaveolens DC. *Padal*, which is superficially like *Cassia fistula* but with opposite leaves is found in the sub-Himalayan zone from Rawalpindi east. (Parker).

PEDALINEAE

Sesamum

Sesamum orientale L. *Til* is sparingly cult. in the plains and foothills.

ACANTHACEAE

Blepharis

Blepharis maderaspatensis (L.) Heyne ex Roth. Sakesar and near Tilla in Jhelum Dist. Leaves usually in fours, elliptic.

B. sindica T. Anders. Khewra (Iftikhar Ahmad). Whole plant a branching inflorescence. Heads in fruit up to 2/3" in diam. and 4" long. Leaves linear.

Ruellia

Ruellia prostrata Lamk. var. *dejecta* Clarke. Rawalpindi; Corolla 1", pale purple.

Daedalacanthus

Daedalacanthus nervosus T. Anders. Cult. in gardens or wild in moist shady places up to perhaps 3,000'. Recognized easily by the foliaceous bracts .5 by .3" which are obovate, cuspidate, white with green veins. Flos. blue. Rawalpindi, Tret, Chattar.

Hemigraphis

Hemigraphis latebrosa Nees. var. *rupestris* Clarke. Flos. blue. Found once on the Murree Road in the chir zone at about 4,000'.

Aechmanthera

Aechmanthera tomentosa Nees var. *wallichii* Clarke. Usually from the Ravi east but I have found it at Tret on the Murree Road and in Poonch. Resembles *Strobilanthes* which has four seeds while this has eight. An erect hoary undershrub of the chir zone with pretty purple flos. in clusters of 3-8. The stem and the lower surface of the leaves are clothed with a dense white wooly tomentum.

Strobilanthes

Strobilanthes glutinosus Nees. Flos. in the winter beginning in Nov. with pale lavender flos., 2" long, sticky and smelling of camphor. Indus east to Nepal in the chir zone. Abbottabad, Murree, Muzaffarabad, Poonch.

S. attenuatus Nees, (*S. alatus* Nees non Blume). Common on shady forest banks with pretty dark blue flos. in Aug. and Sept. 6-10,000'. Can be recognized by the winged petioles of the cordate leaves. Swat, Hazara, Murree, Poonch etc.

S. dalhousieanus Clarke. Another shady forest species with leaves acuminate both ways; bracts rounded; inflorescence capitate. Hazara, Murree, Poonch. 6-8,000'.

Barleria

Barleria acanthoides Vahl. A small, dense, spiny undershrub, scarcely 1' tall. Khewra and Sakesar; Karachi.

B. cristata L. Unarmed and very common in the sub-Himalayan zone and up to 6,000'. Pretty white or pink flos. and characteristic bracteoles which often have a few spinous teeth. Murree, Rawalpindi, Poonch, Hazara.

Lepidagathis

Lepidagathis incurva D. Don (*L. hyalina* Nees). A large herb with very dense, hairy heads is found up to 4,000'. Nurpur, Saidpur. North India to China.

L. fasciculatus Nees, Narh, Murree Hills, 6,500' (Coventry). Resembles *Hemigraphis* but this has bracteoles, is capitellate ; corolla suddenly ventricose in the middle, not tubular

Justicia

Justicia peploides (Clarke) T. Anders. (*J. quinqueangularis* Koen. var. *peploides* Clarke). A monsoon weed of the plains with white margined calyx, nearly glabrous.

J. simplex Don, Another monsoon annual ; plains to Ghora Gali and Abbottabad. Smaller, flos. pink ; inflorescence ragged in appearance, calyx lobes pubescent ; appressed hairs on both sides of the leaves.

Adhatoda

Adhatoda vasica Nees. *Bhakar* or *baikar*. One of the commonest small shrubs of the area to 4,000' in graveyards and waste places. Distasteful to animals. Flos. white ; blooming most of the year.

Dicliptera

Dicliptera roxburghiana Nees. var. *bupleuroides* Nees. A very common pink flowered perennial, flowering throughout the year ; plains and up to 6,000'. Flos. conspicuously two lipped.

Peristrophe

Peristrophe bicalyculata Nees, a common monsoon weed in shady places, often with *Malvastrum*. Flos. pink but smaller than the last. The fruiting inflorescence hangs on through the winter. Rawalpindi, Attock Dist. ; Poonch, Peshawar.

PHRYMACEAE

Phryma

Phryma leptostachya L. Lower Forest Road, Murree, 6,500', in forest during the monsoon ; also Poonch. The small pale flos. are erect but the fruits turn down, close appressed to the stem. Resembles a small *Verbena*.

VERBENACEAE

Lippia

Lippia nodiflora Rich, (*Phyla nodiflora* (L.) Greene). A common prostrate weed in damp places in the plains with small flowers in heads.

Verbena

Verbena officinalis L. A common and widespread erect herb of the hills and plains with tiny pink flos.

V. bonariensis L. A foreign weed which grows near Mansera. Leaves not lobed but sharply toothed.

Callicarpa

Callicarpa macrophylla Vahl. A shrub, 4 to 8' tall, with large, oblong lanceolate leaves, wooly tomentose below. Flos. numerous, pink. In the winter the small white fruits look like flos. from a distance. Ascends to 4,000'. Tret, Poonch.

Premna

Premna barbata Wall. From the Indus eastwards (Parker). I have not seen any Rawalpindi specimens.

Vitex

Vitex negundo L. Common in patches on the banks of streams and water courses and useful for controlling bank erosion. Leaves opposite and digitately 3-5 foliate. The pretty flos. are blue or lavender. Swat, Hazara, Rawalpindi, Poonch etc.

Clerodendron

Clerodendron fragrans (Vent.) Berol. A small shrub with large, evil smelling leaves and corymbose panicles of white, double flos. Cult. in Rawalpindi and apparently wild up to 4,000' on the Murree Road, Poonch City.

Caryopteris

Caryopteris odorata (Ham.) Robinson, (*C. wallichiana* Schauer). A handsome shrub, wild and cult. with a wealth of purplish flos. with long stamens, blooming in the spring. Swat, Abbottabad, Rawalpindi Hills to 4,000', Poonch, Kotli.

C. grata Bth. Common 4-5,500' in Rawalpindi (Parker). Small, white or purplish flos. Ripe fruit red. Poonch. Cymes mostly axillary, calyx lobes in fruit, triangular, spreading.

Duranta

Duranta plumieri Jacq. This tropical American shrub with purple or sometimes white flos. is probably the best hedge plant for Rawalpindi conditions. Malis call it 'dorunta'.

Holmskioldia

Holmskioldia sanguinea Retz. A tall scrambling shrub with quadrangular twigs and a remarkable scarlet, broadly obconic calyx and bright red flos. Cult. in Rawalpindi but apparently wild at Nakial near Kotli. Flos. during the cold weather.

Lantana

Lantana indica Roxb., (*L. indica* var. *alba* Wight). A small shrub with white flos.; often found in *phulahi* forest. Fairly common to 3,000'. Blooms both in spring and autumn.

L. camara L. *Panch phul*, a pan tropic weed which has run wild in many places in India is planted in some Rawalpindi gardens. The vernacular name is due to the fact that the flos. change colour with age.

LABIATAE

Ocimum

Ocimum basilicum L. *Nyazbo* or Sweet Basil, with a strong attractive smell is commonly cult. in the plains and lower hills.

O. canum Sims, (*O. americanum* in Parker) is a wild species resembling the last. It is a dwarf shrub growing in rocky places, Trans Indus and in Attock, Jhelum and Poonch Dists. Hoary Basil. The calyx is distinctive.

O. sanctum L. *Tulsi* with red flos. used to be a favourite of the Hindus. Cult.

Melissa

Melissa officinalis L. One specimen was brought from Abbottabad by a student. Probably cult. Leaves ovate, crenate up to $1\frac{1}{2}$ " flos. stalked, in axillary clusters.

Orthosiphon

Orthosiphon pallidus Bth. A small white flowered spring herb with a woody root suggests *Ocimum*, but the calyx is more symmetrical. Occasional about Rawalpindi after the rains.

Plectranthus

Plectranthus striatus Bth. A small annual, 6-12" tall with ovate lvs. and white flos. grows at Ghora Gali after the rains and in Poonch.

P. coetsa Ham. is a tall, branching herb with lavender flos. growing in Murree forests during the rains. Swat, Poonch.

P. rugosus Wall. is one of the commonest shrubs on sunny slopes from 3-8,000', often growing with Indigofera. Leaves white below. Sakesar, Margalla, Kahuta, Swat, Poonch etc. This plant is said to be the best source of honey in Swat.

Colebrookia

Colebrookia oppositifolia Sm. An anomalous silky, tomentose shrub of the foothill zone to 4,000' with conspicuous catkin like fruiting spikes which persist most of the year and suggest an urticaceous plant. Flos. Jan. to April; Peshawar to Burma.

Elsholtzia

Elsholtzia patrinii (Lepech) Garcke, (*E. cristata* Willd.) An erect herb with flos. on one side of the spicate inflorescence. Pipe Line and Poonch, after the rains.

Perilla

Perilla frutescens (L.) Britt., (*P. ocimoides* L.). A large, ovate leaved shade plant of the foothill zone. Hazara eastward and southward. Sarae Saleh (Haz.); Poonch.

Mentha

Mentha longifolia (L.) Huds., (*Mentha incana* of Fl. Brit. Ind.). Common in wet places such as borders of irrigation ditches and damp meadows from the plains to the higher hills, Trans Indus, Swat, Gilgit, Hazara, Poonch etc.

M. piperita L., *podina*, and possibly *P. viridis* L. also are cult.

Lycopus

Lycopus europaeus L. var. *exaltata* Hk. f. In wet places in the sub-Himalayan zone after the rains. Swat, Hazara, Poonch, Gilgit etc. The leaves are pinnatifid; the inflorescence whorled, axillary; calyx teeth sharp.

Origanum

Origanum vulgare L. One of the commonest mints on dry open banks from 2 to 9,000' with white or pinkish flos. *Banjawain*. Often a pioneer on landslips.

Micromeria

Micromeria biflora Bth. Very common from Rawalpindi to 7,000' in poor gravelly soil or rock crevices. Flos. small; pink; spring and summer.

Calamintha

Calamintha clinopodium Bth. Common from 6-9,000'. Much like the next but there is an involucre about each verticillaster. Swat, Murree, Hazara, Poonch.

C. umbrosa Bth. More common than the last. Abbottabad and the Murree Hills etc., in forest and by roadsides. Flos. smaller. Bracts shorter than the calyx, not forming an involucre.

C. longicaulis Bth. Taller and more slender with white flos., resembling a *Nepeta*. Dunga Gali, Pipe Line, Poonch. Rare. Flos in Aug. and Sept.

Salvia

Salvia moorcroftiana Wall. Common in the plains in waste places in March with showy lavender flos. A perennial growing from a rosette. Sakesar, Swat, Abbottabad, Rawalpindi, Poonch, Kashmir.

S. lanata Roxb. Another perennial with handsome blue flos. ; usually above 4,000' in sunny places. Swat, Murree, Poonch etc.

S. plebeia R. Br. The only annual species in our area. An unattractive weed with very small white to lilac flos. growing in the plains where water is drying up and up to 5,000'. Swat, Poonch, Rawalpindi etc.

S. aegyptiaca L. A small, unattractive perennial with a woody base from the foot of the Himalayas west to the Cape Verde Is. Very xerophytic.

S. santoliniaefolia Boiss. Equally xerophytic with smaller, peculiar leaves. Calyx hairy. Jhalar, Attock Dist., Trans Indus westward.

S. glutinosa L. A tall, glandular herb with yellow flos. is usually found above 7,000'. Above Kalapani, Hazara ; Dunga ; Poonch, Gilgit etc.

Nepeta

Nepeta govaniiana Bth. A tall perennial with pretty yellow flos. ; usually above 7,000'. Swat, Thandiani, Kagan.

N. prainii Duthie, in thin forest ; pale flos. and bracts, spikes interrupted, leaves much veined below, ovate to ovate elliptic ; crenate, about 1" long. Sakesar, Swat, Hazara, the Galis, Barian, Poonch etc. 2-7,000'.

N. spicata Bth. A common, weedy species from 4-9,000; flos. in a purple spike. Swat, Abbottabad, Changla, Poonch etc.

N. raphanorhiza Bth. Purple flos. ; easily recognized by its tuberous root. Common in the spring in Havelian, Abbottabad, Swat etc.

N. graciliflora Bth. A plant of the plains with stalked verticillasters ; flos. few and pedicelled. Mt. Tilla, Attock.

N. hindostana Haines, (*N. ruderalis* Fl. Brit. Ind.), (I previously called *N. mollis*). Found in May ; flos. minute, lower verticillasters stalked ; leaves very small, usually broader than long. Hirnpur and Khewra, Jhelum Dist.

N. erecta Bth. A fine tall blue flowered species, flos. about $\frac{1}{2}$ " long. Swat, Dunga, Changla, Poonch.

Lallemantia

Lallemantia royleana (Wall.) Bth. *Tukhm longa* is a small erect annual, flowering in March and April. Flos. bluish. Widely distributed in the deserts of Central Asia.

Scutellaria

Scutellaria teucrifolia Dunn. A rather rare rock plant of the Galis and Pipe Line with upper lip dark purple and the lower cherry pink, the tube white. Chitral, Gilgit, and Poonch.

S. linearis Bth. A plant of hot, gravelly banks and land slips up to about 5,000', on the Jhelum Valley Road, below Murree ; Mansera, Balakot, Poonch. The tube is cream colour and lips pink.

Brunella

Brunella vulgaris L. Fairly common in Murree and the Galis with dense heads of blue purple flos., by paths and open places in the forest and by irrigation ditches.

Anisomeles

Anisomeles indica (L.) O. Kze., (*A. ovata* R. Br.), a large, rosy flowered herb with large ovate leaves growing by paths and in open places up to 5,000'. The Indus to the Philippines. Sakesar, Abbottabad, Poonch etc.

Craniotome

Craniotome versicolor Reichb. Patriata (A. H. Khan), Poonch. Flos. minute, rosy in slender lax flowered, paniced racemes.

Stachys

Stachys sericea Wall. Fairly common from 4-9,000' with pale purple flos. Stems pubescent; in Abbottabad, the Galis and Murree.

S. melissaefolia Bth. Ghora Dakka, near Dunga Gali (Seen in Dehra Dun). The tips of the calyx are triangular, not spiny tipped as in the last species.

S. parviflora Bth. *Bui* is a white, hoary, evil smelling perennial growing in small clumps in dry places or field borders ; flowering in the hot weather from April to June.

S. alpina L. Next to *S. sericea* but with larger flos. and usually at higher altitudes. Thandiani, Mokshpuri etc.

Leonurus

Leonurus cardiaca L. A tall, erect, temperate species with prickly calyx teeth and leaves more or less palmatifid. Motherwort is found on the Pipe Line, in the Galis, Thandiani, Swat, Poonch etc.

Lamium

Lamium amplexicaule L. A common, prostrate, spring field weed growing in grain fields in the spring from the plains to 9,000'. Recognized by the pretty pink or red-purple flos. Upper flos. crowded in a leafy head, with floral leaves broad and sessile.

L. album L. The white, 'dead nettle,' is common in damp shady places in the Murree Hills and Galis, Swat, Poonch and Kagan.

Otostegia

Otostegia limbata (Bth.) Boiss. *Chitti bui* is the only spiny mint in our area. It is also easily recognized by its pretty orange flos. growing in the early part of the hot weather. Plains and lower hills. Abbottabad, below Murree, Swat, Poonch.

Leucas

Leucas urticifolia Br. A white flowered, monsoon, annual weed in the plains from the foothills to Arabia and Ethiopia. Rawalpindi, Sakesar etc.

L. nutans Spreng. A low level, tropical weed with the white flos. bent down, blooming during, or at the close of the monsoon, about cultivation. Rawalpindi, Murree Road.

L. mollissima Wall. var. *pilosa* (Haines) Muk., (*L. pilosa* var. *pubescens* Bth.) is a hoary, white flowered annual to 3,000'. Tret, Batrasi, Garhi, Poonch.

L. cephalotes Spreng. A similar monsoon weed of cultivation with large, rounded bracteate heads. Trans-Indus, Swat, Rawalpindi, Poonch etc.

Marrubium

Marrubium vulgare L. A vigorous erect, hoary, xerophytic herb. Kurram, Swat, Uchhali, Jhelum Dist. (Iftikhar Ahmad). Kashmir etc.

Phlomis

P. spectabilis Falc. ex Bth: *Gaur* is a large, handsome plant with ovate, cordate leaves and rose purple flos. Kalapani, Abbottabad, Pipe Line, Poonch etc.

P. cashmeriana Bth. Another large handsome perennial which should be worth while in cultivation. The leaves are long for their width and hoary white below ; the flos. pale purple. Chitral, Murree, Patriata.

P. bracteosa Royle. A plant of higher altitudes, smaller, flos. dull blue purple. Thandiani, Nathia. Common on alpine meadows in Kashmir.

Eremostachys

Eremostachys vicaryi Bth. A handsome, spicate, white flowered species of the plains growing from a rosette of pinnately divided leaves, often near *Salvia moorcroftiana*, flowering in March and April. Rawalpindi and Attock Dists.

Teucrium

Teucrium royleanum Wall. A white flowered perennial herb growing among rocks and spreading readily by root suckers in forests in the Murree Hills and Hazara from June to Sept. Also Swat and Poonch.

Ajuga

Ajuga bracteosa Wall. A common xerophytic herb with a characteristic bracteate head of pale pinkish flos. is found in open dry places from Ethiopia to China and blooming from March to Dec. Plains to 7,000'.

A. parviflora Bth. This is also common but the bracts are longer and narrower and the flos. are smaller. Plains to 8,000'. Swat, Abbottabad, Pipe Line, Murree, Poonch.

