

Weed Identification Course Notes

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Plant Classification and Taxonomy

Weed Identification and Control

Classification and naming of plants.

Major weeds and their families.

Classification of herbicides.

Which groups of plants are affected by various herbicide groups.

The aim is to provide an overview.

Weed Identification and Control

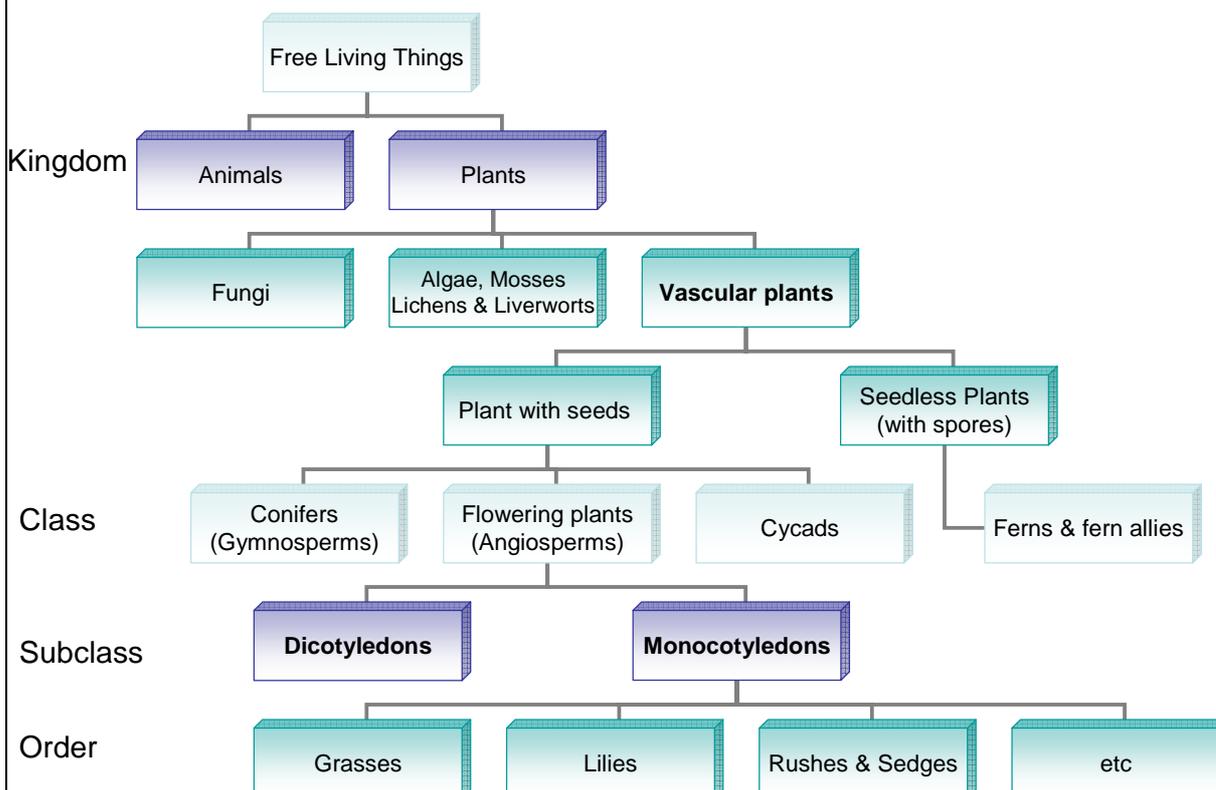
Taxonomy

Naming of species is based on morphological characters (especially reproductive structures).

Represented in a tree like structure with closely related species in groups and sub groups etc.

Kingdom, order, family, (tribe), genus, species, sub species, (cultivar, form, ecotype, races).

