

# Illustrative Guide for Detection & Identification of Regulated Weeds

*Dr. K. Susheela  
Dr. N. Sathyanarayana*

**National Institute of Plant Health Management**  
Department of Agriculture & Cooperation, Ministry of Agriculture, Govt. of India.  
Rajendranagar, Hyderabad 500 030



# Illustrative Guide for Detection & Identification of Regulated Weeds

*Dr. K. Susheela  
Dr. N. Sathyanarayana*



**National Institute of Plant Health Management**  
Department of Agriculture & Cooperation, Ministry of Agriculture, Govt. of India.  
Rajendranagar, Hyderabad 500 030.





## Foreword

One of the major constraints faced by farmers in cultivation of different crops is the menace of weeds. Internationally, studies have shown that weeds cause yield loss to the extent of up to 30-40% in different crops. Weeds, besides causing crop loss, can also have serious implications for the health of livestock, human health and environment. Some weeds can transform the native ecosystems depriving farmer's access to water and agricultural lands. Water hyacinth is a classical example to show the impact of weeds on water bodies. They transform small lakes & ponds into marshy areas and terrestrial ecosystems over a period of time. *Ambrosia psilostachya* and *Parthenium hysterophorus* are weeds which prevent the growth of native species in agricultural lands and open grass lands.

Due to globalization of trade in agriculture, the farmers are forced, on the one hand to tackle the native weeds and on the other hand exotic weeds which make their way through import of agricultural commodities. The problem due to weeds gets accentuated if the exotic weed is invasive in nature. In the last century, India has faced the menace of invasive alien weed species such as *Chromolaena odorata*, *Lantana camara*, *Prosopis juliflora*, *Argemone mexicana*, *Mikania micrantha*, *Eichhornia crassipes*, *Salvinia molesta* etc.

There are 31 weed species regulated as quarantine weeds under Schedule-VIII of PQ Order 2003 in addition to weeds associated with various commodities and pathways mentioned in Schedule VI. Therefore proper identification of weed species to ascertain its category is need of the hour. Prevention of entry of invasive alien species, be it weeds or other pests, is a major challenge faced by the quarantine Officials. Invasive alien weed species can gain easy access particularly through bulk imports and the problem gets complex due to similarity of morphological features of these weeds with that of the main crop that is being imported. It is also common to note that certain exotic species brought as ornamentals have become major weeds in the country.

The quarantine Officials who are armed with Plant Quarantine Order-2003 regulations, need capacity building particularly in detection and diagnostics of invasive alien weeds. In light of the daunting tasks faced by the quarantine officials, NIPHM has decided to come out with "Illustrative guide for detection and identification of Regulated weeds". This reference manual is expected to provide guidance to the quarantine officials while discharging their duties at the port of entries and at regional plant quarantine stations. The identification key for 62 weeds of phytosanitary significance with respect to imports as well as exports is detailed in this illustrative guide.

This manual has taken shape due to the commitment, guidance and personal involvement of Dr. N. Sathyanarayana. Dr. K. Susheela's involvement in compilation of this manual needs special mention. I wish to congratulate both of them for bringing out this manual which will be useful for the quarantine officials and ensure that our native agricultural biosecurity is protected by appropriate & timely detection and identification of Regulated weeds.

  
**Dr. K. Satyagopal**  
Director General



## PREFACE

### ***One year's weed - seven years' seed: One year's seed - seven years' weed***

This proverb aptly highlights the profuse and robust growth potential of weeds. Weed seeds can remain dormant and viable for seven or more years if conditions are not congenial for their growth. It is said that once a weed finds entry in a field, the field requires seven years of weeding. However, in fact the weeds keep on growing year after year defying all efforts to eliminate them, as they are more viable and competitive than crop plants. In addition, they have the innate capacity to overcome the biotic and abiotic stress.

A weed species, exotic or a native one, colonizes and persists in new ecosystems. However, exotic weeds are more aggressive than native ones, especially if they happen to be invasive in nature. Invasion by exotic plants is a growing problem. Invasive species adversely affect the economies and may upset ecological balance/s.

Many invasive plants viz., *Parthenium hysterophorus*, *Phalaris minor*, *Chromolaena odorata*, *Lantana camara*, *Prosopis juliflora*, *Mikania micrantha*, and *Eichhornia crassipes* gained entry into India either deliberately or inadvertently. Exotic weeds in agricultural fields are typical examples of accidental introduction through the pathway of grain trade. Weed seeds, in many instances, are introduced into grain importing countries as grain contaminants. The potential threat from such weeds is very high even if their contamination levels are low. Wheat imports into India, is an eye opening example in this context.

Weed seed contamination is not a cause of concern only as weed *per se*, but also for its ability to have toxins and become noxious. Moreover weeds are foremost among invasive aliens that cause catastrophic effects on the economy and environment of the country. Further, weed seeds are likely to escape border inspection of commodities due to mostly being tiny and may be mistaken for plant debris. Besides, lack of expertise in weed seed identification is an added disadvantage. Therefore the detection and identification of weeds is of prime importance to prevent incursions.

Quarantine weeds are currently regulated in Schedule VIII of PQ Order, 2003 issued under DIP Act. Further, a large number of entries regulating different weeds also find a mention in Schedule VI of PQ Order. The inspection officers often find it difficult to correctly detect & identify weeds that may be interspersed in the imported commodities. To enhance the inspection and identification capabilities of the quarantine officers and phytosanitary certification authorities; a comprehensive guide is compiled with all relevant information.

This illustrative guide for detection & identification of weeds features 62 weeds and provides their taxonomy, distribution and identification characteristics. The physical features of seed and plant, described in the guide, facilitate detection of weed seed in grain movement and further, in detection of weed plants in post entry quarantine and field surveillance.

*Any suggestions are most welcome for consideration in future editions.*

**Disclaimer:** While every care has been taken to ensure that the information provided is true and correct at the time of publication, it must be noted that the information is compiled from various sources as cited in the references. National Institute of Plant Health Management accepts no liability for any losses or damages, including incidental or consequential damages, resulting from use of the material and the published material is only meant to serve as a reference and is not intended for commercial use.

# INDEX

| S.No. | Name of the Weed  | Page No. |
|-------|---|----------|
| 1.    | <i>Allium vineale</i> L. ....                               | 1        |
| 2.    | <i>Ambrosia maritima</i> L. ....                            | 2        |
| 3.    | <i>Ambrosia psilostachya</i> D.C. ....                      | 3        |
| 4.    | <i>Ambrosia trifida</i> L. ....                             | 5        |
| 5.    | <i>Apera-spica-venti</i> (L.) P. Beauv. ....                | 7        |
| 6.    | <i>Bromus secalinus</i> L. ....                             | 8        |
| 7.    | <i>Cenchrus tribuloides</i> L. ....                         | 10       |
| 8.    | <i>Centaurea diffusa</i> Lam. ....                          | 11       |
| 9.    | <i>Centaurea maculosa</i> Lam. ....                         | 13       |
| 10.   | <i>Centaurea solstitialis</i> L. ....                       | 15       |
| 11.   | <i>Cichorium pumilum</i> Jacq. ....                         | 17       |
| 12.   | <i>Cichorium spinosum</i> L. ....                           | 18       |
| 13.   | <i>Cordia curassavica</i> (Jacq.) Roemer & Schultes ....    | 19       |
| 14.   | <i>Cuscuta australis</i> R. Br. ....                        | 20       |
| 15.   | <i>Cynoglossum officinale</i> L. ....                       | 22       |
| 16.   | <i>Echinochloa crus-pavonis</i> (Kunth) J. A. Schultes .... | 23       |
| 17.   | <i>Froelichia floridana</i> (Nutt) Moq. ....                | 25       |
| 18.   | <i>Helianthus californicus</i> DC. ....                     | 27       |
| 19.   | <i>Helianthus ciliaris</i> DC. ....                         | 28       |
| 20.   | <i>Heliotropium amplexicaule</i> Vahl ....                  | 29       |
| 21.   | <i>Leersia japonica</i> Honda ex Honda ....                 | 30       |
| 22.   | <i>Matricaria perforatum</i> (Mérat) M. Lainz ....          | 31       |
| 23.   | <i>Polygonum cuspidatum</i> Sieb. & Zucc. ....              | 33       |
| 24.   | <i>Proboscidea louisianica</i> (P. Mill.) Thellung ....     | 35       |
| 25.   | <i>Salsola vermiculata</i> L. ....                          | 37       |
| 26.   | <i>Senecio jacobaea</i> L. ....                             | 39       |
| 27.   | <i>Solanum carolinense</i> L. ....                          | 41       |
| 28.   | <i>Striga hermonthica</i> (Del) Benth. ....                 | 43       |
| 29.   | <i>Thesium australe</i> R. Br. ....                         | 45       |
| 30.   | <i>Thesium humile</i> Vahl. ....                            | 46       |
| 31.   | <i>Viola arvensis</i> Murr. ....                            | 47       |
| 32.   | <i>Alectra vogelii</i> Benth. ....                          | 48       |
| 33.   | <i>Amaranthus blitoides</i> S. Wats. ....                   | 50       |
| 34.   | <i>Cardiospermum halicacabum</i> L. ....                    | 51       |
| 35.   | <i>Centrosema pubescens</i> Benth. ....                     | 52       |

| S.No. | Name of the Weed  | Page No. |
|-------|---|----------|
| 36.   | <i>Chrysanthemoides monilifera</i> (L.) T. Norlindh .....                     | 53       |
| 37.   | <i>Cirsium vulgare</i> Savi (Ten.) .....                                      | 54       |
| 38.   | <i>Conyza sumatrensis</i> (Retz.) E. Walker .....                             | 56       |
| 39.   | <i>Digitaria velutina</i> (Forssk.) P. Beauv. .....                           | 57       |
| 40.   | <i>Fumaria officinalis</i> L. .....   | 59       |
| 41.   | <i>Lolium multiflorum</i> Lam. .....  | 61       |
| 42.   | <i>Lonicera japonica</i> Thunb .....  | 63       |
| 43.   | <i>Orobanche Cumana</i> Wallr .....   | 65       |
| 44.   | <i>Orobanche minor</i> Sm .....   | 66       |
| 45.   | <i>Oryza longistaminata</i> A. Chev. & Roehr. ....                            | 68       |
| 46.   | <i>Pennisetum macrourum</i> Trin .....  | 70       |
| 47.   | <i>Physalis angulata</i> L. ....  | 72       |
| 48.   | <i>Polygonum persicaria</i> L. ....   | 74       |
| 49.   | <i>Pueraria montana</i> var. <i>montana</i> (Lour.) Maesen .....              | 76       |
| 50.   | <i>Raphanus raphanistrum</i> L. ....  | 78       |
| 51.   | <i>Richardia brasiliensis</i> Gomes .....                                     | 80       |
| 52.   | <i>Senecio inaequidens</i> DC. ....   | 82       |
| 53.   | <i>Senecio madagascariensis</i> Poiret .....                                  | 84       |
| 54.   | <i>Striga aspera</i> (Willd.) Benth .....                                     | 86       |
| 55.   | <i>Thlaspi arvense</i> L. ....  | 87       |
| 56.   | <i>Urochloa plantaginea</i> (Link) RD Webster .....                           | 89       |
| 57.   | <i>Veronica persica</i> Poir .....  | 90       |
| 58.   | <i>Parthenium hysterophorous</i> L. ....                                      | 92       |
| 59.   | <i>Phalaris minor</i> Retz. ....  | 94       |
| 60.   | <i>Echinochloa crus-galli</i> (L.) Beauv. ....                                | 95       |
| 61.   | <i>Cuscuta reflexa</i> Roxb. ....   | 97       |
| 62.   | <i>Striga asiatica</i> (L.) Kuntze .....                                      | 98       |
|       | <i>Annexure-I: A basic illustrated glossary of plant identification</i> ..... | 100      |
|       | <i>Annexure-II: Glossary</i> .....  | 108      |

# 1. *Allium vineale* L.

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Allium kochii</i> Linge;<br><i>Allium compactum</i> Thuill;<br><i>Allium affine</i> Boiss & Helder;<br><i>Allium assimile</i> Halacsy   | <b>Plant habit during flowering</b><br> |
| <b>Common names</b>                | Crow garlic, wild garlic, vineyard onion, false garlic, field garlic, scallions, stag's garlic, wild onion.  |   |
| <b>Family</b>                      | Alliaceae  |   |
| <b>Group</b>                       | Monocot  |   |
| <b>Habit</b>                       | Perennial herb   |   |
| <b>Habitat</b>                     | Open warm-temperate regions occurring on a range of soils but preferring heavy fertile loams. It has become a weed of cereal crops, pastures and roadsides in areas with moderate to warm temperatures.  |   |
| <b>Origin</b>                      | Europe, North Africa & Western Asia.   |   |
| <b>Distribution</b>                | Kenya, Canada, USA, Germany.   |   |
| <b>Identifying characteristics</b> | Basal leaves arise from the bulb. Leaves are linear, grooved above, 15-60 cm long and 2-10mm wide, smooth, round, and hollow. Foliage has the scent of garlic or onion. Seedlings resemble those of a grass but have hollow, round leaves. Flowering stems are solid, unbranched, smooth, erect, and leafless above; they become stiff with age. Flowers lilac, being completely or partially replaced by bulbils.   |   |
| <b>Leaves</b>                      | Slender; hollow, cylindrical at first then channeled on one side, 2 to 3 mm diameter, emerging from lower part of stem.  |   |
| <b>Stem</b>                        | Erect, cylindrical, almost filled with pith, unbranched, sheathed for part of their length.  |   |
| <b>Flowers</b>                     | White, pink or greenish on short stalks, formed in terminal heads often mixed with bulbils (although most heads consist of bulbils only); heads are initially enclosed in a papery sheath.   |   |
| <b>Fruit</b>                       | The fruit is an egg – shaped, tripartite capsule, 3-5 cm long.   |   |
| <b>Seed</b>                        | Black, 3 to 4 mm long, flattened on one side, not common.  |   |
| <b>Roots</b>                       | Shallow, fibrous.  |   |
| <b>Association</b>                 | Cereals (Barley, Triticale and Wheat), small millets, groundnut, pastures, vineyards and lawns.  |   |
| <b>Dispersal</b>                   | Seeds, bulbs, and bulbils spread with the movement of agricultural produce, machinery, vehicles, animals, mud and water. Because bulbils are similar in size and shape to wheat grains and difficult to remove in cleaning operations, contaminated cereal grain is the main means of dispersal.   |   |
| <b>Impact on introduction</b>      | Crow garlic is an important weed because it contains allyl sulphides which impart a strong garlic odour and flavour to agricultural produce, particularly cereal grain, grain products, milk and meat. These products acquire a strong garlic or onion-like taste and/or smell, reducing their value or rendering them useless. Wheat and barley would be severely affected by the weed if it is introduced. An additional problem is that infested grain milled for stock feed often clogs the mill rollers. This may pose a potential danger to flour milling industry in India. It may act as a reservoir of <i>Sclerotinia minor</i> inoculums and as alternate host for viruses such as Onion mite borne latent potexvirus, Shallot mite born latent potexvirus, Sint-Jan's onion latent carlavirus, Welsh onion yellow stripe potyvirus etc. |   |



(a) Flowering branch



(b) Seeds

## 2. *Ambrosia maritima* L.

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Ambrosia maritima</i> auct., non L.<br><i>Ambrosia tenuifolia</i> Spreng.   | <b>Plant habit during flowering</b>   |
| <b>Common names</b>                | Sea ambrosia, Oak of Cappadocia, Damsissa.   |   |
| <b>Family</b>                      | Asteraceae   | (a) Flowering branch  |
| <b>Group</b>                       | Dicot  |  |
| <b>Habit</b>                       | Annual or perennial herb   | (b) Seed  |
| <b>Habitat</b>                     | Sub-humid temperate regions, principally on the lighter soils in open areas, occurring as a weed of roadsides, railway reserves, sand dunes, cultivated fields, stubble paddocks, degraded pastures and waste places.  |   |
| <b>Origin</b>                      | North America  |   |
| <b>Distribution</b>                | Egypt and Mediterranean region.  |   |
| <b>Identifying characteristics</b> | An erect perennial herb, 30-60 cm high forming dense colonies, reproducing by seed and creeping, runner-like roots.  |   |
| <b>Leaves</b>                      | Greyish green; opposite below, alternate above; broadly lanceolate, 6 to 8 cm long, 4 to 5 cm wide, slightly pubescent, deeply twice pinnate into numerous slender linear to oblong segments 1.5 mm wide.  |   |
| <b>Stem</b>                        | Simple or sparsely branched, bristly hairy, more or less woody at the base.  |   |
| <b>Flower</b>                      | Flower is of two kinds on the one plant: male florets greenish white, about 12 exceeding the <i>involucre</i> and grouped into cup-shaped heads about 2.5 mm diameter in spike like racemes at the ends of stems and branches, an involucre of fused bracts enclosing the florets; female florets few, in flowered heads, borne singly in the axils of upper leaves. |   |
| <b>Flowering period</b>            | Summer   |   |
| <b>Seeds</b>                       | Bluntly top-shaped, woody, 3-4 mm long, surmounted by a pointed beak surrounded by 4 to 6 short tubercles.   |   |
| <b>Roots</b>                       | A short robust rootstock giving rise to long creeping, runner like reproductive roots in the upper soil which produce new shoots and feeding roots.  |   |
| <b>Association</b>                 | Clover ( <i>Trifolium</i> sp.) and Alfalfa ( <i>Medicago</i> sp.)  |   |
| <b>Dispersal</b>                   | It can spread long distances by movement of seed which, because of the hooked spines, is extremely well adapted for dispersal by sheep, furred animals, clothing, bags, and other fibrous materials. It also spreads by water, particularly during flooding, providing buoyancy. It may also spread through the movement of contaminated soil.                       |   |
| <b>Impact on introduction</b>      | It is highly competitive and detrimental to crops. May cause allergic reaction in human beings. It spreads rapidly and becomes a major pest especially when it invades cultivated lands.   |   |

### 3. *Ambrosia psilostachya* D.C.

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Ambrosia californica</i> Rydb.,<br><i>Ambrosia coronopifolia</i> Torr. & Gray,<br><i>Ambrosia cumanensis</i> Kunth.,<br><i>Ambrosia psilostachya</i> DC. var. <i>californica</i> (Rydb.) Blake,<br><i>Ambrosia psilostachya</i> DC. var. <i>coronopifolia</i> (Torr. & Gray) Farw.,<br><i>Ambrosia psilostachya</i> DC. var. <i>lindheimeriana</i> (Scheele) Blank.,<br><i>Ambrosia rugelii</i> Rydb. | <b>Plant habit during flowering</b>   |
| <b>Common names</b>                | Western ragweed, cuman ragweed and perennial ragweed.  |   |
| <b>Family</b>                      | Asteraceae   | (a) Flowering branch  |
| <b>Group</b>                       | Dicot  |  |
| <b>Habit</b>                       | Perennial shrub/herb   | (b) Seeds   |
| <b>Habitat</b>                     | Semi-arid grasslands, principally on sandy soils, usually found as a weed along road sides, in uncultivated fields, vacant lots and waste places.  |   |
| <b>Origin</b>                      | USA  |   |
| <b>Distribution</b>                | India, Kazakhstan, Mauritius, Canada, Mexico, USA, Belgium, Hungary, Italy, Netherlands, Poland, Russian Federation, Spain, Sweden, Australia.   |   |
| <b>Identifying characteristics</b> | An erect robust perennial herb 30 to 150 cm high occasionally higher, forming dense colonies: reproducing by seed and vegetatively from a root stock and creeping roots.   |   |
| <b>Leaves</b>                      | Alternate, simple (deeply pinnately lobed), acute, rough and sessile; 4-12 cm, lanceolate to ovate, hairy.   |   |
| <b>Stem</b>                        | Erect, branched, 1-4 feet high (mostly less than 2.0 feet), straw-colored, soft-hairy to bristly.  |   |
| <b>Flowers</b>                     | Minute, green flowers in small axillary clusters. Staminate heads 2-5 mm diam racemiform, in terminal clusters. Pistillate inflorescences, 1-5" with inconspicuous flowers in upper leaf axils.  |   |
| <b>Flowering time</b>              | July-November.   |   |
| <b>Fruit</b>                       | Tiny achenes, < 6 mm, enclosed in two bracts, obovoid, greenish brown, puberulent; spines 0- 7, below beak, blunt or vestigial.  |   |
| <b>Seeds</b>                       | Tricolporate or tetracolporate, 50% have four apertures, Furrows are 5-8 mm in length, with enclosed pores 4-5 mm in diameter. Exine is tectate, about 1.5 mm thick. Surface is finely granular and echinate, with 160-170 spines per grain, which are 3.0-3.5 mm long and 3 mm apart.   |   |

|                               |   |
|-------------------------------|---|
| <b>Roots</b>                  | Rhizome-like roots (creeping root stalk).   |
| <b>Propagation</b>            | Seed and creeping roots.  |
| <b>Association</b>            | Clover ( <i>Trifolium</i> sp.) and alfalfa ( <i>Medicago</i> sp.)   |
| <b>Dispersal</b>              | Perennial ragweed spreads widely because the fruit is well adapted to tangle in wool and stick to furred animals, clothing, bags and other fibrous materials. Spread also occurs when the seeds, in mud stick to animals, farm machinery and vehicles of all kinds. It is also commonly spread when contaminated soil and gravel are moved during road grading and road making; and when such soil is used as garden top dressing.  |
| <b>Impact on introduction</b> | Perennial ragweed is a strongly competitive plant, often growing densely to the detriment of crop and pasture. It spreads rapidly and becomes quite a pest especially when it invades cultivated lands and pastures. Extracts from aerial growth are allelopathic, inhibiting germination and early seedling growth of several plant species. It is not grazed by stock, dense infestations thus reducing pasture productivity considerably. The pollen causes allergic inflammation of nose in human beings. Inhalation of pollen grains may cause hay fever. If dairy cows eat it, their milk becomes bitter. |

## 4. *Ambrosia trifida* L.

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Ambrosia aptera</i> DC,<br><i>A. striata</i> Rydb.,<br><i>A. variabilis</i> Rydb.,<br><i>A. simplicifolia</i> Walter,<br><i>A. integrifolia</i> Muhl. ex. Willd.  | <b>Plant habit during flowering</b>   |
| <b>Common names</b>                | Giant ragweed, great ragweed, horseweed, palmate ragweed, king head, tall ragweed, buffalo weed, rich weed, blood weed, crown weed, wild hemp, bitter weed, tall ambrosia, horse cane.   |  A photograph showing a flowering branch of Ambrosia trifida. The branch is upright and bears several long, slender, greenish-yellow spikes of flower heads. The leaves are large and deeply lobed.             |
| <b>Family</b>                      | Asteraceae   |   |
| <b>Group</b>                       | Dicot  |   |
| <b>Habit</b>                       | Annual herb/ subshrub  |   |
| <b>Habitat</b>                     | River valleys, meadows, roadsides, waste grounds, railroad, pond margins, fields in moist soil and occasionally in cultivated fields, open areas and wood lands.   |   |
| <b>Origin</b>                      | USA  |  A photograph showing five dried, brown, seed pods of Ambrosia trifida against a solid green background. The seeds are elongated and pointed at one end, with a distinct shoulder or protrusion near the base. |
| <b>Distribution</b>                | China, Japan, Korea, Republic of Canada, Mexico, USA, Czech Republic, France, Germany, Italy, Lithuania, Poland, Russian Federation, Slovakia, UK, Ukraine.  |   |
| <b>Identifying characteristics</b> | Monecious; distinguished by its very tall stature (up to 4 m or 15 ft), large, 3-lobed leaves, long, slender spikes of pollen-producing flower heads and large, angular seeds with spines around the upper shoulder. The flower parts are not discernable with the naked eye.  |   |
| <b>Leaves</b>                      | Mostly opposite; blades simple, ovate to orbiculate (10-20 cm long), lobes 3-5 (usually 3), margins serrate, surfaces scabrous; petiolate.   |   |
| <b>Stem</b>                        | Erect, branching above, surfaces coarse, woody at the base sometimes pubescent or reddish; 1 to 4 m tall.  |   |
| <b>Flowers</b>                     | Flower heads monoecious, small, green, nodding, consisting of a receptacle containing a number of small round florets. Staminate heads, 2-5 mm in diameter, phyllaries fused, cup-like, with 3 longest lobes blackish along the mid veins in terminal spikes. Heads composed of staminate (male) or pistillate (female) disc flowers. Pistillate heads are clustered in the leaf axils below the spikes, phyllaries fused, persistent, enclose a single ovary. |   |
| <b>Flowering period</b>            | August-October.  |   |
| <b>Fruit</b>                       | Bur-like (5-9 mm long), formed by floral bracts, single short beak (1 mm long), spines blunt; seeds 1.   |   |

|                    |  |
|--------------------|--|
| <b>Seeds</b>       | Achene 6 to 12 mm long; brown to grey; with a single small seed. Pointed crown present unless damaged. Single plant produces roughly 275 seeds. Newly matured seed is usually dormant and germinate at optimum temperatures of 10-24°C.  |
| <b>Roots</b>       | Taproot  |
| <b>Propagation</b> | Seed   |
| <b>Association</b> | Clover ( <i>Trifolium</i> sp.), alfalfa ( <i>Medicago</i> sp.), common ragweed ( <i>Ambrosia artemisiifolia</i> ), common milkweed ( <i>Asclepias syriaca</i> ), goosefoot ( <i>Chenopodium album</i> ) and curly dock ( <i>Rumex crispus</i> ).   |
| <b>Impact</b>      | Giant ragweed is a common cause of hay fever in August and September. Ingesting or touching the plant can cause allergic reactions in some people. It can be a serious weed in corn, soybeans, and other crops, especially in bottomlands. This ragweed may accumulate nitrates, especially after being sprayed with 2, 4-D. |

## 5. *Apera spica-venti* ( L.) P. Beauv.

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Agrostis spica-venti</i> L.   | <b>Plant habit during flowering</b><br> |
| <b>Common names</b>                | Loose silky bent, silky bent grass, common wind grass, wind grass, silky apera.  |   |
| <b>Family</b>                      | Poaceae  |   |
| <b>Group</b>                       | Monocot  |   |
| <b>Habit</b>                       | Annual herb  |   |
| <b>Habitat</b>                     | Arable fields, wastelands, tracks, roadsides, sandy loam soils, disturbed and open sites.  |   |
| <b>Origin</b>                      | Europe   |   |
| <b>Distribution</b>                | Whole of Europe and West-Siberia   |   |
| <b>Identifying characteristics</b> | An annual panicle erect grass growing up to 1m tall, with either solitary or multiple stem.  |   |
| <b>Seedling</b>                    | Shoot rolled, leaf sheath cylindrical, lamina 20-50 times longer than more or less hairy, ligule membranous dentate. Auricles absent.  |   |
| <b>Leaves</b>                      | Flat, up to 20 cm long by 10 mm wide, hairless, often rough to touch and tapering towards the tip. Ligule up to 1 cm long and the base of leaf sheaths are purple. Lower face flat slightly shiny.   |   |
| <b>Stem</b>                        | Solitary or multiple, stout or slender, green or purple, erect to a height of 150 cm, unbranched, hairless, membranous smooth sheaths; ligule membranous 2-14mm, pointed and short in young plants and lengthens with age, becoming firm with torn or toothed tip, margins continuous; no auricles with darker stem nodes.   |   |
| <b>Flowers</b>                     | Inflorescence is a panicle, purplish or greenish, very finely branched and widely spreading up to 25 cm long and 15 cm wide. Primary panicle branches whorled at most nodes; profusely divided; 3-7 cm long. Spikelets solitary. Fertile spikelets pedicelled. Pedicels 1-3 mm long; scaberulous. Anthers 3; 1-2 mm long. Fertile lemma lanceolate; 2.1-2.8 mm long; membranous; without keel; 5 -veined. Lemma surface scaberulous; rough above. Lemma apex acute; 1-awned. Principal lemma awn sub apical; flexuous; 5-10 mm long overall. Palea 0.9-1 length of lemma; 2 -veined. | (b) Seeds   |
| <b>Flowering period</b>            | May-September.   |   |
| <b>Fruit</b>                       | Caryopsis with adherent pericarp; ellipsoid.   |   |
| <b>Seeds</b>                       | Lancet-shaped with a very long, thin awn, 4-9mm long; seed without its awn is about 1.6 mm long.   |   |
| <b>Roots</b>                       | Adventitious root system.  |   |
| <b>Propagation</b>                 | Seeds.   |   |
| <b>Association</b>                 | Wheat ( <i>Triticum aestivum</i> ), rye ( <i>Secale cereale</i> ), winter oilseed rape ( <i>Brassica napus</i> ), dense silky bent ( <i>Agrostis interrupta</i> ), prickly poppy ( <i>Argemone munita</i> )  |   |
| <b>Impact</b>                      | Potential seed contaminant. It greatly reduces yield and quality of grain and interferes with combine harvesting.  |   |

## 6. *Bromus secalinus* L.

|                                    |  |  |
|------------------------------------|--|--|
| <b>Synonyms</b>                    | <i>Avena secalina</i> (L.) Salisb.,<br><i>Bromus secalinus</i> var. <i>hirsutus</i> ;<br><i>Bromus badensis</i> C.C. Gmel.<br><i>Festuca secalina</i> ,<br><i>Bromus billottii</i> F. W Schultz,<br><i>Bromus brevisetus</i> Dumort.,<br><i>Bromus ehrhartii</i> Gaudin,<br><i>Bromus elongatus</i> Gaudin,<br><i>Bromus mollis</i> L. var. <i>secalinus</i> (L.) Huds.,<br><i>Bromus mutabilis</i> F. W. Schultz,<br><i>Bromus secalinus</i> L. var. <i>billottii</i> (F.W. Schultz) Asch. & Graebn.,<br><i>Bromus submuticus</i> Steud.,<br><i>Bromus vitiosus</i> Weigel,<br><i>Forasaccus secalinus</i> (L.) Bubani and<br><i>Serrafalcus secalinus</i> (L.) Bab | <b>Plant habit during flowering</b>  |
| <b>Common names</b>                | Brome grass, cheat, rye brome, chess grass, drake, wheat-thief, cock grass   | <br>(a) Flowering branch |
| <b>Family</b>                      | Poaceae  | <br>(b) Seeds            |
| <b>Group</b>                       | Monocot  |  |
| <b>Habit</b>                       | Annual herb  |  |
| <b>Habitat</b>                     | Habitats include dry prairies, limestone glades, disturbed grassy meadows, vacant lots, abandoned fields, cropland (especially wheat fields), areas along railroads, and waste areas. This weedy grass is typical of habitats with a history of disturbance.   |  |
| <b>Origin</b>                      | Eurasia  |  |
| <b>Distribution</b>                | USA  |  |
| <b>Identifying characteristics</b> | A robust grass growing up to 1m tall   |  |
| <b>Leaves</b>                      | Leaves are up to 20cm long and 5 mm wide, glabrous or rarely pilose with a blunt ligule up to 4mm long. Leaf-sheath rounded, glabrous, lower ones often tomentose.   |  |
| <b>Stem</b>                        | Solitary tufted softly and densely hairy, 40-80 cm tall  |  |
| <b>Flowers</b>                     | Panicle 12-20 cm long, 2-5 branches per node; each bearing 1-4 Spikelets; Spikelets flattened, oblong-lanceolate, 5 to 15-flowered, glabrous, 1.5-2.5 cm long, lower glume 4-6 mm long, 3-5-nerved, the upper 6-7 mm long, 7-nerved, broader than the lower; lemmas broadly elliptic, 6-7 mm long, 7-nerved, rounded on back, retuse at apices, with a straight awn inserted near apex; paleas as long as lemmas.  |  |

|                               |  |
|-------------------------------|--|
| <b>Flowering period</b>       | June to July   |
| <b>Fruit</b>                  | Caryopsis with adherent pericarp, ellipsoid, hairy at apex, apex fleshy. Hilum linear.   |
| <b>Seeds</b>                  | Seed 6.0 to 8.0 mm long, linear-obovate, deeply grooved, glossy, dark orange brown.  |
| <b>Roots</b>                  | Shallow, fibrous, dense root system.   |
| <b>Propagation</b>            | Seed   |
| <b>Association</b>            | Winter wheat, rye, sorghum, soybean, cotton, maize, sunflower.   |
| <b>Dispersal</b>              | The awns of the mature lemmas can cling to fur and clothing and thus the seeds of Common Chess spread to new areas by animals and humans.  |
| <b>Impact on introduction</b> | This is an important weed in winter rye and winter wheat. May act as a host for the wheat pathogens like <i>Gaumanomyces graminis</i> var. <i>tritici</i> (take-all), <i>Cochliobolus sativus</i> (common root rot), <i>Fusarium graminearum</i> (foot and crown rot) and Wheat dwarf virus. |