PLANTAGINACEAE

Plantago

Plantago major L. *sensu lat.* A very common weed with broadly elliptical leaves, usually in moist or rich soil from the plains to 9,000'. All or part is *P. asiatica* L. var. *angusta* Pilger.

P. lanceolata L. A similar species but with linear leaves is also common. Plains to 9,000' in waste places and roadsides.

P. amplexicaulis Cav. var. *bauphula* (Edgew.) Pilger, is a common spring form of the plains, acaulescent and with five nerved leaves. Leaves a darker green and more glabrous than in the next.

P. ovata Forsk. This *isabgol* is found from the foothills westward to the Canaries. It has narrow, three veined leaves which are more or less cottony. March and April.

P. ciliata Desf. The most xerophytic of the group, very hoary and white ciliate. Trans Indus, Peshawar, Kohat, Jhelum, Attock Dists. Not common in Rawalpindi.

P. psyllium L. Black *isabgol* with very narrow leaves is being tried experimentally. It is a source of commercial psyllium seed.

NYCTAGINACEAE

Bougainvillea

Bougainvillea glabra L. and *B. spectabilis* Willd. are cult. in the plains for their large, showy bracts which hide the inconspicuous flos.

Boerhaavia

Boerhaavia diffusa L., (*B. repens* L.), *itsit* is a common, prostrate, tropical perennial herb with small pink flos. with distinctive glands. Plains and foothills. Glue weed.

B. verticillata Poir. Mt. Tilla, Jhelum Dist. Even more xerophytic, with broad, fleshy, obtuse leaves and clavate shaped fruits with large glands.

B. elegans Choisy. *Sant*, with flos. in di-or trichotomous cymes and long capillary pedicels ; a Sind and Baluchi plant is reported from Kahuta by Duthie.

Mirabilis

Mirabilis jalapa L. *gulabashi*, Marvel of Peru, with pretty tubular flos. which are white, pink or red is an escape around Abbottabad, Rawalpindi, Swat, Poonch etc.

ILLECEBRACEAE

Herniaria

Herniaria hirsuta L. A common, dwarf, 'carpet weed,' is prostrate on bare dry soil in the plains and to 8,000'. It is included in **Caryophyllaceae** by some authors. The leaves are very small and hairy. Swat, Hazara, Rawalpindi, Poonch, Uri etc.

AMARANTHACEAE

Celosia

Celosia argentea L. An erect, tropical weed with a compact silvery terminal inflorescence is a common monsoon field weed in the plains and up to 4,000'. Swat, Hazara, Rawalpindi, Poonch.

Digera

Digera arvensis Forsk. Another widespread tropical weed with small pinkish flos. is found from North Africa to Java. Plains to 4,500'.

Amaranthus

Amaranthus spinosus L. The only spiny species is a common weed in waste places from April to Sept., ascending to 4,000'.

A. cruentus L., (*A. paniculatus* L.). *Surkh chirlai*, Cocks Comb, is widespread and is both wild and cult., usually above 4,000'.

A. viridis L., (*A. gracilis* Desf.) is a common plains weed with a slender, terminal inflorescence. Swat, Rawalpindi, Poonch etc.

A. blitum L. A summer weed of the plains and hills, variable, erect and prostrate with flos. in small axillary clusters. Leaves often retuse at the tip.

Pupalia

Pupalia lappacea (L.) Juss. A noxious perennial of the plains, flowering from Sept. to April and bearing prickly fruits which catch in clothing ; native to tropical Asia and Africa.

Aerua

Aerua persica (Burm.) Merrill, (*A. tomentosa* Forsk.) ; (*A. javanica* Juss.). Erect, spicate, very xerophytic and hoary. From North Africa to Java and Ceylon. A plains form.

A. scandens (Roxb.) Wall. A leaner, not stiff like the last, ranging from Tropical Africa to the Philippines and ascending to 6,000'. Abbottabad, Murree, Swat, Poonch etc.

Achyranthes

Achyranthes aspera L. *Phut kanda* is another common tropical weed which is abundant in the plains after the rains, bearing reversed spines which stick to wool etc. Ascends in the foothills.

A. indica (L.) Mill., (*A. aspera* var. *indica*) with smaller flos. and leaf tips obtuse, rather than acute, has been collected in Rawalpindi and Poonch.

A. bidentata Blume is much more mesophytic and less pubescent and grows in the hills up to 9,000'. The flos. are shorter and the leaves more acuminate. Swat, Hazara, Murree, Poonch etc.

Alternanthera

Alternanthera sessilis (L.) R. Br. A prostrate tropical herb growing in wet soil from the plains to 4,000'. The very small white flos. are borne in axillary, often clustered heads, up to $\frac{1}{2}$ " long. Sind, Swat, Rawalpindi, Poonch etc.

A. repens (L.) Schinz. An African species; seems to be a new introduction. I first saw it a few years ago near the Rawalpindi Race Course and more recently I noticed it in Abbottabad. It is an obnoxious "carpet weed," spreading rapidly like *Tribulus* and bearing numerous prickly fruits.

CHENOPODIACEAE

Chenopodium

Chenopodium album L. *Bathu* is very common as a weed in both plains and mts. from April to September and it commonly bears a farina on stems and leaves. It makes a good *sag* as do several others of the genus. Throughout the area.

C. botrys L. is the most xerophytic of the genus in our area. It grows in bare mineral soil where nothing else will grow and is widespread in plains and hills. It is very aromatic. The oil is used as a vermifuge and medicine for colds.

C. ambrosioides L. Has an even stronger scent which can be easily recognized by crushing a small portion of a leaf when fresh or dry. It is a nitrophile and is common in waste places in plains and lower hills.

C. murale L. A plains species about cultivation and with green stems and leaves without farina. *Kurand* is common in the plains and lower hills.

C. foliosum (Moench.) Aschers., (*C. blitum* of Hooker). According to Aellen the correct name is *C. virgatum* (L.) Amb. The Strawberry Goosefoot makes excellent greens and is easily recognized by the red, berry like fruits. Usually above 5,000'. Swat, Gilgit Kagan, Murree, Poonch.

C. opulifolium Schrad.?. Aellen thinks that this may be *C. afghanicum* Aellen. It is near *C. album* but has less farina and the leaves are broader and the seeds minutely dotted, not smooth. Swat, Thandiani, Murree, Poonch.

Beta

Beta vulgaris L. *Chukandar*, the beet, is commonly cult. throughout.

Acroglochin

Acroglochin chenopodioides Schrad. Kagan and from Nathia to Miranjani, 5-9,000'. An erect, stiff annual with minute, green clustered flos. with 5 sepals, no petals.

Spinacia

Spinacia oleracea L. *Palak* or spinach is much cult.

Atriplex

Atriplex laciniata L., (*A. crassifolia* C.A.M.). A medium sized annual resembling a *Chenopodium* but with white stems and branches. Plains to 12,000' in Tibetan Kashmir.

A. stocksii Boiss. A smaller species, common in Sind, grows in the Salt Range.

Kochia

Kochia indica Wight. A softly hairy weed of the plains, branched from the base. Kohat, Taxila, Rawalpindi. Waste places.

Suaeda

Suaeda fruticosa Forsk. *Lana, lani* is a weed of saline soils from the Punjab to the Atlantic. A source of *sajji*.

Salsola

Salsola foetida Del. Another halophyte and source of *sajji*. *Moti lane, gora lane* or *shora* is a small, pale gray, much branched shrub with minute, fleshy, nearly round leaves Jhelum and Attock Dists., Trans Indus.

Haloxyton

Haloxyton recurvum Bunge. A desert shrub with simple, opposite leaves, 1/8 to 1/3" long, 3 angled, or nearly cylindrical. Fruit one seeded in a glistening, papery, shallow cup. Salt Range, Attock Dist.

PHYTOLACCACEAE

Phytolacca

Phytolacca lathenia (Buch. Ham.) Walt., (*P. acinosa* Hk. f. non Roxb.). A large coarse, perennial herb with large leaves, broadly lanceolate, up to 10" long ; flos. .3" long, green in cylindrical racemes ; the dark purple berries contain an ink like juice.

Mitha kafal may have been introduced from China. It now seems to be wild in Murree, Hazara, Poonch, Uri Range etc. The roots are used to adulterate belladonna.

POLYGONACEAE

Polygonum

Polygonum aviculare L. A very common, prostrate, nitrophilous weed from 4-9,000'. Leaves lanceolate, up to 1" long.

P. plebium R. Br. A similar prostrate herb but it is common in the plains by drying ponds and ditches with minute pink flos. Below 4,000'.

P. amplexicaule D. Don, *Masloon* or *anjbar* is common in the Murree Hills and Hazara from 6-9,000'. It is an erect plant up to 3' tall with pretty spikes of white, pink or red flos. The leaves are stem clasping and the roots rhizomatous.

P. glabrum Willd. A large, gregarious, glabrous plant growing near streams in the plains. Stipules usually eciliate.

P. caespitosum Blume var. *longisetum* (De Br.) Danser, (*P. serrulatum* Lagasc.), is a common weed from the plains to 8,500'. The leaves are pale and the cilia on the ochreae are very long. Swat, Hazara, Murree, Poonch etc.

P. nepalense Meissn. (*P. alatum* Ham.) This is an abundant summer weed from 3-10,000' with small pink flos. and winged petioles. Common in plowed fields.

P. barbatum L. The coarsest and most pubescent of the plains species ; not common in our area. The leaf bases are acute or acuminate. Trans-Indus, Hazara, Wah.

P. hydropiper L. Usually near water and above 4,000'. Can be recognized by the glands on the calyx. Swat, Gilgit, Hazara, etc.

P. flaccidum Meissn. is reported from Rawalpindi Dist. by Gage. Like the last species, but larger, with longer, broader and more pointed leaves. Wet places to 4,000'.

Rumex

Rumex dentatus L. subsp. *klotzschianus* (Meissn.) Rech. fil. is the common Rumex of low lying soils in the plains, flowering in March and April.

R. dictyocarpus Boiss. and Buhse, Peshawar ; near Rawalpindi.

R. acetosa L. Usually a plant of the lower alpine meadows in Kashmir, erect with male and female flos. on separate plants. Racemes leafless. Mokhshpuri, Poonch.

R. hastatus D. Don. A small shrub easily recognized by its hastate leaves and pink flos. followed by pink fruits. A pioneer on landslips and step banks. Frequent on *pushtas* in the sub Himalayan zone to 8,000'.

R. vesicarius L. A plains species, annual, growing in the spring which is easily recognized by its persistent, inflated, pink calyx. Rawalpindi and Attock Dists., Trans Indus.

R. nepalensis Spreng. The commonest species above 6,000', nitrophilous, common by roadsides, forest blanks, where cattle lie etc. The calyx is prickly and hooked and the ripe fruits catch in wool. Swat, Kagan, the Galis, Poonch etc.

Muehlenbeckia

Muehlenbeckia platyclados Meissn. Ribbon bush, with flat phylloclades bearing tiny flos. is often cult. in the plains as a curiosity.

Antigonon

Antigonon leptopus Hk. and Arn., the South Sea Island or Coral creeper with handsome pink flos. is cult. in the plains, blooming at the end of the rains.

PASSIFLORACEAE

Passiflora

Passiflora coerulea L. the *Ghari Phul*, with remarkably complicated flos. of several colours is cult. in gardens.

ARISTOLOCHIACEAE

Aristolochia

Aristolochia punjabensis Lace, *Ghore sum* or *nag bel* is a large or small vine growing in hedges or among rocks with peculiar brownish flos. curved like a Dutchman's pipe. 5-8,000'. Murree, Hazara, Poonch. The six ridged fruits are about 2½' long. Flos. in June and July.

LAURACEAE

Machilus

Machilus odoratissima Nees. *Chan*, a tree with panicles glabrous, and fruit ellipsoid is found from the Indus east to Cochin China at low elevations and up to 6,000' in shady ravines. Murree Brewery, near Kahuta, Poonch, Maksud (Haz.)

M. duthiei King ex Hk.f. grows on shady northern slopes and in damp ravines from 4-8,000'. The panicles are pubescent and the fruit globose, lateral nerves of leaves 12-20 pairs. Swat, Kuldana, Gharial, Poonch etc.

Litsaea

Litsaea chinensis Lamk., (*Neolitsaea chinensis* (Gamble) Chun, from Rawalpindi eastward, bearing grey tomentose leaves below. *Maidasak*. Sub Himalayan tract and adjacent plains (Parker).

L. monopetala (Roxb.) Pers., (*L. polyantha* Juss.), Rawalpindi Dist. eastward, Salt Range, (Parker). Leaves brown pubescent beneath, fruit ovoid.

L. umbrosa Nees. (*Neolitsaea umbrosa* (Nees) Gamble), Common in the Murree Hills from 4-8,000'. *Chirindi, batti*. Leaves three nerved, 3-5" long, pale and glaucous beneath. Grows in moist forests and shady ravines.

PROTEACEAE

Grevillea

Grevillea robusta A. Cunn. The Silver or Australian Oak is cultivated in the plains. The grain of the wood suggests that of oak. The racemes of pretty orange flos. appear at the beginning of the hot weather.

THYMELEACEAE

Thymelaea

Thymelaea arvensis Lamk. An inconspicuous spring herb with minute sessile, axillary flos. grows in Swat, Hasan Abdal, Haripur (Haz.), Peshawar, Gilgit.

Diarthron

Diarthron vesiculosum F. and M. is very similar to the last but with terminal racemes grows in dry fields in the spring. Swat, Rawalpindi and Attock Dists., Peshawar, Chitral.

Daphne

Daphne oleoides Schreb. A small shrub with simple leaves up to 2" long, willow or olive like; very xerophytic. Leaves are very poisonous. Flos. white, Trans-Indus, Hazara, Kagan, Poonch etc.

D. papyracea Dcne. with leaves up to 5" long, is a shrub of forest undergrowth from 5,10,000', bearing pretty white flos. in spring and autumn. It lacks the aromatic odour of *Skimmia* which may be confused with it. Hazara, Murree, Hills, Poonch, Muzaffarabad.

Wikstroemia

Wikstroemia canescens Meissn. A shrub with pretty yellow flos. and a bark with a strong fibre. Swat, Thandiani, Pipe Line, Poonch, Keran (Muz.)

ELAEAGNACEAE

Elaeagnus

Elaeagnus umbellata Thunb. A deciduous shrub with pretty, scented, white flos. with silvery scales on young branches and leaves. 3-10,000'. Swat, Abbottabad, Murree, Poonch.

LORANTHACEAE

Loranthus

Loranthus longiflorus Desr. is found from Rawalpindi Dist. eastward to Sumatra and New Guinea. It is a parasite on Albizzia and other trees of the foothill zone and bears handsome scarlet flos. in the winter and throughout much of the year. Tret, Mirpur.

Viscum

Viscum album L. is common as a parasite on various trees especially walnut and horse chestnut, from 3-9,000', Kurram, Chitral, Swat, Hazara etc. Not common in the Murree Hills as it is much sought after for sale as Christmas greenery. The white berries with a sticky juice ripen in the early winter.

Korthalsella

Korthalsella opuntia (Thunb.) Merrill. Previously known as *Viscum japonicum* is sometimes very common on oak. Much smaller than the true mistletoe. Swat (on *Quercus ilex*) Murree, Muzaffarabad.

SANTALACEAE

Thesium

Thesium himalense Royle, a small, root parasite with small white flos. and very narrow leaves is rare but I have found it at Margalla. It has also been collected at Abbottabad and Sakesar, Poonch, Gilgit etc.

EUPHORBIACEAE

Euphorbia

Euphorbia hypericifolia L. (*E. parviflora* L. may be the proper name as it seems to differ from the American *E. hypericifolia*). A small erect, almost glabrous annual with leaves up to 1" by $\frac{1}{2}$ " and minute flos. in terminal or axillary clusters. The seeds, *hazardana*, are used for colic. Swat, Abbottabad, Rawalpindi, Poonch etc. Plains and lower hills.

E. hirta L. is a pan-tropic weed of the plains, Trans-Indus, Hazara, Rawalpindi, Poonch.

E. granulata Forsk. var. *glabrata* Boiss. which is usually identified as *E. thymifolia* is a very common weed in lawns in the plains.

E. granulata Forsk. The root of a specimen found at Dhamial near Rawalpindi seems to be perennial. The cocci are hirsute; not keeled; seeds faintly pitted. Found in dry soil.

E. clarkeana Hk.f. A glabrous annual with minute involucre, leaves linear oblong 1/6-1/4" long, seeds minutely transversely rugose is reported from Rawalpindi by Aitchison and from Hazara by Falconer.

E. royleana Boiss. A large cactus like shrub, *danda thor*, is common locally in steep rocky places in the foothill zone and is often planted as a hedge plant in the plains.

E. wallichii Hk. f., (*E. jacquemontii* Boiss. fide Croizat), with large yellow bracts, growing in big clumps on open meadows at Changla, Dunga, Nathia, Thandiani, Poonch etc., is the finest of the genus in our area.

E. cornigera Boiss (not *E. cognata* of the First Edition), is often found in the same area as the last species but with much smaller bracts and the capsules are easily recognized by being warty while they are smooth and larger in the last species. Pipe Line, Changla, Murree, Abbottabad.

E. helioscopia L. is a very common weed of the plains blooming in early spring. Seeds deeply pitted. Also found to 6,000'. Parachinar, Swat, Poonch etc.

E. dracunculoides Lamk. is a common erect weed of grain fields and waste places. It resembles the perennial *E. prolifera*. The oil from the seeds is said to be superior to linseed oil. *Kangi*; Plains to 3,000'. The bracts are linear and the seeds are leprous.

E. maddeni Boiss. is a small annual, usually found in forest shade from 5-9,000'. The plant is easily spotted by the two narrow horns of the involucre glands. Swat, Changla, Thandiani, Murree, Poonch.

E. pepplus L. Seems to be a new introduction in the Murree Hills. Found in weedy places. There are two small ridges at each corner of the capsule. Lasts into the winter.