Weed Identification and Control



Weed Identification and Control

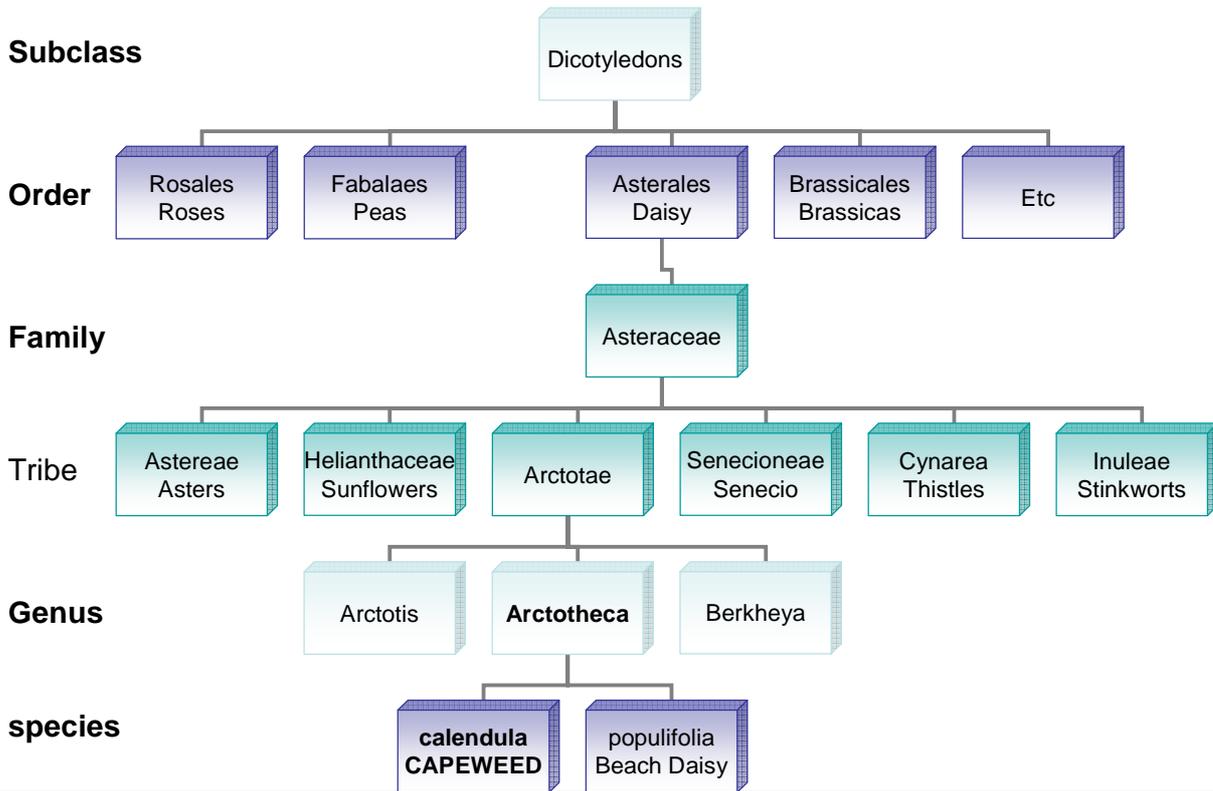
The species is generally characterized as the highest level at which individuals freely interbreed. Most plants are named by quoting their genus and species with the authority or the person/s who assigned that name.

Capeweed is *Arctotheca calendula* (L.) Levyns.

The L. indicates that it was Lineaus who first described the species and Levyns has since revised it. In some older books it will be called *Cryptostemma calendula* (L.).

First collection in Australia from King Georges Sound, Albany, WA in 1833.

Weed Identification and Control



Weed Identification and Control

Over 50% of weeds are in 6 families

Grass (Poaceae)



Iris (Iridaceae)



Pea (Fabaceae)



Daisy (Asteraceae)



Brassica (Brassicaceae)



Weed Identification and Control
The major weeds and their families

Ferns
Bracken



Gymnosperms
Pines



Page16

Weed Identification and Control

The major weeds and their families - Monocotyledons

Grass family

Poaceae

Long narrow leaves with parallel veins.

No showy flowers.

Seeds at the ends of stems.

Fibrous roots

100 species commonly controlled.

About a quarter of our weeds are grasses.