## 7. *Cenchrus tribuloides* L.

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Cenchrus incertus</i> ,<br><i>Cenchrus longispinus</i> (Hackel) Fernald.;<br><i>Cenchrus pauciflorus</i> Benth.,<br><i>Cenchrus echinatus</i> L. var. <i>tribuloides</i> (L.) Torr.,<br><i>Cenchrus microcephalus</i> (Doll) Scribn.,<br><i>Cenchrus tribuloides</i> L. var. <i>macrocephalus</i> Doll,<br><i>Cenchrus vaginatus</i> Steud.   | <b>Plant habit during flowering</b><br> |
| <b>Common names</b>                | Sand dune sandbur, sandbur, sandspur, field sandbur, dune sandbur, long spine sandbur, mat sandbur, grassbur   | (a) Flowering branch  |
| <b>Family</b>                      | Poaceae  |   |
| <b>Group</b>                       | Monocot  |   |
| <b>Habit</b>                       | Annual grass   |   |
| <b>Habitat</b>                     | Sandy areas, floodplains, lawns, fields, pastureland woods, and waste places   |   |
| <b>Origin</b>                      | USA  |   |
| <b>Distribution</b>                | USA, Croatia, France, Greece, Hungary, Italy, Romania, Russian Federation, Spain, Ukraine  | <br>(b) Seeds                           |
| <b>Identifying characteristics</b> | Erect or spreading winter grass of twelve-fourteen inches (often trailing or spreading). Grass of the eastern United States and tropical America having spikelets enclosed in prickly burs   |   |
| <b>Leaves</b>                      | Leaf-sheaths outer margin hairy, ciliate. Ligule 1-2.1 mm long. Leaf-blades 2-14 cm long, 3-14 mm wide, glabrous, apex attenuate   |   |
| <b>Stem</b>                        | Culms 10-70 cm long  |   |
| <b>Flowering period</b>            | July-October   |   |
| <b>Flowers</b>                     | Primary panicle branches accrescent to a central axis; with sessile scars on axis. Panicle axis angular; smooth, or scaberulous; bearing deciduous Spikelet clusters. Panicle linear, dense, or loose (internodes 3-10mm), 2- 8.2 mm long; 1.5-3 mm wide. Basal sterile florets barren with palea. Lemma of lower sterile floret ovate, 5.5-7.5 mm long, 0.8-0.9 length of spikelet, Membranous; 3-7 -veined, acute. Fertile lemma ovate, 6-8.7 mm long, coriaceous; much thinner on margins, without keel, 3 -veined. Lemma Margins flat. Lemma apex obtuse. Palea coriaceous. Anthers 0.8-2.8 mm long. |   |
| <b>Fruit</b>                       | Caryopsis with adherent pericarp. Fruit encased in spiny, round burrs.   |   |
| <b>Seeds</b>                       | Yellow seed heads consist of 6-20 large, round, spiny burs. Each bur is somewhat hairy and is approximately 5 to 7 mm wide. Each bur contains 2 to 4 spikelets that are 4 to 5 mm long.  |   |
| <b>Roots</b>                       | A fibrous root system.   |   |
| <b>Propagation</b>                 | Seed   |   |
| <b>Association</b>                 | Alfalfa, lettuce, citrus, fruit, nut and vegetable crops.  |   |
| <b>Dispersal</b>                   | Spread by matured spiny burs flowing on water; adherence to wool, fur, clothing, bags, tyres and any fibrous material. Spread also occurs in agricultural produce and on farm machinery.   |   |
| <b>Impact on introduction</b>      | The spines have minute barbs, which can break off under the skin and become quite painful to human beings and cattle. The burs, may decrease the value of the wool.  |   |

## 8. *Centaurea diffusa* Lam.

|                                    |   |  |
|------------------------------------|---|--|
| <b>Synonyms</b>                    | <i>Acosta diffusa</i> (Lam.) Sojak  | <b>Plant habit during flowering</b>  |
| <b>Common names</b>                | Diffuse knapweed, white knapweed, spreading knapweed and tumble knapweed.   |  A photograph showing a flowering branch of <i>Centaurea diffusa</i> . The branch has several flower heads, each consisting of a central disc floret surrounded by numerous small, white, tubular ray florets. The leaves are green and pointed. |
| <b>Family</b>                      | Asteraceae  |  |
| <b>Group</b>                       | Dicot   |  |
| <b>Habit</b>                       | Annual, biennial or short lived Perennial herb.   |  |
| <b>Habitat</b>                     | Plains, rangelands, forested Bench lands, rugged terrain, semiarid and arid regions.  |  |
| <b>Origin</b>                      | Eurasia   |  |
| <b>Distribution</b>                | Armenia, Azerbaijan, Georgia (Republic of), Iran, Syria, Turkey, Canada, USA, Argentina, Austria, Bulgaria, Czech Republic, Czechoslovakia (former), France, Germany, Greece, Hungary, Italy, Moldova, Poland, Romania, Russian Federation, Serbia, Sweden, Switzerland, Ukraine, Yugoslavia (former).  |  Two seeds of <i>Centaurea diffusa</i> are shown against a light blue background. The seeds are elongated and slightly curved, with a dark brown, textured surface.   |
| <b>Identifying characteristics</b> | It has an upright growth form, which can grow up to 1m tall.  |  |
| <b>Seedling</b>                    | Cotyledons oblanceolate with short hairs. Seedling is a rosette with hairy and finely divided basal leaves.   |  |
| <b>Leaves</b>                      | Alternate, grayish-green, hairy; very bitter long basal leaves, stalked and divided into narrow, hairy segments which form the rosette (3-8 cm long, and 1-3 cm wide). Stem leaves are smaller, less divided, and stalkless, and become bract-like near the flower clusters.  |  |
| <b>Stem</b>                        | Upright, 10-60 cm tall, highly branched, angled, with short, stiff hairs on the angles.   |  |
| <b>Flowers</b>                     | Solitary or in clusters, rose, lavender, or white flower heads, broadly urn shaped, 1.5-2.0 cm tall, with overlapping spiny bracts. Bracts of the flower heads (phyllaries) are yellowish with a brownish margin, sometimes spotted, fringed on the sides, and terminating in a slender bristle or spine 1-5 mm long. The heads contain ray flowers and tubular disk flowers. |  |
| <b>Flowering period</b>            | July-September.   |  |

|                    |  |
|--------------------|--|
| <b>Fruit</b>       | Achenes are 2-3 mm long, light brown to black, bristles (pappus) generally absent or a mere fringe less than 1 mm long.  |
| <b>Seeds</b>       | Seeds are achenes, 2 to 3 mm long with a plume of bristle-like hairs that vary from scale like to 1/8 the length of the seed. A single plant can produce up to 18,000 seeds.   |
| <b>Roots</b>       | Heavily branched taproot system.   |
| <b>Propagation</b> | Seed   |
| <b>Association</b> | Sunflower, asters and alfalfa  |
| <b>Dispersal</b>   | Dispersal of diffuse knapweed seed is mainly by wind. Further, seeds are dispersed by infested hay, vehicles and equipment, animals or shoes.  |
| <b>Impact</b>      | It may reduce the productivity of rangeland forage species for livestock and wildlife because of the allelopathic chemical, cnicin. The spines may cause injury to the mouth and digestive tract of grazing animals. The species can quickly invade disturbed plant communities, reduce biological diversity, and increase soil erosion. |

## 9. *Centaurea maculosa* Lam.

|                                    |   |   |
|------------------------------------|---|---|
| <b>Synonyms</b>                    | <i>Centaurea biebersteinii</i> DC,<br><i>Centaurea stoebe</i> L. ssp. <i>micranthos</i> (Gugler)<br>Hayek,<br><i>Centaurea stoebe</i> subsp. <i>micranthos</i>  | <b>Plant habit during flowering</b><br> |
| <b>Common names</b>                | Spotted knapweed, knapweed, star thistle  |   |
| <b>Family</b>                      | Asteraceae  |   |
| <b>Group</b>                       | Dicot   |   |
| <b>Habit</b>                       | Annual, biennial or short-lived perennial herb.   |   |
| <b>Habitat</b>                     | Pastures, roadsides, well drained, light moist soils.   |   |
| <b>Origin</b>                      | Europe  |   |
| <b>Distribution</b>                | Iran, Canada, USA, Albania, Austria, Belarus, Belgium, Bosnia-Hercegovina, Bulgaria, Czech Republic, Czechoslovakia (former), Estonia, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Macedonia, Moldova, Netherlands, Poland, Romania, Russian Federation, Serbia, Slovakia, Slovenia, Sweden, Switzerland, Ukraine, Yugoslavia (former), New Zealand |   |
| <b>Identifying characteristics</b> | A biennial or occasionally perennial plant that forms a basal rosette during the first year of growth and produces a flowering stem during the second year. Grows from 0.3 to 1 meter tall. The finely dissected leaves and bracts below the pink to purple flowers help to distinguish this weed.  |   |
| <b>Seedling</b>                    | Cotyledons round at the apex and narrowing to the base. Stays in the rosette stage throughout the first year. Rosette leaves pinnate-divided.   |   |
| <b>Leaves</b>                      | Upper stem leaves not winged, pinnate-divided and resin-dotted. Foliage variously covered with short to medium interwoven grey hairs. Leaves alternate. Lower stem leaves deeply 1- or 2-pinnate-lobed, - 10-20 cm long.  |   |
| <b>Stem</b>                        | Flowering stems are slender and wiry, branching, and covered with downy hairs.  |   |
| <b>Flowers</b>                     | Flowers 30-40 per head. Corolla white, pink, or purple, 12-25 mm long. Involucre (unit of phyllaries) length 10-13 mm. Phyllaries pale green or pink-tinged, with parallel veins. Phyllary tips dark, comb-like, not spine tipped. Self-fertile.  |   |
| <b>Flowering period</b>            | June to October.  |   |



(a) Flowering branch

(b) Seeds

|                               |   |
|-------------------------------|---|
| <b>Fruit</b>                  | An achene, light green to brown and 3 mm long by 2 mm wide. Seed heads have a shorter center spine of the bracts and generally a black spot near the top. An average plant produces about 1,000 seeds annually.   |
| <b>Seeds</b>                  | Achenes are oval, 1/8 inch (3 mm) long, bearing a pappus of simple bristles which are less than the length of the seed (1-2 mm) and persistent. Most stems remain erect after drying, with leaves and flower head bracts attached.  |
| <b>Roots</b>                  | Stout taproot system.   |
| <b>Propagation</b>            | Seed and lateral roots.   |
| <b>Association</b>            | Alfalfa, hay, blue bunch wheat grass, needle and thread or Idaho fescue, Ponderosa pine or Douglas fir, turfgrass.  |
| <b>Dispersal</b>              | Dispersal of achenes over long distances is facilitated by animals and birds. Seeds mixed with soil and mud may be carried by vehicles or other equipment that, in turn, create an ideal seedbed for spotted knapweed establishment. Spotted knapweed seeds can also be transported in rivers and other watercourses, and in crop seed and hay. |
| <b>Impact on introduction</b> | Problem weed on rangelands. Infestation may cause soil erosion, decrease biodiversity and reduce forage for wildlife and livestock.   |

## 10. *Centaurea solstitialis* L.

|                                    |   |   |
|------------------------------------|---|---|
| <b>Synonyms</b>                    | <i>Centaurea solstitialis</i> ,<br><i>Leucantha solstitialis</i> (L.) A. & D. Love  | <b>Plant habit during flowering</b>   |
| <b>Common names</b>                | Yellow star thistle, golden star thistle, yellow cockspur, St. Barnaby's thistle, yellow <i>Centaurea geeldissel</i> , yellow centaury.   |   |
| <b>Family</b>                      | Asteraceae  |   |
| <b>Group</b>                       | Dicot   |   |
| <b>Habit</b>                       | Annual herb   |   |
| <b>Habitat</b>                     | Open grasslands with deep well drained soils; rangelands, pastures, roadsides, cropland, urban areas and disturbed habitats.  |   |
| <b>Origin</b>                      | Mediterranean region and Southern Europe  |   |
| <b>Distribution</b>                | Armenia, Azerbaijan, Georgia (Republic of), Iran, Iraq, Israel, Jordan, Lebanon, Syria, Tajikistan, Turkey, Turkmenistan, Algeria, Botswana, Egypt, South Africa, Swaziland, Tunisia, Canada, USA, Trinidad and Tobago, Argentina, Chile, Uruguay, Albania, Austria, Bulgaria, Czech Republic, Czechoslovakia (former), France, Germany, Greece, Hungary, Italy, Moldova, Poland, Romania, Russian Federation, Serbia, Spain, Switzerland, UK, Ukraine, Yugoslavia (former), Australia, New Zealand, Papua, New Guinea. |  |
| <b>Identifying characteristics</b> | Yellow star thistle grows as a deep-tap rooted winter annual, or rarely as a short-lived perennial. It produces one to many solitary, spiny, yellow flower heads during late spring, summer, and fall. Stem leaves of bolted plants extend downward, giving the stems a winged appearance.  | (a) Plant habit during flowering  |
| <b>Seedling</b>                    | Cotyledons oblong to spatulate, base wedge-shaped, tip +/- squared, glabrous, 6-9 mm long, 3-5 mm wide.   | (b) Seeds   |
| <b>Leaves</b>                      | Alternate, strongly decurrent, gray-pubescent, upper leaves small, entire or dentate, linear to lanceolate. Lower leaves deeply lobed, serrate. Foliage grayish- to bluish-green, densely covered with fine white cottony hairs that hide thick stiff hairs and glands. Rosette leaves typically withered by flowering time.  |   |
| <b>Stem</b>                        | Rigid, winged, openly branched from near or above the base with cottony hairs, 3-10 cm in diameter.   |   |

|                               |   |
|-------------------------------|---|
| <b>Flowers</b>                | Flower heads are ovoid, 2-3 cm in diameter, spiny, solitary on stem tips, and consist of numerous yellow disk flowers. Involucral (phyllaries as a unit) bracts imbricated, numerous, the tips bearing rigid, yellow spines, 1-2 cm long; receptacle bristly, flat; flowers all tubular, yellow.  |
| <b>Flowering period</b>       | May to December.  |
| <b>Fruit</b>                  | Two types of achenes (seeds), both are glabrous, 2-3 mm long, obovoid, flattened, barrel-shaped, compressed and laterally notched at the base.  |
| <b>Seeds</b>                  | Yellow star thistle fruits are achenes of 2 types, both glabrous and about 2 to 3 mm long. Most of the achenes (seeds) (75-90%) have a short (2-5 mm), stiff pappus (plumed). Seeds at the periphery of the flower head are darker in color and have no pappus (plume less).  |
| <b>Roots</b>                  | Taproot system.   |
| <b>Propagation</b>            | Seed.   |
| <b>Association</b>            | Clover, alfalfa, dry land cereals, orchards, vineyards, cultivated crops, and wastelands.   |
| <b>Dispersal</b>              | Dispersed by wind. However, long-distance dispersal of yellow star thistle seed is often directly related to human activities and occurs by movement of livestock, vehicles, equipment, and contaminated hay and crop seed.   |
| <b>Impact on introduction</b> | Dense infestations of yellow star thistle displace native plants and animals, threatening natural ecosystems and nature reserves. Yellow star thistle interferes with grazing and lowers yield and forage quality of rangelands, thus increasing the cost of managing livestock. Also reduces crop yield and quality. It can also reduce land value and limit access to recreational areas. On consumption, it may cause a neurological disorder (chewing disease) leading to death in equines due to toxin production. |

## 11. *Cichorium pumilum* Jacq.

|                                    |   |   |
|------------------------------------|---|---|
| <b>Synonyms</b>                    | <i>Cichorium endivia</i> L. subsp.<br><i>pumilum</i> (jacq.) C. Jeffrey   | <b>Plant habit during flowering</b>   |
| <b>Common names</b>                | Wild endive, endive, Batavian endive  |   |
| <b>Family</b>                      | Asteraceae  |   |
| <b>Habit</b>                       | Annual herb   |   |
| <b>Habitat</b>                     | Fields, roadsides, herbaceous plant communities of the Mediterranean region.  |   |
| <b>Distribution</b>                | Portugal, Spain, Egypt, Libya, Morocco, Tunisia, Iran, Iraq, Israel, Jordan, Lebanon, Syria, Turkey, Armenia, Azerbaijan, Albania, Bulgaria, Croatia, Greece, Italy, Montenegro, France.  |   |
| <b>Identifying characteristics</b> | Green leaves eaten as salad; root used as a substitute for coffee or added to it for a special flavour.   |  |
| <b>Leaves</b>                      | Hairless, 2-9 cm long, dentate and carnosae.  |   |
| <b>Stem</b>                        | Solitary, leafy, with divaricate branching.   |   |
| <b>Flowers</b>                     | Solitary and terminal or in small clusters arranged along the branches. Phyllaries in 2 series, ligules blue.   |   |
| <b>Fruit</b>                       | Achene, 5-angled, smooth, glabrous with 1-2 series of short, blunt, scaly pappus.   |   |
| <b>Propagation</b>                 | Seed and roots.   |   |
| <b>Association</b>                 | Pigweed ( <i>Amaranthus</i> sp.), purslane ( <i>Portulaca oleracea</i> ), lamb squatters ( <i>Chenopodium album</i> ), groundcherry ( <i>Physalis wrightii</i> ) barnyardgrass ( <i>Echinochloa crusgalli</i> ), cup grass ( <i>Eriochloa</i> sp.), junglerice ( <i>Echinochloa colonum</i> ), sprangletop ( <i>Leptochloa</i> sp.), black mustard ( <i>Brassica nigra</i> ), wild radish ( <i>Raphanus sativus</i> ), shepherdspurse ( <i>Capsella bursa-pastoris</i> ), London rocket ( <i>Sisymbrium irio</i> ), cheeseweed ( <i>Malva parviflora</i> ), sowthistle ( <i>Sonchus oleraceus</i> ), prickly lettuce ( <i>Lactuca serriola</i> ), knotweed ( <i>Polygonum</i> sp.), annual yellow sweet clover ( <i>Melilotus indicus</i> ), nettleleaf goosefoot ( <i>Chenopodium murale</i> ), canarygrass ( <i>Phalaris minor</i> ), annual blue grass ( <i>Poa annua</i> ), wild oats ( <i>Avena fatua</i> ) and wild barley ( <i>Hordeum</i> sp.). |   |

## 12. *Cichorium spinosum* L.

|                                    |   |   |
|------------------------------------|---|---|
| <b>Common names</b>                | Spiny chicory, stamnagathi  | <b>Plant habit during flowering</b>   |
| <b>Family</b>                      | Asteraceae  |   |
| <b>Group</b>                       | Dicot   |   |
| <b>Habit</b>                       | Annual or perennial shrub   |   |
| <b>Habitat</b>                     | Sandy places, coastal seashores, cultivated beds, dry rocky slopes, and moist places  |   |
| <b>Origin</b>                      | Mediterranean   | (a) Flowering branch  |
| <b>Distribution</b>                | Italy, Sicily and Malta, Greece, Crete, southwestern Turkey and Cyprus.   |  |
| <b>Identifying characteristics</b> | A Small densely and intricately branched, hemispherical subshrub, with many spiny branches. Biennial/perennial growing to 0.18m.  |   |
| <b>Leaves</b>                      | Basal, 2-9 cm long, dentate and carnosae. The leaves and shoots are edible.   |   |
| <b>Stem</b>                        | Stems are branched from the base, the upper non-flowering and spine like branchlets interlaced and spiny.   |   |
| <b>Flowering period</b>            | June – October.   |   |
| <b>Flowers</b>                     | Flowers are blue, about 2.5 cm (1 in), almost stalk less, solitary or in clusters of 2 - 4. The flowers are hermaphrodite (have both male and female organs) and are pollinated by Bees. Flower head about 15mm across, rays 5-6.   |   |
| <b>Fruit</b>                       | Achenes obovate, 2-3 mm long, 4-5 angled, apex truncate, striated, light brown.   |   |
| <b>Seeds</b>                       | Achenes 1·5-2 mm; pappus-scales 1/10-1/8 as long as achene.   |   |
| <b>Roots</b>                       | Tap root system.  |   |
| <b>Association</b>                 | <i>Amaranthus</i> sp., <i>Portulaca oleracea</i> , <i>Chenopodium album</i> , <i>Physalis wrightii</i> , <i>Echinochloa crusgalli</i> , <i>Eriochloa</i> sp., <i>Echinochloa colonum</i> , <i>Leptochloa</i> sp., <i>Brassica nigra</i> , <i>Raphanus sativus</i> , <i>Capsella bursa-pastoris</i> , <i>Malva parviflora</i> , <i>Sonchus oleraceus</i> , <i>Lactuca serriola</i> , <i>Polygonum</i> sp., <i>Melilotus indicus</i> , <i>Chenopodium murale</i> , <i>Phalaris minor</i> , <i>Poa annua</i> , <i>Avena fatua</i> and <i>Hordeum</i> sp. |   |

## 13. *Cordia curassavica* (Jacq.) Roemer & Schultes

|                                    |   |   |
|------------------------------------|---|---|
| <b>Synonyms</b>                    | <i>Cordia macrostachya</i> (Jacquin)<br>Roemer & Schultes   | <b>Plant habit during flowering</b>   |
| <b>Common names</b>                | blaka uma, black sage cordia, black-sage  |   |
| <b>Family</b>                      | Boraginaceae  |   |
| <b>Group</b>                       | Dicot   |   |
| <b>Habit</b>                       | Shrubby tree  |   |
| <b>Habitat</b>                     | Dry coastal areas   |   |
| <b>Origin</b>                      | Tropical America  |   |
| <b>Distribution</b>                | Argentina, Bolivia, Brazil, Caribbean Islands, Colombia, Costa Rica, Guatemala, Honduras, Indian Ocean islands, Malaysia, Mauritius, Mexico, Nicaragua, Panama, Paraguay, Peru, Sri Lanka.  |   |
| <b>Identifying characteristics</b> | A bushy tropical shrub growing up to 8' tall with pointed leaves and small white flowers in clusters at the end of the many branches.   |  |
| <b>Leaves</b>                      | Lanceolate or ovate, elongate, greyish green, 5-15cm long, base tapering to and along leaf stalk. Leaf margins serrate, rough above with stiff hairs.   |   |
| <b>Stem</b>                        | Odorous shrub 1-3 m tall, hairy, branched at the base of the plant.   |   |
| <b>Flowers</b>                     | One-sided inflorescence. White flowers, small, corolla 5mm on erect spikes at the tips of the stems.  |   |
| <b>Flowering period</b>            | October   |   |
| <b>Fruit</b>                       | Small, fleshy, red fruits, surrounded by calyx, fruit size 5 mm in diameter.  |   |
| <b>Seeds</b>                       | A single stony seed of 4 x 5 mm that is protuberant and warty and very irregularly shaped.  |   |
| <b>Propagation</b>                 | Bird-dispersed seeds.   |   |
| <b>Association</b>                 | Sugarcane, Coconut and other forest vegetation.   |   |
| <b>Impact on introduction</b>      | This species may displace native species and is considered an urban weed. Further, it primarily affect production systems, such as sugarcane plantations and coconut plantations, it retards the growth of young trees. High population density of this large shrub can hinder access to plantation trees. Dense thickets can prevent regeneration or crowd out other vegetation. |   |

## 14. *Cuscuta australis* R. Br.

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Cuscuta obtusiflora</i> Kunth,<br><i>Cuscuta cardofona</i> (Engelm.) Yunck.,<br><i>Cuscuta hygrophilae</i> H. Pearson,<br><i>Cuscuta kawakamii</i> ayata,<br><i>Cuscuta millettii</i> Hook & Arn.   | <b>Plant habit during flowering</b><br> |
| <b>Common names</b>                | Dodder, peruvian dodder, australian dodder, southern dodder  |   |
| <b>Family</b>                      | Convolvulaceae   |   |
| <b>Group</b>                       | Dicot  |   |
| <b>Habit</b>                       | Perennial, parasitic climbing herb.  |   |
| <b>Habitat</b>                     | Cultivated crops, pastures, vine yards.  |   |
| <b>Origin</b>                      | Australia  |   |
| <b>Distribution</b>                | Albania, Bulgaria, France, Germany, Greece, Italy, Portugal, Romania, Russia, Spain, Turkey, Ukraine, Yugoslavia. Introduced into Austria, Czechia, Hungary, Netherlands, Poland, Switzerland, Bangladesh, China, Indonesia, Japan, Korea, Malaysia, Pakistan, Africa: Morocco, Nigeria, USA, Australia, Fiji, Melanesia.  |   |
| <b>Identifying characteristics</b> | Parasitic twiner; stems slender, pale yellow to brown.   |   |
| <b>Leaves</b>                      | Leafless parasite  |   |
| <b>Stem</b>                        | Slender, 1 mm diameter, thread like twining, golden coloured.  |   |
| <b>Flowers</b>                     | Inflorescence cymose, lateral, few to many flowered, subsessile in compact clusters, pentamerous, up to 10 mm diam.; pedicels < 2.5 mm long. Calyx 1.5 mm long, corolla white or creamy white, 2 mm long; lobes rounded triangular, obtuse; shorter than or equal to the corolla tube. Stamens oblong, bifid, shorter than the corolla tube with few fimbriae. Styles 2, equal or unequal in length, stigma globose. |   |
| <b>Flowering period</b>            | June – September.  |   |
| <b>Fruit</b>                       | Capsule enclosed by persistent corolla, depressed, globose, 3-4 mm in diameter, irregularly opened. The fruit is a light-brown, 2-4-seeded boll.   |   |



(b) Seeds

|                               |  |
|-------------------------------|--|
| <b>Seeds</b>                  | Seeds are oval, light-brown or brownish, 1.25-2.5 mm long, 1-1.5 mm wide scabrous.   |
| <b>Roots</b>                  | Haustorial roots.  |
| <b>Propagation</b>            | Seed, stem cuttings.   |
| <b>Association</b>            | Alfalfa, clover, other legumes.  |
| <b>Dispersal</b>              | Major means of dispersal at a local scale is through plant fragments that are carried by people because of their bright colour and appeal and later throw them on other vegetation where they attach very fast and send their haustoria into their vascular systems.   |
| <b>Impact on introduction</b> | Moderate to severe reductions in growth of host plants may occur. Heavy infestation of the weed may lead to loss of vigour and death of host plants. Native plants, ornamental shrubs, trees, groundcovers, and crop plants may be infested with the weed upon introduction into the country. The impact of dodder varies from moderate to severe reductions in growth of the host plant and, in some instances, may result in complete loss of vigor and death. |

## 15. *Cynoglossum officinale* L.

|                                    |   |   |
|------------------------------------|---|---|
| <b>Synonyms</b>                    | <i>Cynaglossum hybridum</i> Thuill.,<br><i>Lindelia spectabilis</i>   | <p><b>Plant habit during flowering</b></p>  <p>(a) Flowering branch</p><br> <p>(b) Seeds</p> |
| <b>Common names</b>                | Beggar's lice, common bur, dog bur, dog's tongue, glove wort, gypsy flower, hound's tongue, purple hound's tongue, rats-and-mice, sheep lice and wool mat.  |   |
| <b>Family</b>                      | Boraginaceae  |   |
| <b>Group</b>                       | Dicot   |   |
| <b>Habit</b>                       | Biennial or short-lived perennial.  |   |
| <b>Habitat</b>                     | Roadsides, sand dunes, meadows, grasslands to mid-elevation forests, coarse, gravelly to sandy soils.   |   |
| <b>Origin</b>                      | Europe, Russia  |   |
| <b>Distribution</b>                | Armenia, Azerbaijan, Georgia (Republic of), Iran, Kazakhstan, Kyrgyzstan, Turkey, Canada, USA, Albania, Austria, Belarus, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Romania, Russian Federation, Slovakia, Spain, Sweden, Switzerland, UK, Ukraine, Yugoslavia (Serbia and Montenegro) |   |
| <b>Identifying characteristics</b> | A rosette plant with leaves shaped like a dog's tongue in the first year. The plant has a disagreeable odour and taste.   |   |
| <b>Leaves</b>                      | Alternate, lanceolate, entire, roughly hairy, and decrease in size of the stem with rosette formation (7 to 30 cm long) resembling the shape of a dog's tongue. Stem leaves are simple, alternate, lanceolate, 4-15 cm long, softly hairy, shorter and stalkless.   |   |
| <b>Stem</b>                        | Erect, simple, 3-9 cm diameter high, branching near the top, stout, ridged, hairy and leafy to the top.   |   |
| <b>Flowers</b>                     | An elongate simple or branched raceme with bright purplish-red flowers, calyx hairy, five-lobed, enlarging in fruit. Corolla funnel shaped, reddish purple, five-lobed, < 15 mm broad, stamens five, pistil with deeply four lobed ovary with simple style.   |   |
| <b>Flowering period</b>            | June-August.  |   |
| <b>Fruit</b>                       | Nutlets four, obovoid, 6 mm long.   |   |
| <b>Seeds</b>                       | Brown to greyish-brown, rounded triangular in shape, covered with short, hooked prickles. Each plant produces about 8000 seeds.   |   |
| <b>Roots</b>                       | Thick, black, long woody taproot that can reach 1 m into the soil. Topped with crowned, oblong leaves.  |   |
| <b>Association</b>                 | Cereal grains and forage grasses.   |   |
| <b>Propagation</b>                 | Seed  |   |
| <b>Impact on introduction</b>      | It may cause yield loss of cereals and forage grasses on introduction. Poisonous to grazing livestock. It may cause cancer, liver damage, dermatitis and eye irritation.  |   |

## 16. *Echinochloa crus-pavonis* (Kunth) J.A. Schultes

|                                    |   |   |
|------------------------------------|---|---|
| <b>Synonyms</b>                    | <i>Echinochloa crusgalli</i> (L.) P. Beauv. var. <i>Cruspavonis</i> (Kunth) Hitchc., <i>Echinochloa sabulicola</i> (Trin.) Hitchc., <i>Oplismenus angustifolius</i> E. Fourn., <i>Oplismenus crus-pavonis</i> Kunth, <i>Panicum cruspavonis</i> (Kunth) Nees, <i>Panicum colonum</i> L. var. <i>bussei</i> Peter, <i>Panicum aristatum</i> Macfadyen  | <b>Plant habit during flowering</b><br> |
| <b>Common names</b>                | Gulf cockspur grass, peacock cockspur, gulf barnyard grass, South American barnyard grass   | (a) Flowering branch  |
| <b>Family</b>                      | Poaceae   |   |
| <b>Group</b>                       | Monocot   |   |
| <b>Habit</b>                       | Annual herb   |   |
| <b>Habitat</b>                     | Wetlands, marshes, cultivated fields, farmyards and waste places.   |   |
| <b>Origin</b>                      | Eurasia   |   |
| <b>Distribution</b>                | Afghanistan, Bangladesh, Bhutan, Brunei, Darussalam, Cambodia, China, India, Indonesia, Iran, Iraq, Israel, Japan, Korea, DPR, Korea, Republic of, Laos, Lebanon, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Taiwan, Thailand, Turkey, Uzbekistan, Vietnam, Egypt, Guinea, Madagascar, Mauritius, Morocco, Mozambique, Senegal, South Africa, Sudan, Swaziland, Tanzania, Tunisia, Uganda, Canada, Mexico, USA, Costa Rica, Cuba, Dominican Republic, Jamaica, Argentina, Brazil, Chile, Colombia, Peru, Uruguay, Austria, Belgium, Bulgaria, Croatia, Czech Republic, Czechoslovakia (former), France, Germany, Greece, Hungary, Italy, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Spain, Sweden, Switzerland, UK, Ukraine, Yugoslavia (former), Yugoslavia (Serbia and Montenegro), Australia, Fiji, New Zealand, Papua New Guinea. |   |
| <b>Identifying characteristics</b> | Adult plant grows up to 80-200 cm high.   |   |
| <b>Seedling</b>                    | Leave Striped in violet base, crenate with clear central vein, margins undulate.  |   |
| <b>Leaves</b>                      | Glabrous, with compressed bi-sharp sheaths, 7-20 cm, reddened or dark, blades 12-60 cm long, 10-25 mm wide, flat, lanceolate, ligule and auricles absent.   |   |
| <b>Stem</b>                        | Erect, stout, succulent, 30-150 cm high, vigorous, geniculate at base, nodes and sheaths glabrous, purplish.  |   |



(b) Seeds

|                               |  |
|-------------------------------|--|
| <b>Flowers</b>                | Inflorescence is an open panicle, 10-40 cm, purplish, formed by dense pendulous racemes arranged along a curved axis with long hairs at the nodes. Spikelets sub sessile or pedicellate two flowered, the lower sterile or male, the upper hermaphrodite, lower glume glabrous. Flowers with short awns. Anthers 0.5-0.7 mm. |
| <b>Flowering period</b>       | July-September.  |
| <b>Fruit</b>                  | Big, elliptic caryopsis, embryos 50-70% as long as the caryopses.  |
| <b>Seeds</b>                  | Seed is 1.2-1.5mm long, 1-1.3mm wide.  |
| <b>Roots</b>                  | Adventitious root system.  |
| <b>Association</b>            | Paddy  |
| <b>Dispersal</b>              | Water, birds, insects, machinery, and animal feet disperse it, but contaminated seed is probably the most common dispersal method.   |
| <b>Impact on introduction</b> | Competitive weed species in rice field, which may drastically reduce crop yield.   |