E. falcata L. Another spring grain field annual which is easily recognized by the long points to the leaves. Plains to 4,000'.

E. prolifera Ham. A perennial with a thick rootstock growing in sterile soil in the plains in March and April.

E. hispida Boiss. (*E. emodi* of Fl. Brit. Ind.). A dwarf, prostrate annual with small, white involucre grows in Swat, Attock, Gharial, Poonch etc. Plains to 7,000'.

E. pulcherrima Willd. The Poinsettia, a native of Central America, with very large red bracts and flowering in the cold weather is much cultivated in the plains.

E. bojeri Hk., often called *E. splendens*, the Crown of Thorns, a low bushy shrub, very thorny with small, reddish flos. is also cult. in the plains.

E. geniculata (Kl. & Garcke) Ortega. A large annual species of the tropics with large green floral leaves is reported from Abbottabad by a student.

Bridelia

Bridelia verrucosa Haines, (*B. montana* Hk. non Willd.). Indus east (Parker); Mirpur. A large shrub or small tree with warted twigs.

Andrachne

Andrachne aspera Spreng. Trans-Indus, Sind, Attock. A dwarf, prostrate, perennial herb, roughly hairy, bears tiny leaves which are often broader than long. A desert plant.

A. telephioides L. A similar prostrate, xerophytic perennial herb with a woody root, glabrous. Baluchistan, Salt Range, Trans Indus.

A. cordifolia Muell. A very common shrub in forest undergrowth and on *pushtar* in the hills from 5-8,000'. Swat, Hazara, Murree, Poonch. The dry leaves are said to be poisonous to large animals.

Phyllanthus

Phyllanthus emblica L. *Aonla*, *ambli*, grows in the lower hills in scrub forest from the Indus east to 4,500'. The fruits are commonly pickled and its use should be encouraged as they are found to be very rich in vitamins. The leaves are used for tanning. Poonch, Mirpur, Rawalpindi.

P. fraternus Webster, (*P. niruri* Hk. f. non L.). A small, annual field weed, fruiting at the close of the monsoon from the plains to 6,000'. Leaves narrowly elliptic, pale below. Swat, Hazara, Rawalpindi, Muzaffarabad.

P. parvifolius Buch. Ham. A small shrub with small leaves up to .5 by .3" and dull black capsules, .2" in diam. grows on rocks at Kalapani, Hazara below Thandiani at about 6,000'.

P. simplex Retz. A large form of this composite, variable species is found in Abbottabad in the autumn and a smaller one in Poonch.

Glochidion

Glochidion velutinum Wight. A small tree of the foothills which is softly tomentose or pubescent all over. The seeds are bright red. Often in *chir* forest. Ghora Gali (Coventry) ; Domel, Kotli, Mirpur.

Securinega (Flueggea)

Securinega virosa (Willd.) Pax and Hoffm., (*Flueggea microcarpa* Blume). Usually a small shrub with straight erect shoots, unarmed ; leaves elliptic to suborbicular, up to 3" long. Fruit of two kinds, mostly dry, .15" in diam and a few .3" in diam ; white succulent and edible. Salt Range, Pabbi Hills, Batrasi (Haz.) ; Muzaffarabad, Poonch. Foothill zone to 5,000'.

Chrozophora

Chrozophora hierosolimitana Spr. An erect bushy, branched annual which often appears in grain fields after harvest. Stems etc., felted and the capsules covered with silvery scales.

C. tinctoria A. Juss. A prostrate annual, also has silvery scales. Bamber reports it from the Salt Range. *C. plicata* A. Juss. which grows in Lahore and has hairy, not scaly capsules is to be expected.

Acalypha

Acalypha brachystachya Hornem. A dwarf spring nettle like weed of the plains ascending to 6,000' has been collected in Hazara, Attock and Rawalpindi Dists. and in Poonch.

A. ciliata Forsk. Saidpur and Hasan Abdal in Sept. (Aitchison). A much larger species with sharply toothed leaves and bracts bearing a distinctive marginal fringe is sometimes found from the plains to 6,000'. Kotli.

Croton

Croton sparsiflorus Mor. Seems to be a new introduction. Cement Factory, Wah ; Poonch, Panjar.

Mallotus

Mallotus philippinensis Muell. *Kameela* is a very common shrub of the foothill zone from Swat east ascending to 4,000'. The red powder on the capsules is used as a dye and the oil is said to have economic possibilities.

Ricinus

Ricinus communis L. is common, cult. and as an escape in the plains and up to 4,000'. The Castor Oil, plant, *arind*, is usually found about villages and is probably of African origin. The oil is valuable.

Sapium

Sapium sebiferum Roxb. *Pepli*, *makkan* or *charbi* is cult. or self sown up to 6,000. It does well near water and is noticeable in the autumn when its leaves turn from lemon to crimson. Resembles *shisham* at a distance.

BUXACEAE

Buxus

Buxus papillosa C. K. Schn. *Shamshad*, a shrub or small tree often grows gregariously on limestone ; 2-4,000'. Kala Chitta Hills, Margala, Hazara, Rawalpindi Dist. ; Sakesar.

Sarcococca

Sarcococca saligna Muell. (*S. pruniformis* Lindl.). *Nerua*, *ban satra*, *ladrun* is a common undershrub from 5-9,000' ; often with *Andrachne*. 2-4' tall, leaves linear lanceolate and long acuminate. Swat eastwards.

ULMACEAE

Ulmus

Ulmus wallichiana Planch, Mature leaves scabrid above, usually very oblique at the base. No root suckers. *Mannu* is usually found above 6,000'. Swat, the Galis, Murree, Poonch.

U. laevigata Royle, the small leaved elm has the mature leaves smooth, sub-equal at the base. Suckers freely. 3,500-10,000'. Abbottabad, Kashmir, Poonch, etc.

URTICACEAE

Celtis (After Parker)

- Ovary and young drupes densely tomentose *C. eriocarpa*
Ovary and young drupes seated on a hairy disk, pilose toward stigma
Leaves sharply and coarsely serrate, drupes ellipsoid, purplish black *C. australis*
Leaves serrate or sub-entire, drupes globose, reddish brown or olive *C. tetrandra*

Celtis eriocarpa Dcne. Found from the plains to 6,000'. Leaves are prominently three nerved. Swat to Kumaon.

C. australis L. *Batkar* is usually found from 5—10,000'. Swat, Abbottabad, Murree Poonch.

C. tetrandra Roxb. A specimen from Mr. Asghar Ali from Chattar on the Murree Road seems to belong here.

Oreocnide

Oreocnide frutescens Miq. (*Villebrunea* of Blume). A slender shrub up to 6' tall with ovate or elliptic leaves which are serrate and caudate acuminate is often found along the rocky banks of streams and water channels ; Swat eastward, up to 5,000'. Muzaffarabad, Poonch.

Trema

Trema politoria Planch. Rawalpindi east ; common along the Jhelum River (Parker.) A plant of the foothills. The surface of the leaves is so rough that they can be used for sandpaper.

Cannabis

Cannabis sativa L., (*C. indica* L.). *Bang*, Indian hemp, grows everywhere in the district from the plains to 8,000' in waste places.

Broussonnetia

Broussonnetia papyrifera Vent., the Paper mulberry, with large, globular, reddish, mulberry like fruit is much planted in Rawalpindi as a garden and roadside tree. It grows with great rapidity and is often self sown. Poonch, Mirpur.

Morus

Morus alba L. the common silkworm mulberry with small reddish or whitish fruits is commonly planted and self sown throughout the region. The wood is very useful and is excellent for sports goods. *Tut.*

M. laevigata Wall, the *shah tut*, with much longer, white fruits is cult. in the plains in Rawalpindi and in Abbottabad.

M. serrata Roxb. with large serrate leaves is the wild forest tree which is common from 4-9,000'. Swat, Hazara, Murree Hills, Keran, Poonch.

Ficus (after Parker)

| | |
|--|-----------------------|
| 1 Erect trees or shrubs | 2 |
| Climbing shrub | 13 |
| 2 Figs axillary | 3 |
| Figs on leafless branches or in clusters on the old wood | 12 |
| 3 Leaves entire smooth | 4 |
| Leaves toothed, at least toward the top or rough if entire | 11 |
| 4 Figs sessile | 5 |
| Figs pedunculate | 8 |
| 5 Petiole jointed to the blade | 6 |
| Petiole not jointed to the blade | <i>F. bengalensis</i> |
| 6 Leaves broad, caudate acuminate, ripe figs black | 7 |
| Leaves ovate acuminate, ripe figs white | <i>F. infectoria</i> |
| 7 Acumen long, petiole terete | <i>F. religiosa</i> |
| 8 Ripe figs white | <i>F. infectoria</i> |
| Ripe figs orange or reddish | 9 |
| 9 Figs 1 to 1½" in diam. | <i>F. glomerata</i> |
| Figs .2-.3" in diam. | <i>F. nemoralis</i> |
| 10 Leaves broadly ovate or lobed, petiole 1-2" long | <i>F. palmata</i> |
| 11 Leaves very unequally sided at the base | <i>F. cunia</i> |
| Leaves symmetrical or nearly so at the base | 12 |
| 12 Basal nerves 3 | <i>F. glomerata</i> |
| Basal nerves 5-7 | <i>F. roxburghii</i> |
| 13 Figs. .6" in diam on .1 to .5" peduncles | <i>F. foveolata</i> |

Ficus bengalensis L., the *bor* or *banyan* is found in every village on the plains and up to perhaps 3,000'. It is usually found by the village tank. Roots grow down from horizontal branches and take root.

Ficus religiosa L., the *peepul* is wild in the foothills and is often planted in the plains. It does much damage to walls and is often found as an epiphyte. A strangling fig.

F. infectoria Roxb. var. *lambertiana* Miq. An excellent shade plant; is much rarer but has been found from the Indus east. Kala Chitta Hills, Saidpur, Havelian, Mirpur.

F. cunia Ham. Rawalpindi Dist. east (Parker). Easily recognized by its unsymmetrical leaves. I have found it in Hazara but not in Rawalpindi.

F. foveolata Wall. is the only climbing fig in our area. It is abundant on rocks and cliffs, 4-7,000'. Swat, Hazara, Murree, Poonch.

F. palmata Forsk., *phagwara* is found from the plains to 9,000'. Leaves may be ovate or palmate. The fruit is purple and edible. Swat, Hazara, Murree, Rawalpindi, Poonch.

F. nemoralis Wall. From Hazara eastwards to 7,000', not common (Parker). Ghora Gali, Poonch.

F. roxburghii Wall., *dusi*, *trembal*, with large ovate or rounded leaves is fairly common up to 5,000'. Hazara, Rawalpindi. Domel, Poonch, Mirpur.

F. glomerata Roxb., *gular*, grows in the plains and foothills with the figs on leafless branches, usually full of insects. Rawalpindi Dist., Salt Range, Mirpur.

F. carica L. The cult. fig or *anjir* is sometimes planted.

Urtica

Urtica pilulifera L. the Roman Nettle, leaves ovate with long teeth, often linear, sharp pointed. Male flos. on slender branching spikes; female in round heads, both on the same plant. Rare. Collected once in Rawalpindi; Trans Indus, Warsak.

U. ardens Link, (*U. parviflora* Roxb.). Stipules ovate, leaves ovate with heart shaped bases. A large nettle. Murree, Poonch.

U. dioica L. The common *bichchu buti* from 4-9,000' in waste places about Abbottabad, Murree, Swat, Kagan, Poonch etc. Teeth of leaves regular, stipules not united, dioecious.

Girardinia

Girardinia heterophylla Dcne. The largest and most painful of our nettles. Upper leaves large and 3-5 lobed. Hazara, Murree, Jhikka Gali, Poonch.

Pilea

Pilea umbrosa Wedd. Often large, hairy; leaves up to 5 by 3½", ovate, broadly toothed, tip tail like. Flos. small in clusters on axillary racemes. A plant of shady places in rich soil, 4-9,000'. Hazara, Murree, Kagan, Swat, Poonch.

P. scripta Wedd. Leaves up to 10 by 3", much longer and more acuminate. Gharial, Poonch; 4-7,000'.

Lecanthus

Lecanthus peduncularis (Royle) Wedd. A common plant of damp forest soil during the rains, sometimes quite small. Flos. minute, crowded on axillary stalked heads. 4-12,000'. Murree, the Galis, Poonch.

Gonostegia

Gonostegia (Pouzolzia) pentandra (Roxb.) Miq. is a tropical plant of the plains growing on the banks of ditches with long prostrate branches and slender spikes. Swat, Sarae Saleh (Haz.), Wah, Rawalpindi, Poonch.

Debregeasia

Debregeasia salicifolia (D. Don) R.R.S., (*D. hypoleuca* Wedd.) is a large, evergreen shrub with willow shaped leaves which are white below. Foothill zone up to 6,000'. Swat, Hazara, Saidpur Hills, Murree, Poonch etc.

Parietaria

Parietaria debilis Forst. f. A delicate annual, growing in the shade of rocks. Swat, Abbottabad, Changla, Keran, Poonch.

Forskohlea

Forskohlea tenacissima L. A rough, weedy, xerophytic herb of rocky desert places from the foothills to Arabia and Egypt. Trans-Indus, Swat, Attock, Hasan Abdal, Salt Range etc.

PLATANACEAE

Platanus

Platanus orientalis L. The *chenar* or Oriental Plane tree is cult. in well watered soil in Abbottabad, Havelian, Swat, Keran, Poonch and occasionally in Rawalpindi.

JUGLANDACEAE

Juglans

Juglans regia L., the walnut is wild and cult. in Hazara, the Murree Hills etc. 5-9,000'.

Engelhardtia

Engelhardtia colebrookeana Lindl. *Samma* grows at Punjar near Kahuta and ranges eastward to Burma (Parker).

CUPULIFERAE

Alnus

Alnus nitida Endl., the alder, *sarol* or *sharol*, grows near streams at Abbottabad, Kakul, Swat, Jhelum Valley Road, Poonch etc. I have not seen it in Rawalpindi.

Corylus

Corylus colurna L. *Urni*, the hazel nut, is found on Changla Gali, in the Kagan Vy., Swat, Poonch etc. Not common in the outer Himalayas.

Quercus

Quercus incana Roxb. the *ban* oak with leaves white below is very common from 4,000 to 7,000'. Sometimes gregarious on southern slopes. Swat, Hazara, Murree, Poonch.

Q. dilatata Lindl., *moru* or *barungi* with leaves green below is one of the commonest trees throughout the Murree Hills and Hazara from 5-9,000'. Because of the pressure of population this valuable tree is lopped excessively for fodder and undamaged trees are rare.

Q. glauca Thunb. Leaves pale and glaucous beneath, serrate, nerves straight, rings around the cup of the acorn. 2-6,000'. Not common about Murree ; Muzaffarabad, Barsala, Garhi Habibullah, Poonch.

Q. pedunculata Ehrh., the English Oak is planted in Abbottabad and Ghora Gali.

Castanea

Castanea sativa Mill., the European chestnut has been planted in Abbottabad and Ghora Gali but does not do well (Parker).

SALICACEAE

Salix

Salix acmophylla Boiss. is the common willow in the plains near ponds or streams and up to 5,000'. Usually planted.

S. wallichiana Anders., (*S. julacea* Anders.) is common in the Murree Hills and Galis from 5-9,000'.

S. tetrasperma Roxb. A polymorphous species planted in the plains. Stamens 5-10, capsules glabrous on a distinct, slender stipe. Wah, Saidpur, Poonch.

S. daphnoides Vill. (*S. dolichostachya* Floderus). A species resembling *S. wallichiana* but its twigs are almost always pubescent. The large silky catkins come before the leaves. Leaves 2-5 by .7-2", glabrous, pale and glaucous beneath when mature ; one year old twigs glabrous or hoary. Fruiting catkins 4-7" long. Usually 7-9,000'. Ghora Gali Poonch.

S. babylonica L. *Bed majnu*, the Weeping willow, is often planted in damp soil in the plains and hills. Easily recognized by its habit. Wood good for cricket bats.

S. denticulata Anders. A gregarious shrub in fairly moist forest, usually above 7,000'. Changla, the Galis, Kagan, Poonch. Leaves 1-2 by .6-.9".

S. denticulata var. *hazarica* Parker. Ovary and capsules silky pubescent. Pipe Line, Galis, Miranjani etc.

Populus

Populus nigra L. var. *pyramidalis* Spach. The Lombardy Poplar or *safeda* is planted in Rawalpindi, Abbottabad. Murree etc. It is an excellent avenue and roadside tree where there is enough moisture. Easily recognized by its habit.

P. alba L. The white poplar is also planted in Abbottabad and about Murree. According to Parker the trees at Ghora Gali are wild. It is easily recognized by the colour of its leaves and the light coloured trunk.

P. ciliata Wall. *Palach*, the Himalayan poplar is common among blue pine and fir on northern slopes about Murree and the Galis ; Poonch, Kishenganga Vy. etc.

P. euphratica Oliv. I have only found this species at Dhok Pathan, Attock Dist. by the river. This species has two kinds of leaves, narrow willow like and broader than long, lobulate in the upper half. A tree of river banks. Common in Sind.

MONOCOTYLEDONAE

HYDROCHARIDACEAE

Hydrilla

Hydrilla verticillata Casp. A submerged water plant with whorls of linear or linear oblong leaves up to .3" long. Common in the plains in still or slowly moving water.

Vallisneria

Vallisneria spiralis L. Another submerged water plant easily recognized by the long thread like coiled stalk of the female flos. Near Rawalpindi in quiet water.

ORCHIDACEAE

Microstylis

Microstylis muscifera Ridley. A monsoon orchid growing in forest humus usually above 8,000'. Dunga Gali, Pipe Line, Thandiani. Stem tuberous below. Flos. $\frac{1}{2}$ ", pale yellow green in a terminal spike like raceme.