African Lovegrass



Annual Poa



Barley Grass



Brome Grass



Couch



Crabgrass



Yorkshire Fog



Pampas Grass



Wild Oat



Phalaris



Kikuyu



Paspalum



Witchgrass

Weed Identification and Control

The major weeds and their families - Monocotyledons

Iris family

Irridaceae

6 petal flowers

Long narrow leaves with

Parallel veins

Often with corms and bulbs

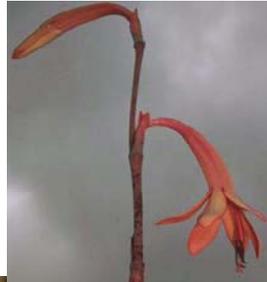
No taproot



Watsonia



Freesia



Cape Tulip



Onion Grass



Onion Weed



Gladiolus

Weed Identification and Control

The major weeds and their families - Monocotyledons

Other Monocots

Juncaceae

Toad Rush, Cultivation Rush,
Spiny Rush



Cultivation Rush



Toad Rush

Asparagaceae

Bridal Creeper



Bridal Creeper

Araceae

Arum Lily



Arum Lily



HG3213

Nutgrass



Cyperaceae

Nut Grass, Sedges

Weed Identification and Control

The major weeds and their families - Dicotyledons

Asteraceae/Compositae

Daisy family

Composite flowers

Broad leaves often lobed

Often rosettes

Taproot

Often wind dispersed seed with parachutes (pappus)



Capeweed



Holly-leaved Senecio



Cotula



Cudweed



Flatweed



Flebane



Stinkwort



Sowthistle



Jo-Jo – Prickle seeds



Slender Thistle



Variagated Thistle



Skeleton Weed

Weed Identification and Control

The major weeds and their families - Dicotyledons

Fabaceae

Pea family

Pea flowers

Broad leaves often with leaflets

Taproot often with nodules

Usually has pods

Often roundish seed.



Clover



Medic



Taylorina



Serradella



Lupins



Gorse



Dolichos Pea



Pea

Weed Identification and Control

The major weeds and their families - Dicotyledons

Brassicaceae

Brassica family – Radish, Turnip, Mustards

4 petal flowers - Crucifers

Broad leaves often lobed

Often rosettes

Taproot

Usually has pods

Often roundish seed.

Often has heart shaped cotyledons



Wild Radish



Hedge Mustard



Mediterranean Turnip



Indian Hedge Mustard



Turnip Weed



Sea Rocket

Weed Identification and Control

The major weeds and their families - Dicotyledons

Polygonaceae

Dock family

Tiny flowers

Broad leaves with a membrane (ochrea) at the base

Often rosettes

Taproot

Single seeds often in cases

Pyrimidal seed

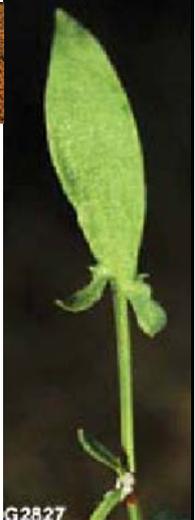
Long thin cotyledons



Dock



Wireweed



G2827



Dou blegee



Sorrel

Weed Identification and Control

The major weeds and their families - Dicotyledons

Other Dicots

Solanaceae

Nightshade, Tomato, Potato

Rosaceae

Blackberry

Oxalidaceae

Sousob, Oxalis

Lamiaceae – Mint family

Pennyroyal, Sages, Stagger Weed

Caryophyllaceae

Chickweeds, Spurry, Catchfly

Chenopodiaceae –Saltbush family

Fathen, Goosefoot, Crumbweed, Kochia

Malvaceae

Mallows

IDENTIFICATION OF AGRICULTURAL WEEDS

Author - Michael Moerkerk

(This is part of a workshop developed by Michael Moerkerk of the CRC for Weed Management, using keys to identify seedlings.)

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INTRODUCTION

In crop production, weeds are unwanted plants which lower yields, interfere with harvesting, act as hosts for crop diseases, and compete for moisture and plant nutrients stored on fallows. Weed control, a critical and costly part of the process of producing crops, is becoming more and more complex with the increasing availability of new types of herbicides (desiccants, residuals, pre-emergents and post emergents) and new methods of application. As weeds are most competitive early in the life of the crop, it is important to be able to recognise them in the seedling stage so they can be sprayed at the appropriate time with the most suitable herbicide. (From "Crop Weeds", by Wilding, Barnett and Amor, Inkata Press 1986)

The identification of weed seedlings in crops and pastures has always been difficult as there has never been an appropriate and readily available source of information until the publication of "Crop Weeds" in 1986. A major aim of this workshop is to assist participants in the rapid identification of the main weed seedlings of dryland agriculture in southern Australia. The workshops are based around the publication "Crop Weeds" and the supplement to this, "More Crop Weeds".