## 17. *Froelichia floridana* (Nutt) Moq.

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Froelichia campestris</i> Small,<br><i>Froelichia floridana</i> (Nutt.) Moq. var.<br><i>campestris</i> (Small) Fernald,<br><i>Froelichia floridana</i> (Nutt.) Moq. var. <i>floridana</i> ,<br><i>Froelichia floridana</i> (Nutt.) Moq. var. <i>pallescens</i><br>Moq. and <i>Oplotheca floridana</i> Nutt.   | <b>Plant habit during flowering</b>   |
| <b>Common names</b>                | Plains snake cotton; Florida snake cotton;<br>Cotton tails, snake cotton, prairie froelichia, cotton<br>weed.  |   |
| <b>Family</b>                      | Amaranthaceae  | (a) Flowering branch  |
| <b>Group</b>                       | Annual herb  |  |
| <b>Habit</b>                       | Dicot  | (b) Seeds   |
| <b>Habitat</b>                     | Sandy open ground, agricultural fields, degraded<br>pastures, stream banks, gravel bars, rail road,<br>edges of woodlands, roadsides.  |   |
| <b>Origin</b>                      | USA  |   |
| <b>Distribution</b>                | USA, Hungary   |   |
| <b>Identifying characteristics</b> | Plant with long flowering stem, swollen nodes<br>and cotton like flower clusters.  |   |
| <b>Leaves</b>                      | Opposite, sessile or short-petiolate, most abundant on proximal 1/2 of plant; blade linear,<br>lanceolate, oblanceolate, oblong, or orbiculate, fulvous abaxially, margins entire, usually<br>pubescent, 3.8-11.2(-21) x 0.5-3.8(-4.2) cm.   |   |
| <b>Stem</b>                        | Erect or procumbent, stout, simple to much-branched, sometimes broom like, usually richly<br>pubescent with short, viscid, whitish or brownish hairs.  |   |
| <b>Flowers</b>                     | Bisexual, Spikes dense, much-branched, apex often pyramidal, flowers arranged in 5-ranked<br>spiral; bracteoles stramineous or blackish, pubescent with small tufts distally. Flowers 4-6 mm;<br>perianth lobes, greenish white to pinkish, oblong, apex acute; filament lobes slightly to greatly<br>recurved distally, stramineous to pinkish, apex acute. Utricles flask-shaped, 5 x 4- 5 mm, with<br>irregularly dentate lateral wings, both surfaces of perianth with distinct spines or tubercles.<br>2-locular; ovule 1; style 1, short or elongate, shorter than staminal tube; stigmas sessile, minutely<br>2-fid to capitate or penicillate. |   |
| <b>Flowering period</b>            | May-September.   |   |

|                               |   |
|-------------------------------|---|
| <b>Fruit</b>                  | Ovoid, indehiscent, membranaceous persistent utricle.   |
| <b>Seeds</b>                  | The seeds are 1.0–1.5 mm long, ovoid, somewhat flattened, and brown.  |
| <b>Roots</b>                  | Tap roots, semi-woody.  |
| <b>Propagation</b>            | Seed  |
| <b>Association</b>            | <i>Aristida purpurascens</i> , <i>Froelichia gracilis</i> , <i>Gaura villosa</i> , <i>Lechea tenuifolia</i> , <i>Oenothera rhombipetala</i> , <i>Penstemon buckleyi</i> , and <i>Polygonum tenue</i> are some of the wild species associated with the weed. |
| <b>Dispersal</b>              | The plant's fluffy, winged fruit are readily dispersed by adhering to animals, clothing, as impurities in harvested pasture seeds, or by the wind.  |
| <b>Impact on introduction</b> | It may spread as an impurity in pasture seed over longer distances. On introduction, it may become a threat species to pasture lands/ grasslands.   |

## 18. *Helianthus californicus* DC.

|                                    |  |   |
|------------------------------------|--|---|
| <b>Common names</b>                | California sunflower   | <b>Plant habit during flowering</b><br><br>(a) Flowering branch |
| <b>Family</b>                      | Asteraceae   |   |
| <b>Group</b>                       | Dicot  |   |
| <b>Habit</b>                       | Perennial herb   |   |
| <b>Habitat</b>                     | Dry to moist places like rocky soils, stream banks, meadows, wet lands, sunny, brushy or grassy creek sides/road cuts and in sedimentary and volcanic regions.   |   |
| <b>Origin</b>                      | USA  |   |
| <b>Distribution</b>                | USA, Mexico  |   |
| <b>Identifying characteristics</b> | Perennial weed, 15-35 cm diameter roots thick, rhizome short and woody.  |   |
| <b>Leaves</b>                      | Alternate; petiole 0-3 cm; blade 10-20 cm, generally lanceolate, entire or few-toothed.  |   |
| <b>Stem</b>                        | Erect, glabrous, glaucous and grooved.   |   |
| <b>Flowers</b>                     | Heads several, peduncles 3-15 cm; involucre 1-2.5 cm diameter; phyllaries 10-25 mm, widely lanceolate, bent back in fruit, margin glabrous or rough ciliate; chaff scales 10-11 mm, sharply 3-lobed, middle lobe acute, short rough-hairy, ray flowers 12-21; ligules 2-3 cm; disk flowers: corollas 6-8 mm, lobes yellow. |   |
| <b>Flowering period</b>            | June-October.  |   |
| <b>Fruit</b>                       | Achene, ± 5 mm; pappus scales 3-4 mm.  |   |
| <b>Seeds</b>                       | The achene is about half a centimeter long.  |   |
| <b>Roots</b>                       | Woody, thick tap root system.  |   |
| <b>Association</b>                 | Alfalfa, oats, cotton, wheat, sunflower and sorghum.   |   |
| <b>Impact on introduction</b>      | <i>Helianthus californicus</i> is threatened by adverse modification and destruction of its habitat.   |   |

## 19. *Helianthus ciliaris* DC.

|                                    |   |
|------------------------------------|---|
| <b>Common names</b>                | Blue weed, texas blue weed  |
| <b>Family</b>                      | Asteraceae  |
| <b>Group</b>                       | Dicot   |
| <b>Habit</b>                       | Perennial herb  |
| <b>Habitat</b>                     | Roadsides, irrigated fields, stream and ditch banks, low drainage areas, alkaline or saline soils.  |
| <b>Origin</b>                      | USA   |
| <b>Distribution</b>                | Australia, Mexico, USA  |
| <b>Identifying characteristics</b> | Erect herbaceous perennial, up to 0.7 m tall, with bluish-green foliage and creeping roots. New shoots from root buds often create dense patches of plants.   |
| <b>Leaves</b>                      | Leaves typically glabrous or hairy on the margins (ciliate), sessile, bluish green, covered with a whitish film (glaucous), mostly opposite, oblong to lanceolate, 3-8 cm long. Margins wavy, entire to shallowly lobed.  |
| <b>Stem</b>                        | Stems often sparsely covered with short stiff hairs.  |
| <b>Flowers</b>                     | Composite flower heads solitary on long peduncles. Ray flowers yellow. Flower head receptacles 1.2-2.5 cm across. Unit of disk flowers rounded on top, yellowish. Ray flower corollas about 1 cm long. Disk flower corollas 4-5 mm long with red lobes. Receptacle scales (chaffy bracts) hairy at the tips, entire or 3-lobed  |
| <b>Flowering period</b>            | June-November   |
| <b>Fruit</b>                       | Achenes 3 mm long, black or greyish at maturity   |
| <b>Seeds</b>                       | Seeds are smooth and hairless, 0.12 to 0.14 inches (3 to 3.5 mm) long.  |
| <b>Roots</b>                       | Woody horizontal creeping roots with buds every few inches. Shallow rooted in uncultivated soils, but develop deeper root systems on cultivated land.   |
| <b>Propagation</b>                 | Vegetative clones from roots and by seed  |
| <b>Association</b>                 | Alfalfa, oats, cotton, wheat, sunflower and sorghum   |
| <b>Dispersal</b>                   | Locally, <i>H. ciliaris</i> is dispersed as rhizome fragments associated with soil, possibly carried by agricultural machinery. Over long distances, however, seeds contaminating various commodities, such as grain, may introduce the weed. Presumably, rhizome fragments may also be carried over long distances in association with any kind of movement of soil. |
| <b>Impact on introduction</b>      | Texas blueweed appears to be invasive mainly on cultivated land, or in wastelands or other marginal situations. It is unpalatable to livestock and severely reduces crop yield in some regions. Because of its competitive nature and persistent growth it may pose the threat of becoming the dominant plant in cultivated fields it has invaded.                    |

Plant habit during flowering



(a) Flowering branch



(b) Seeds

## 20. *Heliotropium amplexicaule* Vahl

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Cachranea nchulsifolia</i> (Poir.) Guerke,<br><i>Heliotropium anchusifolium</i> Poir.   | <b>Plant habit during flowering</b><br><br>(a) Flowering branch |
| <b>Common names</b>                | Blue heliotrope, wild verbena, clasping heliotrope, purple top, turns ole, wild heliotrope, verveine sauvage, violet heliotrope, summer heliotrope.  |   |
| <b>Family</b>                      | Boraginaceae   |   |
| <b>Group</b>                       | Dicot  |   |
| <b>Habit</b>                       | Perennial herb   |   |
| <b>Habitat</b>                     | Roadsides, disturbed areas, fallows and degraded pastures.   |   |
| <b>Origin</b>                      | Argentina  |   |
| <b>Distribution</b>                | Chile  |   |
| <b>Identifying characteristics</b> | Distinguished by branchlets with glandular and non-glandular hairs; leaves with all hairs spreading on the lower surface, leaf base narrowing gradually; cymes without bracts; fruit consisting of 2 hairless mericarps.   |   |
| <b>Leaves</b>                      | Herbaceous, velvet/fuzzy-textured, 2-9 cm long and 0.4-2.5 cm wide, lanceolate, acute, dull-green, hairy with glandular and non-glandular hairs; short-petioled to sub sessile.  |   |
| <b>Stem</b>                        | Decumbent to ascending, 2-6 cm diameter, short-hairy, 15 - 45 cm.  |   |
| <b>Flowers</b>                     | Inflorescence helicoid cyme, spikes 3-5, terminal, flowers violet/lavender in 2 rows on either side of the cyme; calyx lobes ± linear-lanceolate, bristly, joined petals 5.5-8 mm long, yellow-throated.   |   |
| <b>Flowering period</b>            | Throughout the year.   |   |
| <b>Fruit</b>                       | The fruit consists of two small 'seeds' (i.e. nutlets or mericarps) which separate from each other at maturity. Nutlets are roughened and faintly tubercled.   |   |
| <b>Seeds</b>                       | The 'seeds' are rounded (i.e. sub-globular) in shape and have a wrinkled (i.e. rugose) or warty (i.e. tuberculate) surface. They are dark brown or black in colour and hairless (i.e. glabrous). Mericarps are hairless, ovate and 1.5-2.5 mm long.  |   |
| <b>Roots</b>                       | Large tap root system.   |   |
| <b>Association</b>                 | Sugarcane, forage crops.   |   |
| <b>Dispersal</b>                   | The seeds may dispersed by animals, water, vehicles, and in contaminated soil and agricultural produce (e.g. fodder). Root fragments can be broken off and spread about during cultivation or road maintenance, and may also be dispersed longer distances in contaminated soil.   |   |
| <b>Impact on introduction</b>      | It is mainly seen as a weed of roadsides, disturbed sites and pastures. It is an invasive weed containing pyrrolizidine alkaloids, which are toxic to livestock. It may cause acute and chronic liver damage in livestock. It may also adversely affect other production systems and natural ecosystems. It is a potential seed contaminant. |   |

## 21. *Leersia japonica* Honda ex Honda

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Homalocenchrus japonicus</i> Honda,<br><i>Leersia japonica</i> Makino,<br><i>Leersia sinensis</i> K.S. Hao.   | <b>Plant habit during flowering</b><br><br>(a) Flowering branch |
| <b>Common names</b>                | Ashikaki, cut grass  |   |
| <b>Family</b>                      | Poaceae  |   |
| <b>Group</b>                       | Monocot  |   |
| <b>Habit</b>                       | Perennial  |   |
| <b>Habitat</b>                     | Aquatic: Ponds, flooded fields, wet stream sides, ditch banks, lake shores.  |   |
| <b>Origin</b>                      | Japan  |   |
| <b>Distribution</b>                | China and Korea  |   |
| <b>Identifying characteristics</b> | An aquatic weed mostly found in paddy fields.  |   |
| <b>Leaves</b>                      | Leaf-sheath smooth or scaberulous with erect auricles. Ligule an eciliate membrane; 1-2.5 mm long; truncate. Leaf blade surface and margins are scabrous, 6- 12 cm long; 5-7 mm wide.  |   |
| <b>Stem</b>                        | Rhizomes elongated. Culms prostrate; 100-120 cm long; rooting from lower nodes. Culm nodes bearded.  |   |
| <b>Flowers</b>                     | Inflorescence is an open panicle, ovate, 8-11 cm long. Primary panicle branches 4-14 in number; ascending; 1-nate; 5-8 cm long; bearing spikelets almost to the base. Panicle branches flat (1 mm wide). Spikelets solitary. Fertile spikelets pedicelled, lanceolate, laterally compressed; acuminate, 5-6 mm long, falling entire. Glumes absent or obscure. Lemma 5-6 mm long chartaceous; keeled; 5 -veined with ciliate mid vein, glabrous and involute margins. Palea 1 length of lemma, chartaceous, 3 - veined, I-keeled. Palea keels ciliate. Lodicules- 2; anthers 6, 3 mm long, stigmas- 2. |   |
| <b>Flowering period</b>            | Summer and Autumn.   |   |
| <b>Fruit</b>                       | Caryopsis  |   |
| <b>Seeds</b>                       | Possess short hairs along the edges and appear flattened along the edges.  |   |
| <b>Roots</b>                       | Rhizomes elongated   |   |
| <b>Propagation</b>                 | Seeds and tillers  |   |
| <b>Association</b>                 | Paddy, Pseudo cereals, <i>Leersia oryzoides</i> , <i>Leersia sayanuka</i> and <i>Zizania latifolia</i> .   |   |
| <b>Impact on introduction</b>      | Potential seed contaminant. Acts as a host for many diseases such as downy mildew ( <i>Sclerotinia macrorhiza</i> ), leaf blight ( <i>Cochliobolus miyabeanus</i> ), Rice blast ( <i>Magnaporthe grisea</i> ), bacterial leaf blight ( <i>Xanthomonas oryzae</i> pv. <i>oryzae</i> ) and virus diseases such as Northern cereal mosaic virus.  |   |

## 22. *Tripleurospermum perforatum* (Mérat) M. Lainz

|                                    |   |   |
|------------------------------------|---|---|
| <b>Synonyms</b>                    | <i>Chamomilla inodora</i> (L.) Gilib.,<br><i>Matricaria chamomilla</i> L.,<br><i>Matricaria inodora</i> L.,<br><i>Matricaria erforat</i> var. <i>agrestis</i> (Knaf) L.,<br><i>Matricaria maritime</i> ssp.<br><i>Inodora</i> L. (L.) Clapham,<br><i>Matricaria erforate</i> Merat <i>Tripleurospermum Inodorum</i> (L.) Sch. Bip., | <b>Plant habit during flowering</b><br> |
| <b>Common names</b>                | Scentless chamomile, scentless mayweed, scentless false mayweed, inland scentless mayweed, wild chamomile, mayweed, false chamomile, German chamomile   | (b) Flowering branch  |
| <b>Family</b>                      | Asteraceae  |   |
| <b>Group</b>                       | Dicot   |   |
| <b>Habit</b>                       | Annual to short lived perennial   |   |
| <b>Habitat</b>                     | Dry shorelines, roadsides, fence lines, disturbed areas, cultivated beds. It prefers dry or moist places  |   |
| <b>Origin</b>                      | Eurasia, North Africa   |   |
| <b>Distribution</b>                | Canada, France, North America, Scandinavia, British Isles, Spain, USSR, New Zealand, Japan, India   |                                        |
| <b>Identifying characteristics</b> | Erect with ascending branches, easily recognizable by its numerous, small, daisy-like flowers and finely divided leaves.  |   |
| <b>Seedling</b>                    | Seedlings have pointed oval-shaped un-divided cotyledons (3 to 6 mm long). The first set of true leaves is coarsely divided.  |   |
| <b>Leaves</b>                      | Alternate, 2-3 pinnate, hairless, bright glossy green, finely divided into thread-like segments, mostly sessile and scentless when crushed.   |   |
| <b>Stem</b>                        | Erect, up to 1m tall, smooth, and multi-branched.   |   |
| <b>Flowers</b>                     | Flower head 2-4cm diameter, radiate, white ray florets around the margin and yellow tubular florets in the center. Receptacle flat and solid, without scales. The flowers are daisy-like, scented and hermaphrodite.  |   |
| <b>Flowering period</b>            | June to October   |   |
| <b>Fruit</b>                       | Achenes, dark brown or black, with three distinct light-brown ribs.   |   |

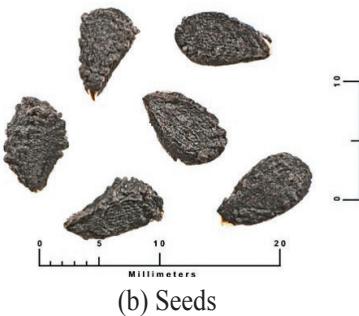
|                               |   |
|-------------------------------|---|
| <b>Seeds</b>                  | Small, 2-3 mm long, slightly grooved, dark brown to black, sometimes lighter on the 3-4 sharp angles and may have a small pappus. Angularly cylindrical with a flat style end. A single plant can produce over a half million seeds.  |
| <b>Roots</b>                  | Dense and fibrous.  |
| <b>Association</b>            | Cereals, wheat, mustard, rape, lentil, flax, pulse, forage and oilseed crops.   |
| <b>Dispersal</b>              | Seeds lack pappus or other morphological adaptations for long distance dispersal but can spread by wind, water, and drifting snow. Seeds are transported with vehicles, contaminated forage, and grain and grass seed.  |
| <b>Impact on introduction</b> | Scentless false mayweed seedlings can form very dense stands upon emerging in the spring, thereby reducing seedling growth among other species. Cereal, pulse, forage and oilseed crops can all be affected. May reduce yields in hay fields, pastures, grain fields, and other crops by forming dense stands. It is likely to alter soil moisture and nutrient availability for other species. It can form near mono cultures around ponds, streams, and other frequently flooded areas, as it can germinate in flooding conditions. This plant is unpalatable to animals, and thus reduces the quality of forage sites in dense stands. It can cause skin rashes and blistering of livestock and wild animal's muzzles. |

## 23. *Polygonum cuspidatum* Sieb. & Zucc.

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Fallopia japonica</i> (Houtt.) Dcne.;<br><i>Pleuropteris cuspidatus</i> (Sieb. & Zucc.) Moldenke;<br><i>Pleuropteris zucarinii</i> (Small) Small;<br><i>Polygonum cuspidatum</i> Sieb. & Zucc var.<br><i>compactum</i> (Hook f.) Bailey;<br><i>Polygonum zucannll</i> Small;<br><i>Reynoutria japonica</i> Houtt  | <b>Plant habit during flowering</b><br><br>(a) Flowering branch |
| <b>Common names</b>                | Japanese bamboo, Japanese knotweed, Mexican bamboo, Japanese fleece flower, Sally rhubarb, donkey rhubarb, gypsy rhubarb, Hancock's curse, wild rhubarb, crimson beauty, German sausage and pea-shooter plant.   | <br>(b) Seeds  |
| <b>Family</b>                      | Polygonaceae   |   |
| <b>Group</b>                       | Dicot  |   |
| <b>Habit</b>                       | Semi-woody perennial shrub   |   |
| <b>Habitat</b>                     | Waste places, neglected gardens, roadsides, and along streambanks  |   |
| <b>Origin</b>                      | Japan  |   |
| <b>Distribution</b>                | China, Georgia (Republic of), Japan, Korea, DPR, Korea, Republic of, Taiwan, Canada, USA, Chile, Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, UK, Australia, New Zealand. |   |
| <b>Identifying characteristics</b> | Japanese knotweed can grow to a height of 13 feet, and the broad, egg shaped leaves and stems that resemble bamboo are some of the key features of this plant. Dioecious.  |   |
| <b>Leaves</b>                      | Leathery, broadly ovate, petiolate, truncate to cuneate at base, 5-15 cm long and 5-12 cm broad, alternate with prominent basal angle.   |   |
| <b>Stem</b>                        | Stout, erect, 1-3 m high, hollow, reddish-brown, glaucous, often mottled, jointed forming dense clumps resembling bamboo. A thin membranous sheath (ocrea) encircles the stem at each joint.   |   |
| <b>Flowers</b>                     | Small, greenish white in axillary panicle clusters (4 to 5 inches long). Outer sepals narrowly winged along the midrib, styles 3 with minute stigma. Fruiting calyx wing-angled, 8-9 mm long.  |   |
| <b>Flowering period</b>            | August to October.   |   |

|                               |   |
|-------------------------------|---|
| <b>Fruit</b>                  | Fruits with sepals 2-8 mm long. Sepals narrowly winged. Achenes shiny (dark) brown, 2-4 mm long.  |
| <b>Seeds</b>                  | Seeds are triangular achenes with 3-mm long nutlets.  |
| <b>Roots</b>                  | Rhizomes those are capable of producing new plants, often result in thick colonies of this species.   |
| <b>Association</b>            | <i>Artemisia vulgaris, Galium aparine, Heracleum sphondylium, Rubus fruticosus, Rumex obtusifolius, Impatiens glandulifera, Sambucus nigra, Acer pseudoplatanus, Calystegia sepium, Chamerion angustifolium, Rubus fruticosus, Rubus idaeus, Solanum dulcamara, Tamus communis, Tanacetum vulgare, Cerastium fontanum, Cirsium arvense, Dactylis glomerata, Potentilla anserina, Ranunculus repens, Rumex crispus, Senecio jacobaea, Sonchus arvensis, Urtica dioica.</i> |
| <b>Dispersal</b>              | A Japanese knotweed rhizome can extend up to 30 feet from the parent plant, and small fragments can give rise to new colonies by being moved mechanically or by moving water. Although vegetative reproduction appears to be the most common means of spread, it can also spread by seed.   |
| <b>Impact on introduction</b> | It may clog canals, streams, rivers, lakes and ponds and lower the quality of habitat for wildlife and fish. The dried biomass acts as a potential fire hazard. It spreads quickly to form dense thickets that exclude native vegetation and greatly alter natural ecosystems. It poses a significant threat to riparian areas, where it can survive severe floods and is able to rapidly colonize scoured shores and islands.  |

## 24. *Proboscidea louisianica* (P. Mill.) Thellung

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Proboscidea Louisiana</i> (Wooton. & S tandl.),<br><i>Martynia louisiana</i> (Miller.),<br><i>Martynia proboscidea</i> ,<br><i>Proboscidea jussieui</i>   | <b>Plant habit during flowering</b><br> |
| <b>Common names</b>                | Ram's horn, unicorn plant, martynia, devil's claw; common devil's claw; common unicorn plant, pale devil's claw, purple flower devil's claw, elephant tusks, goat head and aphid trap.   |   |
| <b>Family</b>                      | Pedaliaceae  |   |
| <b>Group</b>                       | Dicot  |   |
| <b>Habit</b>                       | Annual herb  |   |
| <b>Habitat</b>                     | Moist soils, river banks, cultivated fields and waste places   |   |
| <b>Origin</b>                      | USA  |   |
| <b>Distribution</b>                | Australia, USA, Mexico, New Zealand, Portugal, Russia  |   |
| <b>Identifying characteristics</b> | The plant is an annual, up to 2-3 feet in height, with large, 4 to 12 inch wide, round, slightly pointed leaves.   | <br>(b) Seeds                         |
| <b>Leaves</b>                      | Leaves are round to heart to kidney shaped, with wavy margins, opposite alternate above, simple, 1 to 7 inches long and 1 to 8 inches wide. The margins are shallow-toothed to entire and the tips are usually rounded.                                |   |
| <b>Flowers</b>                     | The flowers are showy, gloxinia-like, 1-2 inches long, 1.5 inch wide, with 5 lobes, yellow-orange nectar guides, and spotted upper lobes. Pinkish white, funnel-shaped, with yellow lines and purple or red spots on the inside surface of the throat. |   |
| <b>Stem</b>                        | Erect or occasionally decumbent, thick, much branched, covered with sticky, glandular hairs. The stem and leaves have an unpleasant odor.  |   |
| <b>Flowering period</b>            | July-October.  |   |
| <b>Fruit</b>                       | Fruit is a two-valved cucumber-like capsule, 2-horned, hairy, woody, curved and beaked. Capsule 1 inch thick and 4-6 inches long at maturity. The pods become very hard when dried. The beak splits at maturity into two claws.                        |   |
| <b>Seeds</b>                       | Many, 7-9 mm, angled, generally black, corky.  |   |

|                               |   |
|-------------------------------|---|
| <b>Roots</b>                  | Tap root system.  |
| <b>Propagation</b>            | Seed, soft wood cuttings.   |
| <b>Association</b>            | Vegetable crops, cotton, sorghum.   |
| <b>Dispersal</b>              | These fruits are easily caught on the legs of deer, rabbits, and cattle or hooked in the wool of sheep by their spreading claws (thus the name devils claw).  |
| <b>Impact on introduction</b> | The plant can be weedy, easily taking hold in disturbed habitat types and displaying a “preference for waste places”. It occurs in pastures, cultivated fields, and feedlots. It is a weed of cotton crops known to cause drastic loss of fiber yields. Its strong essential oil appears to have an allelopathic effect on cotton plants, causing necrosis of the foliage. May become troublesome in vegetable crops. |

## 25. *Salsola vermiculata* L.

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Salsola vermiculata</i> ssp. <i>tenuifolia</i> (Boissier)<br>Botsch.,<br><i>Salsola rigida</i> Pallas var. <i>tenuifolia</i> Boissier   | <b>Plant habit during flowering</b><br><br>(a) Flowering branch |
| <b>Common names</b>                | Shrubby rabica thistle, rabicaanean saltwort, worm leaf salsola, worm leaf saltwort  |   |
| <b>Family</b>                      | Chenopodiaceae   |   |
| <b>Group</b>                       | Dicot  |   |
| <b>Habit</b>                       | Perennial shrub  |   |
| <b>Habitat</b>                     | Disturbed sites, rocky slopes, flats, clay soils, saline soils, sandy arid regions   |   |
| <b>Origin</b>                      | Italy, Portugal and Spain  |   |
| <b>Distribution</b>                | Israel, Jordan, Lebanon, Pakistan, Qatar, Saudi Arabia, Syria, Algeria, Egypt, Libya, Morocco, Spain, Tunisia, USA, Italy, Portugal, Spain   |   |
| <b>Identifying characteristics</b> | Shrubby perennial to about 1 m tall, with inconspicuous flowers and fruits.  | <br>(b) Seeds  |
| <b>Seedling</b>                    | Cotyledons linear, fleshy, green. Subsequent foliage usually densely covered with minute hairs.  |   |
| <b>Leaves</b>                      | Alternate, simple, 3-9 mm long & oblong to ovate, with rounded tips. Foliage typically covered with minute hairs, but sometimes becoming glabrous at maturity.   |   |
| <b>Stem</b>                        | Stems slender, straight, ascending to erect, woody at the base, branched throughout.   |   |
| <b>Flowers</b>                     | Solitary (rarely 2 or 3) in leaf axils at stem tips, small, bracts 1-2, leaf-like. Sepals often pinkish and sparsely covered with minute hairs, especially at the apex, with fan-shaped wings 2 mm long, calyx (sepals as a unit) 2-3 mm long, petals lacking, stamens 5, pistil 1 with two styles.  |   |
| <b>Flowering period</b>            | July-October.  |   |
| <b>Fruit</b>                       | Utricle attached perianth segments are 6-12 mm wide, 1.0-3.0 mm thick, greenish to gray, surrounded by persistent sepals, 7-12 mm in diameter (including sepal wings), wings broad, extending laterally, with fine, light colored veins; wings usually straw-colored to light brown hemispherical, smooth, hardened, often glossy, with a distinct scar. Pericarp surface waxy looking, straw colored to orange-yellow, mostly concealing dark brown embryo. |   |

|                               |  |
|-------------------------------|--|
| <b>Seeds</b>                  | The seeds are more or less round, 2.5 mm slightly flattened, with a transparent membranous seed coat (pericarp) and visible coiled embryo.   |
| <b>Roots</b>                  | Deep taproot and woody root crown that is able to produce many adventitious buds at the soil surface.  |
| <b>Association</b>            | Fodder shrubs <i>viz.</i> , <i>Reaumuria negevensis</i> , <i>R. hirtella</i> , <i>Atriplex glauca</i> , <i>Bassia rabica</i> , <i>Gymnocarpos decandrus</i> , <i>Lycium intricatum</i> , <i>Launaea arborescens</i> , <i>Chenoleoides tomentosa</i> , <i>Opuntia</i> spp. and <i>Australian acacia</i> . |
| <b>Dispersal</b>              | The seed retain their calyx (bracts) and as they are small can easily be spread long distances by wind. If eaten by animals, seeds might pass through the digestive tract undigested due to their small size.  |
| <b>Impact on introduction</b> | May prove strongly competitive in semiarid areas. This weed may affect the dry land cropping systems, rangelands and waste areas. The plant is known to act as alternate host for a virus that causes curly top in sugar beet, tomatoes and melons.  |

## 26. *Senecio jacobaea* L.

|                                    |   |  |
|------------------------------------|---|--|
| <b>Synonyms</b>                    | <i>Senecio jacobaea</i> L.  | <b>Plant habit during flowering</b>  |
| <b>Common names</b>                | Stinking willie, St. James-wort, ragweed, stinking nanny, stagger wort, dog standard, canker wort, stammer wort, tansy ragwort, tansy butter weed   |  |
| <b>Family</b>                      | Asteraceae  | (a) Flowering branch   |
| <b>Group</b>                       | Dicot   |  |
| <b>Habit</b>                       | Biennial or short -lived perennial herb   | (b) Seeds  |
| <b>Habitat</b>                     | Dry soil in agricultural fields, roadsides, waste grounds, pastures, gardens  |  |
| <b>Origin</b>                      | Europe and Western Asia   |  |
| <b>Distribution</b>                | Armenia, Azerbaijan, China, Georgia (Republic of), Japan, Kazakhstan, Kyrgyzstan, Lebanon, Mongolia, Syria, Tajikistan, Turkey, Turkmenistan, Uzbekistan, Algeria, Canada, Saint Pierre and Miquelon, USA, Trinidad and Tobago, Brazil, Uruguay, Albania, Andorra, Austria, Belarus, Belgium, Bosnia-Hercegovina, Bulgaria, Croatia, Czech Republic, Czechoslovakia (former), Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Moldova, Netherlands, Norway, Poland, Portugal, Romania, Russia Federation, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, UK, Ukraine, Yugoslavia (former), Australia, New Zealand. |  |
| <b>Identifying characteristics</b> | A bushy, toxic plant growing 0.3 to 1.2 m tall, furrowed stem, with many deeply-cut leaves, giving it a ragged appearance. A single plant can produce 150,000 seeds, which can remain viable for over 20 years.   |  |
| <b>Seedling</b>                    | Cotyledons oval, - 3 mm long, with tips truncate or slightly indented. Bases rounded-wedge-shaped. First leaves oval with wavy margins, 6-8 mm long, sometimes with a few glandular hairs.  |  |
| <b>Leaves</b>                      | Deep, glossy, green leaves irregularly divided and toothed. Leaves deeply 1- or 2-pinnately dissected, mostly 0.4 to 2.3 diameter long and 2-11 cm wide. Lower leaves petioled, deciduous. Upper most leaves sessile.   |  |
| <b>Stem</b>                        | Erect, coarse, hard, solitary or branched from the crown, glabrous, 1.2 m tall.   |  |
| <b>Flowering period</b>            | July –August.   |  |

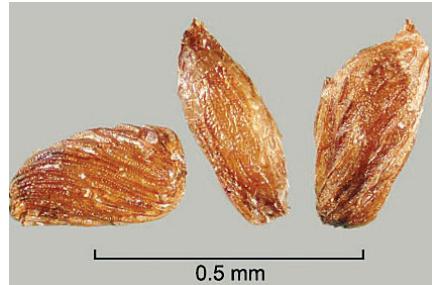
|                    |  |
|--------------------|--|
| <b>Flowers</b>     | Arranged in large, flat-topped bunches (corymbs), the disc 5-10mm wide, involucre, 4mm high with 13 bracts. Ray florets 4-10 mm long, with naked receptacle, pappus capillary, toothed at the outer edge. The flowers are bright yellow, daisy-like, and grouped in flat-topped clusters.  |
| <b>Fruit</b>       | Achene; minutely pubescent.  |
| <b>Seeds</b>       | Seeds of outer (ray) florets are hairless and are normally 2mm long, while those from the inner (disc) florets have fine bristles up to 5mm in length.   |
| <b>Roots</b>       | Crown or short taproot produces many spreading fleshy roots 15 cm long, with numerous, deeper secondary fibrous roots.   |
| <b>Association</b> | Clover and other pastures.   |
| <b>Dispersal</b>   | Achenes are wind-dispersed. Humans and animals also transport achenes. The movement of livestock, and survival of achenes in faeces, is likely to aid dispersal. Movement of hay is also likely to spread the achenes.   |
| <b>Impact</b>      | A potential weed causing environmental deterioration and competes with forage crops. In most introduced regions, <i>Senecio jacobaea</i> is considered to be an agricultural pest. It contains a highly potent pyrrolizidine alkaloid which is severely toxic to livestock, especially cattle and horses and to a lesser extent, sheep. Also, <i>S. jacobaea</i> is known to invade disturbed native forests and woodlands, where it threatens biodiversity. Its high mortality rate after flowering leaves open bare patches on the pasture, allowing invasion of other noxious weeds which may further disrupt the ecological balance. |