Liparis

Liparis rostrata Reichb. A small perennial ; stem swollen at the base, flos. $\frac{1}{3}$ ", yellow green in a terminal raceme 3-6" long. Bhurban, Gharial, Jhikka Gali; in August.

Spiranthes

Spiranthes sinensis Ames. Pink Ladies Tresses. Occasional in damp soil in the open. Murree, Bhurban, Swat, Kashmir.

Cypripedium

Cypripedium cordigerum Don, the Yellow Lady Slipper grows on Mokshpuri in June, Swat, Muzaffarabad ; usually above 8,000' in shady forest.

Neottia

Neottia listeroides Lindl. A leafless perennial form ; symbiotic with a mycorrhiza. Roots short and fleshy in a dense mass. Flos. .6", red or brown green in a velvety raceme up to 12" long. Swat, Jhikka Gali, Dunga, Changla etc., in August.

Gastrodia

Gastrodia orobanchoides Bth. A rare, leafless plant up to 3' tall in, forest, growing from a potato like tuber. Flos. greenish yellow. Upper Topa.

Cephalanthera

Cephalanthera ensifolia Richard. The only orchid to be expected in Murree before the rains. Stems up to 18" and leaves 2-6", folded. Flos. white. Upper Topa, Ghora Gali, Swat, Poonch.

Epipactis

Epipactis veratrifolia Boiss. and Hohen. (*E. consimilis* Wall.). An orchid growing on the banks of streams in March and April. Calyx pale greenish yellow with brown red veins ; corolla greenish yellow ; broad brownish red borders and brown veins. Lip yellow brown. Dhamial and Kala, Rawalpindi Dist., 17th mile Murree Road ; Swat, Chitral, Gilgit.

E. latifolia Sw., (*Amesia latifolia* (Wall). Nelson and Macbr.) ; (*E. helleborine* (L.) Crantz.) is the commonest orchid in forest in the Murree Hills. The flos. are a dingy purple. Swat, Hazara, Poonch etc.

Goodyera

Goodyera repens R. Br. A species of the forest floor spreading by prostrate stems and so several plants tend to be found together. The tiny white flos. are in spikes. Changla, Pipe Line, Thandiani, Kagan, Poonch. Flos. in Aug.

Orchis

Orchis latifolia L. A plant on wet ground, not in forest shade. Roots tuberous, lobed. Stems stout, often tall, leaves 2-6", bases sheathing. Flos. 2/3" long in a spike up to 6" long ; dull purple ; spotted. Usually above 8,000'. Swat, Changla Gali, Kagan, Poonch.

Habenaria

Habenaria susannae R. Br. Very large, 2-4' tall ; flos. 3-4" across, white, spur green, 4-5" long, side lobes of lip fringed. Rare, but was collected at Bani, below Murree by Coventry.

H. intermedia D. Don, the Reindeer Orchid. Spur 2½" ; flos. 2" across, flos. white, fringed ; also on grassy slopes. Murree, Poonch.

H. aitchisoni Reichb. A forest species with small greenish flos. 1/3" in diam. Leaves two up to 3" in diam., nearly round, glaucous, . The leaves are inserted just above the stem base. Murree, Gharial, Pipe Line, Galis, Poonch.

H. latilabris Hk. f. has often been confused with the next species. Both are to be found in Murree and the Galis . Both have greenish yellow flos. and well developed spurs. This species has spurs which are descending or projecting outward while they are erect in the next species. Both grow on grassy slopes and are usually above 6,000'. Bhurban, Charehan, Ghora Gali, Thandiani etc.

H. edgeworthii Hk. f. with upturned spurs. Thandiani, Upper Topa, Poonch, Swat etc.

H. digitata Lindl. Reported by Coventry from Samli at 3,500'.

Satyrium

Satyrium nepalense D. Don. Ghora Gali and Murree with fine pink and white flos. with two spurs.

Herminium

H. angustifolium Bth. Bears a root of two small ovoid tubers and a flowering stem from 1 to 2½' tall with numerous small green flos. Murree, Ghora Gali, Poonch.

Cymbidium

Cymbidium macrorhizon Lindl. Reported from Ghora Gali and Samli in July by Coventry. The leaves are very large for an orchid suggesting over sized leaves of *Plantago major*. Not seen by me. Could it have been a *Calanthe* ?

Adenostylis

Adenostylis strateumatica (L.) Ames, (*Zeuxine sulcata* Lindl.). This is the only orchid which is common in the plains. It grows at the edge of streams and bears small, white flos. in March and April. Mingora (Swat), Poonch, Rawalpindi.

Epipogum

Epipogum sp. ? A leafless orchid with yellow flos. and a tuberous root was collected at Kala by Mohindar Nath. Was it *Eulophia* ?

E. tuberosum Duthie. This leafless species with a tuberous base and a spike of brownish yellow flos. with crimson spots was found in Aug. 1956 in Thandiani at the base of a tree at about 8,000'.

SCITAMINEAE

Canna

Canna indica L. Commonly cult. in gardens in the plains.

Zingiber

Zingiber officinale Roscoe. Ginger, *adrak*, is occasionally cult. It is said to do well at Tret.

Curcuma

Curcuma longa Wall. *Haldi*, *turmeric*, is cult. in Haripur Tehsil, Hazara.

Amomum

Amomum sp. A pink flowered sp. of cardamum is cult. at Chattar, Rawalpindi Dist.

Roscoea

Roscoea alpina Royle with pretty pink flos. is occasional on the Pipe Line in July. Mokhshpuri, Thandiani, in forest.

MUSACEAE

Musa

Musa sapientum L. A banana of rather poor quality is cult, up to 4,500' in Hazara, Rawalpindi, Poonch.

HAEMADORACEAE

Liriope

Liriope graminifolia (L.) Baker with pale blue flos. grows at Abbottabad, above Uri, Ghora Gali, Kagan, Poonch.

Ophiopogon

Ophiopogon intermedius D. Don, with pretty spikes of white flos. and narrow, grass like leaves is found on forest banks during the rains. Murree, Hazara, Poonch.

O. planiscapum Bailey is very similar but the peduncle is flattened and the leaves are a little wider. Murree, in forest. Aug.

IRIDACEAE

Iris

Iris aitchisoni Boiss. with purple flos. is reported from Choia Saidan Shah, Jhelum Dist. by Dr. Sultan Ahmad. Very xerophytic.

I. aitchisoni var. *chrysantha* Baker with yellow flos. is found on limestone at Margalla and in the Kala Chitta Hills in March and April.

I. germanica L. Blue and white varieties are cult. in the plains and hills. Often planted on graves.

I. hookeriana Foster. A gregarious plant of alpine meadows. Flos. purple; Mokhsh-puri, Kagan, Poonch.

AMARYLLIDACEAE

Hypoxis

Hypoxis aurea Lour. A small, yellow flowered, lily like herb with grass like leaves grows in Abbottabad and Murree during the late summer. Thandiani, Poonch.

Agave

Agave cantala Roxb. *Kanwar gandal*, the Century Plant, is much used for hedges in the plains. The flos. are replaced by large bulbils. Hazara, Rawalpindi.

A. americana L. with yellow and green variegated leaves is also planted in the plains and in Murree. Below Abbottabad.

Hemerocallis

Hemerocallis fulva L. The Day lily with pretty yellow flos. is cult. in both plains and hills.

Zephyranthes

Zephyranthes rosea Lindl. is a hot weather favourite in gardens.

Narcissus

Narcissus poeticus L. the Narcissus begins to bloom in Nov. or Dec. in the plains.

Dioscoreaceae

Dioscorea melanophyma Prain ex Burkill (*D. kumaonensis* of F.B.I.) with leaves digitately compound and with curious black bulbils grows at Kalapani (Haz.), Poonch and between Kuldana and Barian.

D. deltoidea Wall. with tuberous roots and ovate lanceolate leaves is common on forest borders and among shrubs from 3-8,000'.

D. bulbifera L. Gets its name from the large warted bulbils which are 1" across. Tret in Sept., Shinkiyari (Haz.). Hajira (Poonch).

LILIACEAE

Smilax

Smilax aspera L. A climber with prickly branches, with small white flos. and deltoid leaves is common up to 6,000'. Ghora Gali, Jhelum Vy. Road ; Poonch.

S. parvifolia Wall. with cirrhose petioles and acute or acuminate leaves and purple flos. is common from 4-8,000'. Murree, Abbottabad, Swat, Poonch.

S. vaginata Dcne. is a dwarf, erect shrub usually less than 2' tall growing in forest usually above 7,000' Murree, Changla, Dunga, Thandiani.

Asparagus

Asparagus gracilis Royle is common in dry places in the plains and the foothill zone, Jhelum, Rawalpindi, Hazara, Poonch etc. Flos. solitary or in small clusters.

A. adscendens Roxb. is another plant of the foothill zone ; flos. in racemes, cladodes in tufts of 6-20, spines straight. Hazara, Rawalpindi Hills, Kotli, Mirpur, Sakesar.

A. filiciinus Ham. is a herbaceous species in forest in the temperate zone. *Shakakal, safed musti*. Changla, Mokshpuri, Thandiani.

A. sprengeri Regel and *A. plumosus* Baker are frequently planted in gardens and *A. officinalis* L., the Garden Asparagus, is sometimes planted.

Polygonatum

Polygonatum multiflorum All. is common in thin forest from 5-9,000', blooming in April and May. The leaves are alternate and more ovate than in the next two species.

P. verticillatum All. An erect plant with 4-8 linear leaves in each whorl is from 2-4' tall and is found from 6-11,000'. Murree, the Galis, Kagan, Poonch, Gilgit.

P. geminiflorum Dcne. An opposite leaved plant, smaller and usually at higher altitudes than the first species. Swat, The Galis, Kagan, Poonch.

Asphodelus

Asphodelus tenuifolius Cavan. *Piazi* or *bhagat* is one of the commonest weeds in grain fields in the plains with a distribution from Bengal to the Canary Islands.

Eremurus

Eremurus persicus Boiss. A rare, white flowered scapose plant has been found in a number of sattered places. Does well on limestone above Abbottabad and above Kakul. Cherat, Sakesar, Lehrar, in Attock Dist. Mirpur. Used as a *sag*.

Allium

Allium ascolonicum L. grows wild on the Pir's Mt. above Hasan Abdal ; at Margalla, in the Kala Chitta Hills and near Abbottabad. The flos. are white and the outer scales of the bulbs reddish.

A. stracheyi Baker, with very narrow, flat leaves, bulbs small ; clustered, narrowly ovoid, produced into a long neck ; flos. pale yellow or rosy, stamens far protruding has been collected on Mt. Miranjani above 9,000'.

A. griffithianum Boiss. is common in gravelly soil in March in the plains, Salt Range, Swat etc. The flos. are near the next species but paler and a little larger.

A. rubellum M. Bieb. resembles the last and often grows near by. This has smaller, pinker flos. Abundant in plains and hills.

A. ameloprasum L. the leek, *A. cepa* L., the onion, and *A. sativum* L. the garlic are all cult.

Dipcadi

Dipcadi serotinum Medic. with greenish brown flos. outside ; white within, is found in rocky places in the foothills, Attock Dist., Rawalpindi, Margalla, Mirpur etc. but never abundant. March and April.

Scilla

Scilla hohenackeri F. and M. with a spike of pretty blue flos. and white corms is common locally in desert places in Rawalpindi and Attock Dists., also Swat and the Jhelum Valley Road.

Lilium

Lilium polyphyllum D. Don is rare about Murree. I found it once in Barian in June; Swat, Kagan, Poonch.

Notholirion

Notholirion thomsonianum (Royle) Stapf, (*Lilium thomsonianum* Royle), with delicate, pale lavender flowers blooms in open rocky places in April. Swat, Abbottabad, Domel, Poonch. Worth cultivating.

Tulipa

Tulipa stellata Hk. (*T. clusiana* DC. var. *stellata* (Hk.) Regel) is one of the finest wild flos. of the area, flowering in March and April. Plains to 9,000'.

Gagea

Gagea lutea (L.) Ker-Gawl. grows in Murree, Hazara and Kashmir, usually above 7,000', just after the snow melts. The inflorescence is umbellate and the leaf is from .25-.5" broad. Flos. yellow.

G. reticulata R. and S. with more linear leaves is found on the plains and up to 6,000' in early spring. Swat, Abbottabad, Rawalpindi, Domel, Poonch etc.

Colchicum

Colchicum luteum Baker, *talakh surinjan* is often the first flower to bloom on lawns in Abbottabad and the Murree Hills from Jan. to March. Flos. yellow.

Merendera

Merendera persica Boiss. and Kotsch. *Surinjan shireen* is one of the first flos. to bloom on the plains with white to lavender flos. in Rawalpindi, Jhelum and Attock Dists. Fatch-jang, Margalla etc.

Iphigenia

Iphigenia indica Kunth. One of the few flos. with a perianth which is nearly black in colour. A small grass like herb growing from a solid corm with a single flower up to .75" long. Ghora Gali in Oct.

Gloriosa

Gloriosa superba L. This handsome lily with reflexed perianth and climbing by means of its leaf tips is rare in the area. It has been found in the Margalla Range and near Kahuta and Barakao in Sept; Lehri in Jhelum Dist.; Mirpur.

Trillium

Trillium govanianum Wall. An erect, glabrous herb with a single whorl of three leaves and a single flower which is yellow or yellow green. May-June, usually above 8,000'. Murree, Changla, Thandiani, Poonch.

PONTEDERIACEAE

Eichornia

Eichornia crassipes (Mart.) Solms., the Water Hyacinth, with a large spike of handsome blue flos. is occasionally found filling ponds in the plains.

COMMELINACEAE

Commelina

Commelina benghalensis L. A succulent, creeping herb with pretty blue flos. in a small cluster or cyme enclosed in a folded leaf like bract or spathe is fairly common after the rains from the plains to 6,000'. Poonch, Abbottabad, Rawalpindi, Poonch.

C. obliqua Ham. Leaves lanceolate, tip acute, is not rare in the plains and lower hills after the rains. Abbottabad, Rawalpindi, Poonch.

C. glabra Clarke is reported from Rawalpindi by Aitchison.

JUNCACEAE

Juncus

Juncus bufonius L. a small, annual species is common in the spring in the plains by drying ponds and stream banks and ascends into the mountains.

J. lampocarpus Ehrh. Another plant of wet soil from the plains to 14,000'. The leaves are cylindrical, not flat ; the interior divided by transverse partitions of pith. Swat, Kagan, Murree, Poonch etc.

J. glaucus Ehrh. Stems many, stiff, in large tufts, bases brown in colour ; leafless. Murree Hills, Swat, Poonch.

PALMACEAE

Phoenix

Phoenix dactylifera L. The *khajur* or date palm of Arabia and the Sahara is planted here and there in dry places in the plains. Root suckers develop at the base of the trees.

P. sylvestris Roxb. A similar tree but basal root suckers do not form, and the crowns are more dense and hemispherical. Sub-Himalayan tract from the Indus eastwards.

P. humilis Royle, is shorter, reaching 12' in height. It is found in the Saidpur Hills, Jhelum Valley Road, Poonch etc., up to 3,000'.

Nannorhops

Nannorhops ritchieana H. Wendl. is common in the rocky Trans-Indus Hills and in parts of the Salt Range. I have only found one patch in Rawalpindi Dist. at Margalla. The *chatai* palm. The leaves are palmately not pinnately divided.

Livistona

Livistona chinensis R. Br. is the common fan palm of verandah tubs and of lawns in the plains. A native of China.

TYPHACEAE

Typha

Typha angustata Chaub and Bory. The Lesser Cat-tail or '*kundar*' is common on the borders of ponds, marshes and slow streams.

T. elephatina Roxb. A larger species with the stem base and enclosing leaves elliptic, not round in cross section. Common along the Jhelum and the Jhelum Canal in Gujrat. Attock Dist. and Trans-Indus.

SPARGANIACEAE

Sparganium

Sparganium ramosum Huds. The *bur reed*, a marsh plant with sessile heads and large leaves up to 1" broad and four feet long, grows in Hazara, Attock Dist. etc.

ARACEAE

Arisaema

Arisaema wallichianum Hk. f. with three leaflets is the finest of the genus in our area. It is found in rich forest and usually at 8,000' or above. Changla, the Pipe Line and the Galis, Kagan, Poonch.

A. jacquemontii Blume with five leaflets is more common with green spathes, while there are maroon mottlings in the last species. Abundant in Murree Hills, Galis etc.

A. flavum Schott with a small yellow-green spathe is a smaller plant and grows in stony places in the open. Leaflets more numerous and pedately, not palmately arranged. Swat, Thandiani, the Galis, Poonch Flos. in June and July.

Sauromatum

Sauromatum guttatum Schott. *Samp ki buti* is common from 3-8,000' in sunny places. The large, strap shaped spathe is much mottled with maroon and it appears before the large pedate leaves. The leaf stalks are mottled so as to suggest a snake. Throughout the area from Swat to Poonch.

Colocasia

Colocasia esculenta (L.) Schott, *kach alu* or *arbi* is cultivated in the plains and lower hills. It is found at Hasan Abdal by irrigation ditches and is common in Haripur Tehsil (Haz.). Swat, Poonch etc.

Richardia

Richardia africana Kunth the white Arum *lily* is commonly cult. in gardens.

LEMNACEAE

Lemna

Lemna minor L. with one rootlet and the under surface of the thallus flat, is abundant, floating on ponds. Swat to Poonch.

L. gibba L. Fronds a little larger and thicker, convex below. Rawalpindi, Kashmir.

L. polyrhiza L. Roots several. Hasan Abdal, Khanna, Swat.

L. paucicostata Hegelm. is reported from Rawalpindi by Aitchison. It may be the species I have called *L. minor*.

Wolffia

Wolffia arrhiza Wimm. which looks like green sand floating on stagnant ponds is abundant in the warm weather as are some of the Lemnas.