The workshop is designed to expose the participants to many common and not so common weeds in their seedling stage, using each one to highlight the characteristics of seedling weeds that need to be observed to aid in accurate identification. In addition, a key to the identification of seedling broad leaf weeds in Crop Weeds and many in More Crop Weeds has been developed and included in these notes. A modified key incorporating the narrow leaf weeds in Crop Weeds and More Crop Weeds is included as an aid to identification.

Practical exercises, with mixed populations, allows hands on experience in applying the skills developed for seedling weed identification.

BROAD LEAFED WEEDS

BROAD LEAFED WEEDS (DICOTYLEDONS)

Broad leafed weeds have two cotyledons and the leaves, unlike those of narrow leafed weeds, do not have parallel veins (figure 1). Some plants, such as legumes, have characteristic stipules (a pair of leafy or scaly appendages at the junction of the stem and leaf stalk) and tendrils (figure 2). The leaves may be in rosettes (when the stem is very short and the leaves emerge from the base), opposite (in equal sized pairs), alternate (growing individually one after the other and of different sizes), or in whorls (growing from a central point around the stem) (figure 3).

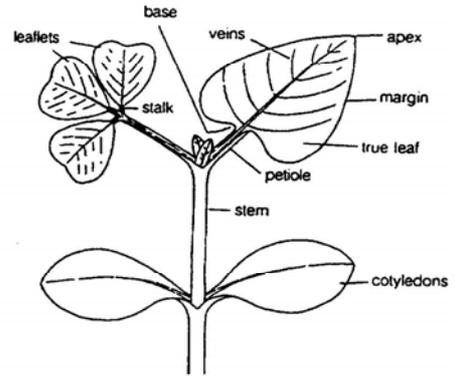


Figure 1 Parts of a broad leafed weed.

SEEDS

Weed seeds have characteristic sizes and shapes and it is sometimes useful, particularly with grasses, to pull up a seedling to inspect the seed as an aid to identification. Illustrations of seeds can be found in "Crop Weeds".

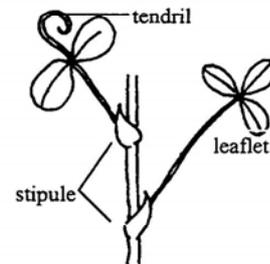


Figure 2 Parts of a legume leaf.

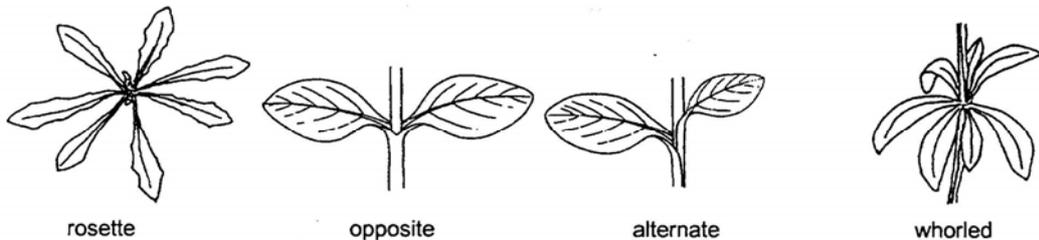


Figure 3 Leaf arrangements.

The cotyledons, first leaves and mature leaves are described with emphasis on the shape of the leaf, including the apex, base and margin, and whether its surface has hairs or prickles. Terms used in describing the leaf apex, base and margin shapes are shown in Figures 4, 5 and 6.