## 27. *Solanum carolinense* L.

|                                    |  |   |
|------------------------------------|--|---|
| <b>Common names</b>                | Horse nettle, Carolina horse nettle, bull nettle, sand briar, apple of sodom, devil's tomato, ball nightshade.   | <b>Plant habit during flowering</b>   |
| <b>Family</b>                      | Solanaceae   |   |
| <b>Group</b>                       | Dicot  |   |
| <b>Habit</b>                       | Perennial shrub  |   |
| <b>Habitat</b>                     | Fields, fencerows, gardens, waste ground, disturbed sites, pastures, roadsides, rail roads, sandy and well-drained soils.  |   |
| <b>Origin</b>                      | USA  |   |
| <b>Distribution</b>                | Bangladesh, China, Georgia (Republic of), Japan, Korea, Republic of, Nepal, Canada, USA, Haiti, Brazil, Croatia, Italy, Netherlands, Norway, Australia.  |  |
| <b>Identifying characteristics</b> | Stems and leaves with prickles and star-shaped hairs. All parts of the plant, except the mature fruit, are poisonous to livestock.   | (b) Seeds   |
| <b>Seedling</b>                    | Cotyledons oblong, glossy green above, light green below with short and stiff hairs on the margins. Hypocotyl is purple tinged.  |   |
| <b>Leaves</b>                      | Simple, alternate, elliptic oblong to oval, petioled, 2 1/2-4 1/2 inches long and covered on both surfaces with star-shaped hairs. Leaves also emit a potato odor when crushed, and contain prominent prickles (6-12 mm long) on the mid vein and petiole.   |   |
| <b>Stem</b>                        | Erect, up to 1m tall, greenish to purple, angled at the nodes, become woody with age, and have prickles and stellate hairs.  |   |
| <b>Flowers</b>                     | Inflorescence axillary racemes (sometimes branching) compact in flower but quickly elongating in fruit to +/-20cm long. Occur in clusters on prickly flower stalks and are star-shaped with 5 white to violet petals and a yellow cone-shaped center, which is actually 5 stamens with yellow anthers. |   |
| <b>Flowering period</b>            | May – October.   |   |
| <b>Fruit</b>                       | A berry, 1/2-3/4 inches in diameter, globose, green when immature turning orange-yellow and wrinkled with maturity. A single berry may contain from 40 to 120 seeds.   |   |

|                               |  |
|-------------------------------|--|
| <b>Seeds</b>                  | The seeds are obovate, flattened and slightly granulose. They are about 2-3 mm diameter and 0.5 mm thick. The mature seeds are pale to dark yellow, light brown or orange.   |
| <b>Roots</b>                  | Deep, spreading rhizomes.  |
| <b>Association</b>            | Brinjal, maize, soybean.   |
| <b>Dispersal</b>              | <i>S. carolinense</i> is disseminated by seeds, roots and root cuttings. The seeds can maintain viability even after passing through the digestive tract of cattle, horses, pigs or sheep. The berries may be eaten by farm animals and the seeds subsequently scattered over large areas in animal droppings. Tillage of fields infested with <i>S. carolinense</i> promotes the dissemination of the plant by cutting the roots and dragging them elsewhere. Harvesting operations may transport mature berries to other places, which also encourages dissemination.  |
| <b>Impact on introduction</b> | <i>S. carolinense</i> is a troublesome weed in pastures and in field crops such as maize and groundnuts in the USA, Canada and Japan. It is also a problem in vegetable fields, orchards and tree nursery stock. The plant causes yield losses due to its competition with crops. The presence of <i>S. carolinense</i> fruits in groundnut harvests affects the grade or quality assigned to the groundnuts. <i>S. carolinense</i> is also an important alternate host for insect pests such as the Colorado potato beetle and the pepper maggot. It is also host for the potato psyllid, which transmits psyllid yellow disease to potatoes and tomatoes, tomato leafspot fungus and several viruses. <i>S. carolinense</i> contains solanin and is poisonous to cattle, horses and sheep when ingested. |

## 28. *Striga hermonthica* (Del.) Benth

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Buchnera hermontheca</i> Del.<br><i>Striga hermontheca</i> (Del.) Benth.<br><i>Striga senegalensis</i> Benth.   | <b>Plant habit during flowering</b><br><br>(a) Flowering branch |
| <b>Common names</b>                | Witchweed, Purple<br>witchweed, Shriga   |   |
| <b>Family</b>                      | Scrophulariaceae   |   |
| <b>Group</b>                       | Dicot  |   |
| <b>Habit</b>                       | Parasitic annual herb  |   |
| <b>Habitat</b>                     | Degraded soils, areas of low soil fertility.   |   |
| <b>Origin</b>                      | Native of Madagascar.  |   |
| <b>Distribution</b>                | Cambodia, Saudi Arabia, Yemen, Angola, Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Congo, Congo Democratic Republic, Côte d'Ivoire, Egypt, Eritrea, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Madagascar, Malawi, Mali, Mauritania, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe.  | <br>(b) Seeds  |
| <b>Identifying characteristics</b> | <i>Striga hermonthica</i> normally parasitize sorghum plants. In some cases it was reported on pearl millet as well. <i>S. hermonthica</i> is usually larger than the other <i>Striga</i> species. Emerge 2-3 weeks around the plants of the field crop that has been planted.   |   |
| <b>Leaves</b>                      | Leaves are rather thick, 6-9 x 1.1-1.5 cm, both surfaces scabrous, margins with hispid hairs at regular intervals.   |   |
| <b>Stem</b>                        | Stem quadrangular with groove on each face, yellowish green with rough hairs.  |   |
| <b>Flowers</b>                     | Pale red, but vary considerably from red or pink to white  |   |
| <b>Fruit</b>                       | Loculicidal capsule, which contains 400-500 seeds and a single plant, may produce 20,000 seeds.  |   |
| <b>Seeds</b>                       | Seeds are tiny dust-like seeds in a pod and are elliptic, ovate, oblong, occasionally D-shaped, triangular, rhombic, or irregular; often twisted or angled from crowding or position in capsule; 0.2-0.6 mm long, 0.1-0.3 wide and thick. Orange to golden brown, light to dark brown, or grey to blackish. Surface glabrous, with prominent often ropelike longitudinal or diagonal reticulations that sometimes appear as closely spaced ridges rather than reticulations and are often twisted in appearance. |   |

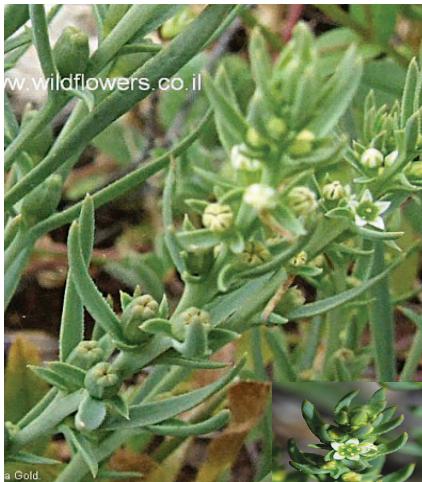
|                               |   |
|-------------------------------|---|
| <b>Roots</b>                  | Parasitic by nature, <i>Striga</i> compensates for the lack of its own root system by penetrating the roots of other plants, diverting essential nutrients from them, and stunting their growth.  |
| <b>Association</b>            | Sorghum, pearl millet, finger millet, maize, rice, wheat, and sugar cane, cowpeas, sunflower, soybean, groundnut, tobacco, beans and several grass weeds.   |
| <b>Dispersal</b>              | The small seeds are wind dispersed, can be moved with runoff following heavy rains, on the feet of man and livestock, on farm implements and in animal faeces following their ingestion of the seed.  |
| <b>Impact on introduction</b> | <i>Striga hermonthica</i> is the largest and most destructive among the <i>Striga</i> species. It can parasitize important agricultural crops such as corn, sorghum, millets and maize. The host plant's nutrients are depleted and energy is spent supporting the parasitic <i>Striga</i> . Infestations of witch weed reduce yields and contaminate crops. Damage is particularly severe under conditions of low rainfall and poor soil fertility. It may affect cereals productivity in India with expected yield losses around 30-90%. Cash crops such as tobacco and sugarcane would also be affected. |

## 29. *Thesium australe* R. Br

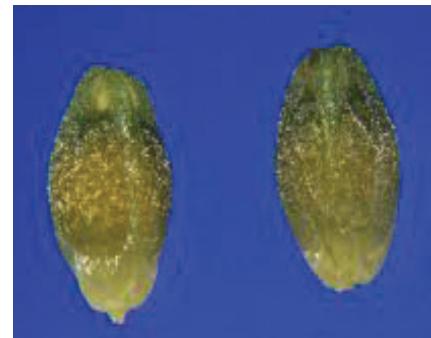
|                                    |  |   |
|------------------------------------|--|---|
| <b>Common names</b>                | Austral toadflax   | <b>Plant habit during flowering</b><br><br>(a) Flowering branch |
| <b>Family</b>                      | Santalaceae  |   |
| <b>Group</b>                       | Monocot  |   |
| <b>Habit</b>                       | Perennial parasitic herb   |   |
| <b>Habitat</b>                     | Grassland or grassy woodland, damp sites   |   |
| <b>Origin</b>                      | Mediterranean region   |   |
| <b>Distribution</b>                | Africa, Australia, eastern Asia, Spain and USA. Within Australia, it is listed as endangered in Victoria, vulnerable in New South Wales & Queensland, likely extinct in Tasmania and threatened in Victoria.   |   |
| <b>Identifying characteristics</b> | A small, short lived, straggling root parasite that takes water and nutrients from other plants. It grows up to 40 cm tall and is palatable to stock and native animals.   |   |
| <b>Leaves</b>                      | Alternate, Leaves are pale green to yellow-green, narrow and linear in shape somewhat succulent, 1- 4 cm long and 0.5 -1.5 mm wide.  |   |
| <b>Stem</b>                        | Small, hairless, straggling perennial herb, 40 cm tall with only a few yellow-green wiry stems that radiate from a central rootstock.  |   |
| <b>Flowers</b>                     | Flowers are minute and white to greenish-yellow, cylindrical, five-lobed, 2 narrow bracts (leaf-like structures) at the base and are solitary or on short stalks that arise from the axils. The flowers have both male and female parts and are approximately 2 mm long. |   |
| <b>Fruit</b>                       | Fruit ± globose, 2–2.5 mm diam., reticulate-striate, ± glaucescent, crowned with persistent tepals.  |   |
| <b>Seeds</b>                       | The seed can remain dormant for at least a year and may be stimulated to mass germination after fire.  |   |
| <b>Roots</b>                       | Haustorial root system   |   |
| <b>Association</b>                 | Barley, sugarcane, Kangaroo grass ( <i>Themeda australis</i> ), pea bush ( <i>Pultenaea</i> sp.), bitou bush ( <i>Banksia integrifolia</i> ), coastal wattle ( <i>Acacia sophorae</i> ), <i>Stemmacantha australis</i> and other grasses.                                |   |
| <b>Dispersal</b>                   | Human activities, animals and agricultural practices aid in dispersal.   |   |
| <b>Impact on introduction</b>      | It may cause loss and degradation of habitat and/or populations for residential infrastructure and agricultural developments by intensification of grazing regimes, invasion of weeds, developmental activities (widening or re-routing of roads) etc.                   |   |

## 30. *Thesium humile* Vahl.

|                                    |  |
|------------------------------------|--|
| <b>Synonyms</b>                    | <i>Thesium dollineri</i>   |
| <b>Common names</b>                | Dwarf thesium  |
| <b>Family</b>                      | Santalaceae  |
| <b>Group</b>                       | Dicot  |
| <b>Habit</b>                       | Herb non-succulent   |
| <b>Habitat</b>                     | Herbaceous plant communities of the Mediterranean territory, root semi-parasite  |
| <b>Origin</b>                      | Mediterranean region   |
| <b>Distribution</b>                | Africa, Australia, Czechoslovakia, France, Egypt, Greece, Israel, Jordan, Portugal, Spain, Turkey and USA                                    |
| <b>Identifying characteristics</b> | <i>Thesium humile</i> Vahl (Santalaceae) is a root-hemiparasite which causes economic losses in cereal crops in the Mediterranean countries. |
| <b>Leaves</b>                      | Alternate, entire, smooth.   |
| <b>Flowers</b>                     | Green  |
| <b>Flowering Period</b>            | February, March, April, May  |
| <b>Roots</b>                       | Haustoria  |
| <b>Association</b>                 | Wheat, Barley, Onion, Sugarcane  |
| <b>Impact on introduction</b>      | <i>Thesium humile</i> Vahl., causes damage in cereal crops in Mediterranean countries.   |



(a) Flowering branch



(b) Seeds

## 31. *Viola arvensis* Murr.

|                                    |   |                                     |
|------------------------------------|---|-------------------------------------|
| <b>Synonyms</b>                    | <i>Viola tricolor</i> L. var. <i>arvensis</i> (Murr.) Boiss.  | <b>Plant habit during flowering</b> |
| <b>Common names</b>                | Field violet, wild pansy; European field pansy  |                                     |
| <b>Family</b>                      | Violaceae   |                                     |
| <b>Group</b>                       | Dicot   |                                     |
| <b>Habit</b>                       | Annual herb   |                                     |
| <b>Habitat</b>                     | Fields, roadsides, nurseries and gardens.   |                                     |
| <b>Origin</b>                      | Europe  |                                     |
| <b>Distribution</b>                | Canada, USA, Belgium, Finland, Norway, Poland, Switzerland, UK.   |                                     |
| <b>Identifying characteristics</b> | Plant of 4 to 12 inches in height and has attractive yellow and purple flowers. Hairy leaves along the veins with round teeth on the margin, and the typical violet-like flowers.   |                                     |
| <b>Seedling</b>                    | Cotyledons are partially round and oval with a short stem, 3 to 5 mm long and 3 to 4 mm wide, and occur on petioles. Subsequent leaves occur alternately but develop as a basal rosette. The first true leaves and subsequent leaves are oval to spatula-shaped with rounded teeth along the margins.   |                                     |
| <b>Leaves</b>                      | Alternate, ovate- lanceolate with notched margins. Basal leaves are approximately 3/4 to 11/2 inches long and almost as wide. Leaves are mostly without hairs except for along the veins on the leaf undersides Upper leaves linear, ranging from 3/4 to 3 inches long and about 1/2 inch wide. Stipules occur at the base of the leaf petioles in the upper portions of the flowering stern, and these stipules are divided into 5 to 9 linear segments. |                                     |
| <b>Stem</b>                        | Upright, reaching as much as 12 inches in height, branched or unbranched, smooth or pubescent.  |                                     |
| <b>Flowers</b>                     | Petals-5, white to yellow in color, usually with some purple markings or purple tinges. Individual flowers are typically 1/2 inch in length and width with one larger petal below four smaller; long stalked, axillary.   |                                     |
| <b>Flowering period</b>            | April to September.   |                                     |
| <b>Fruit</b>                       | A round glabrous, tripartite capsule approximately 5 to 10 mm long.   |                                     |
| <b>Seeds</b>                       | Seeds are obovate, slightly squeezed, strongly sharpened at the base, from yellow to tan-colored, with dark-brown seed suture, glossy, more rare dull, with fine-wrinkled surface, 1.5-1.8 mm in length.  |                                     |
| <b>Roots</b>                       | Fibrous root system.  |                                     |
| <b>Association</b>                 | Wheat, maize, other cereals, small millets, soybean, canola and pastures.   |                                     |
| <b>Impact on introduction</b>      | The weed may reduce crop yields and become a potential threat to native plant biodiversity.   |                                     |



(a) Flowering branch



(b) Seeds

## 32. *Alectra vogelii* Benth.

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Alextra angustifolia</i> Engl.<br><i>Alextra merkeri</i> Engl.<br><i>Alextra scharensis</i> Engl.   | <b>Plant habit during flowering</b><br> |
| <b>Common names</b>                | Cowpea witchweed, Vogel alectra  |   |
| <b>Family</b>                      | Scrophulariaceae   |   |
| <b>Group</b>                       | Monocot  |   |
| <b>Habit</b>                       | Annual   |   |
| <b>Habitat</b>                     | leguminous crops   |   |
| <b>Origin</b>                      | West Africa  |   |
| <b>Distribution</b>                | Angola, Botswana, Burkina Faso, Cameroon, Congo Democratic Republic, Ethiopia, Ghana, Guinea, Kenya, Malawi, Mali, Mozambique, Namibia, Nigeria, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Uganda, Zambia, Zimbabwe  |   |
| <b>Identifying characteristics</b> | As flowering specimens are very leafy and with a similar habit to many free-living plants, people who are not familiar with root hemi-parasites are unlikely to recognize that <i>A. vogelii</i> is indeed parasitic. Below ground, bright orange stems are attached to host roots by a spherical haustorium up to 2 cm in diameter.   |                                        |
| <b>Leaves</b>                      | Leaves, which can be 1.5 to 3.5 cm long by 0.3 to 1.5 cm wide, are conspicuously hairy. Leaf shape, particularly the nature and extent of toothing along the edge of the lamina, varies considerably.  |   |
| <b>Stem</b>                        | Plants grow to 30-45 cm tall, often as a single stem but sometimes branching from near soil level.   |   |
| <b>Flowers</b>                     | Flowers appear singly on a short stem in the axils of upper leaves or bracts. Up to 10 flowers may open on one day. The flower buds are enclosed in a densely hairy calyx whose five lobes each have a triangular tip with an obtuse apex. The tubular corolla is formed of five petals fused towards the base, so that the flower is bell-shaped when open. The corolla is 0.6 to 1 cm in diameter and somewhat longer than the calyx. The petals are pale yellow and may or may not have three deep red veins. |   |
| <b>Fruit</b>                       | The flowers wither and remain covering the developing globose seed capsule which swells to approximately 5 mm in diameter at maturity.   |   |

|                               |  |
|-------------------------------|--|
| <b>Seeds</b>                  | The dust-like seeds have a complex structure. An outer cell layer of the testa is modified into a cone or a ‘trumpet-like’ structure about 1 mm long within which the ‘kernel’ of the seed, measuring about 0.15 mm by 0.25 mm, is suspended. The surface of the seed coat is covered in indentations. |
| <b>Roots</b>                  | Below ground, bright orange stems are attached to host roots by a spherical haustorium up to 2 cm in diameter. This is composed of a mass of host and parasite tissue and the orange adventitious roots of the parasite.   |
| <b>Association</b>            | Annual parasitic weed of legume crops, particularly cowpea, groundnut and soybean, in semi-arid areas of East, West, Central and Southern Africa. It is closely associated with cultivation, is occasionally found associated with weeds of fallows but rarely in natural vegetation.                  |
| <b>Dispersal</b>              | Seeds are dispersed by water and wind. Seeds of the parasite may contaminate grain legume seeds during threshing and transported to markets or neighboring farms during local sales.   |
| <b>Impact on introduction</b> | <i>A. vogelii</i> infestation causes severe yield losses, especially in grain legumes, through delayed flowering, a reduced number of flowers and pods.  |

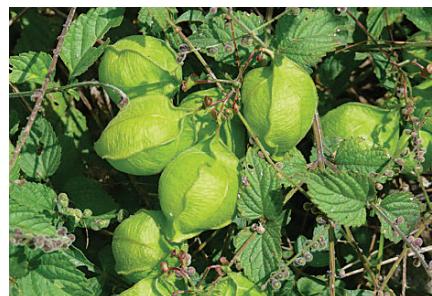
### 33. *Amaranthus blitoides* S. Wats.

|                                    |   |   |
|------------------------------------|---|---|
| <b>Synonyms</b>                    | <i>Amaranthus graecizans</i> L.   | <b>Plant habit during flowering</b><br><br>(a) Flowering branch |
| <b>Common names</b>                | Spreading amaranth, Prostrate pigweed, Amarante blite   |   |
| <b>Family</b>                      | Amaranthaceae   |   |
| <b>Group</b>                       | Dicot   |   |
| <b>Habit</b>                       | Annual herb   |   |
| <b>Habitat</b>                     | Agricultural weed, casual alien, cultivation escape, naturalized & noxious weed.  |   |
| <b>Origin</b>                      | S. America, N. America – Canada, U.S  |   |
| <b>Distribution</b>                | Iran, Iraq, Israel, Jordan, Lebanon, Morocco, South Africa, Canada, Mexico, USA, Albania, Austria, Bulgaria, Czechoslovakia (former), France, Germany, Greece, Hungary, Italy, Netherlands, Poland, Portugal, Romania, Russian Federation, Spain, Australia, New Zealand. |   |
| <b>Identifying characteristics</b> | A generally prostrate weed, very similar to <i>A. graecizans</i> , but differing from that species in having five perianth segments, not three.   |   |
| <b>Leaves</b>                      | Leaves 1.5-3 cm, oblong-lanceolate to obovate-spathulate, obtuse, with distinct membranous margin.  |   |
| <b>Stem</b>                        | Stems are 10-70 cm long, branched, prostrate to decumbent, glabrescent.   |   |
| <b>Flowers</b>                     | The inflorescences are dense axillary cymes. The bracteoles are foliaceous shorter than the flowers. Tepals 4-5, unequal, oblong to elliptic. Stamens 3. Stigma 3, recurved.  |   |
| <b>Flowering period</b>            | Early summer to fall.   |   |
| <b>Fruit</b>                       | Fruit circumscissile, 2–2.2 mm long, smooth or weakly wrinkled above the dehiscence line, globose to obovoidal, longer than the tepals. Fruit dehiscing transversely. $2n=32$ .   |   |
| <b>Seeds</b>                       | Black, lenticular to broadly plumply lenticular, 1.3-1.6 mm diam., shiny and ovoid.   |   |
| <b>Roots</b>                       | The root system consists of a stout taproot and may reach 50 cm in depth and spread horizontally for 120 cm.  |   |
| <b>Association</b>                 | Sugar beet, Tomato, Capsicum.   |   |
| <b>Dispersal</b>                   | Pigweed seeds are dispersed to new locations by irrigation or flood water, manure, and soil clinging to footwear, tractor tires, or tillage tools. In addition, tumble pigweed actively disperses seeds when mature plants break off and move with the wind.              |   |
| <b>Impact on introduction</b>      | Recorded as a significant weed in a wide range of crops in the USA, Europe and the Middle East. Yields of Capsicum peppers were reported to be reduced by 33%.  |   |

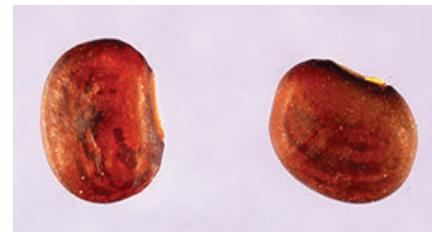


(b) Seeds

## 34. *Cardiospermum halicacabum* L.

|                                    |   |   |
|------------------------------------|---|---|
| <b>Synonyms</b>                    | <i>Cardiospermum inflatum</i><br><i>Corindum halicacabum</i><br><i>Cardiospermum corycodes</i><br><i>Cardiospermum glabrum</i><br><i>Cardiospermum halicacabum</i> var. <i>arabicum</i> | <b>Plant habit during flowering</b><br> |
| <b>Common names</b>                | Balloon Vine, Balloonvine, Balloonvine Heartseed, Heart-Pea, Heartseed, Lesser Balloonvine, Love in a Puff, Winter-Cherry   | (a) Flowering branch  |
| <b>Family</b>                      | Sapindaceae   |   |
| <b>Group</b>                       | Dicot   |   |
| <b>Habit</b>                       | Perennial   |   |
| <b>Habitat</b>                     | Forest margins , shrublands, grasslands, cultivated areas, wastelands.  |   |
| <b>Origin</b>                      | Bermudas, Florida and Texas.  | <br>(b) Seeds                           |
| <b>Distribution</b>                | India, Indonesia, Malaysia, Myanmar, Philippines, Vietnam, Cuba.  |   |
| <b>Identifying characteristics</b> | The plant climb with tendrils and needs some form of support.   |   |
| <b>Leaves</b>                      | The leaves are alternate on the stem, compound, and comprised of 9 serrate leaflets. Leaves are trifoliate, up to 4 inches long, with highly lobed leaflets.                            |   |
| <b>Stem</b>                        | Stems and branches green, 5- or 6-sulcate, slender, glabrous or sparsely hairy.   |   |
| <b>Flowers</b>                     | The small white flowers about 4mm long bloom from summer through fall, flowers are not very showy.  |   |
| <b>Flowering period</b>            | June, July, August, September.  |   |
| <b>Fruit</b>                       | An “inflated, green, papery capsule”, with 3 chambers, 3-4.5 cm in diameter.  |   |
| <b>Seeds</b>                       | Black, opaque, smooth with a white, finely porous heart shaped spot at the micropyle. Measures 5mm in diameter. Seeds ripen from August to October.                                     |   |

## 35. *Centrosema pubescens* Benth.

|                                    |   |   |
|------------------------------------|---|---|
| <b>Synonyms</b>                    | <i>Bradburya pubescens</i> (Benth.) Kuntze<br><i>Centrosema schiedeanum</i> (ined.)   | <b>Plant habit during flowering</b><br> |
| <b>Common names</b>                | Centro  |   |
| <b>Family</b>                      | Fabaceae  |   |
| <b>Group</b>                       | Dicot   |   |
| <b>Habit</b>                       | Perennial   |   |
| <b>Habitat</b>                     | Widespread in cane fields, roadside banks and other disturbed areas.  |   |
| <b>Origin</b>                      | Native to Central America and Mexico.   |   |
| <b>Distribution</b>                | Indonesia, Malaysia, Philippines, Thailand, Burundi, Togo, Uganda, Cuba.  |   |
| <b>Identifying characteristics</b> | Forms a tangled mat about 50cm deep or grows up shrubs to 3m or more.   | (a) Flowering branch<br>               |
| <b>Leaves</b>                      | Dark green leaves are trifoliate with leaflets ovate to orbicular about 2cm long and 1-1.5 cm wide and covered with fine, downy hairs.  |   |
| <b>Stem</b>                        | Perennial, trailing-climbing herb with strong tendency to root at nodes of trailing stems. The slightly hairy stems do not become woody for at least 18 months.                         |   |
| <b>Flowers</b>                     | Flowers, borne in axillary racemes, are bright or pale lilac with violet stripes.   |   |
| <b>Fruit</b>                       | Pods are linear, slightly twisted, 7.5 cm to 15 cm long and become dark brown when ripe. They contain up to 20 seeds.   |   |
| <b>Seeds</b>                       | Seeds transversely oblong to very slightly reniform, approx. 5 mm long, yellowish-greenish with dark mottles. 100-seed weight is approximately 2.7 g (36,000 seeds/kg).                 |   |
| <b>Roots</b>                       | It has a deep root-system with tap roots and lateral roots. The root system can reach up to 30 cm in depth, frequently in association with <i>Rhizobium</i> , nitrogen-fixing bacteria. |   |
| <b>Impact on introduction</b>      | Invades pastures, cane fields, roadside banks and other disturbed areas.  |   |

## 36. *Chrysanthemoides monilifera* (L.) T. Norlindh

|                                    |  |                                     |
|------------------------------------|--|-------------------------------------|
| <b>Synonyms</b>                    | <i>Osteospermum moniliferum</i> L.   | <b>Plant habit during flowering</b> |
| <b>Common names</b>                | Boneseed   |                                     |
| <b>Family</b>                      | Asteraceae   |                                     |
| <b>Group</b>                       | Dicot  |                                     |
| <b>Habit</b>                       | Perennial shrub  |                                     |
| <b>Habitat</b>                     | It prefers sandy or medium-textured soils and disturbed situations, particularly near the sea where it tolerates saline conditions.  |                                     |
| <b>Origin</b>                      | Mozambique, South Africa   |                                     |
| <b>Distribution</b>                | Mozambique, South Africa, USA, France, Italy, Australia, New Zealand   |                                     |
| <b>Identifying characteristics</b> | Perennial shrub, between 1 and 3 m high  |                                     |
| <b>Leaves</b>                      | Leaves are alternate, 3-8 cm long, ovate, tapering at the base, irregularly serrated or toothed, shortly stalked, practically hairless except for a cottony down on young leaves. Inner phyllaries are ovate or lanceolate.  |                                     |
| <b>Stem</b>                        | The stems are much-branched, green or often purplish-green when young, and become woody with age.  |                                     |
| <b>Flowers</b>                     | Florets are bright yellow, in shortly stalked heads, 2-3 cm in diameter, clustered at the ends of branches; ray florets (petals) 5-13 per head.  |                                     |
| <b>Flowering period</b>            | Flowering occurs throughout the year, though mostly during the cooler late autumn and winter months.   |                                     |
| <b>Fruit</b>                       | Fruits (6-9 mm across) have green fleshy skin at first, becoming black then flaking off to leave a hard, whitish inner coat, 5-8 mm in diameter. Each fruit contains a single, hard seed.  |                                     |
| <b>Seeds</b>                       | The seeds (6-8 mm in size) are whitish, bone-coloured or light brown, almost round (i.e. globose), and have a smooth surface texture.  |                                     |
| <b>Roots</b>                       | Roots are shallow, with no distinct taproot.   |                                     |
| <b>Association</b>                 | <i>Leucopogon parviflorus</i>  |                                     |
| <b>Dispersal</b>                   | Seed dispersal is via wind and running water. Birds are a major agent of spread because they readily eat the fleshy fruit, and seed is either passed or regurgitated in a viable condition. Rabbits, foxes and cattle also eat the fruit and spread the seeds in their droppings, whereas ants have been observed carrying the fruit to their nests where they eat the fleshy skins and discard the seeds. |                                     |
| <b>Impact on introduction</b>      | Affects wildlife, destroys, or drastically alters, the habitat of native birds and animals. Replaces plant species known to be important food sources for migratory birds. Replace plants that are deemed important to apiarists as a source of nectar and pollen during winter. Negatively impacts tourism. Reduced amenity values. Reduced native biodiversity.  |                                     |



(a) Flowering branch



(b) Seeds

## 37. *Cirsium vulgare* Savi (Ten.)

|                                    |  |  |
|------------------------------------|--|--|
| <b>Synonyms</b>                    | <i>Ascalea lanceolata</i> (L.) Hill<br><i>Carduus lanceolatus</i> L.<br><i>Carduus vulgaris</i> Savi<br><i>Cirsium lanceolatum</i> (L.) Scop.<br><i>Cirsium vulgare</i> (Savi) Airy-Shaw<br><i>Cnicus lanceolatus</i> (L.) Willd.  | <b>Plant habit during flowering</b>  |
| <b>Common names</b>                | Spear thistle, Bank thistle, bell thistle, bird thistle, blue thistle, bull thistle, bur thistle, burr thistle, button thistle, common burr thistle, Fuller's thistle, lance-leaved thistle, plum thistle, roadside thistle  |                |
| <b>Family</b>                      | Asteraceae   |  |
| <b>Group</b>                       | Dicot  |  |
| <b>Habit</b>                       | Annual, Biennial, Perennial  |  |
| <b>Habitat</b>                     | Pastures, roadsides, ditch banks, hay fields, Coastal areas, Cultivated / agricultural land, Disturbed areas, Managed forests, plantations and orchards.   |  |
| <b>Origin</b>                      | Europe, Western Asia, and Northern Africa.   | <br>(b) Seeds |
| <b>Distribution</b>                | Afghanistan, Armenia, Azerbaijan, China, Georgia (Republic of), Iran, Iraq, Japan, Kazakhstan, Kyrgyzstan, Pakistan, Turkey, Turkmenistan, Algeria, Kenya, Morocco, South Africa, Tunisia, Canada, Saint Pierre and Miquelon, USA, Costa Rica, Guatemala, Argentina, Bolivia, Chile, Ecuador, Peru, Uruguay, Albania, Austria, Belarus, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Moldova, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Spain, Sweden, Switzerland, UK, Ukraine, Yugoslavia (Serbia and Montenegro), Australia, New Zealand. |  |
| <b>Identifying characteristics</b> | The seedling is hairy and produces numerous spines. It has a short hypocotyl and no epicotyl.  |  |
| <b>Leaves</b>                      | The leaves of which are elliptical in shape, spiny and coarsely toothed. The cauline leaves are lanceolate, up to 30 cm long and are much more dissected and lobed than the rosette leaves.  |  |
| <b>Stem</b>                        | The stem is winged up to 7 ft. (2.1 m) tall and spiny, with alternate leaves.  |  |
| <b>Flowers</b>                     | The purple bisexual flowers (florets) are tubular, arranged into capitula (flower heads- 3.8-5.1 cm in diameter and 2.5-5.1 cm long with narrow, spine-tipped bracts) that may occur solitarily or in terminal clusters of two or three.   |  |

|                               |  |
|-------------------------------|--|
| <b>Flowering period</b>       | June to September.   |
| <b>Fruit</b>                  | The fruit is an achene, which may range in colour from white to yellow, grey, brown or black. The achenes are typically 5 mm long and 1.5 mm wide, with a weight of 3.5 mg.  |
| <b>Seeds</b>                  | The seeds are 5 mm long, with a downy pappus (2-2.5 cm), which assists in wind dispersal. As in other species of <i>Cirsium</i> (but unlike species in the related genus <i>Carduus</i> ), the pappus hairs are feathery with fine side hairs.   |
| <b>Roots</b>                  | The plant has a branched taproot system, which may include several primary taproots.   |
| <b>Association</b>            | Associated with perennial communities (e.g., grasslands) as well as species of disturbed habitats.   |
| <b>Dispersal</b>              | Wind dispersed. Migration of bull thistle across large geographical regions is probably the result of human activities including movement of livestock, vehicles, farm machines, and plant products (such as seed and hay). Bull thistle seeds may also be carried by animals.                     |
| <b>Impact on introduction</b> | It can invade almost any type of disturbed area, such as forest clear cuts, riparian areas and pastures. Plants can form dense thickets, displacing other vegetation. The spiny nature of the plant renders it unpalatable to wildlife and livestock and reduces the forage potential of pastures. |