ALISMACEAE

Alisma

Alisma plantago L. The Water Plantain with a pyramidal panicle of pale pink flos. is common in ditches and ponds to 5,000'. Wah, Rawalpindi, Ghora Gali (Prof. Hamid).

SAGITTARIA

Sagittaria sagittifolia L. Arrowhead.

S. guayanensis Humb. Leaves deeply cordate, not hastate, grows in ponds in the plains of Jhelum and Rawalpindi Dists.

NAIADACEAE

Potamogeton

Potamogeton indicus Roxb. Floating leaves 3-4½ by 1-2¼", oblong with rounded tip, leathery; submerged leaves longer, narrower, papery. Lakes and pools, Rawalpindi, Swat, Poonch.

P. perfoliatus L. Leaves sessile, ovate, translucent, submerged. Rawalpindi, Swat, Jhelum Dist.

P. crispus L. Leaves narrow, translucent, crisped and toothed at the edges. Swat, Rawalpindi.

P. pectinatus L. Leaves filiform, achenes little beaked; inflorescence interrupted. Jhelum, Rawalpindi, Kagan etc.

Zannichellia

Zannichellia palustris L. ssp. *pedicellata* Wahl. is common in the plains and Trans Indus. The small flos. are sessile in the leaf axils and the leaves are entire, not toothed as in Naias. Carpels 4, distinct with long styles.

Naias

Naias graminea Del. A slender submerged herb with toothed leaves. Riwat, Rawalpindi.

Ruppia

Ruppia rostellata Koch. A long, slender, branched, submerged plant found in brackish water. Leaves 1-3", threadlike, sheaths stipule like. Kalar Kahar, Jhelum Dist. (Bamber).

CYPERACEAE

Key to Genera (Adapted from Collett).

A. Nut bearing flos. containing perfect stamens.

I Glumes in two opposite rows

Axis of fruiting spikelet disarticulating and falling off

Styles 2 branched

Kyllinga

Styles 3 branched

Mariscus

Axis of fruiting spikelet persistent

Styles 2 branched ; nut laterally compressed

Pycreus

Styles 2 branched ; nut dorsally compressed

Juncellus

Styles 3 branched

Cyperus

II Glumes imbricated all around the axis

Flowers with bristles or scales

Bristles 6-9, not longer than the glumes

Nut crowned by the swollen style base

Eleocharis

Nut pointed ; style base not swollen

Scirpus

Bristles divided into numerous segments, longer than the glumes.

Eriophorum

Flowers without bristles or scales

Style swollen at the base, nut pointed, style base falling off

Fimbristylis

Style not swollen at the base ; nut pointed

*Scirpus**

B. Nut bearing flowers without stamens ; nut wholly enclosed in a bag like bract or utricle

Carex

* In some species of *Scirpus* bristles are present and in others they are absent.

Kyllinga

Nut bearing glume not winged in the upper half of its keel *K. brevifolia*

Nut bearing glume winged in upper half of keel

Rhizome creeping, elongate ; upper half of keel with a lunate, glandular wing

K. cephalotes

Stems tufted, annual ; keel winged by incise-toothed crest *K. squamulata*

Kyllinga brevifolia Rottb. is reported from the Sohan Bridge, Sept. 1870, by Aitchison. Swat, Kotli.

K. cephalotes (Jacq.) Druce, (*K. monocephala* Rottb.). At Wah.

K. squamulata Vahl, Burbhan, 6,000' ; Mokhshpuri, 9,000' ; Thandiani.

Pycneus

Stem decumbent at base, often clothed 1/3 its length by leaf sheaths *P. sanguinolentus*
Glumes usually marked with red.

Roots fibrous, leaves close to base of stem, annual, spikes pale, flat *P. globosus*

Pycneus sanguinolentus (Vahl) Nees, (*Cyperus eragrostis* Vahl.) Common in poorly drained soil in plains and hills. Often in fields.

Pycneus globosus (All.) Reichb., (*P. capillaris* Nees). Also common in damp soil in both plains and hills.

Juncellus

Inflorescence umbelled *J. serotinus*

Stem with one head of spikelets, rhizome creeping *J. laevigatus*

Juncellus serotinus Clarke. A coarse species in wet places. Rawalpindi, Poonch

J. laevigatus (L.) Clarke, Rawalpindi, Jhelum. Near water, heads small and pale.

Cyperus (After C. B. Clarke)

A. Inflorescence umbellate throughout or capitate ; spikelets digitate or clustered, not spicate.

I Annual, umbel simple, spikelets very small, linear oblong, most densely crowded *C. difformis*

II Perennial, rhizome woody, short, rootlets wiry ; inflorescence of one white head *C. niveus*

III Rhizome woody, creeping, rootlets thick, often wooly, inflorescence umbellate or one headed, not white.
Conglomerati.

(1) Stems solitary, distant, on a much divided creeping rhizome. Roots not wooly ; leaves often overtop stem. *C. arenarius*

(2) Stems at base close together, roots wooly, Leaves $\frac{1}{2}$ stem, sometimes longer *C. conglomeratus*

B. Inflorescence umbellate, spikes often more or less corymbed ; spikelets spicate.

I Rachilla of spikelets not much winged. Leaves and bracts long.

- (1) Annuals or sometimes flowering the second year
- (a) Small, umbel nearly simple or only one head *C. aristatus*
- (b) Larger, 6-24", leaves 1/5" broad, grasslike, umbel 2-20", usually compressed, yellow or sometimes brown *C. iria*
- (2) Perennial, rhizome becoming woody, elongate, stolons frequent, large *C. eleusinoides*
- II Rachilla of spikelets usually conspicuously winged.
- (1) *Bulbosi*. Stolons slender, soon disappearing, terminating in tunicated bulbils *C. bulbosus*
- (2) *Subimbricatae*, Tall, rhizome very short, woody,
- (3) *Stolons O*, glumes scarcely imbricate in fruit.
- (a) Rhizome horizontal, stout, woody, Stems 3' ; spikelets 10-20 flos. fine brown or reddish *C. tegetum*
- (b) *Rotundi*. Tall or medium, stem at base nodosely thickened, suddenly constricted into a wiry rhizome. Woody tubers 1/3 to 1" in diam. *C. rotundus*
- (c) Stem at base erect, stolons lateral, long, very slender bearing tubers, leaves and bracts long, spikelets yellow or yellow brown, glumes plicate striate over nearly their whole length. Glumes less closely imbricated *C. esculentus*

Cyperus difformis L. Rawalpindi, Jhelum and Poonch Dists. near water.

C. niveus L. Easily recognized by the snowy colour of its heads. Common from Swat to Poonch from the plains to 4,000'.

C. arenarius Retz. Reported from Rawalpindi by Aitchison.

C. conglomeratus Rottb. Xerophytic. Salt Range and Attock district.

C. aristatus Rottb. A dwarf summer weed, sometimes common in mineral soil, 4-9,000". Swat, Thandiani, Dunga, Murree, Poonch.

C. iria L. Common near water, ditches and *bands* of rice fields, Swat, Abbottabad, Rawalpindi, Balakot, Poonch.

C. eleusinoides Kunth. Common in the plains in wet places. Hazara, Rawalpindi.

C. bulbosus Vahl. Lehri, Jhelum Dist. on a wall ; Rawalpindi district.

C. tegetum Roxb. Rawalpindi (Aitchison) ; near *rotundus*.

C. rotundus L. with reddish inflorescences is often a pestiferous weed in poorly drained soil. Hard to eradicate because of its corms and underground stems. All warm regions.

C. esculentus L. Mansehra, Hazara Dist. (Herb. Dehra).

Eleocharis

E. dulcis (Burm. f.) Trin, (*E. plantaginea* Br.) Style 2-3 fid, nuts smooth, stems robust, septate when dry, spikelets fuscous straw colour. Gregarious in shallow water, Rawalpindi and Jhelum districts.

E. mitracarpa Steud. Common in flooded brick fields and wet places in the plains to Ladak and Zanskar in Tibetan Kashmir.

E. monostachya Hasskl. Khanna near Rawalpindi.

E. uniglumis (Link) Schultes, Jhikka Gali, Murree Hills. (Under *E. palustris* in Fl. Brit. Ind.)

Fimbristylis

Styles 2 fid

A Spikelets solitary or up to 3

F. schoenoides

B Spikelets several or many.

I Nut obovoid, conspicuously longitudinally striate, trabeculate.

(a) Spikelets angular, stems 2-10 ; leaves equalling stem *F. dichotoma*

(b) „ cylindric, stems 6-24', leaves 1/3 height of stem

F. annua

II Nut obovoid, smooth, reticulate, leaves short or none

F. ferruginea

Styles 3 fid ; nuts 3 sided

A. Stems terminating in more than one spikelet

(a) Spikelets numerous, no stolons, stems 4-5 angled at top

F. quinqueangularis

(b) „ in clusters of 2-5

F. junciformis

B. Stems terminating in a single spikelet

F. monostachya

Fimbristylis schoenoides Vahl, with one or two small white heads with pale ovate bracts and nuts is found in the plains.

F. dichotoma (L.) Vahl is common in rice fields and wet places in warm regions bearing many small heads and with glumes more keeled than in the next. Swat to Poonch, Gilgit.

F. annua (All.) R. and S.), (*F. diphylla* (Retz.) Vahl.). Common up to 7,000' in wet places with fewer and larger heads. Crush a ripe head to see the distinctive nutlets.

F. ferruginea Vahl. Common in all warm regions. Perennial. Peshawar, Hasan Abdal, Rawalpindi, Hazara.

F. quinqueangularis Kunth. Rawalpindi, Poonch.

F. junciformis Kunth, with short woody rhizomes. Abbottabad, Rawalpindi, Poonch.

F. monostachya Hasskl. Spiketlets pale, nuts obovoid, more or less tuberculate, straw coloured or pale brown. All warm countries.

Mariscus

Mariscus sieberianus Nees. Abbottabad, Murree, Ghora Gali, Poonch.

Scirpus

- Sect. 1. Stems leafy only near the base, no hypogynous bristles, style long, 3 fid ; umbel lateral, rarely single, of distant dense globes of numerous small spikelets scarcely $1/5''$, on stalks of various lengths *S. holoschoenus*
- Sect. 2. Stems leafy only near the base ; hypogynous bristles often present. Style long.
- (A) Nuts somewhat transversely muricated i.e., ends of cells make a wavy line.
- (a) Stems slender, terete, spikelets in single dense head, glumes 2-3 times as long as broad ; spikelets somewhat flattened *S. roylei*
- (b) Stems coarse, triquetrous, glumes ovate, lowest bract trigonous *S. mucronatus*
- (B) Nuts smooth or obscurely reticulate, glumes notched at tip
- (a) Stems stout, terete or somewhat triangular, usually standing in water, rhizome horizontal, umbel large
- (1) Style trifid *S. lacustris*
- (2) Style bifid *S. l. var. tabernaemontani.*
- (b) Stems triangular, leafy, rhizome creeping, woody, dilating into tubers.
- (1) Heads 1-3, large, ovoid, lanceolate, glumes straw coloured, style 2 fid. *S. strobilimus*
- (2) Heads variable in no. ; often numerous, glumes chestnut or brown, Styles 3 fid *S. tuberosus*
- (c) Stems not tuberous at base, hardly any rhizome, bristles plumose *S. pectinatus*

S. holoschoenus L. Rare, has the smallest spikelets. Abbottabad.

S. roylei (Wight) A. A. Beetle, (*S. quinquefarius* Ham.) Found in wet places in the plains after the rains.

S. mucronatus L. Rawalpindi, Kashmir.

S. lacustris L. Rawalpindi, Wah.

S. lacustris L. var. *tabernaemontani* (Gmel.) Doll. Kala, Wah.

S. strobilimus Roxb. (*S. affinis* Roth.) Common at Khanna near Rawalpindi. Roxburgh's name is one year older than Roth's.

S. tuberosus Desf. (*S. maritimus* auctt.) Rawalpindi brick fields. As in many other genera it is necessary to dig up the underground parts to be more certain of one's identification.

S. pectinatus Roxb. (Under *S. littoralis* in Fl. Brit. Ind.). Rawalpindi.

Eriophorum

Eriophorum comosum Wall. Very common ; plains and hills especially on cliffs and steep banks. Umbel compound or decompound, spikelets numerous, rusty brown.

Carex

* Style 2 fid, Terminal spike fem. at base ; male at top

A. Spikes short, ovoid or oblong

Leaves narrow, involute ; utricles many nerved on both faces

C. nubigena

Leaves flat, not involute ; anthers crested

C. foliosa

B. Spike linear, cylindric, peduncled, inflorescence loose

C. brunnea

** Style 3 fid

A. Terminal spike fem. at base, male at top

Spikes short, very numerous.

Beak linear as long as the utricles, inflor. green, leaves hardly 1/4" broad

C. filicina

Utricle narrowed at both ends, beak 1/2 as long as utricles, spikes dark red comose

C. sanguinea

B. Terminal spike male at base, fem. at top ; beak long and scabrous

C. psychrophila

C. Terminal spike wholly male, spikes not very numerous up to 12 ; utricles hairy or minutely setulose

(1) Rhizome short

(a) No stolons seen, stems terete, 1/8" broad ; spikes 4-10, chestnut purple

C. haematostoma

(b) Stems caespitose on a short, stout rootstock, leaves 1/10" broad, flowering glumes large, conspicuous by their strong ribbed, broad, green back ; male glumes often chestnut red

C. cardiolepis

(2) Rhizomes long creeping

- (a) Leaves $\frac{1}{8}$ - $\frac{1}{6}$ " broad, utricle $\frac{1}{10}$ - $\frac{1}{12}$, brown green, hispid, stems 1-2' ; Spikes $\frac{1}{2}$ -2" long *C. setigera*
- (b) Leaves $\frac{1}{12}$ " broad,, overtopping stem, utricle very small, ovoid, hispid, $\frac{1}{20}$ " long, stems 4-10", slender, spikes $\frac{1}{3}$ " *C. schlagintweitiana*
- (c) Leaves $\frac{1}{4}$ " broad, beak of utricle short but divided to base into two prickly teeth *C. wallichiana*

Carex nubigena D. Don. Leaves narrower than in the next. Burbhan near Murree, Mokshpuri.

Carex foliosa D. Don, (*C. muricata* var. *foliosa* Clarke). Murree, Abbottabad, Poonch etc.

C. brunnea Thunb. Potha below Murree at 4,000'.

C. filicina Nees var. *meiogyna* (Nees) Strachey. Common about Murree during the rains, Changla, Thandiani, Poonch.

C. sanguinea Boott. On rocks about Murree in April and May. Heads many and deep red in colour. Poonch, Domel.

C. psychrophila Nees. Florets yellow and green. Murree, Dunga, above Kohala, Kagan, Poonch.

C. haemostoma Nees. Murree, Hazara, Poonch.

C. cardiolepis Nees. Murree, Hazara, Poonch. A specimen from the Pipe Line which I would have placed here has been identified as *C. chitralensis* Nelmes.

C. setigera D. Don. Murree.

C. schlagintweitiana Boeck. Murree. Some make this a small variety of the last.

C. wallichiana Prescott is the only *Carex* to grow in the plains in our area. Khanna, Wah, Abbottabad. A marsh plant.

GNETACEAE

Ephedra

Ephedra foliata Boiss. A tall, scandent shrub with slender branchlets climbing over shrubs like *Cuscuta reflexa*, but dull green in color. The female flos. are usually in pairs with the tubillus exerted, short and straight. The ovoid fruit is .3" long, white, translucent. Plains and Salt Range ; Topi Park, Rawalpindi, flowering from Feb. to March.

CONIFERAE (After Parker)

Resin ducts in leaves and bark ; female flos. in cones

A. Cones woody.

(1) Cones falling off entire.

I Leaves needle like.

(a) Leaves in bundles of 3 or 5

Pinus

(b) Leaves single

Picea

II Leaves scale like

Cupressus

(2) Cones breaking up on ripening.

(1) Leaves flattened more or less in two rows

Abies

(2) Leaves triquetrous, fascicled on dwarf shoots,
single and spirally arranged on long shoots

Cedrus

B. Cones more or less succulent when ripe, forming a
berry like fruit. (Not found wild in our area).

Juniperus

No resin ducts in leaves or bark ; female flower of only one
ovule

Taxus

Pinus

Leaves in bundles of 3 ; cone of thick woody scales

Pinus roxburghii

Leaves in bundles of 5 ; cone of slightly woody scales.

P. excelsa

Pinus roxburghii Sargent, (*P. longifolia* Roxb.). The *chir* pine is usually found in our area from 3-6,000' though many are cultivated in Rawalpindi at 1,700'. One of the most important trees of the district often forming pure stands as from Tret to Sunnybank. This 'pitch' pine is very resinous and the Forestry Dept. taps the trees, sending the resin to the factory at Jallo. The thick bark usually protects old trees from severe damage by forest fires which are common before the monsoon breaks.

Pinus excelsa Wall. The blue pine or *biar* is usually found above 6,000' and it too is often found in pure or mixed forests. Its wood is also valuable. Abundant in the Murree Hills and Galis.

Picea

Picea smithiana Boiss. The spruce is not common in the Murree Hills but there are scattered groups on Mokshpuri above 8,000' and on the side of Nathia Gali toward Mokshpuri. *Tos, rai*.

Abies

Abies pindrow Royle. The low level silver fir ; *paludar* or *palandar*, is usually found above 7,000'. In Murree there is a good deal of it found on the shady slope from Sunnybank around to Jhicca Gali and Gharial. It is abundant on Changla and the Galis. The wood is useful but not as valuable as the wood of the pines for most purposes.

Cedrus

Cedrus deodara Loudon. The deodar is the most valuable tree in the Western Himalayas because of its ability to resist the ravages of termites and because it makes excellent furniture. There are a number of trees found at various places in Murree but they all seem to have been planted. There are, however, a few patches in the Galis. The easiest to find are on the Pipe Line near Dunga Gali and also above and below the motor road about a mile before one reaches Dunga Gali. The tree is also found at Biran Gali.