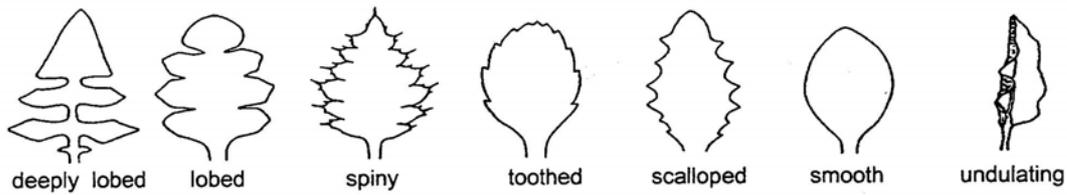


Figure 4 Margin Shapes

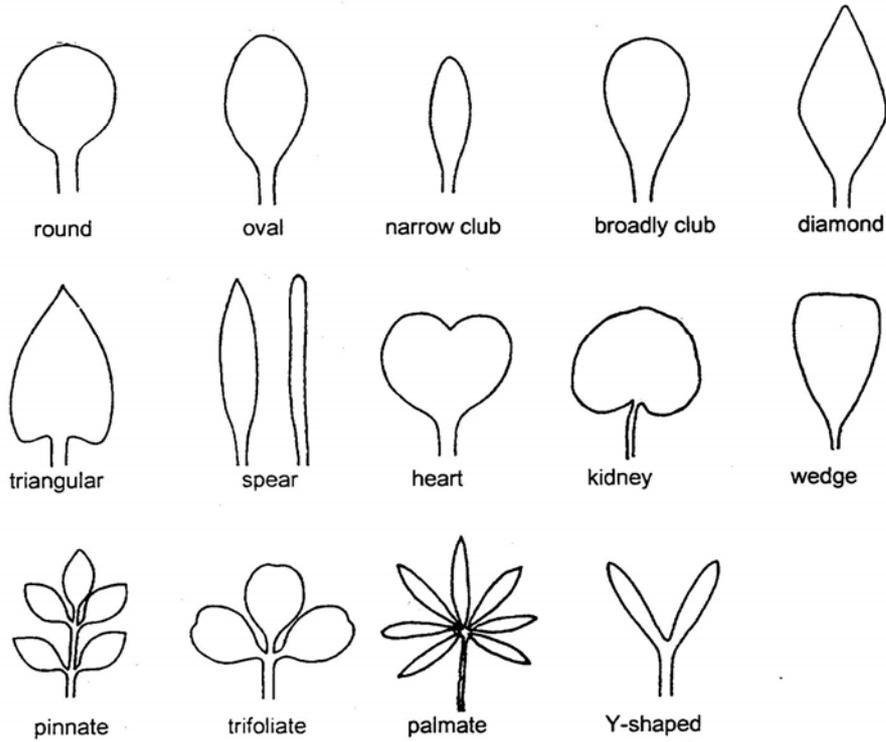


Figure 5 Leaf Shapes.

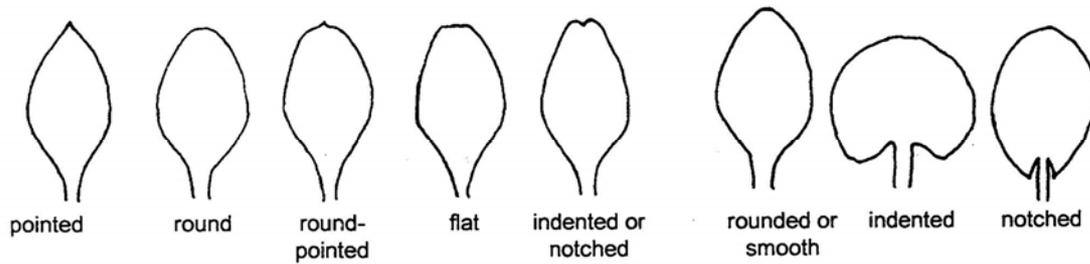


Figure 6 Apex shapes.

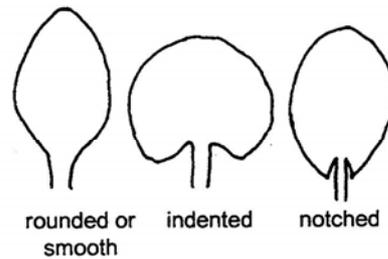
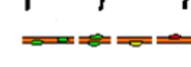


Figure 7 Base Shapes.

Computer Keys for Broad-leaved Plants.