## 38. *Conyza sumatrensis* (Retz.) E. Walker

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Conyza albida</i> Willd. ex Sprengel<br><i>Conyza floribunda</i> (H.B. & K.)<br><i>Coyza bonariensis</i> var. <i>microcephala</i> (Cabrera)<br>Cabrera <i>Erigeron floribundus</i> (Sch. Bip.)<br><i>Erigeron sumatrensis</i> Retz.   | <b>Plant habit during flowering</b><br> |
| <b>Common names</b>                | Tall fleabane, broad-leaved fleabane, fleabane, Guernsey fleabane.   |   |
| <b>Family</b>                      | Asteraceae   |   |
| <b>Group</b>                       | Dicot  |   |
| <b>Habit</b>                       | An erect annual or short-lived perennial.  |   |
| <b>Habitat</b>                     | Cultivated/agricultural land, disturbed areas, Managed forests, plantations and orchards, Natural forests.   |   |
| <b>Origin</b>                      | North America, Sub-tropical South America.   |   |
| <b>Distribution</b>                | Afghanistan, Bhutan, China, Indonesia, Japan, Malaysia, Philippines, Sri Lanka, Botswana, Cameroon, Congo, Côte d'Ivoire, Gabon, Ghana, Guinea, Guinea-Bissau, Kenya, Madagascar, Namibia, Nigeria, Sierra Leone, South Africa, Spain, Swaziland, Uganda, Zimbabwe, Argentina, Bolivia, Brazil, Guyana, Paraguay, Uruguay, Venezuela, Bulgaria, France, Greece, Romania, Serbia, Spain, UK, Yugoslavia (former), Australia, Fiji, New Zealand, Papua New Guinea. |   |
| <b>Identifying characteristics</b> | An erect plant growing to 1 to 2 metres in height. It has a central stem branching towards the top of the plant below the inflorescence (flower heads).  |   |
| <b>Leaves</b>                      | The leaves are grey/green in colour they are 4-10cm long and 5-12mm wide. The basal leaves form a rosette and are lanceolate with toothed edges. The leaves are covered in small, white hairs.   |   |
| <b>Stem</b>                        | The stems are very leafy and softly hairy.   |   |
| <b>Flowers</b>                     | The flowers are arranged in groups that form a pyramid like shape. Each "flower" is broad-campanulate (bell-shaped) and is 4-6mm long and 6-10mm wide.   |   |
| <b>Flowering period</b>            | December to August.  |   |
| <b>Fruit</b>                       | The fruit is 3mm in length, ovoid and sparsely hairy. It is single seeded with a straw coloured pappus that has minutely barbed bristles.  |   |
| <b>Seeds</b>                       | Seeds are very light and all bear a pappus that facilitates wind transport.  |   |
| <b>Roots</b>                       | Tap root   |   |
| <b>Association</b>                 | <i>Camellia sinensis</i> (Tea), <i>Solanum tuberosum</i> (Potato), Turfgrasses.  |   |
| <b>Dispersal</b>                   | <i>C. sumatrensis</i> is principally a wind-dispersed species. Moving along roadsides, especially during seed production, is also likely to increase spread. Also, late tillage or other practices at such inappropriate times will also facilitate seed dispersal.  |   |
| <b>Impact on introduction</b>      | <i>C. sumatrensis</i> is a known host for Tomato yellow leaf curl virus in Spain and Turnip mosaic virus.  |   |

## 39. *Digitaria velutina* (Forssk.) P. Beauv.

|                                    |  |  |
|------------------------------------|--|--|
| <b>Synonyms</b>                    | <i>Digitaria divaricata</i> Henr.<br><i>Digitaria fenestrata</i> (A. Rich.) Rendle<br><i>Digitaria ulugurensis</i> Pilg.<br><i>Digitaria zeyheri</i> (Nees) Henr.<br><i>Panicum abyssinicum</i> var. <i>setigerum</i> Chiov.<br><i>Panicum fenestratum</i> A. Rich.<br><i>Panicum forskalii</i> Christensen<br><i>Panicum psilostachyum</i> Th. Dur. & Schinz<br><i>Panicum redemptum</i> Chiov.<br><i>Panicum sanguinale</i> var. <i>cognatum</i> Schweinf.<br><i>Panicum sanguinale</i> var. <i>fenestratum</i> (A. Rich.) Schweinf.<br><i>Panicum velutina</i> Forssk.<br><i>Panicum zeyheri</i> Nees | <b>Plant habit during flowering</b>  |
| <b>Common names</b>                | Velvet finger grass, annual couch grass, long plumed finger grass, velvet crabgrass.   | <br>(a) Flowering branch |
| <b>Family</b>                      | Poaceae  | <br>(b) Seeds           |
| <b>Group</b>                       | Monocot  |  |
| <b>Habit</b>                       | Slender, annual grass.   |  |
| <b>Habitat</b>                     | Cultivated / Agricultural land, Disturbed areas.   |  |
| <b>Origin</b>                      | Africa and Asia.   |  |
| <b>Distribution</b>                | Yemen, Botswana, Burundi, Congo Democratic Republic, Côte d'Ivoire, Egypt, Ethiopia, Kenya, Malawi, Mozambique, Rwanda, Senegal, South Africa, Sudan, Tanzania, Uganda, Zambia, Zimbabwe, Mexico, USA, Costa Rica, El Salvador, Guatemala.   |  |
| <b>Identifying characteristics</b> | Slender, annual grass with ascending stems up to 120 cm high that are often bent at the nodes and produce roots from the lower nodes.  |  |
| <b>Leaves</b>                      | Leaves are thin, broadly linear to lanceolate, 2-15 cm long and 3-17 mm wide.  |  |
| <b>Stem</b>                        | The racemes are delicate, 3-13 cm long, the longer occasionally branched near the base.  |  |

|                               |   |
|-------------------------------|---|
| <b>Flowers</b>                | The inflorescence is a panicle composed of 7-20 racemes diverging from a common axis 1-7 cm long.   |
| <b>Flowering period</b>       | Spring period.  |
| <b>Fruit</b>                  | The fruit is an ellipsoid grain, mostly grey, or sometimes yellowish or purplish brown.   |
| <b>Seeds</b>                  | Fertile lemma 1.5–2.1 mm long, without keel, 3 -nerved. Lemma apex muticous. Lodicules present.   |
| <b>Roots</b>                  | Plants often bend at the nodes and produce roots from the lower nodes.  |
| <b>Association</b>            | Annual grasses where arable practices favour the elimination of broadleaved weeds.  |
| <b>Dispersal</b>              | Water is likely to be the most common form of non-biotic dispersal of <i>D. velutina</i> , either by rain on crop fields or by waterways where this weed grows along the canal, river and stream banks. Furthermore, it is likely that seeds and stem fragments of <i>D. velutina</i> are dispersed around fields and neighboring land on farm implements such as hoes, mechanical cultivators and crop harvesters. |
| <b>Impact on introduction</b> | It causes crop yield losses of 20-30% on farms. Negatively impacts agriculture, Competition - monopolizing resources, Pest and disease transmission.  |

## 40. *Fumaria officinalis* L.

|                                    |   |   |
|------------------------------------|---|---|
| <b>Synonyms</b>                    | <i>Fumaria cirrhata</i><br><i>Fumaria diffusa</i><br><i>Fumaria disjuncta</i><br><i>Fumaria pulchella</i>   | <b>Plant habit during flowering</b>   |
| <b>Common names</b>                | Common fumitory   |   |
| <b>Family</b>                      | Papaveraceae  |   |
| <b>Group</b>                       | Dicot   |   |
| <b>Habit</b>                       | Annual  |   |
| <b>Habitat</b>                     | Gardens, fields, waste ground, shores   |   |
| <b>Origin</b>                      | Eurasia   |   |
| <b>Distribution</b>                | Iran, Iraq, Israel, Jordan, Lebanon, Pakistan, Turkey, Turkey-in-Asia, Algeria, Egypt, Mauritius, Morocco, South Africa, Sudan, Canada, USA, Argentina, Chile, Uruguay, Albania, Austria, Belgium, Bulgaria, Czechoslovakia (former), Denmark, Finland, Former USSR, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Jersey, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Spain, Sweden, Switzerland, Yugoslavia (former), Australia, New Zealand |  |
| <b>Identifying characteristics</b> | Slender bushy-branched stems with long internodes, which are weak with an erect to prostrate growth, usually reaching a height from 10 to 40 cm, in extreme cases up to 60 cm, foliage glaucous.  |   |
| <b>Leaves</b>                      | Leaves are alternate, long-stalked, bipinnate, finely dissected, up to 8 cm long, ultimate pinnae obovate 1 to 1.5 cm long, deeply lobed.   |   |
| <b>Stem</b>                        | 20–30 cm (8–12 in.). Stem ascending—erect, quite abundantly branched.   |   |
| <b>Flowers</b>                     | Flowers irregular, perfect tubular, sepals 2, minute, dentate; petals 4, the upper spurred, flesh-coloured to pinkish with purplish tips, 8 to 10 mm long; one pistil, six stamens, ovary superior, bracts in the base of the pedicel much shorter than the spreading pedicels.   |   |
| <b>Flowering period</b>            | July-August.  |   |
| <b>Fruit</b>                       | Fruit a one-seeded indehiscent globular capsule, nutlet-like lenticular, 2-2.5 mm in diameter, slightly compressed, somewhat indented at the apex.  |   |

|                               |  |
|-------------------------------|--|
| <b>Seeds</b>                  | Seed reddish-brown, glabrous, dull, Round to slightly heart-shaped. Almost circular cross section. The surface is granulated to wrinkled. Thousand grain weight is approximately 3.4 g.  |
| <b>Roots</b>                  | Fumitory has a strong tap root.  |
| <b>Association</b>            | Beets, Canola, Vegetable crops, Cereals.   |
| <b>Dispersal</b>              | Fumitory can be spread via clothing, boots, vehicles, tillage and harvest machinery, crop and pasture seed and forage. In practice, insufficiently cleaned crop seed, especially canola and sub-clover seed, is the most common method of long distance dispersal. Seeds are also spread up to 10m by ants who are natural dispersal agents. Fumitory seed may also be moved by water along creeks and rivers. |
| <b>Impact on introduction</b> | Fumitory's semi-climbing habit allows it to outgrow and smother smaller plant species. In addition, allelopathic interference is exhibited by clusters of individual plants. The competitive impact of fumitory depends on crop species and cultivar, time of fumitory emergence and density of the infestation. Fumitory can reduce wheat yields by up to 40% and canola yields by up to 36%.                 |

## 41. *Lolium multiflorum* Lam.

|                                    |   |                                     |
|------------------------------------|---|-------------------------------------|
| <b>Synonyms</b>                    | <p><i>Lolium multiflorum</i> Lam. subsp. <i>italicum</i><br/>(A. Braun) Schinz &amp; R. Keller</p> <p><i>Lolium multiflorum</i> Lam. var. <i>diminutum</i><br/>Mutel</p> <p><i>Lolium multiflorum</i> Lam. var. <i>muticum</i> DC.</p> <p><i>Lolium perenne</i> L. subsp. <i>italicum</i><br/>(A. Braun) Husnot</p> <p><i>Lolium perenne</i> L. var. <i>aristatum</i> Willd.</p> <p><i>Lolium perenne</i> L. var. <i>multiflorum</i><br/>(Lam.) Parnell</p>   | <b>Plant habit during flowering</b> |
| <b>Common names</b>                | Italian ryegrass  |                                     |
| <b>Family</b>                      | Poaceae   |                                     |
| <b>Group</b>                       | Monocot   |                                     |
| <b>Habit</b>                       | Annual to biennial  |                                     |
| <b>Habitat</b>                     | Readily colonizes disturbed areas and adjacent border habitats.   |                                     |
| <b>Origin</b>                      | Central and Southern Europe, North-west Africa and South-west Asia.   |                                     |
| <b>Distribution</b>                | Afghanistan, China, Indonesia, Iran, Iraq, Japan, Jordan, Lebanon, Nepal, Pakistan, Philippines, Saudi Arabia, Turkey, Algeria, Egypt, Ethiopia, Kenya, Libya, Morocco, South Africa, Spain, Tunisia, Zimbabwe, Canada, USA, Argentina, Brazil, Chile, Colombia, Ecuador, Peru, Suriname, Uruguay, Albania, Belgium, Bulgaria, Denmark, France, Germany, Greece, Hungary, Italy, Netherlands, Poland, Portugal, Romania, Spain, Switzerland, UK, Yugoslavia (former), Australia, Fiji, New Zealand. |                                     |
| <b>Identifying characteristics</b> | An annual to biennial poaceous species.   |                                     |
| <b>Leaves</b>                      | Leaf blades green to dark green, hairless, flat, upper surface evenly ribbed, lower surface smooth and shiny. Length up to 40 cm, width 5-12 mm. Young leaves are rolled in the bud. Auricles are small and narrow. Ligule is white, translucent, shorter than wide.  |                                     |
| <b>Stem</b>                        | Stems (culms) are comprised of nodes and internodes. Each node bears a leaf. The uppermost culm segment is called the peduncle, the structure that supports the inflorescence.  |                                     |



(a) Flowering branch



(b) Seeds

|                               |  |
|-------------------------------|--|
| <b>Flowers</b>                | The inflorescence of annual ryegrass is a solitary spike with alternately arranged spikelets attached edgewise directly to the central axis.   |
| <b>Flowering period</b>       | Flowering takes place from April through September.  |
| <b>Seeds</b>                  | Seed is a mature ovule enclosed by a lemma and a palea. The lemma, the lower bract, is 0.15 to 0.3 inch (4 to 8 mm) long, with a straight, slender awn up to 0.6 inch (15 mm). The rachilla segment is somewhat wedge shaped.              |
| <b>Roots</b>                  | The root system of annual ryegrass is highly branched and dense, with many fibrous, adventitious roots. Annual ryegrass has no rhizomes or stolons.  |
| <b>Association</b>            | Cereal and Grass seed crops.   |
| <b>Dispersal</b>              | Seeds are relatively heavy and compact. Their dispersal is limited, but they can be transported by animals.  |
| <b>Impact on introduction</b> | Forms dense stands and outcompetes native vegetation. Ryegrass is allelopathic; it inhibits the growth of surrounding species. Infestations of Italian ryegrass may increase erosion rates. It is a host plant to wheat yellow leaf virus. |

## 42. *Lonicera japonica* Thunb

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Lonicera aureoreticular</i> T. Moore<br><i>Lonicera japonica</i> var. <i>Chinensis</i><br><i>Lonicera japonica</i> var. <i>Halliana</i><br><i>Nintoaa japonica</i> (Thunb.) Sweet   | <b>Plant habit during flowering</b><br> |
| <b>Common names</b>                | Japanese honeysuckle   |   |
| <b>Family</b>                      | Caprifoliaceae   |   |
| <b>Group</b>                       | Dicot  |   |
| <b>Habit</b>                       | Perennial woody climber  |   |
| <b>Habitat</b>                     | Forest floors, canopies, roadsides, wetlands, and disturbed areas.   |   |
| <b>Origin</b>                      | China, Japan and Korea   |   |
| <b>Distribution</b>                | China, Japan, Korea, DPR, Korea, Republic of, Taiwan, Kenya, Canada, Mexico, USA, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Puerto Rico, Argentina, Bolivia, Brazil, Colombia, France, Portugal, UK, Ukraine, Australia, New Zealand.   |   |
| <b>Identifying characteristics</b> | Perennial woody climber that ascends shrubs and small trees, forming a curtain 2 m thick on a horizontal plane. Where it spreads over herbaceous vegetation it forms a dense mat up to 1.5 m deep.   |   |
| <b>Leaves</b>                      | The leaves are opposite, simple, pubescent on the lower midrib, shiny green on the upper surface and yellowish green below.  |   |
| <b>Stem</b>                        | Stems are pubescent when young and generally reddish to purplish brown in colour (Webb et al., 1988), twining clockwise around the host and the plant's own stems. In the presence of support it can reach 7 m tall (North America), at least 8 m (Australia) or up to 15 m (New Zealand). Stems are commonly 0.5-2 cm in diameter, with major ascendant stems sometimes reaching more than 10 cm. The bark is corky on older stems and becomes shredded, peeling readily. |   |
| <b>Flowers</b>                     | Flowers are in axillary pairs, fragrant, borne on densely hairy peduncles 0.5-2.5 cm long.   |   |
| <b>Flowering period</b>            | April-July.  |   |
| <b>Fruit</b>                       | The small shiny globular fruits turn from green to black as they ripen. Each fruit contains 2-3 small brown to black ovate seeds.  |   |

(a) Flowering branch



(b) Seeds

|                               |   |
|-------------------------------|---|
| <b>Seeds</b>                  | Fruit contains 2-3 ovate to oblong seeds that are 2-3 mm long, dark-brown to black, ridged on one side and flat to concave on the other.  |
| <b>Roots</b>                  | The main roots form an interlaced and twisted mass at or near the soil surface, while root branches and adventitious roots extend down as far as 1 m, and horizontal lengths up to 3 m. |
| <b>Association</b>            | Eucalyptus, Pines, Deciduous woodlands.   |
| <b>Dispersal</b>              | Birds help the plants spread by pooping seeds out in new places.  |
| <b>Impact on introduction</b> | It can girdle small saplings by twining around them, and can form dense mats in the canopies of trees, shading everything below.  |

## 43. *Orobanche Cumana* Wallr.

|                                    |  |                                     |
|------------------------------------|--|-------------------------------------|
| <b>Synonyms</b>                    | <i>Orobanche cernua</i> subsp. <i>cumana</i><br><i>Orobanche arenaria</i><br><i>Orobanche comana</i>   | <b>Plant habit during flowering</b> |
| <b>Common names</b>                | Sunflower Broomrape  |                                     |
| <b>Family</b>                      | Orobanchaceae  |                                     |
| <b>Group</b>                       | Dicot  |                                     |
| <b>Habit</b>                       | Biennial or Perennial  |                                     |
| <b>Habitat</b>                     | Associated with alluvial loamy soils.  |                                     |
| <b>Origin</b>                      | Bulgaria, Russia   |                                     |
| <b>Distribution</b>                | India, Israel, Turkey, Bulgaria, Germany, Hungary, Romania, Russian Federation.  |                                     |
| <b>Identifying characteristics</b> | The parasite has whitish stalk, later becoming violet.   |                                     |
| <b>Leaves</b>                      | Instead of leaves, stem has skins.   |                                     |
| <b>Stem</b>                        | Stalk is simple, branchless, 50 cm in height. Further it turns brown, forming fruits as double-fold bolls.   |                                     |
| <b>Flowers</b>                     | Bluish tubular flowers with a bent crown.  |                                     |
| <b>Fruit</b>                       | About 40 bolls are formed on a stalk, each containing up to 2000 seeds.  |                                     |
| <b>Seeds</b>                       | Broomrape seeds are extremely small (dust-like seeds), and individual plants can produce an impressive number that remain viable in the soil for up to 20 years.   |                                     |
| <b>Roots</b>                       | Haustorium   |                                     |
| <b>Association</b>                 | <i>Helianthus annuus</i> L. (Sunflower), <i>Lycopersicon esculentum</i> Mill. (tomato), <i>Solanum melongena</i> L. (aubergine), <i>Nicotiana tabacum</i> L. (tobacco), <i>Artemisia austriaca</i> , <i>A. maritime</i> , <i>Solanu</i> spp. |                                     |
| <b>Dispersal</b>                   | Easily dispersed by water, wind, animals, humans, machinery, or through attachment to sunflower seeds.   |                                     |
| <b>Impact on introduction</b>      | Broomrape attacks are frequently severe and yield losses can reach up to 50%.  |                                     |



(a) Flowering branch

## 44. *Orobanche minor* Sm

|                                    |   |                                     |
|------------------------------------|---|-------------------------------------|
| <b>Synonyms</b>                    | <i>Orobanche abyssinica</i> A. Rich.<br><i>Orobanche apiculata</i> Wallr.<br><i>Orobanche barbata</i> Poir.<br><i>Orobanche concolor</i> Duby<br><i>Orobanche crithmi</i> Bertol.<br><i>Orobanche euglossa</i> Rchb.f.<br><i>Orobanche grisebachii</i> Reut.<br><i>Orobanche hyalina</i> Spruner ex Reut.<br><i>Orobanche laurina</i> Bertol.<br><i>Orobanche livida</i> Sendtn. ex Freyn<br><i>Orobanche pyrrha</i> Rchb.f.<br><i>Orobanche unicolor</i> Boreau<br><i>Orobanche yuccae</i> Pa.Savi ex Bertol.  | <b>Plant habit during flowering</b> |
| <b>Common names</b>                | Common broomrape  |                                     |
| <b>Family</b>                      | Orobanchaceae   |                                     |
| <b>Group</b>                       | Dicot   |                                     |
| <b>Habit</b>                       | Annual  |                                     |
| <b>Habitat</b>                     | Cultivated / agricultural land, Disturbed areas, Managed grasslands (grazing systems), Rail / roadsides.  |                                     |
| <b>Origin</b>                      | Southern Europe   |                                     |
| <b>Distribution</b>                | Azerbaijan, Georgia (Republic of), Israel, Japan, Jordan, Lebanon, Pakistan, Saudi Arabia, Syria, Turkey, Algeria, Egypt, Eritrea, Ethiopia, Kenya, Libya, Malawi, Mauritius, Morocco, Mozambique, South Africa, Spain, Sudan, Tanzania, Tunisia, Uganda, Zimbabwe, USA, Chile, Albania, Austria, Belgium, Bulgaria, Cyprus, Czechoslovakia (former), Denmark, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Poland, Portugal, Romania, Russian Federation, Serbia, Spain, Sweden, Switzerland, UK, Ukraine, Yugoslavia (Serbia and Montenegro), Australia, New Zealand. |                                     |
| <b>Identifying characteristics</b> | Obligate parasites on the roots of various host plants and lack any chlorophyll.  |                                     |
| <b>Leaves</b>                      | Leaves are represented by alternate brown scales, ovate to lanceolate, acuminate, 6-20 mm long.   |                                     |
| <b>Stem</b>                        | Stems are un-branched, yellowish-brown, often tinged with purple, generally 30-50 cm tall but sometimes exceeding 100 cm (especially in Ethiopia), glandular-villous or nearly glabrous.  |                                     |



(a) Flowering branch



(b) Seeds

|                               |  |
|-------------------------------|--|
| <b>Flowers</b>                | Flowers are sessile, arranged spirally, each subtended by a single narrow, ovate-acuminate, glandular-hairy bract 10-15 mm long x 3-5 mm wide.   |
| <b>Flowering period</b>       | Winter and Spring.   |
| <b>Fruit</b>                  | Capsule 7-10 mm long, splitting into two valves when ripe, shedding several hundred minute seeds.  |
| <b>Seeds</b>                  | Seeds commonly narrowly to broadly wedge shaped, irregularly wedge shaped, or teardrop-shaped, also elliptic, obovate, or oblong; tiny, dust like, 0.3 mm long, 0.1–0.5 mm wide and thick with coarse reticulate marking. Seeds are very small (dust-size) and remain viable for 10 or more years.   |
| <b>Roots</b>                  | Roots short, unbranched and scaly – they attach to the roots of other plants.  |
| <b>Association</b>            | Tobacco, tomato, pepper, bean, pea, sunflower, Lucerne, forage legumes (e.g., clover and alfalfa) and leafy green vegetables (e.g., spinach and kale).   |
| <b>Dispersal</b>              | Seeds of <i>O. minor</i> are small enough to be blown some distance by wind. Movement in surface water is likely to occasionally provide longer-distance dispersal. Movement by animals may occasionally occur but only in a sporadic way. The most important agent of local dispersal is farm machinery transporting contaminated soil from field to field and from farm to farm. |
| <b>Impact on introduction</b> | Apart from yield reduction, <i>O. minor</i> can greatly reduce the value of clover and lucerne seed crops due to the danger of seed contamination. Heavy infestations can cause crop failure.  |

## 45. *Oryza longistaminata* A. Chev. & Roehr.

|                                    |   |   |
|------------------------------------|---|---|
| <b>Synonyms</b>                    | <i>Oryza barthii</i> sensu<br><i>Oryza dewildemani</i> Vanderyst<br><i>Oryza perennis</i> Wild<br><i>Oryza sylvestris</i> A. Chev   | <b>Plant habit during flowering</b>   |
| <b>Common names</b>                | Wild rice, red rice, long-stamen rice   |   |
| <b>Family</b>                      | Poaceae   |   |
| <b>Group</b>                       | Monocot   |   |
| <b>Habit</b>                       | Perennial   |   |
| <b>Habitat</b>                     | Found in swampy areas, at the edges of lakes or ponds, streams or river sides, in irrigation canals, in and at the edges of rice fields.  |   |
| <b>Origin</b>                      | Southern Africa   |   |
| <b>Distribution</b>                | Angola, Botswana, Burkina Faso, Cameroon, Congo Democratic Republic, Côte d'Ivoire, Gabon, Gambia, Ghana, Guinea, Kenya, Liberia, Madagascar, Malawi, Mali, Mozambique, Namibia, Niger, Nigeria, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Uganda, Zambia, Zimbabwe.  |   |
| <b>Identifying characteristics</b> | Erect or spreading, robust perennial grass with extensive creeping, branched rhizomes   |  |
| <b>Leaves</b>                      | Leaf sheaths are pale-green to brownish, glabrous, nearly as long as the internodes, with 15 mm long auricles at the junction with the blade.   |   |
| <b>Stem</b>                        | Glabrous, smooth culms are up to 250 cm tall, up to 2.5 cm diameter at the base, have up to 10 nodes, are erect but sometimes floating, weak and spongy with adventitious roots developing from lower nodes.  |   |
| <b>Flowers</b>                     | The panicle is 16-40 cm long, erect or slightly drooping with a tuft of hairs at the base of branches. Narrowly oblong spikelets, on 0.5-4 mm long pedicels, are 7-15 mm long, scabrid to hispid and shed when mature. Glumes are reduced to a narrow membranous rim. Sterile lemmas are 2-3.8 mm long, glabrous and smooth. Fertile lemmas are slightly shorter than the spikelet, stiffly hispid, with 6 stamens, a blackish stigma and awns 2.6-7.5 cm, usually pink or purplish when fresh. |   |

|                               |  |
|-------------------------------|--|
| <b>Flowering period</b>       | October to May.  |
| <b>Seeds</b>                  | The seeds are 7.5-8.5 mm long, oblong, glabrous, light-brown and glossy.   |
| <b>Roots</b>                  | Adventitious roots develop from lower nodes.   |
| <b>Association</b>            | Rice   |
| <b>Dispersal</b>              | Dispersal is most commonly as a contaminant in rice stock.   |
| <b>Impact on introduction</b> | Yield losses of 75%-85%, Competitive effect on the crop, contaminate commercial rice grain and alternative hosts of rice yellow mottle sobemo virus and rice bacterial blight. |

## 46. *Pennisetum macrourum* Trin

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Pennisetum angolense</i> Rendle<br><i>Pennisetum giganteum</i> A. Rich.<br><i>Pennisetum quartinianum</i> A. Rich.  | <b>Plant habit during flowering</b><br> |
| <b>Common names</b>                | African feather grass  |   |
| <b>Family</b>                      | Poaceae  |   |
| <b>Group</b>                       | Monocot  |   |
| <b>Habit</b>                       | Annual or Perennial  |   |
| <b>Habitat</b>                     | Pasture & other grasslands, roadsides, waste ground and disturbed areas. Grows best in damp situations such as swamps and along the borders of streams, but can tolerate drought and establish on dry shady banks; it prefers light sandy soil.  |   |
| <b>Origin</b>                      | South Africa   | <br>(b) Seeds                           |
| <b>Distribution</b>                | Yemen, Angola, Botswana, Cameroon, Cape Verde, Congo Democratic Republic, Ethiopia, Gabon, Guinea, Kenya, Madagascar, Malawi, Nigeria, Seychelles, Somalia, South Africa, Spain, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Canada, Mexico, USA, Argentina, Chile, Ecuador, France, Portugal, UK, Australia, Micronesia, Federated states of New Zealand. |   |
| <b>Identifying characteristics</b> | Erect perennial grass, densely tufted but with a rhizome up to 1 m or more.  |   |
| <b>Leaves</b>                      | Leaves are strongly ribbed, up to 120 cm long and ca. 13 mm wide, light green above and grey-green below.  |   |
| <b>Stem</b>                        | The stems are erect, unbranched, cylindrical and hairless. The creeping underground stems are up to 7 mm thick and 2 m long and give rise to shoots and roots.   |   |
| <b>Flowers</b>                     | The individual components of the flower head (spikelets) are 5 to 7mm long and surrounded by feather-like serrated bristles 10 to 15mm long with one bristle longer and thicker than the rest.   |   |
| <b>Flowering period</b>            | August, September.   |   |
| <b>Seeds</b>                       | Seeds are 5 to 7mm long and yellow to brown in colour.   |   |

|                               |   |
|-------------------------------|---|
| <b>Roots</b>                  | Fibrous root system to 1m depth. It also has a system of underground creeping stems. It also has sturdy rhizomes about 7 mm in diameter and up to 2 m in length. The rhizomes are partly enclosed in a sheath and occur from just below the soil surface to a depth of 30 cm. |
| <b>Association</b>            | Weed of pasture and other grasslands, but is also found in perennial crops such as Lucerne.   |
| <b>Dispersal</b>              | Seeds are dispersed by water and wind. Further, barbed bristles on the seed husk assist dispersal through animal hair and clothing.   |
| <b>Impact on introduction</b> | It spreads quickly, crowding out native low growing plant species. It is also a fire hazard, can block waterways and prevent site access. It has the potential to become a major weed of production forestry, roadsides, coastlines, wetlands, amenity and urban areas.       |

## 47. *Physalis angulata* L.

|                                    |   |                                     |
|------------------------------------|---|-------------------------------------|
| <b>Synonyms</b>                    | <i>Physalis ciliata</i> Sieber<br><i>Physalis minima</i> L.<br><i>Physalis minima</i> L. var. <i>indica</i> (Lam.)<br><i>Physalis parviflora</i> R. Br.<br><i>Physalis angulata</i> L. var. <i>angulata</i><br><i>Physalis angulata</i> L. var. <i>lanceifolia</i> (Nees) Waterf.<br><i>Physalis angulata</i> L. var. <i>pendula</i> (Rydb.) Waterf.<br><i>Physalis lanceifolia</i> Nees<br><i>Physalis pendula</i> Rydb.   | <b>Plant habit during flowering</b> |
| <b>Common names</b>                | Cutleaf groundcherry  | (a) Flowering branch                |
| <b>Family</b>                      | Solanaceae  |                                     |
| <b>Group</b>                       | Dicot   |                                     |
| <b>Habit</b>                       | Annual  |                                     |
| <b>Habitat</b>                     | Urban open spaces, disturbed areas, roadsides, croplands, orchards, nurseries and fallow land.  |                                     |
| <b>Origin</b>                      | Tropical America  | (b) Seeds                           |
| <b>Distribution</b>                | Cambodia, China, India, Indonesia, Japan, Korea, Republic of, Kuwait, Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Taiwan, Thailand, Turkey, Vietnam, Yemen, Angola, Benin, Botswana, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo, Congo Democratic Republic, Côte d'Ivoire, Egypt, Equatorial Guinea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Kenya, Liberia, Madagascar, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Réunion, Rwanda, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe, Bermuda, Mexico, USA, Antigua and Barbuda, Bahamas, Barbados, Belize, British Virgin Islands, Costa Rica, Cuba, Dominican Republic, El Salvador, Grenada, Guadeloupe, Guatemala, Haiti, Honduras, Jamaica, Leeward Islands, Martinique, Nicaragua, Panama, Puerto Rico, Saint Kitts and Nevis, Saint Vincent and the Grenadines, Trinidad and Tobago, United States Virgin Islands, Windward Islands, Argentina, Bolivia, Brazil, Colombia, Ecuador, Falkland Islands, French Guiana, Guyana, Peru, Suriname, Venezuela, Greece, American, Samoa, Australia, Cook Islands, Fiji, French Polynesia, Guam, Kiribati, Marshall Islands, Micronesia, Federated states of, Nauru, New Caledonia, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu, Wallis and Futuna Islands. |                                     |
| <b>Identifying characteristics</b> | An annual herb growing to 1 m, hairless, although there may be short appressed hairs on the younger parts.  |                                     |
| <b>Leaves</b>                      | Leaves are ovate to lanceolate, 4-10 cm long and 3-6 cm wide, usually irregularly toothed but sometimes smooth; unequal leaf bases.   |                                     |

|                               |  |
|-------------------------------|--|
| <b>Stem</b>                   | Branched erect, angled and hollow stems growing up to 1-2 m in height. It is usually hairless (glabrous); however, occasional plants have short hairs, especially on the younger parts.  |
| <b>Flowers</b>                | Flowers are borne on stalks (5-40 mm), yellow corolla usually without spots or occasionally with distinct spots (4-12 x 6-12 mm), blueish or violet anthers (2.5 mm) borne on stalks up to 5 mm long   |
| <b>Flowering period</b>       | June to October.   |
| <b>Fruit</b>                  | The fruit is an orange-coloured round berry, 1-1.8 cm long and is enclosed in the outer layer (a balloon-like calyx of 5 lobes with a small apical opening), which is 2-6 mm long; it grows around and encloses the fruit.   |
| <b>Seeds</b>                  | Seeds are disc-shaped to broadly reniform, 1-2 mm long, flat, pale yellow.   |
| <b>Roots</b>                  | Tap roots  |
| <b>Association</b>            | Soyabean, Cotton and Maize.  |
| <b>Dispersal</b>              | Natural dispersal by water is likely. Birds and mammals may disperse the seeds while eating the fruit. The seeds can be carried short distances on people's clothing or footwear.  |
| <b>Impact on introduction</b> | Apart from competing with annual and plantation crops, <i>P. angulata</i> is a host of the causal agent of tomato bacterial spot, <i>Xanthomonas campestris</i> pv. <i>vesicatoria</i> , as well as viruses found in tobacco, potato, okra, capsicum pepper, lucerne, beans and several other crops, physalis mottle virus (PhyMV), and also several root-knot nematodes ( <i>Meloidogyne</i> spp.). |