Cupressus

Cupressus sempervirens L. The *saru* or Pyramidal Cypress is not wild but is cult. in old gardens and graveyards in the plains and lower hills. It can be recognized from afar because, like the Lombardy Poplar, it is very tall for its width.

Thuja

Thuja orientalis L. *Maju* is a tree introduced from China and Japan reaching 20' in height. The leaves are scale like, growing in opposite pairs on the twigs which are flattened and are usually vertical. The cones are .7" long composed of 6 imbricate scales of which the upper two are sterile. Cult. in gardens in Rawalpindi and Abbottabad.

Taxus

Taxus baccata L. The *yew* or *barmi* is not rare in shady forest in Murree and the Galis. The trunk is thick for the height of the tree and and more than one trunk may come off from the same base. Adventitious leafy branches may grow out of the trunk. When the fruits are ripe in Sept. a bright red aril nearly covers the single olive green seed. The trees are monoecious and male trees seem to be more common. The small male cones can be collected from Feb. to April. Usually found above 6,000'.

CYCADACEAE

Cycas

Cycas revoluta Thunb. is usually the only Cycad cultivated in Rawalpindi. It is common in old gardens looking like a dwarf pinnate leaved palm. The leaves are very tough and xerophytic and the trunk grows very slowly. One five feet tall may be about 100 years old. I have only seen female plants.

GRAMINACEAE

BAMBUSEAE

Dendrocalamus

Dendrocalamus strictus (Roxb.) Nees. The district is too dry for bamboos to flourish but a few have been planted in Rawalpindi gardens. Parker reports this species as wild in the Margalla Reserve and it is also found at Chattar on the Murree Road. *Bans*.

FESTUCEAE

Bromus

Bromus ramosus Huds., (*B. asper* Murray). A perennial grass with reflexed hairs on the lower sheaths. Swat, Murree, Changla, Poonch.

B. japonicus Thunb. One of the most abundant grasses along roadsides and about cultivation both in the plains and the hills. It is called *B. patulus* by some authors.

B. japonicus var. *falconeri* (Stapf) R.R.S. This is a variety with more pubescent spikelets and longer divergent awns. Swat, Peshawar, Rawalpindi etc.

B. mollis L. Another annual which is common by roadsides etc., in Murree. The spikelets are softly pubescent and rounder in cross section.

B. tectorum L. Common in grain fields in many places as a weed but only Gen. Wingate has reported it from Rawalpindi. Usually above 6,000'.

B. catharticus Vahl. This fine fodder grass has begun to establish itself in Murree. Lemmas keeled on the backs, spikelets much flattened practically awnless.

Festuca

Festuca rubra L. var. *pubescens* Hack. (Or this may be var. *villosa* of Mert. and Koch.) Dunga, Thandiani.

F. myuros L. (*Vulpia myuros* (L.) Gmel.) Murree, Poonch. A small narrowly spicate annual.

F. gigantea Vill. Thandiani, Kagan, Siran Vy., Suggests *Helictotrichon* but the awns are straight and long.

Brachypodium

Brachypodium distachyon (L.) Beauv. A spring annual of dry places. Trans Indus, Jhalar, Attock Dist. Kohala, Poonch. A low tufted plant with stiff culms ending in a raceme of one to few short pedicelled many flowered cylindrical spikelets.

B. silvaticum (Huds.) Beauv. A common species along forest borders and paths in the shade in Murree and the Galis. Perennial. Resembles *Agropyron* but the spikelets are in a raceme and the young spikelets are round in cross section and not quite sessile.

Sclerochloa

Sclerochloa dura (L.) Beauv. A dwarf, tufted spring annual with very blunt glumes. May grow with *Schismus*. Swat, Abbottabad ; Uri, Kashmir Road ; Wah.

Poa

Poa annua L. This is a very common spring annual, often making lawns in Rawalpindi green in Feb. and March and dying down in the heat. Plains and Hills.

P. infirma HBK. Rare. Closely resembles the last but the leaves are almost translucent, the sheaths are almost to the inflorescence. Upper floret much different from lower. Rawalpindi det. Dr. Bor.

P. supina Schrad. Murree, Siran Vy., Like *annua* but perennial; has leafy runners.

P. jaunsariensis Bor. (*P. ludens* in my first edition). A species like *P. pratensis* but with larger spikelets and long ligules. Murree (Trotter) in Herb. Gordon.

P. pratensis L. This grass is common in grasslands in Murree, Poonch, the Galis etc. It can be recognized by the underground rhizomes which are thin and covered with scales. It is important in this genus to gather specimens with roots.

P. angustifolia L. (*P. pratensis* var.). Like the last species but the leaves are more narrowly linear. Common in the Galis; Murree.

Aeluropus

Aeluropus lagopoides (L.) Trin. (*A. repens* (Desf.) Parl.) is abundant on the alkali plains in Jhelum Dist. in the Salt Range. It is creeping or a leaner with ovate heads and short, very narrow sharp pointed leaves. Khewra (Drummond).

Eragrostis

Eragrostis tenella R. and S. (*Eragrostis amabilis* (L.) Wight), (*E. tenella* var. *plumosa* Stapf). A summer ruderal in Rawalpindi about gardens with many tiny spikelets.

E. cilianensis. (All.) Link ex Lutati. Stink Grass. Spikelets long and many flowered, longer than in our other species. Swat, Rawalpindi.

E. papposa (R. and S.) Steud. A common, xerophytic plains perennial. Trans Indus, Swat, Rawalpindi, Attock; with pale, very narrow spikelets on long filiform pedicels.

E. pilosa L. A common annual species with very numerous spikelets in flexuous panicles. Lower Hills.

E. poaeoides Beauv. (*E. minor* Host.) This cosmopolitan annual is usually the commonest species of the genus in waste places in hills and plains up to 11,000'.

Desmostachya

Desmostachya bipinnata (L.) Stapf, (*Eragrostis cynosuroides* Beauv.). *Dab* or *drab* is one of the commonest and most xerophytic perennials in the plains, often growing on *bands* and field borders. It is a tough pioneer and is only edible when young.

Dactylis

Dactylis glomerata L. Orchard Grass is common on banks in the Murree Hills, usually above 6,000'. Throughout Northern Hemisphere.

Lamarckia

Lamarckia aurea (L.) Moench. A golden coloured annual from the Mediterranean flora. Attock, Jhalar, Trans-Indus. The crowded fascicles are drooping.

Arundo

Arundo donax L. Usually the largest of our grasses; often planted as a hedge in the plains and foothills. *Nara, bans, sukna*. In this the lemmas are silky hairy while in the next genus the rachilla is penicillate. Trans-Indus, Swat, Abbottabad, Rawalpindi, Poonch.

Phragmites

Phragmites karka (Retz.) Trin. *Nal, naria, dila* is another very large grass but it requires more water and it is often on the banks of ditches. Trans-Indus, Wah, Sind Sakesar etc.

Neyraudia

Neyraudia arundinacea (L.) Henr., (*N. madagascariensis* Hk. f.). Another large grass, up to 8' tall but smaller than the last two. Occasional up to 5,000'. Handsome when mature but the tiny spikelets remain immature for a long time and are often collected in that condition. Mansera, Abbottabad, Garhi, Mt. Tilla, Sakesar.

Enneapogon (Pappophorum)

Enneapogon persicum Boiss. (*Pappophorum persicum* (Boiss). Steud., (*P. aucheri* J. and S.). A handsome tufted xerophytic species with many hairs in the inflorescence. Swat, Attock, Trans-Indus, Rawalpindi, Gilgit etc.

E. elegans Nees. Seems only to have been reported from Mt. Tilla in the Salt Range by McDonell, and Peshawar (J. L. Stewart).

Melica

Melica scaberrima (Nees.) Hk. f. Kagan, Kalapani, Thandiani. Spikelets pale, awnless, located at intervals on a long branching inflorescence about 12" long.

HORDEAE

Agropyron

Agropyron semicostatum Nees ex Steud. Occasional in the Murree Hills and Galis. Jhikka Gali, Swat.

Triticum

Triticum aestivum L. *Gahun, kanak*. Wheat is cultivated throughout the area, mostly without irrigation.

Hordeum

Hordeum vulgare L. *Jao*, barley, is also an important crop.

H. murinum L. Wild barley is not common in Rawalpindi but is fairly common in Murree on roadsides and in cult. land. Our form may be *H. glaucum* Steud.

Lolium

Lolium perenne L. Common in Murree, Hazara etc. A good forage grass.

L. multiflorum Lam. Italian rye grass. Murree, Nathia Gali. In *L. perenne* the lemmas are awnless while in this, at least the upper lemma is awned. Useful.

L. remotum Schrank, (*L. rigidum* in my first list). A stiff erect annual which I have only collected in Jhelum; Rawalpindi (A. Rahman).

L. temulentum L. Darnel is a fairly common, spicate, coarse, annual weed growing in fields and waste places in Rawalpindi, Murree, Trans-Indus etc. Awns longer than in the other species.

Parapholis

Parapholis incurva (L.) C. E. Hubb., (*Pholurus incurvus* (L.) Schinz. and Thell). Rare. Only found once in Topi Park, Rawalpindi beside a pond. Spicate, a long narrow inflorescence.

AVENEAE

Schismus

S. arabicus Nees. (*Schismus barbatus* (L.) Thell.), (*S. marginatus* Beauv.). A common desert annual, Baluchistan to Gilgit. Peshawar, Abbottabad. Leaves very narrow.

Koeleria

Koeleria gracilis Pers., (*K. cristata* auctt.). A perennial grass with a silvery panicle which is common in the temperate zone, Murree, the Galis, Kashmir etc.

Lophochloa (Koeleria in part)

Lophochloa pumila (Desf.) Bor. A common annual weed in the plains with pubescent spikelets. Attock, Margalla, Rawalpindi, Jhelum etc.

L. phleoides (Vill). Reichb. Another small common annual of gardens and roadsides in plains and up to 6,000'. Attock, Abbottabad, Rawalpindi etc.

Avena

Avena fatua L. False Oats is very common as a weed in grain fields throughout the area. The grains are smaller than in true oats, (*jai*) and the lemmas have numerous rusty hairs.

A. sativa L. Oats, *jai*, is sometimes cult.

A. sterilis L. Cult. at the Pindi Ag. Farm.

A. byzantina C. Koch is also sparingly cult. about Rawalpindi.

A. meridionalis Roshev. Aitchison's 1134 from Fatehjang. Related to *A. fatua* but with larger glumes and spikelets.

Helictotrichon

Helictotrichon virescens (Nees) Henr., (Under *Avena aspera* in Hooker). Murree, the Galis, Thandiani. The genus can be separated from *Avena* by the twisted awns.

AGROSTIDEAE

Agrostis

Agrostis munroana (Aitch. and Hemsl.) Dr. Bor has transferred this and the next species back to *Agrostis* from *Calamagrostis*. An unimportant but fairly common grass usually above 5,000'. Awn not extruded.

A. nervosa (Nees ex Trin.). (*A. pilosula* Trin.) Awned. Common and variable. Murree and the Galis.

A. semiverticillata (Forsk.) C. Christ., (*A. verticillata* Vill). A plant of wet, swampy soil such as ditches or where water overflows. Potha, Kuldana. Ligule long.

A. subaristata Aitch. and Hemsl. Similar to the last and growing in wet places but this has a short but definite awn. Ligule short.

A. stolonifera L. (*A. alba* var. in Hooker). The largest of the genus with broader leaves is also fond of moist soil. Murree, Swat, Poonch. Rhizomes present.

A. clarkei Hk. f. Usually above 8,000'. Thandiani, Mokshpuri. Like *A. canina* but awnless.

Alopecurus

Alopecurus myosuroides Huds. (*A. agrostis* auctt.). An annual weed of cult. ground in the spring with larger more awned spikes. Peshawar, Swat, Abbottabad.

A. nepalensis Trin. ex. Steud. Another unimportant spring annual with narrower, less awned spikes growing in poorly drained soil. Rawalpindi.

Polypogon

Polypogon fugax Nees, (*P. interruptus* HBK.), (*P. littoralis* auctt.). A spring annual about gardens with awns twice the length of the tiny spikelets. Common in wet soil in plains and hills.

P. monspeliensis (L.) Desf. A similar weed but with a more fulvous appearance because the awns are many times longer than the spikelets. Plains and hills.

Phleum

Phleum himalaicum Mez., (*P. arenarium* Hook. non L.) A small annual weed with fringed glumes. Swat, Abbottabad, Kohala.

P. paniculatum Huds. A similar species but lacks the fringe to its glumes. Abbottabad, Kohala, Ghora Gali, Poonch etc.

Muehlenbergia

Muehlenbergia duthieana Hack, (*M. sylvatica* of Fl. Brit. Ind.). A summer grass in Murree and the Galis, 4-9,000'. The panicle is erect, little drooping.

M. himalayensis Hack. ex Hk. f. Hazara and the Murree Hills, 3-7,000'. Spikelets 1/7"; empty glumes equal.

M. huegelii Trin., (*M. viridissima* Nees), 6-9,000'. Murree and the Galis, Mokhsh-puri, Swat, Poonch etc. The most lax inflorescence of the genus with the smallest florets. Spikelets 1/10", empty glumes usually unequal.

Sporobolus

Sporobolus marginatus Hochst., (*S. arabicus* Boiss.). *Lunakh*. Dhamyal, Rawalpindi, Wah, Sind, Attock. Common on alkali and barren soils and often unmixed with other grasses.

S. coromandelianus (Retz.) Kunth. A small annual with very tiny spikelets which is common in Rawalpindi in the hot weather. Abbottabad.

S. diander (Retz.) Beauv. *Nonak*, *hornak* is found in Abbottabad, Rawalpindi, Swat etc. An annual 1-3' tall, florets in pairs, diandrous; glumes I and II much shorter than 3.

S. indicus (L.) R. Br. Rare in Rawalpindi. An erect grass growing in tufts 1-2' tall, florets very small, narrow, acute.

S. stocksii Bor. (*S. ioelados* in first edition). In a Rawalpindi pond. Inflorescence large, lax, much branched.

Milium

Milium effusum L. A temperate forest grass found above 6,000'; glabrous, awnless erect, perennial, blades flat, panicles open. Kagan, Murree (Trotter).

Oryzopsis

Oryzopsis lateralis Stapf., (*S. molinoides* in first edition). Common from 4-9,000'. This is the most spicate of the genus. A tufted, perennial grass on steep banks.

O. lateralis var. *effusa* (Hk. f.) R.R.S. The inflorescence is a little less strict *i.e.*, it is a little branched at base. The spikelets are often tinged with purple and a little larger. Swat, Murree Hills.

O. munroi Stapf. Whole plant taller, larger and more branched. Common above 4,500'.

O. aequiglumis Du. The largest of our species, including the spikelets. The Galis and Thandiani.

Stipa

Stipa jacquemontii J. and S. A rock crevice perennial with a slender erect inflorescence. Lower Topa, the Pipe Line and the Galis, Thandiani, Swat.

S. tortilis Desf. A xerophytic annual with many awns, 3-4" long. Column of awn hairy. Trans-Indus, Campbellpur.

Aristida

Aristida depressa Retz. (*A. adscensionis* auctt.). A widespread desert type on poor soils. Ascends to 8,000' on the Indus. Lower glume twice the length of the upper, both very acute.

A. cyanantha (Nees) Steud. Much the largest of the genus in our range. Forms large tufts on cliffs and steep banks in the foothill zone to about 4,500'. Abbottabad to Kalapani, Darya Gali, Common along the Jhelum, Swat etc.

A. royleana Trin. and Rupr., (*A. funiculata* of Ed. l.). A common monsoon annual about Rawalpindi in the hot weather, sometimes on roofs. Awn branches long and prominent, 2½ cm. Trans Indus, Attock.

A. mutabilis Trin. and Rupr. Common in sandy, desert soils. Annual. Attock Dist. Trans-Indus. Ligule bearded; inflorescence condensed.

A. hystrix L. A desert perennial is reported from Rawalpindi by Aitchison but I have not found any specimens. Perhaps an error.

A. pogonoptila Boiss. I have found this species with awn feathery to the tip in the Sargodha area but Falconer reports it from Hasan Abdal. Could it have been the next species?

A. hirtigluma Steud. This handsome desert type is common in Attock Dist., Trans-Indus, in the Kala Chitta Hills etc. The awns are feathery but the tips are naked.

ZOYSIEAE

Tragus

Tragus biflorus (Roxb.) R. and S. (*T. racemosus* Hk. f.) A common dwarf annual of barren plains and up to 4,000' with a pair of distinctive prickly spikelets. Swat, Abbottabad, Attock, Rawalpindi.

CHLORIDEAE

Leptochloa

Leptochloa chinensis (L.) Nees. A summer weed of the plains about cultivation. Rawalpindi.

L. panicea (Retz.) Ohwi., (*L. filiformis* auctt.). Like the last but there are only 2-3 instead of 4-7 florets per spikelet. Plains. Rawalpindi, Haripur (Haz.)

Tripogon

Tripogon filiformis Nees ex Steud. A slender, summer annual with very small spikelets and a narrow flexuous panicle. Poonch, Murree and the Galis up to 6,500'.

T. compressa (Forsk.) Aschers. and Schw., (*T. purpurascens* Duthie), (*T. abyssinicus* of Hooker). This is a small, perennial, forming a turf on rocky, banks and walls from 2-9,000'. Stems reddish. Hasan Abdal, Abbottabad, Pipe Line, Ghora Gali, Poonch etc.

Eleusine

Eleusine compressa (Forsk.) Aschers. and Schw., (*E. flagellifera* Nees.) A useful plant of the desert areas analagous with *Cynodon* but in drier sandier places. With hard and bulbous stem bases. Sind, Trans-Indus, Attock Dist. *Phalwan, chhimbar, ghanitl.*

E. indica (L.) Gaertn. An annual, edible grass found about cultivation in the plains. Bears an umbel of 5-7 spikes with only one or two below. Rawalpindi, Garhi.