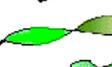
Weed Identification

Leaf | Flower, fruit, seed, root | General, stem, cotyledon | ID Editor

LEAF:	<input type="checkbox"/>		3 leaf or 2 plus tendril
Arrangement	<input type="checkbox"/>		Alternate
Features	<input type="checkbox"/>		Fingered Palmate
Colour	<input type="checkbox"/>		Leaflets Pinnate Bipinnate
LEAF/BLADE:	<input type="checkbox"/>		Long, Thin & Sheath (Monocot)
Tip	<input type="checkbox"/>		Opposite Paired Whorled
Sides	<input type="checkbox"/>		Reduced to scales
Base	<input type="checkbox"/>		Rosette or basal
Surface	<input type="checkbox"/>		
Size	<input type="checkbox"/>		
PETIOLE:	<input type="checkbox"/>		
Features	<input type="checkbox"/>		
Length	<input type="checkbox"/>		
GRASS:	<input type="checkbox"/>		
Ligule	<input type="checkbox"/>		
Auricles	<input type="checkbox"/>		
Collar	<input type="checkbox"/>		
Sheath	<input type="checkbox"/>		
Leaf bud	<input type="checkbox"/>		

Weed Identification

Leaf | Flower, fruit, seed, root | General, stem, cotyledon | ID Editor

LEAF:	<input type="checkbox"/>		Folded
Arrangement	<input type="checkbox"/>		Hairless
Features	<input type="checkbox"/>		Hairy
Colour	<input type="checkbox"/>		Prickly
LEAF/BLADE:	<input type="checkbox"/>		Ribbed Striped Grooved
Tip	<input type="checkbox"/>		Shiny
Sides	<input type="checkbox"/>		Sticky
Base	<input type="checkbox"/>		Top differs to underside
Surface	<input type="checkbox"/>		Undulating
Size	<input type="checkbox"/>		
PETIOLE:	<input type="checkbox"/>		
Features	<input type="checkbox"/>		
Length	<input type="checkbox"/>		
GRASS:	<input type="checkbox"/>		
Ligule	<input type="checkbox"/>		
Auricles	<input type="checkbox"/>		
Collar	<input type="checkbox"/>		
Sheath	<input type="checkbox"/>		
Leaf bud	<input type="checkbox"/>		

Weed Identification

Leaf | Flower, fruit, seed, root | General, stem, cotyledon | ID Editor

LEAF:	<input type="checkbox"/>		Curved Rounded
Arrangement	<input type="checkbox"/>		Indented Constricted
Features	<input type="checkbox"/>		Lobed or toothed
Colour	<input type="checkbox"/>		Straight and angular
LEAF/BLADE:	<input type="checkbox"/>		Straight and parallel
Tip	<input type="checkbox"/>		
Sides	<input type="checkbox"/>		
Base	<input type="checkbox"/>		
Surface	<input type="checkbox"/>		
Size	<input type="checkbox"/>		
PETIOLE:	<input type="checkbox"/>		
Features	<input type="checkbox"/>		
Length	<input type="checkbox"/>		
GRASS:	<input type="checkbox"/>		
Ligule	<input type="checkbox"/>		
Auricles	<input type="checkbox"/>		
Collar	<input type="checkbox"/>		
Sheath	<input type="checkbox"/>		
Leaf bud	<input type="checkbox"/>		

Weed Identification

Leaf | Flower, fruit, seed, root | General, stem, cotyledon | ID Editor

LEAF:	<input type="checkbox"/>		Boat shaped
Arrangement	<input type="checkbox"/>		Flat or square
Features	<input type="checkbox"/>		Indented
Colour	<input type="checkbox"/>		Pointed
LEAF/BLADE:	<input type="checkbox"/>		Rounded
Tip	<input type="checkbox"/>		Spined
Sides	<input type="checkbox"/>		
Base	<input type="checkbox"/>		
Surface	<input type="checkbox"/>		
Size	<input type="checkbox"/>		
PETIOLE:	<input type="checkbox"/>		
Features	<input type="checkbox"/>		
Length	<input type="checkbox"/>		
GRASS:	<input type="checkbox"/>		
Ligule	<input type="checkbox"/>		
Auricles	<input type="checkbox"/>		
Collar	<input type="checkbox"/>		
Sheath	<input type="checkbox"/>		
Leaf bud	<input type="checkbox"/>		

HAIRS

Hairs may occur on any part of the plant. The distribution of hairs may be on the upper and/or lower surface, petiole, margin or veins or any combination of these. The **length** (short or long), **density** (sparse or dense) and **texture** (stiff or woolly) of hairs are also important distinguishing features.