## 48. *Polygonum persicaria* L.

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Persicaria dolichopoda</i> (Ochi) Sasaki<br><i>Persicaria maculata</i> (Raf.) S.F. Gray<br><i>Persicaria maculosa</i> S.F. Gray<br><i>Persicaria mitis</i> Delarbre<br><i>Persicaria persicaria</i> (L.) Small<br><i>Persicaria ruderalis</i> (Salisb.) C.F. Reed<br><i>Persicaria vulgaris</i> Webb & Moq.<br><i>Polygonum dubium</i> Stein<br><i>Polygonum fusiforme</i> Greene<br><i>Polygonum minus</i> auct. non Huds.<br><i>Polygonum puritanorum</i> Fern.<br><i>Polygonum vulgaris</i> Samp.  | <b>Plant habit during flowering Seeds</b>   |
| <b>Common names</b>                | Redshank, Spotted lady's thumb   |   |
| <b>Family</b>                      | Polygonaceae   | (a) Flowering branch  |
| <b>Group</b>                       | Dicot  |  |
| <b>Habit</b>                       | Annual herb  | (b) Seeds   |
| <b>Habitat</b>                     | Grows best in moist to wet areas of waste ground, meadows, river banks, roadsides, railroads, and disturbed sites, including croplands and gardens.  |   |
| <b>Origin</b>                      | Europe   |   |
| <b>Distribution</b>                | Afghanistan, Bangladesh, Bhutan, China, India, Iran, Iraq, Japan, Nepal, Pakistan, Philippines, Turkey, Egypt, Kenya, Tunisia, Uganda, Canada, Mexico, USA, Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Albania, Austria, Belarus, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Faroe Islands, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Moldova, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Serbia, Slovenia, Spain, Sweden, Switzerland, UK, Ukraine, Yugoslavia (Serbia and Montenegro), Australia, New Zealand. |   |
| <b>Identifying characteristics</b> | Erect to spreading to 0.2-1.2 m tall and generally sprawls with age.   |   |
| <b>Leaves</b>                      | The leaves of this species typically have a dark green splotch, which is often 'V'-shaped, in their centers and grow anywhere between 2 to 6 inches long and 1-1/4 inches wide.  |   |
| <b>Stem</b>                        | The stems are glabrous, branching at base, erect, herbaceous, typically reddish and swollen at nodes growing to a height of 10 to 60 cm (4 to 24 in). <i>P. persicaria</i> has a distinctly fringed ocrea, distinguishing it from other <i>Polygonum</i> species.  |   |

|                               |  |
|-------------------------------|--|
| <b>Flowers</b>                | Flowers light to deep pink; calyx 2.5-3 mm long, 5-lobed to near the middle; stamens 6, included; style branches 2 or 3.   |
| <b>Flowering period</b>       | July-September.  |
| <b>Fruit</b>                  | The seed-like fruit are small, glossy black and three-sided.   |
| <b>Seeds</b>                  | Achenes (seeds) are black, shiny, two-sided, lenticular or some often trigonous, 2-2.5 mm long.  |
| <b>Roots</b>                  | Roots are typically a taproot with branches or Fibrous roots with a shallow taproot.   |
| <b>Association</b>            | <i>Allium cepa</i> (onion), <i>Beta vulgaris</i> (beetroot), <i>Brassica rapa</i> subsp. <i>oleifera</i> (turnip rape), <i>Daucus carota</i> (carrot), <i>Glycine max</i> (soyabean), <i>Helianthus annuus</i> (sunflower), <i>Hordeum vulgare</i> (barley), <i>Medicago sativa</i> (lucerne), <i>Nicotiana tabacum</i> (tobacco), <i>Phaseolus vulgaris</i> (common bean), <i>Pisum sativum</i> (pea), <i>Solanum tuberosum</i> (potato), <i>Triticum aestivum</i> (wheat), <i>Zea mays</i> (maize).      |
| <b>Dispersal</b>              | Dispersal over short distances (1-10 m) is generally by wind or animals. Dispersal over longer distances can occur with water, particularly floods. Birds and other animals can consume and disseminate seeds. In agricultural areas, both cultivation and harvesting machinery can carry seeds from field to field.   |
| <b>Impact on introduction</b> | It can be very competitive with crop plants, particularly in moist soils and can have significant economic impacts in the requirements for use of increased tillage and herbicides. It competes with natural vegetation, particularly in moist areas along ditches, streams, rivers, and marshes. Further, it can slow water flow in canals and streams. It can compete strongly with other herbaceous vegetation in moist areas and as such can replace the natural vegetation and threaten biodiversity. |

## 49. *Pueraria montana* var. *montana* (Lour.) Maesen

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <p><i>Dolichos montanus</i> Lour. 1790<br/> <i>Glycine javanica</i> L. 1753<br/> <i>Pachyrhizus montanus</i> (Lour.) DC 1825<br/> <i>Pueraria lobata</i> var. <i>montana</i> (Lour.) Maesen<br/> <i>Pueraria omeiensis</i> Wang &amp; Tang nom. nud. 1980<br/> <i>Pueraria thunbergiana</i> var. <i>formosana</i><br/> Hosokawa 1932<br/> <i>Pueraria tonkinensis</i> Gagnep. in Lecomte 1916<br/> <i>Stizolobium montanum</i> (Lour.) Spreng. 1826<br/> <i>Zeydora agrestis</i> Lour. ex Gomes 1868</p> | <b>Plant habit during flowering</b>   |
| <b>Common names</b>                | Rhodesian Kudzu-Vine, Japanese arrow root  |   |
| <b>Family</b>                      | Fabaceae   | (a) Flowering branch  |
| <b>Group</b>                       | Dicot  |  |
| <b>Habit</b>                       | Perennial  | (b) Seeds   |
| <b>Habitat</b>                     | A weed of riparian vegetation, moist forests, watercourses, roadsides, waste areas and disturbed sites in warmer temperate, sub-tropical and tropical regions.   |   |
| <b>Origin</b>                      | China, Japan and other parts of South-East Asia.   |   |
| <b>Distribution</b>                | China, Japan, Laos, Myanmar, Philippines, Taiwan, Thailand, Vietnam.   |   |
| <b>Identifying characteristics</b> | Kudzu is a perennial climbing vine that produces very large tubers up to 2 m long and 18-45 cm wide that can weigh as much as 180 kg on old plants.  |   |
| <b>Leaves</b>                      | Leaves are pinnately trifoliate, 8-20 cm long and 5-19 cm wide with leaflets ovate to orbicular and unlobed to trilobed. Leaves are pale green above and light to greyish green below.   |   |
| <b>Stem</b>                        | Stems or branches are strong, approximately 0.6-2.5 cm in diameter and up to 30 m in length. Its rampant stems are relatively thick and covered with long, appressed to spreading, yellowish-brown hairs.  |   |
| <b>Flowers</b>                     | Its pea-shaped flowers (12-20 mm long) are arranged in elongated clusters in the leaf forks. These flowers are either purple, blue, pink or violet in colour with a yellow spot near their centres.  |   |
| <b>Flowering period</b>            | July-October.  |   |
| <b>Fruit</b>                       | The fruit is an elongated and flattened pod (5-12 cm long and about 12 mm wide) that is densely covered in rusty colored hairs. These pods contain several (8-12) seeds.   |   |

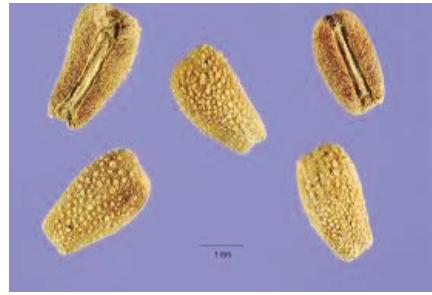
|                               |  |
|-------------------------------|--|
| <b>Seeds</b>                  | Seeds are borne in golden-haired, brown, flattened, oblong pods, 4-13 cm long and 0.6-1.3 cm wide. The seeds, visible through the pod, are flattened, ovoid and reddish brown with a black mosaic pattern. They are approximately 4-5 mm long by 4 mm wide and 2 mm thick. |
| <b>Roots</b>                  | Roots develop into large tubers (up to 1.8 m long and 15 cm wide).   |
| <b>Association</b>            | <i>Pinus</i> spp.  |
| <b>Dispersal</b>              | Kudzu seeds are dispersed by wind, animals, human activity, and water. Vegetative spread by rooting stems and movement of vegetative parts (stem segments or tubers) in soil is also common.   |
| <b>Impact on introduction</b> | Kudzu kills plants by smothering, growing over them and blocking out all available light thus preventing photosynthesis. Kudzu kills all plants that it overgrows.   |

## 50. *Raphanus raphanistrum* L.

|                                    |   |   |
|------------------------------------|---|---|
| <b>Synonyms</b>                    | <i>Raphanus landra</i> Moretti ex DC.<br><i>Raphanus segetum</i> Clav.<br><i>Raphanus raphanistrum</i> L. subsp. <i>raphanistrum</i>  | <b>Plant habit during flowering</b>   |
| <b>Common names</b>                | Wild radish, Jointed charlock, Mediterranean radish   |   |
| <b>Family</b>                      | Brassicaceae  |   |
| <b>Group</b>                       | Dicot   |   |
| <b>Habit</b>                       | Annual or Biennial  |   |
| <b>Habitat</b>                     | A weed of disturbed sites, waste areas, roadsides, crops, pastures, waterways, floodplains and open woodlands in temperate, sub-tropical, semi-arid and sometimes also tropical regions.  |   |
| <b>Origin</b>                      | Europe, the Azores, the Madeira Islands, the Canary Islands, northern Africa and western Asia   |   |
| <b>Distribution</b>                | Africa: Algeria; Egypt, Morocco; Tunisia, Asia-Cyprus; Iran; Iraq; Jordan; Lebanon; Syria; Turkey, Europe – Denmark, Finland, Ireland, Norway, Sweden, U.K., Austria, Belgium, Germany, Hungary, Netherland, Portugal, Switzerland, France, Spain, Portugal, N. America, S. America, Kenya, Tanzania, India (Sikkim), Australia, Greece, Canada, Mexico, U.S. |  |
| <b>Identifying characteristics</b> | Distinguished by heart-shaped first leaves (cotyledons) on seedlings; white to yellow or mauve petals often violet-veined, sometimes veins indistinct. Fruit to 9 cm long (including beak), and strongly constricted between seeds, breaking into 1-seeded ribbed units at maturity. Stems with bristle-like hairs.   |   |
| <b>Leaves</b>                      | Alternate, stalked. Basal leaf-blades pinnately lobed, terminal lobe larger than others.  |   |
| <b>Stem</b>                        | Stems are erect, branching, ranging from 12 to 32 inches in height. Stems are covered with hairs.   |   |
| <b>Flowers</b>                     | The flowers have four petals, commonly yellow or white, but sometimes pink or purple.   |   |
| <b>Flowering period</b>            | April-July.   |   |
| <b>Fruit</b>                       | Seedpods are mostly 4–8 cm long and 4–6 mm wide, with a nearly uniform diameter for most of the length, and a beak about 1–2 cm long. Dry pods are noticeably constricted between seeds.  |   |

|                               |  |
|-------------------------------|--|
| <b>Seeds</b>                  | Seed are round to egg shaped, from less than 2–4 mm long and roughly 2 mm wide. They are brown, reddish brown, or yellowish brown.   |
| <b>Roots</b>                  | Strong tap root over 1m deep allowing it to survive periods of moisture stress and regrow following slashing or grazing due to root reserves.  |
| <b>Association</b>            | Cereals, Potato, Brassica crops.   |
| <b>Dispersal</b>              | Seeds are spread shorter distances by wind, water, animals and human activities. Dispersal via contaminated agricultural produce is thought to be the most significant means of long range spread. |
| <b>Impact on introduction</b> | Environmental weed, troublesome in cereal and brassica crops. It is also thought to be poisonous to livestock.   |

## 51. *Richardia brasiliensis* Gomes

|                                    |   |   |
|------------------------------------|---|---|
| <b>Synonyms</b>                    | <i>Richardia pilosa</i> Ruia & Pav<br><i>Richardia rosea</i> (St Hil.) Schult<br><i>Richardsonia brasiliensis</i> (Gomez) Hayne<br><i>Richardsonia emetica</i> Mart<br><i>Richardsonia rosea</i> St Hil<br><i>Richardsonia scabra</i> St Hil<br><i>Spermacoce hexandra</i> A. Rich  | <b>Plant habit during flowering</b>   |
| <b>Common names</b>                | White-eye, Brazilian calla-lily, Mexican-clover   |   |
| <b>Family</b>                      | Rubiaceae   |   |
| <b>Group</b>                       | Dicot   |   |
| <b>Habit</b>                       | Annual to perennial   |   |
| <b>Habitat</b>                     | Disturbed sites and roadsides, and in pastures and lawns.   |  |
| <b>Origin</b>                      | Tropical America  | (b) Seeds   |
| <b>Distribution</b>                | Afghanistan, Armenia, Azerbaijan, China, Georgia (Republic of), Iran, Iraq, Israel, Japan, Jordan, Lebanon, Syria, Turkey, Algeria, Egypt, Ethiopia, Kenya, Libya, Morocco, Mozambique, South Africa, Spain, Tunisia, Zimbabwe, Canada, Mexico, USA, Honduras, Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, Albania, Austria, Belarus, Belgium, Bosnia-Hercegovina, Bulgaria, Croatia, Cyprus, Czechoslovakia (former), Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Moldova, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, UK, Ukraine, Yugoslavia (former), Australia, New Zealand. |   |
| <b>Identifying characteristics</b> | Prostrate, spreading annual (occasionally perennial) herb, usually 50-60 cm across and 10 cm tall.  |   |
| <b>Leaves</b>                      | The leaves occur in opposite pairs and are joined across the stem by a small green ridge with several broad irregular bristles. Each leaf has a short stalk which broadens into an oval or ovate leaf with smooth margins and ends in a blunt point. The leaves are 1.5 to 5.5 cm long, strongly veined, and finely hairy, especially along the edges.  |   |
| <b>Stem</b>                        | The stems are prostrate, much branched, greenish and 4-angled when young, with very small whitish hairs.  |   |

|                               |   |
|-------------------------------|---|
| <b>Flowers</b>                | The small funnel-shaped flowers occur in dense flat clusters of about 20 above the leaves, and at the tips of the stems. Each flower cluster is surrounded by two or four stalkless leaf-like bracts, which surround a flattened or slightly domed cushion from which the flowers arise. Most flowers have six tapering white (rarely pink or bluish) petals giving each flower a star-like appearance, surrounding the six yellow stamens and trifid stigma. |
| <b>Flowering period</b>       | September to January.   |
| <b>Fruit</b>                  | Fertilized flowers develop into bluntly triangular three sectioned fruits which split apart and fall at maturity, each section containing a single 'seed' (mericarp).   |
| <b>Seeds</b>                  | The 'seeds', approximately 1 mm long, are brown, ovoid and ellipsoidal with long sharp papillae and a definite ridge along the inner side.  |
| <b>Roots</b>                  | The species has a strong, white, thick and often contorted, central taproot, from the crown of which the many stems ramify.   |
| <b>Association</b>            | Onion, groundnut, pigeon pea, tea, bell pepper, pecan, cinchona tree, watermelon, citrus, arabica coffee, <i>Glycine soja</i> , cotton, sunflower, rubber, sweet potato, apple, lucerne, tobacco, rice, common bean, <i>Philodendron</i> , peach, Japanese plum, sugarcane, tomato, potato, sorghum, <i>Stylosanthes gracile</i> , grapevine, maize.  |
| <b>Dispersal</b>              | The seeds are dispersed with soil, plant debris and by water.   |
| <b>Impact on introduction</b> | A nuisance in lawns and gardens, and has also invaded and replaced native vegetation, as well as being a crop seed contaminant. The species is also an alternative host for <i>Fusarium roseum</i> f.sp. <i>cerealis</i> , <i>Thanatephorus cucumeris</i> and <i>Meloidogyne javanica</i> .   |

## 52. *Senecio inaequidens* DC.

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Senecio burchellii</i> DC.  | <b>Plant habit during flowering</b><br><br>(a) Flowering branch |
| <b>Common names</b>                | South African ragwort, Narrow-leaf ragwort   |   |
| <b>Family</b>                      | Asteraceae   |   |
| <b>Group</b>                       | Dicot  |   |
| <b>Habit</b>                       | Perennial  |   |
| <b>Habitat</b>                     | Along major roads, on railway tracks, in car parks, pavement cracks and demolition sites   |   |
| <b>Origin</b>                      | South Africa   |   |
| <b>Distribution</b>                | Taiwan, Botswana, Lesotho, Mozambique, Namibia, South Africa, Swaziland, Mexico, Argentina, Colombia, Andorra, Austria, Belgium, Croatia, Czech Republic, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Poland, Spain, Sweden, Switzerland, UK. |   |
| <b>Identifying characteristics</b> | Herbaceous, woody (at base) short-lived perennial, up to 100 cm tall, arising from a shallow taproot.  |   |
| <b>Leaves</b>                      | Leaves alternate, bright green, usually clasping stem at the base (occasionally petiolate), becoming reduced in size from the base, very variable, up to 10 cm long and 1 cm wide (usually much narrower).   |   |
| <b>Stem</b>                        | Stems are erect, glabrous, often much branched from the base.  |   |
| <b>Flowers</b>                     | Inflorescences are open, terminal or axillary, corymbose panicles, 80 to 100 per plant.  |   |
| <b>Flowering period</b>            | Spring and Autumn.   |   |
| <b>Fruit</b>                       | Achenes (Fruit).   |   |
| <b>Seeds</b>                       | Achenes 2-2.5 mm long, cylindrical, pubescent between ribs. Pappus white, 2- to 3-times as long as achenes, readily detached.  |   |
| <b>Roots</b>                       | Tap root system.   |   |



(b) Seeds

|                               |   |
|-------------------------------|---|
| <b>Association</b>            | Grapevine, Apple tree orchards, Cereals.  |
| <b>Dispersal</b>              | Achenes are wind-dispersed. Humans and their animals transport achenes, as they readily attach to rough surfaces. Achenes are likely dispersed by the movement of soil during building works, and by attachment to vehicles or in the slip-stream of road and rail vehicles. Furthermore, wool movement has been important in the past. |
| <b>Impact on introduction</b> | It can be poisonous to cows, sheep and horses; if it spreads further into arable land this could cause significant economic impacts. Forms dominant population.   |

## 53. *Senecio madagascariensis* Poiret

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Senecio burchellii</i> auct. non DC. sensu Cabrera<br><i>Senecio burchellii</i> auct. non DC.<br><i>Senecio incognitus</i> Cabrera<br><i>Senecio junodianus</i> O. Hoffm.<br><i>Senecio ruderalis</i> Harvey  | <b>Plant habit during flowering</b><br> |
| <b>Common names</b>                | Fireweed, Madagascar ragwort   |   |
| <b>Family</b>                      | Asteraceae   |   |
| <b>Group</b>                       | Dicot  |   |
| <b>Habit</b>                       | Perennial  |   |
| <b>Habitat</b>                     | A weed of pastures, open woodlands, grasslands, suburban bushland, roadsides, disturbed sites, waste areas, parks and coastal environs in subtropical and warmer temperate regions.  |   |
| <b>Origin</b>                      | Southern Africa and Madagascar   |   |
| <b>Distribution</b>                | Japan, Kenya, Madagascar, Mauritius, Mozambique, Réunion, South Africa, Swaziland, USA, Argentina, Brazil, Colombia, Uruguay, Australia.   |                                        |
| <b>Identifying characteristics</b> | Fireweed is a daisy-like plant that grows from 10 to 60 cm high. It has a variable growth habit and leaf structure, but the most common form of fireweed is a low, heavily branched, annual or short lived perennial plant.  |   |
| <b>Leaves</b>                      | Generally bright green in colour, fleshy and narrow, leaves are 2–7 cm long, alternately arranged on the stem, and have serrated, entire or lobed margins. Broader leaves usually clasp around the stem.   |   |
| <b>Stem</b>                        | Stems are erect, often much branched.  |   |
| <b>Flowers</b>                     | The ‘daisy-like’ flower-heads (15-20 mm across) have 12-15 yellow ‘petals’ (i.e. ray florets) that are 6-14 mm long. They have a yellow center made up of numerous tiny flowers (i.e. tubular or disc florets) and are surrounded by about twenty (19-21) greenish bracts (4-5 mm long). These flower-heads (i.e. capitula) are loosely clustered at the tips of the branches. |   |
| <b>Flowering period</b>            | Late Autumn-Late Summer  |   |
| <b>Fruit</b>                       | Achenes (Fruit).   |   |

|                               |  |
|-------------------------------|--|
| <b>Seeds</b>                  | Seeds (i.e. achenes) are cylindrical in shape (1.5-3 mm long and less than 0.5 mm wide), brownish in colour and shallowly ribbed. They are covered with very tiny hairs and topped with a silky tuft (i.e. pappus) of hairs (3.5-6.5 mm long).                     |
| <b>Roots</b>                  | Fireweed has a shallow, branched taproot with numerous fibrous roots growing from 10 to 20 cm deep.  |
| <b>Association</b>            | It is not normally a weed of crops but is a major concern wherever poorly managed and overgrazed pasture occurs.   |
| <b>Dispersal</b>              | Most dispersal of seed is by wind movement, but some seeds may be spread by animals, vehicles and in contaminated agricultural produce.  |
| <b>Impact on introduction</b> | Livestock poisoning, decrease pasture production, competition with useful species and incur high control costs. It competes with natural vegetation, reducing grass and other low-growing plants. This can lead to soil erosion as well as a loss in biodiversity. |

## 54. *Striga aspera* (Willd.) Benth

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Euphrasia aspera</i> Wild.  | <b>Plant habit during flowering</b><br><br>(a) Flowering branch |
| <b>Common names</b>                | Witch weed   |   |
| <b>Family</b>                      | Scrophulariaceae   |   |
| <b>Group</b>                       | Dicot  |   |
| <b>Habit</b>                       | Annual   |   |
| <b>Habitat</b>                     | Grassland, cultivated grass and cereal crops   |   |
| <b>Origin</b>                      | West Africa  |   |
| <b>Distribution</b>                | Benin, Burkina Faso, Cameroon, Central African Republic, Côte d'Ivoire, Ethiopia, Gambia, Guinea-Bissau, Malawi, Mali, Niger, Nigeria, Senegal, Sudan, Tanzania, Togo.   |   |
| <b>Identifying characteristics</b> | Parasitic plant, very similar but usually slightly smaller than <i>Striga hermonthica</i> , bract 1-2 mm wide, occurs on rice maize sorghum and wild grasses, occurs on moisture sites.  |   |
| <b>Leaves</b>                      | Leaves divergent, narrow, up to 6 cm. long, usually less than 3 mm, wide, and scabrid.   |   |
| <b>Stem</b>                        | Slightly angled, hispid with upward pointed hairs.   |   |
| <b>Flowers</b>                     | Corolla pink, tube 15 mm long, densely puberulent, bent and inflated just below limb; upper lip of corolla emarginated, slightly recurved, lower lobes spreading, 5-8 mm. long.  |   |
| <b>Fruit</b>                       | Fruit a loculicidal capsule with numerous seeds.   |   |
| <b>Seeds</b>                       | Seeds elliptic, ovate, oblong, occasionally D-shaped, triangular, rhombic, or irregular; often twisted or angled from crowding or position in capsule; tiny, dust like, 0.2–0.6 mm long, 0.1–0.3 wide and thick. Orange to golden-brown, light to dark brown, or grey to blackish; sometimes sparkling with colored light at high magnification. Surface glabrous, with prominent often rope like longitudinal or diagonal reticulations that sometimes appear as closely spaced ridges rather than reticulations and are often twisted in appearance. |   |
| <b>Roots</b>                       | Fine roots, not extensively branched attached to the underground part the stem. Base of the stem fixed on grass host roots by a haustorium.  |   |
| <b>Association</b>                 | Rice, Sorghum, Millet, Maize, wild grasses etc.  |   |
| <b>Dispersal</b>                   | The small seeds are wind dispersed, can be moved with runoff following heavy rains, on the feet of man and livestock, on farm implements and in animal faeces following their ingestion of the seed. Further, Endo zochory by beetles may facilitate the dispersal of viable seeds after passage through the gut.  |   |
| <b>Impact on introduction</b>      | <i>S. aspera</i> causes significant damage to rice and maize in several countries.   |   |



(a) Flowering branch



(b) Seeds

## 55. *Thlaspi arvense* L.

|                                    |  |   |
|------------------------------------|--|---|
| <b>Common names</b>                | Field pennycress<br>French weed  | <b>Plant habit during flowering</b><br> |
| <b>Family</b>                      | Brassicaceae   |   |
| <b>Group</b>                       | Dicot  |   |
| <b>Habit</b>                       | Annual   |   |
| <b>Habitat</b>                     | Gardens, yards, flower beds, arable land, fallow land, paths, waste ground, heaps of earth, rubbish tips, seaweed piles.   |   |
| <b>Origin</b>                      | Central or western Asia  |   |
| <b>Distribution</b>                | Afghanistan, Armenia, Azerbaijan, Bhutan, China, Georgia (Republic of), Iran, Israel, Japan, Jordan, Kazakhstan, Korea, DPR, Korea, Republic of, Kyrgyzstan, Lebanon, Mongolia, Pakistan, Tajikistan, Turkey, Turkmenistan, South Africa, Tunisia, Canada, Greenland, USA, Argentina, Colombia, Albania, Austria, Belarus, Belgium, Bulgaria, Czechoslovakia (former), Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Spain, Sweden, Switzerland, UK, Yugoslavia (former), Australia, New Zealand. |   |
| <b>Identifying characteristics</b> | The entire plant is glabrous and bright green, with an unpleasant odour when bruised.  |   |
| <b>Leaves</b>                      | The leaves are alternate, with basal leaves narrowly obovate, petioled and soon withering, the middle and upper leaves are oblong, entire or irregularly toothed and clasp the stem by two earlobes, 1 to 1.5 mm long.   |   |
| <b>Stem</b>                        | Stems are erect, 18 to 80 cm tall, simple or branched above.   |   |
| <b>Flowers</b>                     | The flowers are initially in a small, flat cluster at the top of the leafy stem with racemes becoming longated when in fruit, perfect, regular with four sepals, four white petals, 3 to 4 mm long; six stamens, two shorter than others.  |   |
| <b>Flowering period</b>            | June–September.  |   |

(a) Flowering branch



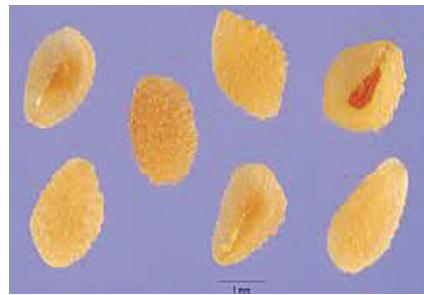
(b) Seeds

|                               |  |
|-------------------------------|--|
| <b>Fruit</b>                  | Many-seeded, oval, flat, widely winged, 10–15 mm (0.4–0.6 in.) long silicula, notched at apex. Bristle tip shorter than wing's breadth. Stalk approx. 15 mm (0.6 in.).   |
| <b>Seeds</b>                  | The seeds are ovoid, 1.2 to 2.3 mm long and 1 to 1.5 mm wide, reddish or purplish-brown to black, unsymmetrically oval in outline, somewhat flattened with several concentric ridges resembling a finger print, each face with a narrow groove extending from the hilum to the centre of the seed. |
| <b>Roots</b>                  | The plant has a slender taproot and fibrous lateral roots.   |
| <b>Association</b>            | Wheat  |
| <b>Dispersal</b>              | Over short distances, seed may be spread by grain harvesters and other farm machinery, in soil on the feet or fur of humans or animals. The seeds are winged and wind dispersal may carry the seed for distances of up to 1 km or more. The seed may also travel as a contaminant of crop seed.    |
| <b>Impact on introduction</b> | Reduce wheat yields in cultivated fields. It is an alternate host for the nematode <i>Heterodera schachtii</i> and the fungus <i>Plenodomus lingam</i> , which infect many other brassicaceae as well.   |

## 56. *Urochloa plantaginea* (Link) RD Webster

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Brachiaria plantaginea</i> Link<br><i>Panicum distans</i> Salzm. & Doell<br><i>Panicum plantagineum</i> Link  | <b>Plant habit during flowering</b><br> |
| <b>Common names</b>                | Broad leaf panicum alexander grass, Plantain signal grass  |   |
| <b>Family</b>                      | Poaceae  |   |
| <b>Group</b>                       | Monocot  |   |
| <b>Habit</b>                       | Annual   |   |
| <b>Habitat</b>                     | Agricultural weed, naturalized   |   |
| <b>Origin</b>                      | Africa, North America and South America  |   |
| <b>Distribution</b>                | Mexico, USA, Costa Rica, Guatemala, Honduras, Nicaragua, Puerto Rico, Argentina, Brazil, France.   |   |
| <b>Identifying characteristics</b> | Plants not prostrate, up to 1 m high under fertile and humid soils.  |   |
| <b>Leaves</b>                      | Leaves: 4-15 cm grooved sheaths, light green or white, hairless but with ciliated margins. Membranous ligules, 1 mm long with white hairs.   | <br>(b) Seeds                          |
| <b>Stem</b>                        | Stoloniferous perennial with smooth, angled culms that root at the lower nodes.  |   |
| <b>Flowers</b>                     | Ascendent panicles, 10-30 cm long, bearing 3 to 8 clusters, alternately inserted on the upper part, each cluster 3-10 cm long. Spikelets alternate and imbricated on the rachis.                           |   |
| <b>Flowering period</b>            | Summer   |   |
| <b>Fruit</b>                       | Fruit oval, plain convexed, 3.2-4 mm long, 2.2 mm wide, 0.9 mm thick, hairless. Fertile lemma ovobate to elliptic with a fine transverse roughness. Palea somehow convexed and shorter than fertile lemma. |   |
| <b>Roots</b>                       | Roots fasciculate.   |   |
| <b>Association</b>                 | Citrus, carrot, soyabean, cotton, sunflower, lettuce, rice, beans, plum, sugarcane, maize.   |   |
| <b>Impact on introduction</b>      | A highly competitive weed and causes harvest losses.   |   |

## 57. *Veronica persica* Poir.

|                                    |   |   |
|------------------------------------|---|---|
| <b>Synonyms</b>                    | <i>Veronica agrestis</i> var. <i>byzantia</i> Sm.<br><i>Veronica buxbaumii</i> Tenore<br><i>Veronica byzantia</i> Sibth. & Sm.<br><i>Veronica tournefortii</i> C. C. Gmel   | <b>Plant habit during flowering</b>   |
| <b>Common names</b>                | Creeping speedwell, Bird's eye, creeping veronica.  |   |
| <b>Family</b>                      | Scrophulariaceae  |   |
| <b>Group</b>                       | Dicot   |   |
| <b>Habit</b>                       | Annual  |   |
| <b>Habitat</b>                     | Gardens, landscaped areas, turf, orchards, vineyards, crop fields, roadsides, and other disturbed sites.  |   |
| <b>Origin</b>                      | Eurasia   |   |
| <b>Distribution</b>                | Afghanistan, Bhutan, China, Iran, Israel, Japan, Jordan, Korea, DPR Korea, Republic of, Nepal, Pakistan, Turkey, Egypt, Lesotho, South Africa, Canada, Mexico, USA, Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Peru, Uruguay, Austria, Belgium, Czechoslovakia (former), Finland, France, Germany, Hungary, Iceland, Italy, Netherlands, Norway, Poland, Portugal, Russian Federation, Spain, Sweden, Switzerland, UK, Australia, New Zealand, Papua New Guinea. |  |
| <b>Identifying characteristics</b> | Annual herbaceous plant.  |   |
| <b>Leaves</b>                      | Lower leaves opposite, petioled, coarsely toothed, round-ovate, to 2 cm long; upper leaves similar but alternate and sessile, scattered pubescence on all leaves.   |   |
| <b>Stem</b>                        | Stems 10-50 cm long, simple or branched, often prostrate with roots at nodes and scattered long hairs.  |   |
| <b>Flowers</b>                     | Flowers solitary, axillary on pedicels to 2 cm long (longer than leaves); flower calyx 4-lobed, green, 6-8 mm long; corolla 4-lobed, blue, 8-12 mm in diameter, stamens 2.  |   |
| <b>Flowering period</b>            | June–September.   |   |

|                               |  |
|-------------------------------|--|
| <b>Fruit</b>                  | Fruit a 2-celled capsule, broadly heart-shaped, lobes point outward with a shallow notch, clearly wider (6 to 8.5 mm) than tall (4 to 6 mm); style and calyx persistent; somewhat pubescent, 7-18 seeds per capsule. |
| <b>Seeds</b>                  | Seeds obovoid, brown to yellowish-brown, to 1.5 mm long, one side deeply concave, other rounded, surface tuberculate.  |
| <b>Roots</b>                  | Fibrous roots.   |
| <b>Association</b>            | Cereals, Sugar beet.   |
| <b>Dispersal</b>              | Seed is spread as an impurity in crop seed, manure and fodder. Ants are said to transport the seeds. Earthworms ingest common speedwell seeds and viable seeds have been recovered from worm cast soil.              |
| <b>Impact on introduction</b> | Alternative host for a range of crop pests and pathogens. It also acts as a host for beet western yellows luteo virus.   |