E. verticillata Roxb. (*Achrachne racemosa* (Heyne) Ohwi). Another plains ruderal of the hot weather but this species is awned and the spikes are more scattered, *i.e.*, not umbelled. Swat, Attock Dist., Rawalpindi, Poonch, Hazara.

E. corocana (L.) Gaertn. *Madal, mandal* is the cult. form. Jhelum, Poonch.

Dactyloctenium

Dactyloctenium aegyptium (L.) Aschers., (*Eleusine* in Hk. f.). A common, weedy annual of the plains in the summer. Abbottabad, Rawalpindi, Poonch etc.

D. scindicum Boiss. Another prostrate, desert grass with wiry stems and erect inflorescences, Trans-Indus, Dhok Pathan, Attock Dist.

Cynodon

Cynodon dactylon (L.) Pers. Bermuda Grass, *dab* or *dub* is the best grass for lawns and for fodder from the plains to 9,000'.

Chloris

Chloris dolichostachya Lagasca, (*C. digitata* (Roxb.) Steud.) A tall, weedy, monsoon grass often leaning, in the protection of bushes. Rawalpindi.

Tetrapogon

T. villosa (Desf.) Pers., (*Tetrapogon villosus* Desf.) A very common perennial on sterile land in the plains. Abundant on *usar* soil (Duthie). The stem bases are pale and flattened with overlapping leaf bases. Abbottabad, Attock and Rawalpindi Dists. Swat.

T. tenellus (Roxb.) Chiov., (*C. tenella* Roxb.), a smaller more delicate plant also has leaf bases folded. Fateh Jang (Aitchison) ; Sakesar.

C. gayana Kunth, Rhodes Grass, is occasionally planted. I found it once at Potha in the Murree Hills. Planted or an escape.

Castellia

Castellia tuberculosa (Moris) Bor. (*Catapodium* in Ed. I.) New to the sub continent. Found along the railway tracks near Campbellpur. (Nasir).

Melanocenchris

Melanocenchris abyssinicus (R. Br.) Hochst., (*M. plumosa* J. and S.). Domeli and Jhelum (Sultan Ahmad). A small but pretty desert grass.

PHALARIDEAE

Phalaris

Phalaris arundinacea L. Reed Canary Grass is a large perennial of very wet ground. Reported from Murree by Trotter ; specimen in Gordon Herbarium. Baluchistan.

P. minor Retz. A common annual weed of cult. ground growing in the spring in the plains and lower hills. Heads cylindrical or ovoid, dense. Baluchistan, Kurram, Swat, Wah, Rawalpindi.

ORYZEAE

Oryza

Oryza sativa L. Rice is cult. in a few places but the area is too dry and there is too little irrigation for much rice cultivation.

MELINIDEAE

Arundinella

Arundinella nepalensis Trin. (*A. brasiliensis* Hk. f.). A common perennial of the plains and lower hills with a panicle suggesting *Panicum antidotale* but this is awned. Called *garali*, *garham* or *gram*. Tret (Trotter) ; Sakesar (Drummond).

PANICEAE

Digitaria

Digitaria cruciata (Nees). A Camus., (*D. bifasciculata* (Trin.) Henr.) Common in the plains and up to 8,000', often about cultivation. A good fodder grass, the spikelets are more elliptic and less acuminate than in the next species.

D. adscendens Henr. Much like the last but spikelets more acuminate. Rawalpindi.

D. adscendens ssp. *fimbriata* (Stapf) Henr., (*D. ciliaris* (Retz.) Koeler). The hairs of the mature spikelets are spread out like a fringe on both sides. Plains to 8,000'.

D. a. ssp. *chrysolephara* Henr. Much like the last. Two specimens from Rawalpindi are referred here by Dr. Bor. Swat.

D. nodosa Parl. (*Panicum sanguinale* var. *pubulare* Hk. f.). A common and easily recognized desert perennial with woody, bulbous roots and pale, very pubescent spikelets growing in Jhelum, Rawalpindi, Attock Dists. and Trans-Indus.

D. stricta Roth ex Roem. (*D. royleana* (Nees) Prain). Much smaller than the preceding and the spikelets are less than 1/12" ; numerous, the seeds black and the hairs on the spikelets have clavate tips. Pubescence mealy. Murree, Rawalpindi.

D. violascens Link, (*D. longiflora* (Retz.) (Pers.). A similar species has verrucose, not clavate hairs, Swat, Abbottabad, Kishenganga Vy.

D. granularis (Trin.) Henr., *D. pedicellaris* (Trin.) Prain., Burbhan, Murree Hills, 6,000'.

Brachiaria

Brachiaria erucaeformis (J. E. Sm.) Griseb. A plant of poorly drained soils ; often in grain fields ; the smallest and most numerous spikelets. Baluchistan, Swat, Gharial, Kashmir.

B. ramosa (L.) Stapf, (*Panicum ramosum* L. or *P. petiverii* Trin.). A good fodder grass which is common in the plains in the hot weather. Abbottabad, Rawalpindi, Poonch.

B. reptans (L.) Gard. and Hubb., (*Panicum reptans* L.). Another hot weather grass of the plains, often in fields. Swat, Lower Hazara, Rawalpindi, Wah.

Urochloa

Urochloa panicoides P. Beauv., (*U. helopus* (Trin.) Stapf), Another useful, tropical monsoon grass, common up to 5,000'. It is sometimes hard to separate from *Brachiaria ramosa*. This is more pubescent, the spikelets are larger, overlap more and the lower glume is 1/3 shorter than the spikelet.

Paspalum

Paspalum distichum L. This good fodder grass is always in wet places. The spikes are almost always in pairs, rarely more. Rawalpindi.

Paspalidium

Paspalidium flavidum (Retz.) A. Camus, (*Panicum flavidum* Retz.). Very common after the monsoon in the plains and up to 4,000'. Useful as fodder and the seeds are rich in oil and used as food in time of famine. Spikes distant on main stem.

Panicum

Panicum antidotale Retz. A large, tough stemmed perennial, common all over the plains country in hedges and among bushes up to 5' tall, with solid, terete stems which are smooth and polished. Rather tough for a fodder grass., Baluchistan, Sind, Trans-Indus, Rawalpindi etc.

P. hydaspicum Edgew. A common hot weather plains annual. Rawalpindi. *P. atrosanguineum* Hochst. may be an older name. Sheaths hairy, spikelets tiny, seeds nearly black, shiny.

P. miliaceum L. *Cheena*, *Cheeni*, *chinwa*. This millet is occasionally found but is of little importance as a crop.

P. proliferum Lam. A large, tropical, thick stemmed water grass with long rapidly growing stems in the water. Rawalpindi, Khanna.

Isachne

Isachne near *himalaica* Hk. f. *Sarae Saleh* (Haz.), Rawalpindi after the monsoon. Wah. This is probably the grass Aitchison called *I. australis*.

Oplismenus

Oplismenus undulatifolius (Ard.) Beauv. Fairly common in the Murree Hills. The genus resembles *Panicum* but both glumes are awned while in *Panicum* the outer glume is never awned. In this species the spikelets are fascicled on a simple terminal spike.

O. compositus (L.) Beauv. In this the main stem of the inflorescence bears branches. Only seen at Saidpur in shade.

Echinochloa

Echinochloa colonum (L.) Link. *Sanwak*, *sawank* is a coarse grass which is common in the plains and lower hills. Baluchistan, Sind, Swat, Rawalpindi etc. A common weed in cult. fields and an excellent fodder.

E. crus galli (L.) Beauv. *Bara sanwak*, barnyard grass, is usually equally common and is larger and coarser. It favours damp soil and often grows on the borders of rice fields. A good fodder, green or dried. Baluchistan, Sind, Attock, Rawalpindi, Murree etc.

E. stagnina Beauv. Rawalpindi. Awns longer. Florets small. A large vigorous grass.

E. frumentacea (Roxb.) Link. *Sanwak* is the cultivated form which is found in the Punjab and Kashmir Hills. The heads are denser and tend to hang down from the weight of the ripening seeds.

Tricholaena

Tricholaena teneriffae (L. f.) Parl. This pretty perennial grass belonging to the Mediterranean flora grows during the summer in rocky places, often on limestone. Trans Indus, Attock, Malakand, Hasan Abdal. Inflorescence ciliate with long hairs.

Setaria Foxtail

Setaria italica (L.) Beauv. *Kangni*, *churri*. Italian or foxtail millet with a spicate inflorescence with ripe heads drooping, is often cult. especially in the inner, higher valleys.

S. glauca (L.) P. Beauv., (*S. lutescens* (Weigel) Hubb.) *Bandra*, *bandri*, *ban kangni*. This rusty headed foxtail is one of the commonest weeds about cultivation in both plains and hills. The fruitlets are transversely wrinkled. Useful as fodder.

S. tomentosa (Roxb.) Kunth, (*S. intermedia* (Roth,) R. and S.) A sub tropical foxtail with the false spike, thin and ragged and the young fruits finely, transversely wrinkled. Common about Rawalpindi, Wah, Sind.

S. verticillata (L.) Beauv. A large tropical weed preferring shady places. The barbs on the bristles point backwards and the inflorescences become tangled and stick together. It is a coarse grass which is edible when young and tender. Rawalpindi, Wah, Lahore, Sind etc. Bur bristle grass.

S. viridis (L.) Beauv. Another cosmopolitan weed, common, 4-9,000'. The false spikes are green, not rusty and the young fruits are not transversely wrinkled. Will colonize bare landslides.

Pennisetum

Pennisetum flaccidum Griseb. A temperate grass with a slender flexuous foxtail like inflorescence. Swat, Hazara, Murree Hills, Poonch etc. Usually above 6,000'.

P. orientale Rich. A very common perennial from 2-7,000'. Easily recognized by the inner bristles being copiously ciliate. Inflorescence loosely arranged.

P. typhoides (Burm.) Stapf and Hubb., (*P. glaucum* (L.) R. Br.) *Bajra*, Bulrush or spiked millet is a common hot weather crop on unirrigated land. Plains to 3,000' in Swat.

Cenchrus

Cenchrus barbatus Schum. (*C. catharticus* Schum.) *Bhurt*, *Bhurat*. The rigid involucrel spines make it a pest when ripe but it is considered to be a good fodder when tender. Plains.

C. pennisetiformis Hochst. and Steud. (*C. ciliaris* auctt.). *Sitti*, *anjan*, *dhaman* is very common and much valued. Common in desert places.

C. setigerus Vahl. (*C. biflorus* Roxb.). Another valuable desert fodder with smaller spikelets and short involucrel spines. Same names as the last (Gorrie).

ANDROPOGONEAE

Imperata

Imperata cylindrica (L.) Beauv. var *koenigii* Dur. and Schinz. is one of the easiest grasses to recognize. Cotton grass grows in poorly drained soil and bears pure white cylindrical spike like panicles of silky spikelets. It is found in all warm countries and forms good pasture when young. Called *kaii* in Tret fide Bhatti. Usually plains to 6,000'.

Saccharum

Saccharum officinarum L. Very little sugar cane is raised in Rawalpindi but a good deal is cult. about Hasan Abdal.

S. spontaneum L. This is a larger gregarious grass which grows near water, on islands and banks of rivers and in waterlogged places. It is a pioneer in land ruined by torrents and is invaluable in reclamation work but is hard to eradicate from cult. ground. The inflorescence is white and the ripe fruits are deciduous leaving naked stalks. *Kan*, *kans*, *kahi*. Usually below 4,000'.

S. bengalense Retz. (*S. munja*, *S. sara*, or *S. arundinaceum*). *Kana* or *sarkanda* is one of our largest grasses making huge clumps in the flood plains of main rivers. A plant of the plains which may attain 15' in height with a fine plume of flos. The different parts of the plant have separate names and many uses. A good soil binder.

Erianthus

Erianthus filifolius Nees ex Hack. Murree and the Galis, usually above 5,000'. A large perennial grass with tough xerophytic leaves with long slender leaf tips and a reddish inflorescence.

E. griffithii (Munro) Hk. f. A very large, tufted, xerophytic grass analagous to *Saccharum bengalense* but growing in hot dry places instead of river banks. The inflorescence is white and fluffy. It grows in great clumps, being very common in the Salt Range, the Attock Hills, Trans Indus ; the hills of the plains portion of Rawalpindi etc.

E. ravennae (L.) Beauv. Kagan; rare in Rawalpindi. Resembles *Saccharum bengalense* but the spikelets are awned.

Microstegium (Eulalia)

Microstegium nudum (Trin.) A Camus, (*Eulalia nuda* (Trin.) Kze.), (*Pollinia nuda* Trin.) A weak, more or less prostrate grass rooting at the nodes which is common in the Murree Hills and Hazara in shade from 4-9,000'.

Eulaliopsis

Eulaliopsis binata (Retz.), Hubb., (*Ischaemum angustifolium* Hack.). *Bhabbar* is abundant enough in the district to be of economic importance. It is a plant of dry, rocky places in the lower hills and is useful for making paper. The white wool at the swollen bases of the secondary tufts of stems is distinctive. Swat, Attock and Rawalpindi Dists. Poonch.

Arthraxon

Arthraxon hispidus (Thunb.) Makino, (*A. ciliaris* Beauv.). Kahuta, Abbottabad. Joints of the rachis $2/3$ spikelet length and about $\frac{1}{2}$ in the next. Below 5,000'. Rare.

A. serrulatus Hochst. (*A. lanceolatus* (Roxb.) Hochst.), (*A. nudus* Hochst.) Leaves are narrower and there are fewer hairs on the leaf margins. 2-8,000'. Sheaths much less hairy, common.

A. lancifolius (Trin.) Hochst. A dwarf, annual grass, usually from 4-8,000' on banks and walls. Murree, Poonch, Gilgit.

Pogonatherum

Pogonatherum paniceum (Lam.) Hack. A slender grass, bearing simple spikes and often forming a turf in the outer hills on steep ground below springs or in the seepage from irrigation ditches ; from the plains to 6,000'. Murree, Kagan, Poonch, Attock.

Apluda

Apluda aristata L. *Chhat* or *chhat* is one of the commonest perennial monsoon grasses up to 7,000' throughout the area. Also in Salt Range.

A. mutica L. Swat, Wah. A similar species but prefers damper soil, awnless ; inflorescence more bracteate.

Themeda

Themeda anathera (Nees) Hack. *Loonder, lunji* is exceedingly abundant in the foothill and temperate zone up 7,500'. Another good fodder grass. The hairs on the glumes very variable.

Iseilema

I. prostratum (L.) Anders. (*Iseilema laxum* Hack.) *Chhat* is a weak grass in low lying but good soil. Uncommon but a good fodder. Reported from Rawalpindi by Duthie but I have not found it. Lahore.

Bothriochloa

Bothriochloa pseudoischaemum (Nees.) Henr., (*B. ischaemum* (L.) Keng.) *Palwan* is one of the commonest and most widespread grasses in the region from the plains to 11,000'. It is a good fodder grass but a nuisance on a hockey lawn.

B. pertusa (L.) A. Camus, (*Andropogon pertusus* Willd.) This is much like the last but the lower glumes of the sessile spikelet have rounded pits. Usually below 6,000'. A good fodder grass.

Hyparrhenia

Hyparrhenia hirta (L.) Stapf. A perennial of the dry frontier areas; Swat, Cherat, Attock, near Abbottabad, Kagan, Chitral. Awns three or four times the length of the spikelets.

Capillipedium

Capillipedium parviflorum (R. Br.) Stapf. Potha, Murree Hills, Abbottabad, Poonch, Kotli. A grass which likes damp soil such as banks of irrigation ditches. A multitude of tiny spikelets on filiform stalks.

Dichanthium

Dichanthium annulatum (Forsk.) Stapf., (*Andropogon annulatus* Forsk.) *Palwan* is one of the commonest grasses in the plains and lower hills. It is an excellent fodder grass. It can be recognized by the blunt glumes, the way the scales overlap like those of a snake and the enlarged bases of the hairs on the spikelets.

Eremopogon

Eremopogon foveolatus (Del.) Stapf., (*Andropogon annulatus* Del.). Abundant on sandy and rocky ground in the plains and is considered to be a good fodder grass. The spikes are solitary and the glumes are pitted, much branched below. Sind, Swat, Attock, Margalla etc.

Cymbopogon

Cymbopogon stracheyi Raizada and Jain, (*C. distans* auctt.). The western form of what has been called *Andropogon distans*. An odoriferous grass growing from 4-8,000' which is found in Murree and the Galis. The panicles are deflexed and the leaves filiform and long tipped.

C. jwarancusa (Jones) R. and S. Bur, *khavi* is a very common scented desert grass of the plains and low hills. The raceme fascicles are densely congested and hairy. The leaf bases are flat and the older ones curled. Stems reddish brown when ripe. Trans Indus, Attock, Kala Chitta Hills.

C. martini (Roxb.) Watson, *Rauns*, the source of rusa oil is much the largest of the genus and may be found in tall clumps. The leaf bases are broad and semiamplexicaul. Occasional, usually from 2-4,000'. Baluchistan, Rawalpindi, Tret, Poonch.

C. schoenanthus (L.) Spreng. (*And. schoenanthus* L.). Also called *Rusa* grass, is lemon scented, often growing on low lying ground in the dry frontier areas. It is sometimes hard to tell from *C. jwarancusa* and there may be hybridization. The basal sheaths are in dense tufts, tightly clasping, thickened below and the blades are filiform and flexuous except when very short. Baluchistan, Swat, Attock, Rawalpindi etc.

Vetiveria

Vetiveria zizanioides (L.) Nash, (*And. squarrosus* Hack.). *Khas khas* grass is a strong, tall water grass which furnishes oil for perfumery. It grows in low lying ground beside ponds etc., and is eaten by buffaloes when young. The scabrid spikelets are distinctive. Topi Park, Rawalpindi.

Sorghum

Sorghum halepense (L.) Pers., (*And. halepense* Brot.). *Baru*, Johnson Grass, is a large troublesome grass of cult. lands, common to 5,000'. It grows rapidly and is hard to eradicate. It is good for fodder under certain conditions but when starved, in conditions of drought or frost, it seems to be poisonous. Common to 5,000'.

S. nitidum (Vahl) Pers. (*And. serratus* Thunb. var. *nitidus* Hack.). *Barwani*, *chhota baru* closely resembles the last but it is not common. The fruiting spikelets are smaller and usually dark coloured. In this the primary branches of the panicle are up to 4" long while they are branched and up to 8" in *baru*. Tret.

S. sudanense Stapf., (*And. sorghum* Brot.) *Jowar* is one of the most important summer crops in the plains of Rawalpindi and adjacent districts. When grown for fodder it is called *chari*.

Chrysopogon

Chrysopogon montanus Trin. *Dhau* is a very common grass of the dry plain and foot-hills zone. I have found this and related forms very difficult to distinguish and Dr. Bor, to whom I have sent specimens for confirmation has not agreed with my division of the genus in my first list. There is a good deal of difference in the size of florets.

C. serrulatus Trin. Similar to the last but the florets are smaller. Murree Hills.,

C. echinulatus Stapf., (*C. gryllus* (L.) Trin. var.). The florets and the inflorescence are large and the awns are longer than in the last species. Chitral, Murree, Poonch. The best thatching grass. (Osmaston).

Heteropogon

Heteropogon contortus (L.) Beauv., (*And. contortus* L.) *Sariala, surwala* or Spear Grass is probably the commonest grass in the low hills after the rains. Very common about Rawalpindi and up to 5,000'. Abbottabad, Attock, Poonch etc. It is a good fodder but must be harvested before the barbs are ripe or much later when they are ripe enough to shake out. The awns adhere in masses when ripe.

Rottboellia

Rottboellia exaltata Lf. *Phallia* is a robust perennial monsoon grass with peculiar jointed terete spikes which fall apart when ripe. A good fodder but not common. Tret.

Phacelurus

Phacelurus speciosus (Steud.) C. E. Hubb. (*Rottboellia speciosa* Hack.). 4-11,000'. Swat, Hazara, Murree Hills, Kashmir etc. Often tall and variable. Spikes sometimes only one.

Mnesithea

Mnesithea laevis (Retz.) Kunth, (*Rottboellia perforata* Roxb.). A subtropical grass found up to about 4,000'. It has a very slender spike with pairs of sessile spikelets, appressed when young and with a ring at their base. The glumes appear polished and are without veins. Grows on low lying land and is edible. Hazara, (Mansera and Siran Range). Rawalpindi.

Hemarthria

Hemarthria compressa (Lf.) R. Br. Close to the last and may be a leaner near water. Unlike the last there is no ring where the pair of sessile spikelets arise. Spikes 2-4" long, terminal and from the upper axils; 2-5,500'. Murree Hills, Swat, Rawalpindi, Poonch. Trans Indus.

Lasiurus

Lasiurus hirsutus (Forsk.) Boiss. A beautiful grass wide ranging to North Africa in desert regions. The stems are erect and the terminal heads clothed with a silvery pubescence; rachis brittle, spikelets in 3s at each node of the rachis. Sind to Rawalpindi, Indus.

Hackelochloa

Hackelochloa granularis (L.) Kuntze. A slender erect summer annual with roughly sculptured bead like fruits. Plants hairy. Sind, Sakesar, Rawalpindi, Poonch.

MAYDEAE

Coix

Coix lacryma-jobi L. This is a large water grass only found at Wah near Hasan Abdal. The hard, white, shell or bead like involucre are known as 'Job's Tears.' They are eaten in Assam, Burma etc.

Chionachne

Chionachne koenigii (Spreng.) Thw. (*Polytoca barbata* (Roxb.) Stapf.) Another large monsoon grass, rare in this area but is found in the Tret Hills and in Poonch. It may grow on the *bands* between cult. fields. The leaves and sheathes are armed with long, bristle like, irritant hairs. The hard, white, polished fruit cases resemble those of *Coix* but are roughly $\frac{1}{2}$ the size.

Zea

Zea mays L. Maize, *makki*, is an important monsoon crop everywhere in the Murree Hills and Hazara and in many places on the plains. More productive types should be planted.

PTERIDOPHYTA

Cystopteris

Cystopteris fragilis (L.) Bernh. Common above 6,000'. Ghora Gali (Murree), the Galis, (Haz.) Thandiani, Kagan etc.

Dryopteris

Dryopteris odontoloma Moore. Common in the Murree Hills and Hazara in forest undergrowth.

D. crenata (Forsk.) O. Kze. A plant of rock crevices with a thick rhizome which is usually difficult to extract. The fronds may be large and are broadly triangular, bearing a beautiful tuft of chestnut coloured basal scales. Abbottabad, The Pipe Line, Kalapani (Haz.) ; Poonch.

D. chrysocoma (Christ) C. Chr., (*D. cochleata* var. *schimperiana* Hochst.) A rock plant with very large sori ; stem and basal scales rust coloured. Sidandi Hill. Thandiani. Miranjani. Ext. of range.

D. ramosa (Hope) C. C. Chr. The largest of the genus, thrice pinnate, with a thick, slowly creeping rhizome. This has been referred to *D. marginata* by some collectors but I do not think that any true *D. marginata* gets this far west. In the Mussoorie hills the plant which is called "*marginata*" has a more slender rhizome which creeps more freely and the fronds do not come off in a tuft at the tip of the rhizome.

D. dentata (Forsk.) Kaulf. (*D. parasitica* O. Kze.), (*D. mollis* (Jacq.) Hier.). Common in the foothill zone. The fronds are hairy, once pinnate and the basal pinnae are reduced. Swat to Poonch.

D. latrepens (Trotter and Hope) C. Chr., with a widely creeping rhizome and tall, rather narrow leaves is found in damp places in the forest, usually above 5,000'. Swat, the Pipe Line and the Galis, Poonch.

D. blanfordii Hope, with a short stipe compared with the size of the fronds has been reported from the Galis.

Ampelopteris

Ampelopteris prolifera (Retz.) Copeland, (*Goniopteris prolifera* Roxb. in Beddome). This is a vigorous tropical fern which I have found in two places in Haripur Tehsil of Hazara Dist. near irrigation ditches. Strong axillary shoots take root and the plant spreads vegetatively.

Polystichum

Polystichum nigropaleaceum (Christ) Diels., (*P. aculeatum* var. in various authors.) This is the only common *Polystichum* in the Murree area. It is a forest species and the leaves are not as stiff and xerophytic as are those of *P. squarrosum* which has been found in the Siran and Kagan Vys. The basal scales of this species are ovate and nearly black while they are more chestnut coloured in *P. squarrosum*.

P. thomsoni (Hk.) Bedd. This is a smaller, more delicate species which is also found in forests. Changla, Dunga, Thandiani.

Athyrium

Athyrium mackinnoni (Hope) C. Chr. (*Asplenium mackinnoni* Hope). A large forest species with a pale stipe and rachis, attenuate at the tips of the main stems and the pinnae; often 12 to 18" wide below; lowermost pinnae little shorter than the next pair. Near *A. nigripes*. Murree, Changla, Dunga, Thandiani, Poonch.

A. acrostichoides Diels. Large and very common, often gregarious on hillsides amongst herbage. The fronds are in tufts and often 3' tall, the lobing of the pinnae is very regular and the scales are very pale and hair like. Kurram eastward from 7-11,000'; Pipe Line, Dunga, Thandiani, Kagan etc.

A. schimperi Moug. Near *A. filix-foemina* but this has a widely creeping rhizome. Not common, but Abdul Hamid found it near the water tanks in Murree. I have found it at Thandiani and it grows between Ghora Daka and Dunga Gali. A forest plant.

A. rupicola (Hope) C. Chr. A smaller species with distinctive old broken leaf bases has been reported from Dunga Gali.

Asplenium

Asplenium trichomanes L. the Maidenhair Spleenwort is common on rocks in the forest throughout the area, Swat to Poonch. Once pinnate and the rachises are a shiny black.

A. ruta muraria L. The wall Spleenwort is not so common. It is a rock plant which sometimes is found on walls in the sun. Fronds small and branching and the tiny lobes are rounded. The Kurram to Nepal, often growing on limestone. The Pipe Line, Nathia Gali, Thandiani, Poonch etc. Not common.

A. varians Hk. and Grev. is often the commonest fern on rocks and tree bases in the forests about Murree. It is dark green and delicately cut. 4-12,000', Kurram eastwards.

A. pekinense Hance. Reported from Dhamtaur (Haz.) at about 5000' by Oertel.

Diplazium

Diplazium polypodioides Bl. *Lingra* is a very large fern, often up to 4' tall and much branched. Fruits freely. I have collected this in Swat and Poonch but not in the Murree area but I have a Murree specimen in the Trotter collection. It is probable that this and several other ferns have become extinct though the increase of population.

Ceterach

Ceterach dalhousiae (Hk.) C. Chr. (Usually known as *Asplenium alternans* Wall.) One of the commonest ferns of the area, growing in the open by roadsides, on walls etc. 3-8,000'. Once pinnate, lobes alternate and about an inch long.

Coniogramme

Coniogramme intermedia Hieron. Previously referred to *C. fraxinea*, a composite species. A large fern, twice or even thrice pinnate. Thandiani, 8,000' in forest, Trotter collected it in Murree many years ago. Ghora Gali, Jhikka Gali, Poonch.

Pellaea

Pellaea hastata (Thunb.) Prantl., (*P. calomelanos* Link). Abbottabad on rocks in *chir* forest. A xerophytic fern like a small *Pteris* with old leaf bases. An extension of range westward.

P. nitidula (Wall.) Baker. A plant of the outer ranges superficially like *Cheilanthes subvillosa* but lacks its hairs on the veins below. Without farina. The stems are a dark reddish purple. A rock fern found on the Pipe Line, Abbottabad, the Galis, Swat, Poonch etc.

Cheilanthes

Cheilanthes pteridioides C. Chr. (*C. fragrans* Webb and Berth.). A xerophytic Mediterranean fern found in the dry outer ranges to about 5,000'. The ultimate leaflets are small and rounded and lack the long hairs on the lower surface which distinguish the next species. The Khyber, Cherat, Margalla, Hasan Abdal, Abbottabad, Pindi Point in Murree.

C. persica (Bory) Mett., (*C. szovitzii* F. and M.) Hasan Abdal, Kala Chitta Hills, Chitral, Gilgit, Poonch. Is another xerophytic Mediterranean type. Pinnae below, very hairy.

C. subvillosa Hk. Resembles *Pellaea nitidula* but fronds bear hairs on the lower surface. Stipes densely tufted, brittle, bright chestnut coloured. There is no farina. Kalabagh (Haz.) ; Pipe Line, Thandiani, Miranjani, Poonch. On sunny rocks.

C. albomarginata Clarke, A common fern from Hazara eastwards from 4-9,000'. The name comes from the scales on the stipes which are narrowly ovate with a pale border. Old fronds have little powder. Banks, cliffs and walls, Ghora Gali, Murree, Changla, Poonch.

C. dalhousiae Hk. Scales concolorous. It lacks white powder at all stages ; the stipes are from 2-4" long, the fronds 6-9" long and 2-4" broad, acute lanceolate in outline. Murree, the Galis, Thandiani.

C. grisea Blanf., (*C. farinosa* Kaulf. var. *grisea* (Blanf.) C. Chr.). This form whether recognized as a species or a variety has been reported from Hazara to Sikkim from 3-11,000'. It has been considered as a high level form but it is reported from Mansera at about 4,000'. The fronds are said to be dimorphous and powdered on both surfaces. Abbottabad, Thandiani ?.

C. anceps Blanf., (*C. farinosa* var. *anceps* (Blanf.) C. Chr.). According to Hope *C. anceps* is stiffer and darker coloured as to stipes and upper surface of frond and more snowy white. Usually decidedly larger than var. *grisea* with more triangular fronds. Hazara (Trotter and Oertel), Mt. Tilla, Jhelum Dt. (Aitchison).

C. farinosa (Forsk.) Kaulf. This is the typical silver fern with the lower leaf surfaces pure white. It is found from Hazara to Burma and from the edge of the plains to about 5,000'. The fronds are deltoid, the lowest pair of pinnae being the broadest. Salt Range.

Onychium

Onychium contiguum (Wall.) Hope, (*O. japonicum* Kze. var. *multisecta* Hend.). This is one of the commonest ferns in forests of the outer ranges from 6-9,000'. The forests in Thandiani and the Galis are full of it and it is also in the Murree Hills. The fronds may be two feet tall and as they are divided again and again and the ultimate segments are very narrow it has been called Lace Fern or Carrot Fern.

Adiantum

Adiantum incisum Forsk., (*A. caudatum* of the Indian floras). This Maidenhair fern is often called a 'Walking Fern' because it forms roots at the ends of the older fronds which start new plants vegetatively. It is usually below 5,000'. Swat to Burma.

A. capillus veneris L. has a very wide distribution and is found in the plains as well as hills. It is commonly planted in pots and it likes to grow on the damp wall of wells or near the seepage from springs and in the spray of waterfalls. Maidenhair.

A. venustum Don. This is abundant in forest from 4,000 to 12,000'. Most abundant from 6-9,000'. A handsome fern.

Pteris

Pteris vittata L., (*P. longifolia* L. in part.) This is one of the few plains ferns and is commonly planted in canisters or in beds. It is found in the lower hills from Dir and Swat eastward. Common at Wah and Hasan Abdal.

P. cretica L. Like the last fern this too is one of wide distribution and is common in our area from 3-8,000'. The leaves are dimorphic, the fertile being narrower and taller, developing in August.

Pteridium

Pteridium aquilinum (L.) Kuhn. Our form of this cosmopolitan species is var. *wightianum* of Tryon. The Bracken is often large and gregarious, spreading by means of its branching rhizome. Swat, the Galis, Topa (Murree Hills), Poonch, Gilgit etc.

Actinopteris

Actinopteris australis (L. fil.) Link, (*A. radiata* Link.) This is one of the most xerophytic of ferns which has heretofore been found only on the Indian plains. Last April we found it growing freely on the rocky west slope of Khairi Murat Hill in Attock Dist. An extension of range. Bears miniature fan shaped leaves.

OSMUNDACEAE

Osmunda

Osmunda regalis L. has been found growing near Nathia Gali by M. A. Kazmi. The upper portion of the fronds of the Royal Fern are fertile while the greater portion is sterile. An extension of range.

OPHIOGLOSSACEAE

Ophioglossum

O. aitchisoni (Clarke) d'Almeida. Mr. Alston thinks that this may turn out to be the same as *O. polyphyllum* or *O. pumilum*. It is found in the plains and outer dry hills fruiting in April. Four to ten leaves may be borne annually in succession and the rhizome has persistent brown sheaths. The grass like leaves are easily overlooked. It is found in the Topi Park in Rawalpindi, at Tilla, Rohtas and Lehri in Jhelum Dist. and in the Kurram.

FERN ALLIES

EQUISETACEAE

Equisetum

E. arvense L. is easily recognized by being dimorphic. The fertile spikes develop early in the spring and are unbranched while the sterile leaves which develop later are much branched. Swat, Murree, Kagan, Poonch etc.

E. ramosissimum Desf. This branched species is often found as a leaner in vegetation near water in both plains and hills. It is so close to *E. debile* Roxb. that they are hard to tell apart. The differences are said to be as follows. Ribs, prominent, narrow, very scabrous, plants 1-4' tall, spikes sessile $\frac{1}{4}$ to 1" long. *E. ramosissimum*
 Ribs less prominent and less scabrous ; 1-10' long, spikes usually subsessile, $\frac{1}{4}$ to $\frac{3}{4}$ " long
E. debile.

Both species have been reported from our area.

SELAGINELLALES

Selaginella

Selaginella sanguinolenta (L.) Spring forma *indica* (Milde) Alston, (var. *jacquemontii* Spring). The specific name comes from the reddish stems. Gregarious on rocks. Common in Swat and it grows on Sidandi Hill near Thandiani.

S. chrysorhizos (Hk. and Grev.) Spring. Sparing in forests in Murree and Poonch and ususally sterile, while it fruits freely in Mussoorie and further east than Pakistan.

MARSILIACEAE

Marsilia

Marsilia minuta L. This very common water fern with four leaflets making the leaves look much like a four leaved clover is abundant in rice fields, brick fields and shallow water in the plains and up to 5,000' in the Kashmir lakes. Leaves formed on dry land after the water has dried up are smaller and are often erose tipped and have been given the name of *M. erosa*.

A D D E N D A

CALLITRICHACEAE

Callitriche

Callitriche verna L. This floating water plant which may also root in mud with small oblong or spatulate leaves up to .5" long, grows in a pond near Thandiani. It grows in nearly all temperate and cold climates.

FRANKENIACEAE

Frankenia

Frankenia pulverulenta L. A small prostrate desert herb with sessile pink flos. grows near Lahore, Peshawar and in Attock Dist. It is often found in alkaline soil.

ASCLEPIADACEAE

Ceropegia

Ceropegia bulbosa Roxb. A slender stemmed climbing herb with very variable leaves, the uppermost being linear and grass like. The stem develops from an ovate tuber nearly 1" in diam. The flos. are slender, tubular, greenish without and purplish within. As in the next species the corolla tips are joined together. Lehri, Jhelum Dist.

C. macrantha Wight. Another climbing herb with opposite leaves which are thin and much larger; mature leaves being from 4-7" long by 1.5-3.5" broad. The flos. are up to 1.5" long; the calyx is small and filiform but the base of the corolla tube is swollen, pale, the upper, narrower part of the tube being spotted. The corolla lobes are narrow, .5" long and connivent at their tips. Abbottabad, Muzaffarabad, Poonch.