## 58. *Parthenium hysterophorus* L.

|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Argyrochaeta bipinnatifida</i> Cav.<br><i>Parthenium lobatum</i> Buckl.<br><i>Villanova bipinnatifida</i> Ortega  | <b>Plant habit during flowering</b><br> |
| <b>Common names</b>                | <i>Parthenium</i> weed, barley flower, bastard feverfew, broom weed, congress grass, congress weed, dog flea weed, mugwort, Santa Maria feverfew, whiteheads, wormwood.  |   |
| <b>Family</b>                      | Asteraceae   |   |
| <b>Group</b>                       | Dicot  |   |
| <b>Habit</b>                       | Annual herb  |   |
| <b>Habitat</b>                     | Wastelands, vacant lands, orchards, forestlands, flood plains, agricultural areas, scrub/shrub lands, urban areas, overgrazed pastures and along roadsides and railway tracks.   |   |
| <b>Origin</b>                      | Native to Mexico, Central, South America and the Caribbean.  | <br>©2008 Simon S. Co                  |
| <b>Distribution</b>                | Bangladesh, Bhutan, China, India, Israel, Japan, Korea, Republic of, Nepal, Sri Lanka, Taiwan, Kenya, South Africa, Swaziland, Tanzania, Uganda, Mexico, USA, Hawaii, New York, Belize, Cuba, Guatemala, Netherlands Antilles, Brazil, Chile, Peru, Venezuela, Belgium, Australia.     |   |
| <b>Identifying characteristics</b> | <i>P. hysterophorus</i> is an erect, much-branched with vigorous growth habit, aromatic, annual (or a short-lived perennial), herbaceous plant with a deep taproot.  |   |
| <b>Leaves</b>                      | Leaves are pale green, lobed, hairy, initially forming a basal rosette of strongly dissected leaves that are up to 30 cm in length, close to the soil, alternate, sessile, irregularly dissected and bipinnate, having small hairs on both the sides, resembling the leaves of carrot. |   |
| <b>Stem</b>                        | Mature stems are greenish and longitudinally grooved, covered in small stiff hairs, and become much branched at maturity.  |   |
| <b>Flowers</b>                     | Flower heads are both terminal and axillary, pedunculate and slightly hairy, being composed of many florets formed into small white capitula, 3-5 mm in diameter.  |   |
| <b>Fruit</b>                       | The fruit is cypsella.   |   |

|                               |  |
|-------------------------------|--|
| <b>Seeds</b>                  | Seeds (achenes) are black, flattened, about 2 mm long, each with two thin, straw-coloured, spathulate appendages (sterile florets) at the apex which act as air sacs and aid dispersal.  |
| <b>Roots</b>                  | Deep tap root system.  |
| <b>Association</b>            | Okra, Onion, Cashew nut, Groundnut, Papaya, Chickpea, Watermelon, Citrus, Coconut, Coffee, Pumpkin, Carrot, Finger millet, Teff, Cotton, Sunflower, Mango, Bitter gourd, Banana, Rice, Beans, Guava, Sugarcane, Sesame, Tomato, Aubergine, Potato, Sorghum, Wheat, Maize, Main pastures.   |
| <b>Dispersal</b>              | The seeds are mainly dispersed through water currents, animals and the movement of vehicles, machinery, livestock, grain, stock feed and other produce, and to a lesser extent by the wind. Most of the long distance spread is through vehicles, farm machinery and flooding.   |
| <b>Impact on introduction</b> | Aggressive colonizer of disturbed ground, reported to cause yield loss in vegetable crops and forage crops, inhibits fruit setting, possess allelopathic properties, health hazardous to livestock and human, environmental hazardous weed, acts as a reservoir for necrosis virus and as a host of plant thrips spreads the virus to peanuts. |

## 59. *Phalaris minor* Retz.

|                                    |  |
|------------------------------------|--|
| <b>Common names</b>                | Little seed canary grass   |
| <b>Family</b>                      | Poaceae  |
| <b>Group</b>                       | Monocot  |
| <b>Habit</b>                       | Winter Annual  |
| <b>Habitat</b>                     | Winter crop fields, alfalfa fields, grain fields (including rice), seasonally wet sites, ditch banks, roadsides and other disturbed, unmanaged areas.  |
| <b>Origin</b>                      | North Africa, Europe, and South Asia   |
| <b>Distribution</b>                | Afghanistan, Bangladesh, Bhutan, India, Iran, Iraq, Israel, Jordan, Lebanon, Nepal, Pakistan, Saudi Arabia, Syria, Egypt, Morocco, South Africa, Zimbabwe, Mexico, USA, Argentina, Brazil, Colombia, Ecuador, Uruguay, Albania, Belarus, France, Greece, Italy, Portugal, Spain, UK, Yugoslavia, Australia, New Zealand. |
| <b>Identifying characteristics</b> | Little seed canary grass is an erect winter annual grass with dense spike like flower heads.   |
| <b>Leaves</b>                      | Leaves with a smooth sheath at the base. Ligule a membrane without a fringe of hairs. Leaves flat, 2-30cm long, 3-13mm wide, hairless, smooth to slightly rough, edges slightly rough, with a long fine point.   |
| <b>Stem</b>                        | It is erect or decumbent, caespitose, more-or-less slender with stems up to 90 cm tall.  |
| <b>Flowers</b>                     | The inflorescence is thick, oblong-shaped spike which is 2.5-7.5 cm long and composed of densely crowded overlapping spikelets. Spikelets are laterally compressed.  |
| <b>Fruit</b>                       | Greyish black caryopsis.   |
| <b>Seeds</b>                       | It produces 300-450 seeds per panicle. Seeds are small and shining with blackish colour at maturity. Seeds with 0 bristles. Mature seed heads elliptical to cylindrical.   |
| <b>Roots</b>                       | Fibrous roots.   |
| <b>Association</b>                 | Wheat, Onion, Indian mustard, Chickpea, Barley, Lentil, Flax, Pea, Potato, Berseem clover.   |
| <b>Dispersal</b>                   | Most spread is by planting, then seed being dispersed by animals or birds. Also spread as a contaminant in hay, grain and produce.   |
| <b>Impact on introduction</b>      | It causes yield reduction and developed herbicide resistance (Isoproturon). Farmers harvest wheat as fodder in case of severe infestation. Little seed canary grass can be toxic to livestock when ingested in quantity.   |

**Plant habit during flowering**



(a) Flowering branch



(b) Seeds

## 60. *Echinochloa crus-galli* (L.) Beauv.

|                     |   |  |
|---------------------|---|--|
| <b>Synonyms</b>     | <i>Echinochloa caudata</i> Roshev.<br><i>Echinochloa commutata</i> Schult.<br><i>Echinochloa crus-corvi</i> (L.) Beauv.<br><i>Echinochloa dubia</i> Roem. & chult.<br><i>Echinochloa echinata</i> (Willd.) akai<br><i>Echinochloa formosensis</i> (Ohwi) S.L. Dai<br><i>Echinochloa hispida</i> (E.Forst.) Schult.<br><i>Echinochloa hispidula</i> (Retz.) Nees ex Royle<br><i>Echinochloa macrocorvi</i> Nakai<br><i>Echinochloa madagascariensis</i> Mez<br><i>Echinochloa micans</i> Kossenko<br><i>Echinochloa muricata</i> (P. Beauv.) Fern.<br><i>Echinochloa occidentalis</i> (Wiegand) Rydb.<br><i>Echinochloa paracorvi</i> Nakai<br><i>Echinochloa spiralis</i> Vasinger<br><i>Echinochloa subverticillata</i> Pilger<br><i>Milium crus-galli</i> (L.) Moench<br><i>Oplismenus crus-galli</i> (L.) Dumort.<br><i>Oplismenus dubius</i> (Roem. & Schult.) Kunth<br><i>Oplismenus echinatus</i> (Willd.) Kunth<br><i>Panicum crus-galli</i> L.<br><i>Panicum hispidulum</i> Retz.<br><i>Pennisetum crus-galli</i> (L.) Baumg. | <b>Plant habit during flowering</b>  |
|                     |   |  <p>(a) Flowering branch</p> |
|                     |   |  <p>(b) Seeds</p>           |
| <b>Common names</b> | Barnyard grass  |  |
| <b>Family</b>       | Poaceae   |  |
| <b>Group</b>        | Monocot   |  |
| <b>Habit</b>        | Annual herb   |  |
| <b>Habitat</b>      | Disturbed moist places, roadsides, ditches, irrigated crop fields, pastures, orchards, vineyards, landscaped areas, and margins of ponds and rice fields.   |  |
| <b>Origin</b>       | Europe  |  |

|                                    |   |
|------------------------------------|---|
| <b>Distribution</b>                | Afghanistan, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, India, Indonesia, Iran, Iraq, Israel, Japan, Korea, DPR, Korea, Republic of, Laos, Lebanon, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Taiwan, Thailand, Turkey, Uzbekistan, Vietnam, Egypt, Guinea, Madagascar, Mauritius, Morocco, Mozambique, Senegal, South Africa, Sudan, Swaziland, Tanzania, Tunisia, Uganda, Canada, Mexico, USA, Costa Rica, Cuba, Dominican Republic, Jamaica, Argentina, Brazil, Chile, Colombia, Peru, Uruguay, Austria, Belgium, Bulgaria, Croatia, Czech Republic, Czechoslovakia (former), France, Germany, Greece, Hungary, Italy, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Spain, Sweden, Switzerland, UK, Ukraine, Yugoslavia (former), Yugoslavia (Serbia and Montenegro), Australia, Fiji, New Zealand, Papua, New Guinea. |
| <b>Identifying characteristics</b> | Annual, coarse, tufted with erect stems or decumbent at the base and rooting at the nodes.  |
| <b>Leaves</b>                      | Leaves are blade-shaped, 5-65 cm long, 0.6-2.2 cm wide; rounded at the base to acute at the tip, rough at the margin, glabrous though often with a few long hairs at the base, no ligule.   |
| <b>Stem</b>                        | Stems cylindrical in section, glabrous and filled with white pith. Leaf sheaths glabrous to fimbriate at the margin.  |
| <b>Flowers</b>                     | They range from 6.4–25.4 cm long and consist of branches densely clustered with knot like flowers. Upper branches are stiff and stand erect to somewhat erect from the flowering stem. Lower branches spread farther apart than the upper branches. The flower head is held erect or droops and is sometimes purplish.  |
| <b>Flowering period</b>            | June-October.   |
| <b>Seeds</b>                       | Seed ovoid, compressed, 1.5-2 mm long with hairy lemmas.  |
| <b>Roots</b>                       | Barnyard grass has a fibrous root system.   |
| <b>Association</b>                 | Rice  |
| <b>Dispersal</b>                   | Water, birds, insects, machinery, and animal feet disperse it, but contaminated seed is probably the most common dispersal method.  |
| <b>Impact on introduction</b>      | It has been observed to impact at least 36 different crops (e.g., rice, lettuce, cotton, tomato) and cause yield loss. Root exudates from <i>E. crus-galli</i> were found to contain 15 phytotoxic compounds that are thought to be allelo chemicals against the growth of other plant species. This grass has been reported to accumulate levels of nitrate in its tissues high enough to be toxic to farm animals. It is capable of hosting and transmitting the southern rice black-streaked dwarf virus.  |

## 61. *Cuscuta reflexa* Roxb.

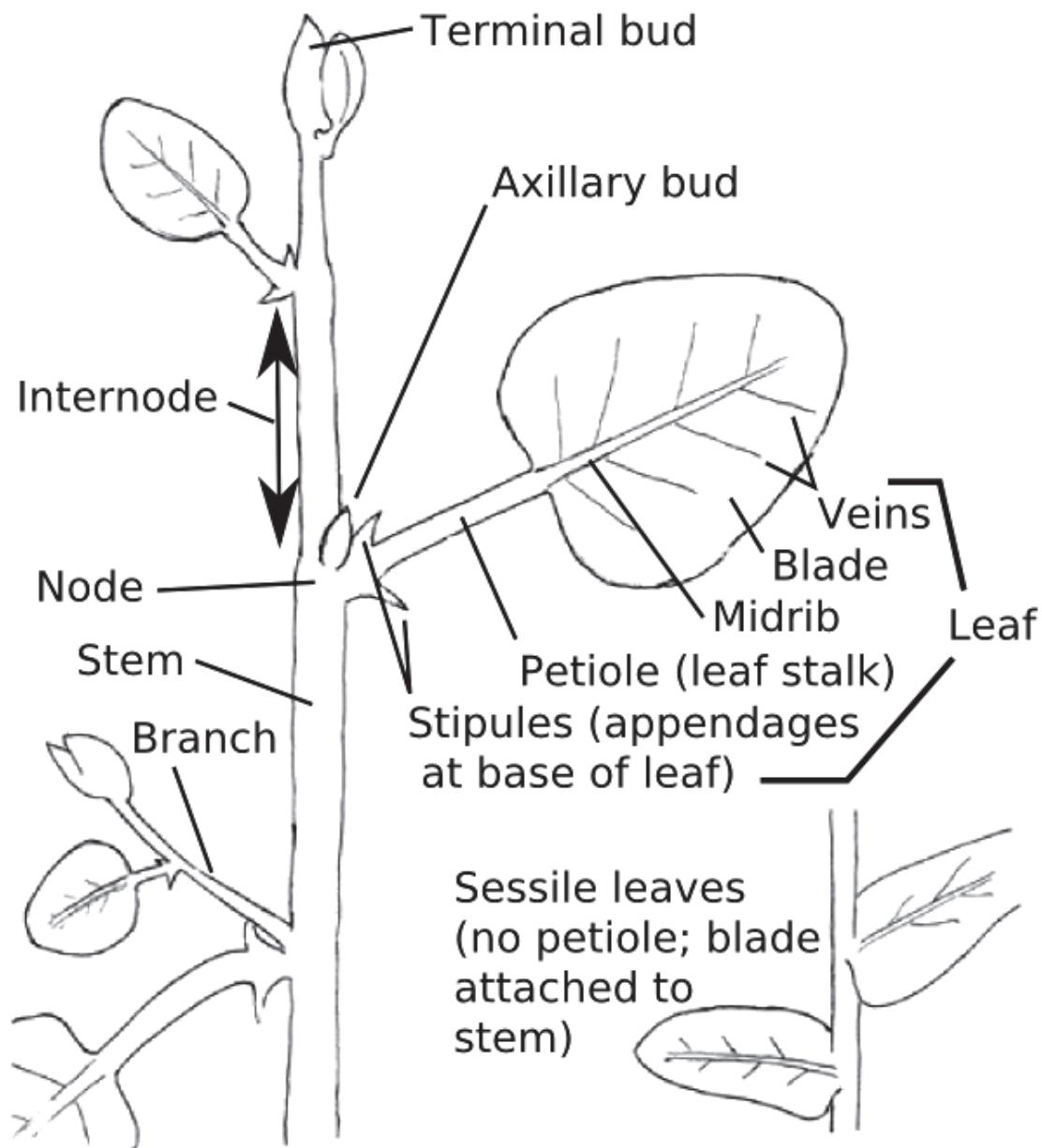
|                                    |  |   |
|------------------------------------|--|---|
| <b>Synonyms</b>                    | <i>Cuscuta elatior</i> Choisy<br><i>Cuscuta hookeri</i> Sweet<br><i>Cuscuta macrantha</i> Don.<br><i>Cuscuta megalantha</i> Steudel<br><i>Cuscuta verrucosa</i> Sweet  | <b>Plant habit during flowering</b><br><br>(a) Flowering branch |
| <b>Common names</b>                | Dodder   |   |
| <b>Family</b>                      | Cuscutaceae  |   |
| <b>Group</b>                       | Dicot  |   |
| <b>Habit</b>                       | Stem parasite  |   |
| <b>Origin</b>                      | Tropical Asia  |   |
| <b>Distribution</b>                | Afghanistan, Bangladesh, Bhutan, China, India, Nepal, Pakistan, SriLanka, Mauritius.   |   |
| <b>Identifying characteristics</b> | It can be identified by its thin stems appearing leafless, with the leaves reduced to minute scales. In these respects it closely resembles the similarly parasitic, but unrelated genus Cassytha.   |   |
| <b>Leaves</b>                      | Leaves are reduced to minute scales.   |   |
| <b>Stem</b>                        | Stems are very long, rather stout, closely twining, branched, glabrous, pale greenish yellow, sometimes dotted with red.   |   |
| <b>Flowers</b>                     | Flowers are solitary or in umbellate clusters of 2-4 or in short racemes; pedicels short, glabrous, usually curved (rarely 0); bracts 1.5 mm. long, ovate-oblong, obtuse fleshy. The flowers are also much longer, up to 10 mm long, white or pinkish with 5 obtuse lobes, much shorter than the lobes, in loose clusters. |   |
| <b>Flowering Period</b>            | Mid-summer to Early autumn.  |   |
| <b>Fruit</b>                       | Capsules are 6-8 mm in diameter, depressed-globose, glabrous, circumscissile near the base.  |   |
| <b>Seeds</b>                       | Seeds are 3-3.5 mm long, black, glabrous.  |   |
| <b>Roots</b>                       | The twining stem develops haustoria which are root like and penetrate the host stem to draw water and nourishment.   |   |
| <b>Association</b>                 | Citrus, Coffee, Lichi, Peach, Jujube.  |   |
| <b>Dispersal</b>                   | Seed spreads mainly through seed contamination.  |   |
| <b>Impact on introduction</b>      | Voracious and destructive vine which usually will overgrow and kill the host. It is also a cause of transmission of different virus diseases such as Citrus mosaic and Purple Blotch to field crops and trees.   |   |

## 62. *Striga asiatica* (L.) Kuntze

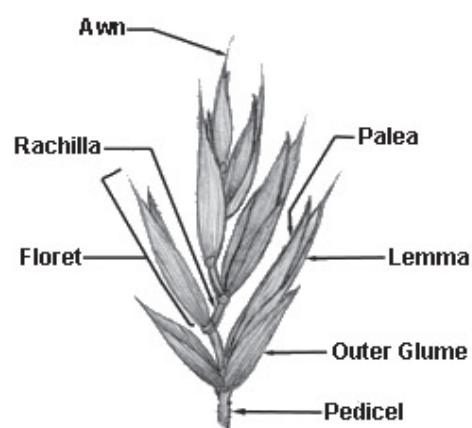
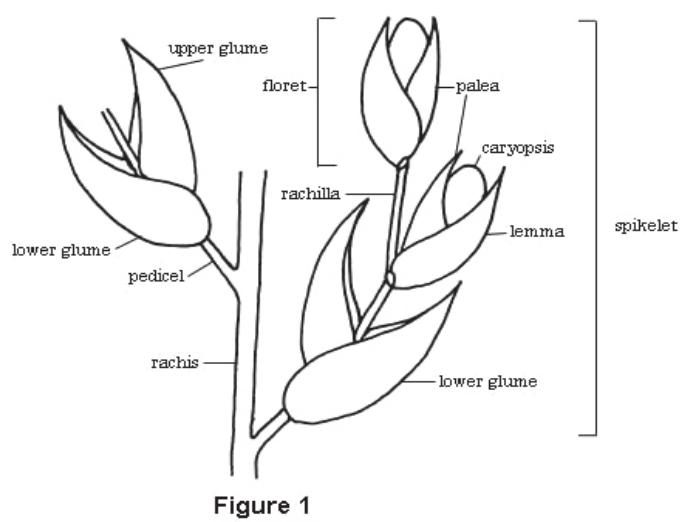
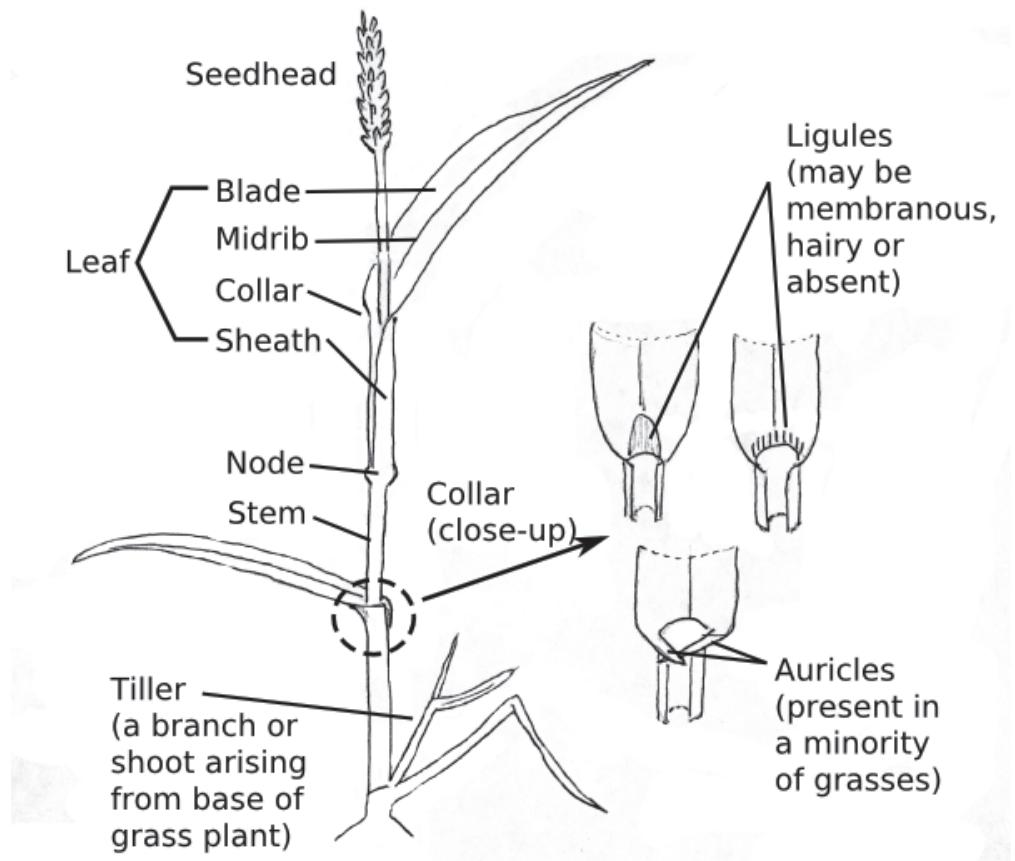
|                                    |   |  |
|------------------------------------|---|--|
| <b>Synonyms</b>                    | <i>Buchnera asiatica</i> L.<br><i>Buchnera coccinea</i> Benth.<br><i>Buchnera hirsuta</i> Benth.<br><i>Campuleia coccinea</i> Hook.<br><i>Striga coccinea</i> (Benth.) Benth.<br><i>Striga gracilis</i> MIQ.<br><i>Striga hirsuta</i><br><i>Striga lutea</i> Lour.<br><i>Striga parvula</i> MIQ.<br><i>Striga phoenicea</i> Benth.<br><i>Striga pusila</i> Hochst.<br><i>Striga spanopheana</i> MIQ.<br><i>Striga zangebarica</i> Klotsch   | <b>Plant habit during flowering</b>  |
| <b>Common names</b>                | Witch weed  |  |
| <b>Family</b>                      | Scrophulariaceae  |  |
| <b>Group</b>                       | Dicot   | (a) Flowering branch   |
| <b>Habit</b>                       | Erect, annual or biennial herb, 10-50 cm tall.  | (b) Seeds  |
| <b>Habitat</b>                     | Coastal areas, Cultivated / agricultural land, Disturbed areas, Rail / roadsides, Arid regions, Natural grasslands.   |  |
| <b>Origin</b>                      | Africa and Asia.  |  |
| <b>Distribution</b>                | Bangladesh, Bhutan, Cambodia, China, India, Indonesia, Japan, Malaysia, Myanmar, Nepal, Oman, Pakistan, Philippines, Saudi Arabia, Singapore, Sri Lanka, Thailand, Vietnam, Yemen, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Comoros, Congo, Congo Democratic Republic, Côte d'Ivoire, Egypt, Ethiopia, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Madagascar, Malawi, Mali, Mauritius, Mozambique, Namibia, Niger, Nigeria, Réunion, Rwanda, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe, USA, Australia, New Zealand. |  |
| <b>Identifying characteristics</b> | Distinguished by bell-like swellings where roots attach to a suitable host; above ground stems 4-sided and covered with rough hairs.  |  |
| <b>Leaves</b>                      | Leaves are nearly opposite, narrowly lanceolate, about 1-3cm long, with successive leaf pairs perpendicular to one another. <i>S. asiatica</i> flowers in summer and fall.  |  |
| <b>Stem</b>                        | Mature plants have green foliage above ground and that is sparsely covered with coarse, short, white, bulbous-based hairs. Normally 15-30cm tall but have grown to 60cm.  |  |

|                               |   |
|-------------------------------|---|
| <b>Flowers</b>                | Flowers are small (less than 1.5cm in diameter) are sessile, axillary, the corolla is two-lipped, and they occur on loose spikes. Flower colour varies regionally, from red, orange, or yellow in Africa to pink, white, yellow, or purple in Asia. |
| <b>Fruit</b>                  | The flowers give way to swollen seeds pods, each containing thousands of microscopic seeds. Fruit, a capsule is about 4 mm long and 2 mm wide, containing 550 seeds on average.   |
| <b>Seeds</b>                  | Seeds dust-like, 0.2–0.3 mm long, brown, ribbed.  |
| <b>Roots</b>                  | The roots are succulent, round, without root hairs, and found attached to a host species root system.   |
| <b>Association</b>            | Grass crops (maize, millet, rice, sorghum, sugarcane) and some broadleaf crops (e.g. sunflower, tomatoes, some legumes).  |
| <b>Dispersal</b>              | The small seeds are wind dispersed, can be moved with runoff following heavy rains, on the feet of man and livestock, on farm implements and in animal faeces following their ingestion of the seed.  |
| <b>Impact on introduction</b> | Infestations reduce yields and contaminate crops. It is also known to parasitize certain weedy grasses. <i>S. asiatica</i> absorbs nutrients and moisture by tapping directly into a host's root system.  |

## A basic illustrated glossary of plant identification

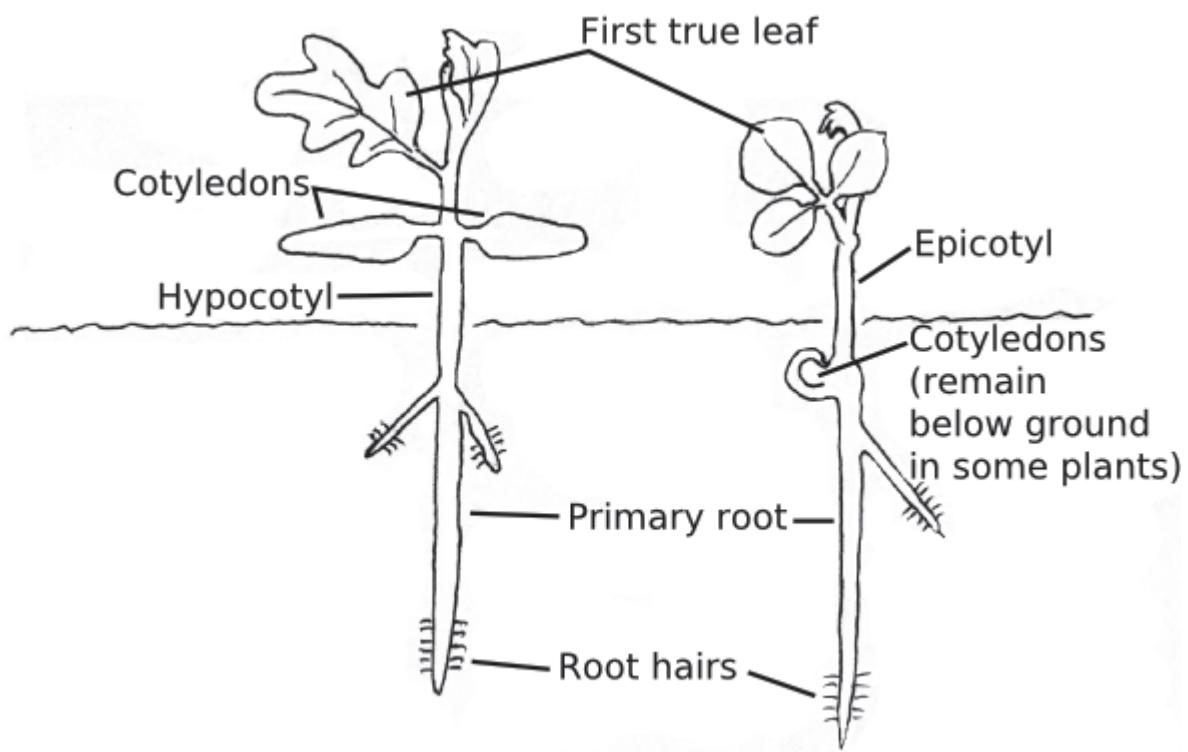


*Figure 1: Structures on a broadleaf weed or crop*

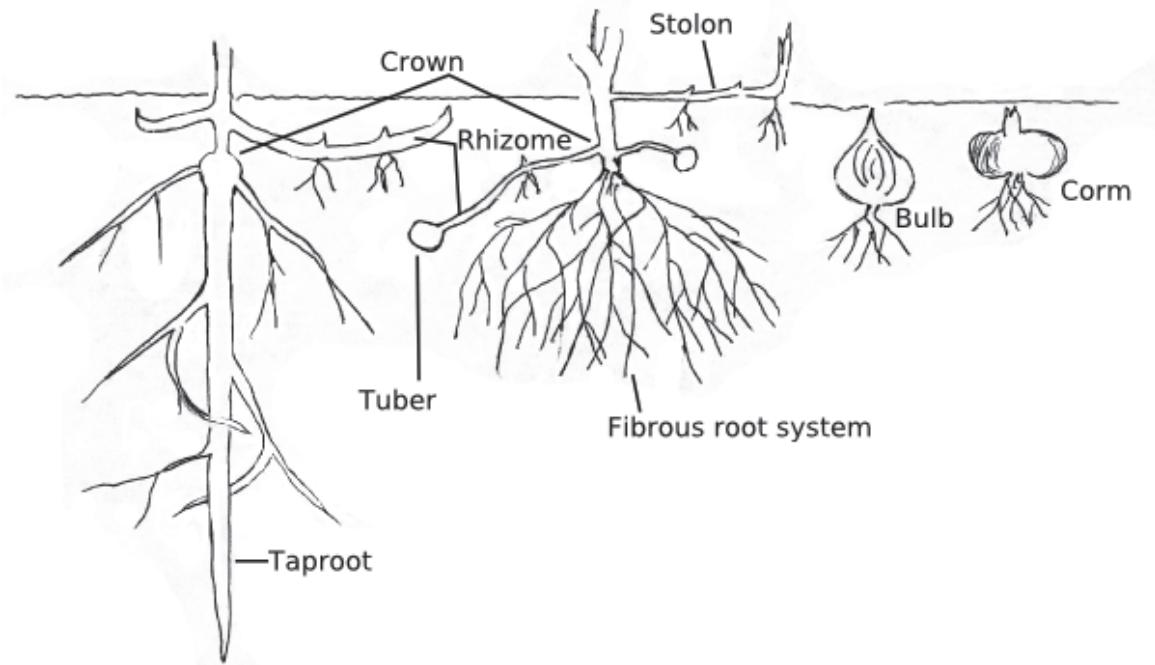


## Spikelet

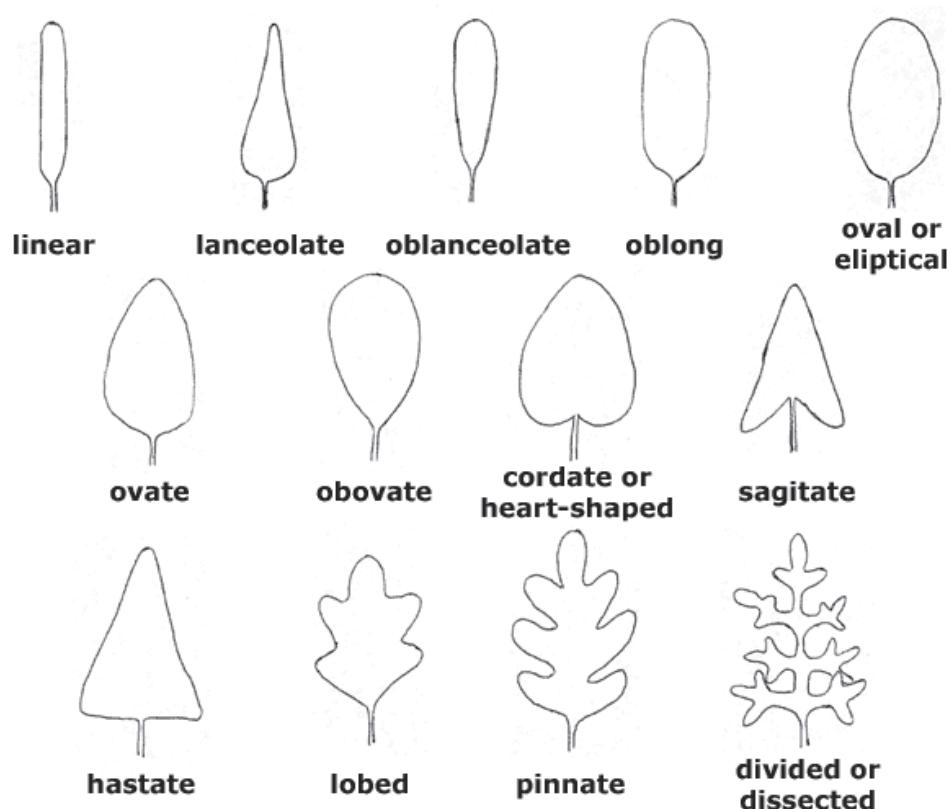
*Figure 2: Structures on a grass weed or crop*



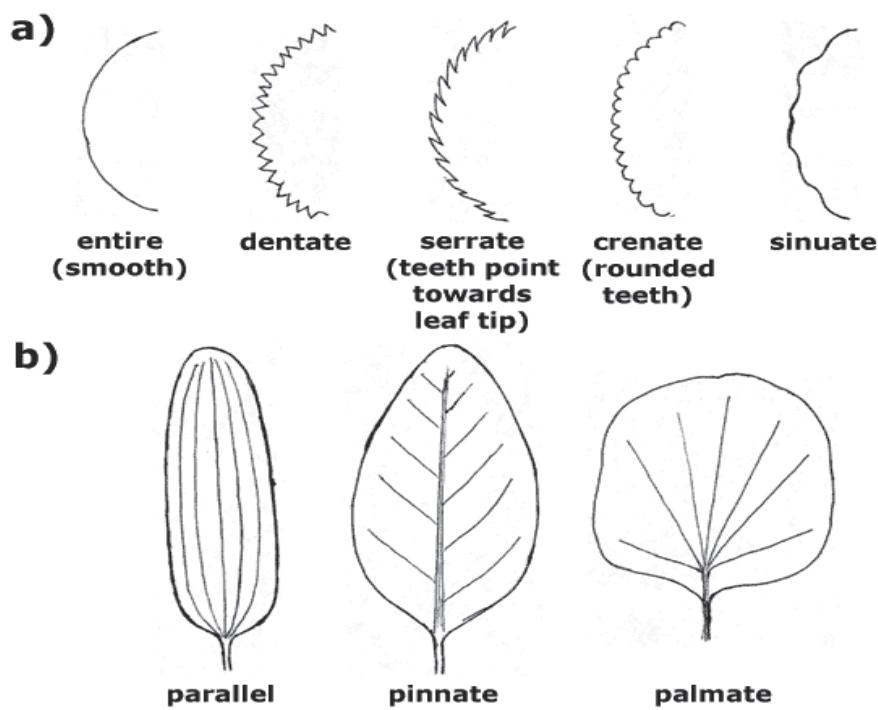
*Figure 3. Broadleaf seedlings*



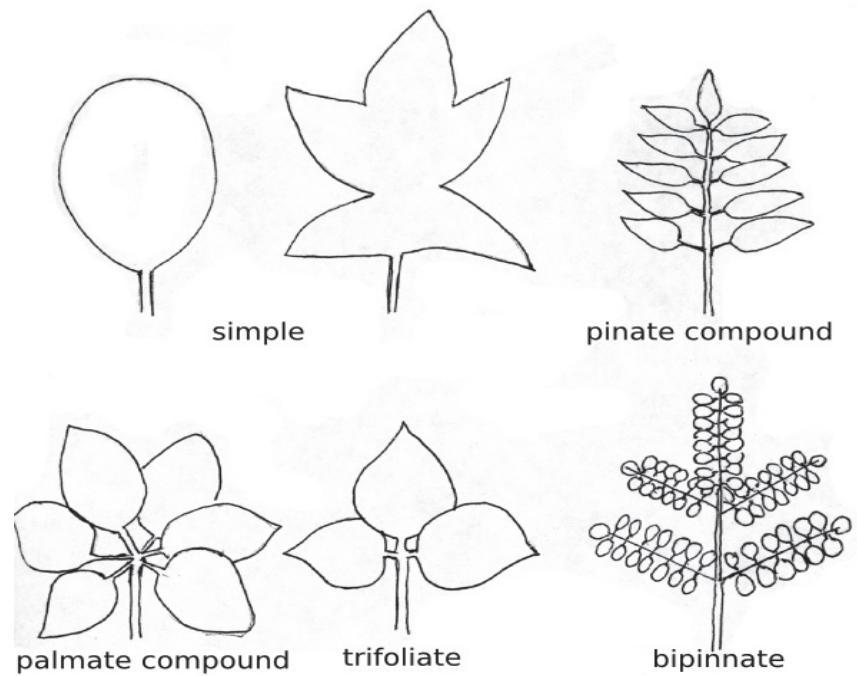
*Figure 4. Roots and other underground structures*



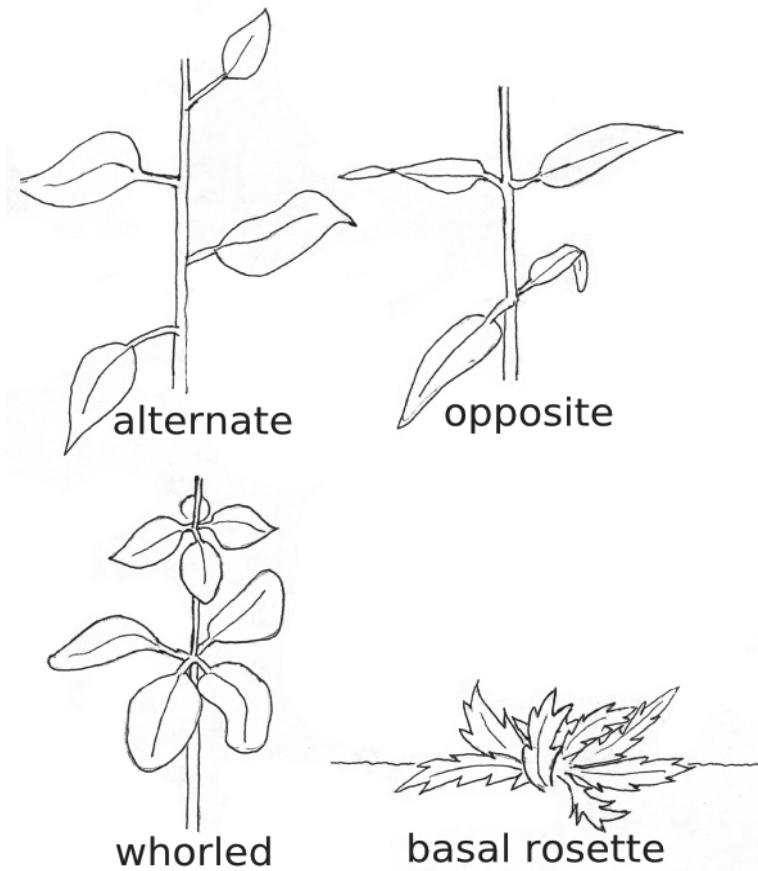
*Figure 5. Leaf shapes*



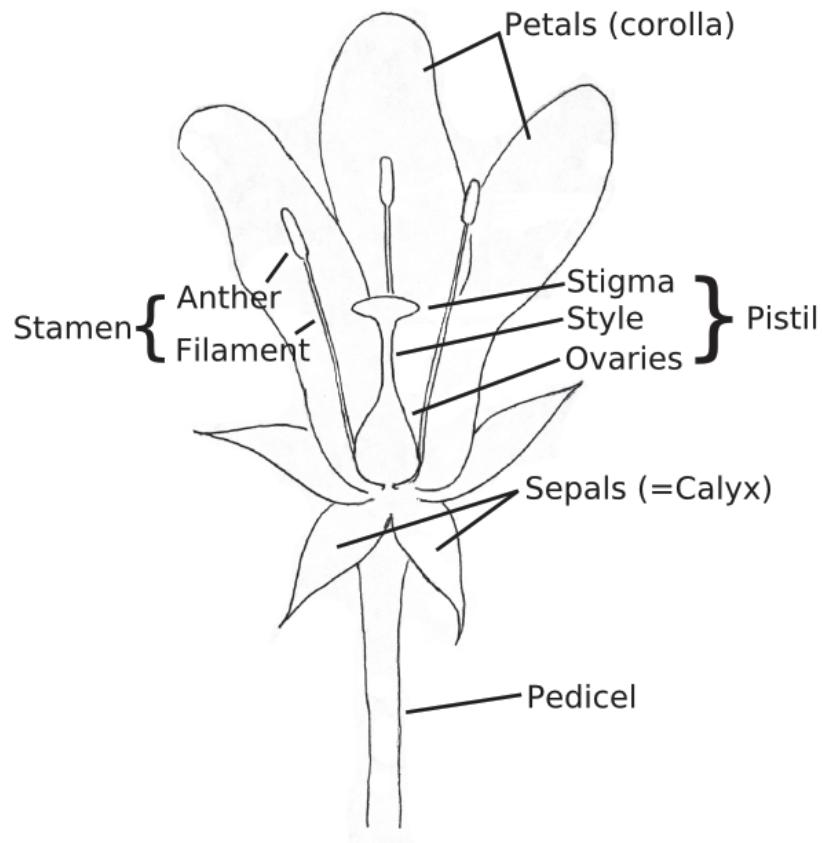
*Figure 6. (a) Leaf margins (b) Leaf venation*



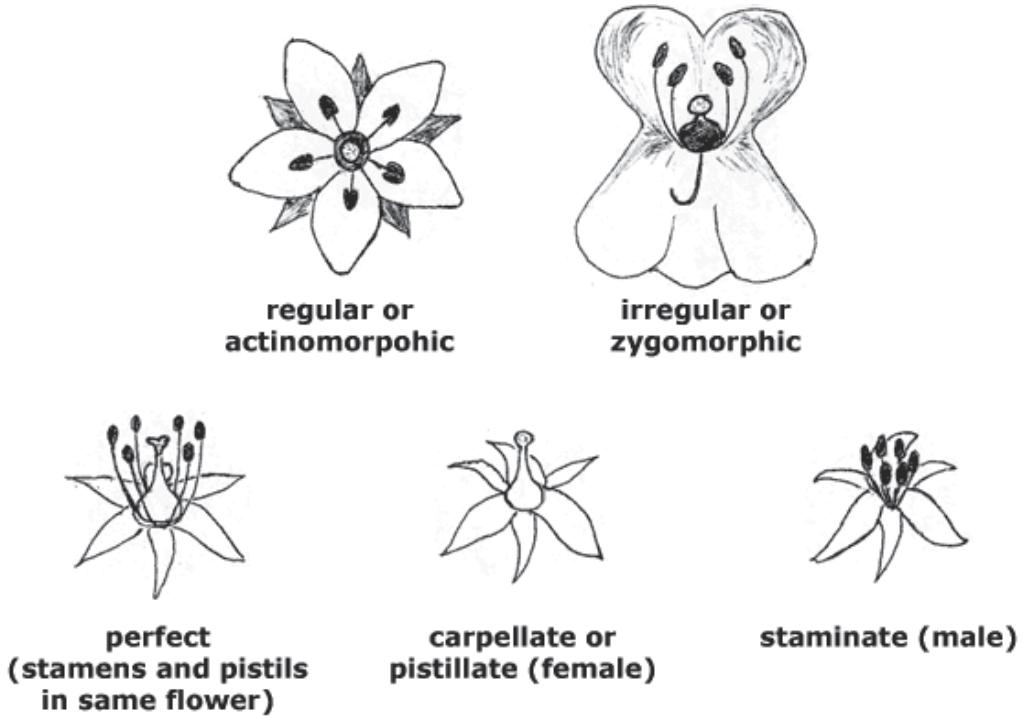
*Figure 7. Leaf structures*



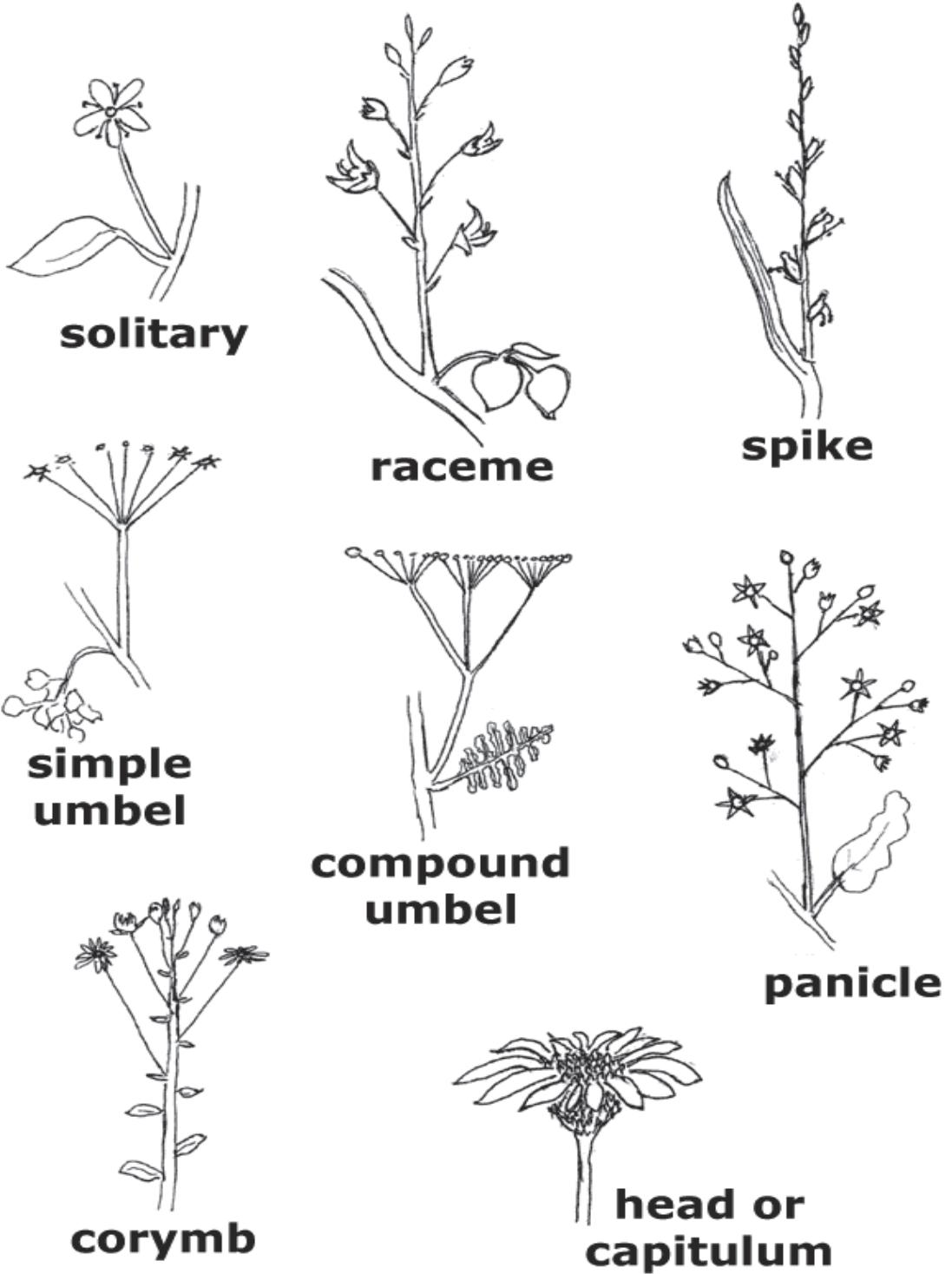
*Figure 8. Arrangement of leaves on stem*



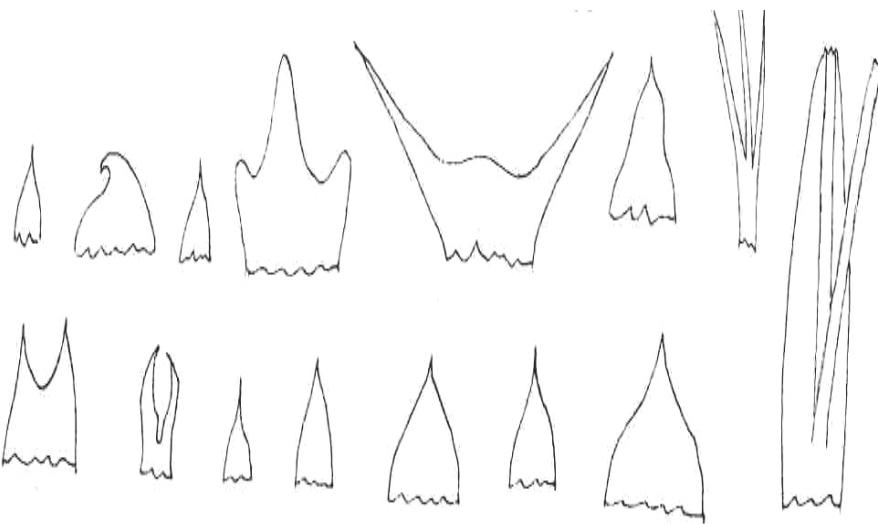
*Figure 9. Flower structures*



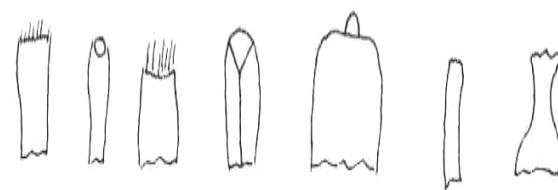
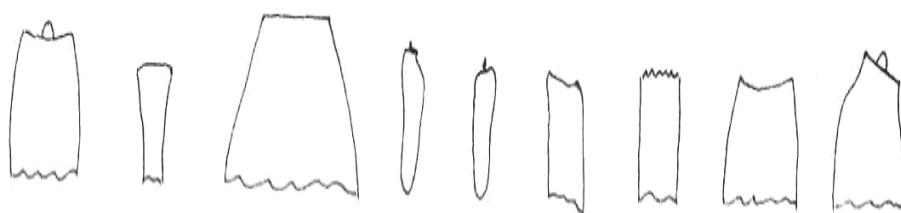
*Figure 10. Types of flowers*



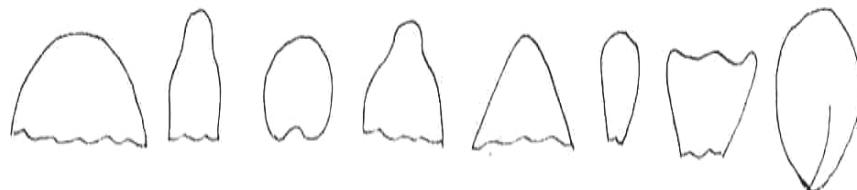
*Figure 11. Inflorescences (arrangement of flowers in clusters)*



a. Seeds with apex terminating in a sharp Point, Awn, Hooks or Spines



b. Seeds with apex truncate or oblong in outline



c. Seeds with apex not truncate or not terminate in sharp points or do not have awn

Figure 12: Seed structures

## GLOSSARY

|                       |   |   |
|-----------------------|---|---|
| Abaxial               | : | Facing away from the axis.  |
| Accrescent            | : | Increasing in size with age   |
| Achene                | : | A small, hard, 1-seeded, dry indehiscent fruit  |
| Adventitious buds     | : | Buds arising irregularly.   |
| Alternate             | : | Describes leaves that are not opposite each other on the axis, but arranged singly at different height.   |
| Attenuate             | : | Tapered, narrowed.  |
| Annual                | : | A plant whose life cycle is of only one year's duration.  |
| Auricle               | : | An ear shape appendage (lobe).  |
| Awns                  | : | Bristle like appendage  |
| Axil                  | : | An upper angle formed between the axis and any organ arising from it, as that between a stem and a leaf on it   |
| Axillary              | : | Situated in the axil  |
| Biennial              | : | Plant with a life cycle that is completed in two years or seasons, with the second season usually devoted to flowering and fruiting.                                  |
| Bristle               | : | A hair like prickle   |
| Bulb                  | : | A modified underground bud with scales.   |
| Bulblet               | : | Bearing bulbs   |
| Burrs                 | : | A rough prickly husk covering fruit or seeds  |
| Capsule               | : | A dry dehiscent fruit   |
| Caryopsis             | : | A grain, such as grasses; a seed-like fruit with a thin pericarp adnate to the contained seed.  |
| Composite flower head | : | A dense cluster of sessile or nearly sessile flowers on a very short axis or receptacle; heart-shaped.  |
| Coriaceous            | : | Leathery  |
| Corolla               | : | Interior series of perianth   |
| Corymb                | : | Centripetal inflorescence where the branches or pedicels arise at different levels but attain nearly the same height to form a flat- topped or slightly domed cluster |
| Crenate               | : | Toothed with rounded teeth.   |
| Culms                 | : | Hallow stem of grasses anti bamboos.  |
| Cuneate               | : | Wedge- Shaped   |

|               |   |   |
|---------------|---|---|
| Cymose        | : | A centrifugal inflorescence in which the secondary or lateral branches continued to grow and may extend beyond the main axis. |
| Deciduous     | : | Falling off, not persistent   |
| Decurrent     | : | Prolonged downwards from the base   |
| Dentate       | : | Sharply toothed   |
| Dicot         | : | Pair of leaves present on the embryonic plant while still in the seed.  |
| Echinate      | : | Beset with prickles or spines   |
| Ellipsoid     | : | An elliptical solid body  |
| Elliptic      | : | Narrow at the ends and broad near the center.   |
| Elongate      | : | Much longer than wide   |
| Embryo        | : | The incipient new plant within the seed   |
| Erect         | : | Vertical or upright   |
| Fimbriae      | : | Fringed   |
| Geniculate    | : | Bent abruptly like a knee   |
| Glabrous      | : | Without any kind of hairs   |
| Glandular     | : | Bearing glands or of the nature of a gland.   |
| Globose       | : | Globe-shaped  |
| Glomerules    | : | A small compact cluster   |
| Glume         | : | Outer empty floral bracts of grasses  |
| Haustoria     | : | A specialized absorbing structure of a parasitic plant through which, it obtains chemical substances from its host.           |
| Hermaphrodite | : | With the flowers bisexual   |
| Hilum         | : | Scar left on a seed at the former point of attachment   |
| Hypocotyls    | : | The part of the stem of an embryo or young seedling below the cotyledons.   |
| Imbricate     | : | Overlapping like the tiles on a roof.   |
| Inflorescence | : | The disposition of the flowers on the floral axis ; flower clusters as whole  |
| Involucre     | : | A circle or collection of bracts surrounding a flower cluster or head or a single flower.                                     |
| Lanceolate    | : | Shaped like a lance-head  |
| Lemma         | : | The lower of the two bracts enclosing the flower in the grasses   |
| Ligule        | : | A strap- shaped organ at the base of the leaf within  |
| Linear        | : | Several times longer than wide  |
| Loculicidal   | : | Longitudinally dehiscent between the partitions of the locule   |

|              |   |   |
|--------------|---|---|
| Lodicule     | : | One of a pair of tiny scales at the base of a grass floret believed to be reduced perianth segments.                        |
| Monocot      | : | Leaf present on the embryonic plant while still in the seed   |
| Monoecious   | : | With the male and female parts in different flower but on the same individual plant   |
| Oblanceolate | : | Spherical but flattened at the poles and shaped like a lance- head.   |
| Obovoid      | : | Having the form of an inverted egg  |
| Obtuse       | : | Blunt or rounded at the end   |
| Orbiculate   | : | Circular in outline   |
| Ovate        | : | Egg-shaped  |
| Palea        | : | Chaffy or hyaline scale present in the inflorescence of some plants   |
| Palmette     | : | Diverging like the widely spreading fingers of a hand   |
| Panicle      | : | A repeatedly branched inflorescence   |
| Pappus       | : | Tuft of hairs on fruits   |
| Pedicellate  | : | Stalked flowers   |
| Perennial    | : | A plant whose life cycle lasts for three or more seasons  |
| Perianth     | : | Flower envelope of 1 or 2 series i.e. calyx and corolla   |
| Pericarp     | : | The wall of a fertilized ovary  |
| Petiole      | : | The stalk of a leaf   |
| Phyllary     | : | One of the bracts under the flower head of a plant, especially in Asteraceae  |
| Pilous       | : | Hairy with rather long, soft, distinct hairs  |
| Pinnate      | : | Organs or leaflets arranged on side of a common axis as in a feather.   |
| Pistillate   | : | The complete female part of a flower  |
| Puberulent   | : | Slightly hairy with short hairs   |
| Pubescent    | : | Clothed with soft hairs   |
| Receme       | : | A centripetal inflorescence with lengthened axis and equally pedicellate flowers  |
| Racemiform   | : | Raceme inflorescence  |
| Receptacle   | : | Part of the axis that bears one or more organs or flowers   |
| Retuse       | : | A shallow notch in a rounded apex   |
| Rhizome      | : | An horizontal or elongated underground stem   |
| Rhombic      | : | Refers to leaves, tepals, etc., which are diamond-shaped, with base and tip having acute angles and the sides having obtuse |
| Rosette      | : | A cluster of leaves which grows in a circular overlapping pattern   |

|              |   |   |
|--------------|---|---|
| Scabrous     | : | Very scabrid  |
| Sepal        | : | A single element of the calyx   |
| Serrate      | : | Sharp marginal teeth with forward-pointing  |
| Sessile      | : | Without stalk   |
| Slender      | : | Thin  |
| Solitary     | : | Borne singly or alone; not in clusters  |
| Spatulate    | : | Narrowly oblong with the end expanded and broader, more or less like a spatula  |
| Spikelets    | : | A cluster of 1 or more flowers each in the axil of one or a pair  |
| Spikes       | : | An inflorescence with sessile flowers on a usually elongate axis  |
| Staminate    | : | Floral organ bearing anther and pollen  |
| Stellate     | : | With its parts radiating like the points of a conventional star   |
| Stigma       | : | Part of the pistil which receives the pollen  |
| Stramineous  | : | With stamen   |
| Subsessile   | : | With a slight stalk   |
| Succulent    | : | Soft and juicy  |
| Tetraporate  | : | Describes a pollen grain which has four elongated and rounded apertures.  |
| Tomentose    | : | Densely matted with wooly hairs   |
| Tricolporate | : | Describes a pollen grain which has three elongated and rounded apertures.   |
| Tripartite   | : | Divided into three parts.   |
| Truncate     | : | As though cut off at the end  |
| Tubercl      | : | A small tuber or tuber-like body  |
| Tubular      | : | With the petals partly united to form a tube.   |
| Utricle      | : | A membranous sac or a bladder like appendage  |
| Vestigial    | : | A nonfunctioning structure that is the remnant of an organ appendage that was once functional in previous generation or earlier stages of development |
| Winged       | : | With projecting thin flat membranes or corky outgrowths   |

## References

- Anitha K, N Sivaraj, SK Chakrabarty, B Sarath Babu, RDVJ Prasada Rao, KS Varaprasad and RK Khetarpal (2007). Weed Species of Quarantine Significance to India (2007), National Bureau of Plant Genetic Resources, Hyderabad, India, 71 p.
- Auld, B. A., & Medd, R.W. (1987). Weeds: an illustrated botanical guide to the weeds of Australia. Elsevier.
- CABI (2015). Crop Protection Compendium.
- CABI (2015). Invasive Species Compendium.
- Holm, L.G., J. Doll, P. Holm, Juan V., and J.P. Herberger (1997). World Weeds: Natural histories and distribution. John Wiley & Sons, Inc, New York. 1129 pp.
- James H. Everitt, Robert I. Lonard, and Christopher R. Little (2007). Weeds in South Texas and northern Mexico: a guide to identification. Published by Texas Tech University Press.
- Nathaniel L. Britton and Helen. C. Brown (1913). An Illustrated Flora of the Northern United States, Canada And The British Possessions. Library of the Arnold Arboretum Jamaica plain. Harvard University.
- Parsons, W.T., & Cuthbertson, E.G. (2001). Noxious weeds of Australia. CSIRO publishing.
- Randall, R. P. (2012). A Global Compendium of Weeds. 2<sup>nd</sup> Edition. Department of Agriculture and Food, Western Australia.
- <http://www.flowersofindia.net/catalog/slides/Balloon%20Vine.html>
- [http://zipcodezoo.com/Plants/C/Cardiospermum\\_hallicacabum/](http://zipcodezoo.com/Plants/C/Cardiospermum_hallicacabum/)
- [http://www.illinoiswildflowers.info/weeds/plants/pros\\_pigweed.htm](http://www.illinoiswildflowers.info/weeds/plants/pros_pigweed.htm)
- <http://www-personal.umich.edu/~rburnham/SpeciesAccountsPDFs/CardhaliSAPIFINAL.pdf>
- [http://www.tropicalforages.info/key/Forages/Media/Html/Centrosema\\_pubescens.htm](http://www.tropicalforages.info/key/Forages/Media/Html/Centrosema_pubescens.htm)
- <http://www.fao.org/ag/AGP/AGPC/doc/Gbase/data/pf000019.htm>
- [http://www.iewf.org/weedid/Conyza\\_sumatrensis.htm](http://www.iewf.org/weedid/Conyza_sumatrensis.htm)
- <http://www.luontoportti.com/suomi/en/kukkakasvit/common-fumitory>
- <http://www.plantwise.org/KnowledgeBank/Datasheet.aspx?dsID=24583>
- <http://ir.library.oregonstate.edu>
- [http://www.agroatlas.ru/en/content/weeds/Orobanche\\_cumana/](http://www.agroatlas.ru/en/content/weeds/Orobanche_cumana/)
- [http://nceppc.weebly.com/uploads/6/8/4/6/6846349/small\\_broomrape.pdf](http://nceppc.weebly.com/uploads/6/8/4/6/6846349/small_broomrape.pdf)
- <http://www.issg.org/database/species/ecology.asp?si=1353&fr=1&sts=1>
- [http://www.dpiw.tas.gov.au/internnsf/Attachments/LBUN-87B8NM/\\$FILE/twan\\_Africanfeathergrass.pdf](http://www.dpiw.tas.gov.au/internnsf/Attachments/LBUN-87B8NM/$FILE/twan_Africanfeathergrass.pdf)
- [http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Physalis\\_angulata\\_\(Wild\\_Gooseberry\).htm](http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Physalis_angulata_(Wild_Gooseberry).htm)
- [http://www.ppws.vt.edu/scott/weed\\_id/polpe.htm](http://www.ppws.vt.edu/scott/weed_id/polpe.htm)
- [http://www.murrumbidgee.cma.nsw.gov.au/downloads/info\\_sheets/dryland\\_cropping/Wild\\_Radish\\_Revised.pdf](http://www.murrumbidgee.cma.nsw.gov.au/downloads/info_sheets/dryland_cropping/Wild_Radish_Revised.pdf)
- [http://www.ppws.vt.edu/scott/weed\\_id/rapra.htm](http://www.ppws.vt.edu/scott/weed_id/rapra.htm)
- [http://www.agmrc.org/media/cms/thlaspi\\_arvense\\_0DF0842489133.pdf](http://www.agmrc.org/media/cms/thlaspi_arvense_0DF0842489133.pdf)
- <http://riceweed.plantnet-project.org/showbyaccno.php?acno=STRAS>
- [http://www.eppo.int/QUARANTINE/plants/Senecio\\_inaequidens/SENIQ\\_ds.pdf?utm\\_source=extension.org&utm\\_medium=link&utm\\_campaign=weeds&utm\\_content=pigweeds-amaranthus-spp#VVHQsfmqko](http://www.eppo.int/QUARANTINE/plants/Senecio_inaequidens/SENIQ_ds.pdf?utm_source=extension.org&utm_medium=link&utm_campaign=weeds&utm_content=pigweeds-amaranthus-spp#VVHQsfmqko)
- <http://www.avogel.ca/en/plant-encyclopedia/cardiospermum-hallicacabum.php>
- <http://www.florida.plantatlas.usf.edu/Plant.aspx?id=1844>
- <http://www.fs.fed.us/database/feis/plants/forb/cirvul/all.html>
- [http://www.gardening.eu/arc/plants/Shrubs/Phalaris-velutina-Forssk/22555/index\\_a.asp](http://www.gardening.eu/arc/plants/Shrubs/Phalaris-velutina-Forssk/22555/index_a.asp)
- <http://www.pfaf.org/user/Plant.aspx?LatinName=Fumaria+officinalis>
- [http://archive.lls.nsw.gov.au/\\_data/assets/pdf\\_file/0007/495349/archive-fumitory.pdf](http://archive.lls.nsw.gov.au/_data/assets/pdf_file/0007/495349/archive-fumitory.pdf)
- [http://aknhp.uaa.alaska.edu/wp-content/uploads/2013/01/Lolium\\_multiflorum\\_BIO\\_LOMU.pdf](http://aknhp.uaa.alaska.edu/wp-content/uploads/2013/01/Lolium_multiflorum_BIO_LOMU.pdf)
- [http://www.fcps.edu/islandcreeks/ecology/japanese\\_honeysuckle.htm](http://www.fcps.edu/islandcreeks/ecology/japanese_honeysuckle.htm)
- <http://www.incdafundulea.ro/anale/77/77.6.pdf>
- [http://polj.uns.ac.rs/~korovi/engleski/orobanche\\_cumana.html](http://polj.uns.ac.rs/~korovi/engleski/orobanche_cumana.html)
- <http://www.fao.org/ag/agp/AGPC/doc/gbase/Safricadata/orylong.htm>
- [http://keyserver.lucidcentral.org/weeds/data/03030800-0b07-490a-8d04-0605030c0f01/media/Html/Raphanus\\_raphanistrum.htm](http://keyserver.lucidcentral.org/weeds/data/03030800-0b07-490a-8d04-0605030c0f01/media/Html/Raphanus_raphanistrum.htm)
- <http://edis.ifas.ufl.edu/fw033>
- [http://keyserver.lucidcentral.org/weeds/data/03030800-0b07-490a-8d04-0605030c0f01/media/Html/Senecio\\_madagascariensis.htm](http://keyserver.lucidcentral.org/weeds/data/03030800-0b07-490a-8d04-0605030c0f01/media/Html/Senecio_madagascariensis.htm)
- [http://montana.plant-life.org/species/thlas\\_arven.htm](http://montana.plant-life.org/species/thlas_arven.htm)
- <http://www.luontoportti.com/suomi/en/kukkakasvit/field-pennycress>
- <http://www.gardenorganic.org.uk/weeds/common-field-speedwell>
- [http://www.ipm.ucdavis.edu/PMG/WEEDS/littleseed\\_canarygrass.html](http://www.ipm.ucdavis.edu/PMG/WEEDS/littleseed_canarygrass.html)
- [http://www.herbiguide.com.au/Descriptions/hg\\_Canary\\_grass.htm](http://www.herbiguide.com.au/Descriptions/hg_Canary_grass.htm)
- [https://legacy.wlu.ca/page.php?grp\\_id=2147&p=19554](https://legacy.wlu.ca/page.php?grp_id=2147&p=19554)
- [http://issg.org/database/species/impact\\_info.asp?si=968&fr=1&sts=&lang=EN](http://issg.org/database/species/impact_info.asp?si=968&fr=1&sts=&lang=EN)
- [http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Striga\\_asiatica\\_\(Red\\_Witchweed\).htm](http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Striga_asiatica_(Red_Witchweed).htm)
- <http://www.extension.org/pages/32635/weed-identification-tools-and-techniques#.VZO1rfmqqkp>