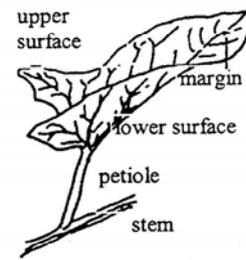


Figure 8 Distribution of hairs.

LEAF SURFACE STRUCTURE AND COLOUR

The texture of the leaf surface can be described as **smooth**, **wrinkled**, **warty**, **pimply**, **glossy**, **frosted**, **dull**, or **succulent**. The **colour** of the leaf and stem are also distinguishing features. The colour may vary depending on the environment in which the plant is growing. Deeper green colouration is evident when the plant is healthy and has plenty of light and a yellowish colouration is present when light is low, such as under a crop canopy.

LEAF MARKINGS

Leaf markings can vary within one species. The main terms in describing markings are their **colour** (white, red, purple, pinkish), **shape** (irregular, crescent) and the **position** (scattered, basal) on the leaf. Leaf markings will vary according to the environment in which the plant is growing. Red markings are often more intense when the plant is under stress.

VENATION

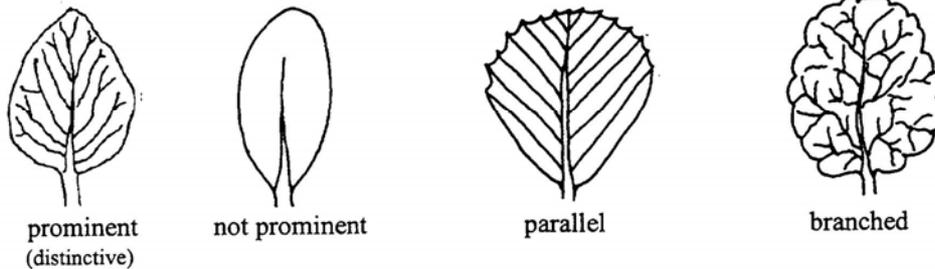
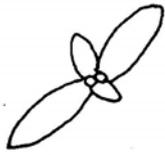


Figure 9 Venation types.

Venation can be described as **prominent** or **not prominent** on both the cotyledons and leaves. Veins may form a **parallel** pattern or may be **branched** or web-like.

PETIOLE LENGTH



absent
(no petiole)



short
(less than $\frac{1}{2}$ length
of leaf blade)



long
(Greater than the length
of leaf blade)

Figure 10 Petiole length.

Both cotyledons and leaves may be attached to the stem by petioles. These may be described as **absent** (no petiole), **short** (petiole less than half the length of the leaf blade) or **long** (greater than the length of the leaf blade).

Computer Keys for Broad-leaved Plants.

Weed Identification

Leaf | Flower, fruit, seed, root | General, stem, cotyledon | ID Editor

LEAF:

- Arrangement
- Features
- Colour

LEAF/BLADE:

- Tip
- Sides
- Base
- Surface
- Size

PETIOLE:

- Features
- Length

GRASS:

- Ligule
- Auricles
- Collar
- Sheath
- Leaf bud

Clasping

Indented Notched

Sheathing or grass-like

Squarish

Tapered

Weed Identification

Leaf | Flower, fruit, seed, root | General, stem, cotyledon | ID Editor

LEAF:

- Arrangement
- Features
- Colour

LEAF/BLADE:

- Tip
- Sides
- Base
- Surface
- Size

PETIOLE:

- Features
- Length

GRASS:

- Ligule
- Auricles
- Collar
- Sheath
- Leaf bud

Hairless

Hairy

Ribs Wings Stripes Spiry

Weed Identification

Leaf | Flower, fruit, seed, root | General, stem, cotyledon | ID Editor

LEAF:

- Arrangement
- Features
- Colour

LEAF/BLADE:

- Tip
- Sides
- Base
- Surface
- Size

PETIOLE:

- Features
- Length

GRASS:

- Ligule
- Auricles
- Collar
- Sheath
- Leaf bud

Aroma

Cylindrical Solid

Fleshy

Hollow

Stipules Ochrea

> 2mm

Weed Identification

Leaf | Flower, fruit, seed, root | General, stem, cotyledon | ID Editor

GENERAL:

- Type
- Growth
- Size

STEM:

- Shape
- Arrangement
- Features
- Bark
- Colour
- Size

COTYLEDON:

- Tip
- Sides
- Base
- Surface
- Petiole
- Type
- Size

Longer than blade

Shorter than blade

Tiny to none

Weed Identification

Leaf | Flower, fruit, seed, root | General, stem, cotyledon | ID Editor

FLOWER:

- Colour
- Type
- Arrangement
- Time
- Features

FRUIT:

- Size
- Features

SEED:

- Shape
- Features
- Colour
- Size

ROOT:

- Type

3 Petaled

4 Petaled

5 Petaled

6 Petaled

Daisy

Grass

Pea

Small or crowded

Thistle

Tubular

Selected Characters:

Flower Type is 4 Petaled

78 species have these characters.

Automatically Update

Update Now Ask

Clear All Help Close

COMMON MISTAKES IN BROADLEAF WEED IDENTIFICATION

HEART SHAPED COTYLEDONS

Wild radish has a true heart shaped cotyledon with a smooth tapering base. The cotyledons of charlock are squarer than wild radish. The cotyledons on turnip weed are not as deeply indented at the apex as charlock. Canola and wild turnips' cotyledons both have slightly indented bases. The cotyledons of wild turnip are more indented than canola. Leaves of canola are hairless. When chewed, the stem base of wild radish, turnip weed and wild turnip taste like radish and turnip respectively. Both canola and charlock do not have distinctive tastes.

SHEPHERDS PURSE AND BLUE MUSTARD

Blue mustard has a warty leaf surface whilst shepherds purse has a smooth leaf surface

FUMITORY, BIFORA AND CORIANDER

Both bifora and coriander have a strong smell. Bifora has narrower more deeply divided leaves and cotyledons than coriander. Fumitory does not have the strong smell of coriander. It is difficult to tell the fumitory species apart in the seedling stage.

PLANTS WITH WHORLED LEAVES

Field madder, cleavers and bedstraw are often confused. Bedstraw has narrower leaves and cotyledons than cleavers, which has more narrow leaves and cotyledons than field madder. The number of leaves in the first whorl can help distinguish between these plants. Field madder has 4 leaves, bedstraw has 4-5 leaves and cleavers has 5-6 leaves.

AMSIACKIA, POACHED EGG DAISY, MALLEE CATCH FLY AND CORN SPURRY (PLANTS WITH SPEAR SHAPES OR LINEAR COTYLEDONS OR LEAVES)

Amsinckia is easy to identify because of the Y shaped cotyledons and the leaves are warty. Poached egg daisy is very densely hairy, whilst mallee catch fly is moderately hairy and corn spurry is hairless.

HOGWEED, TREE HOGWEED AND REDSHANK

Cotyledons of tree hogweed are always over 10 mm long and are larger than the cotyledons of hogweed. The leaves of tree hogweed are larger than hogweed and the stem base of tree hogweed is often red rather than the pink seen in hogweed. The leaves of redshank have a dark blotch in their centre and are much broader than either hogweed or tree hogweed.

CATS EAR, HAIRY HAWKBIT, DANDELION AND SKELETON WEED

Cats ear leaves are broader, stiffer, more irregularly lobed and have a flatter growth habit than hairy hawkbit. Flower stems of hairy hawkbit are unbranched and solid unlike cats ear stems which are branched and hollow. Both skeleton weed and dandelions are hairless and exude a milky sap when damaged. The leaves of skeleton weed have backward pointing lobes whilst dandelion leaves point forward. Dandelion flowers are on single hollow hairless stems unlike hairy hawkbit stems which are solid and hairy at the base.

NARROW LEAFED WEEDS

Narrow leafed weeds have one cotyledon or seed leaf and the mature leaves are long, narrow and usually with parallel veins. They are notoriously difficult to distinguish at the seedling stage. Exposure and experience plays a significant role in recognition of the narrow leaf weeds.

The majority of narrow leaf crop weeds are grasses. The parts of the grass weed are illustrated in figure 11.

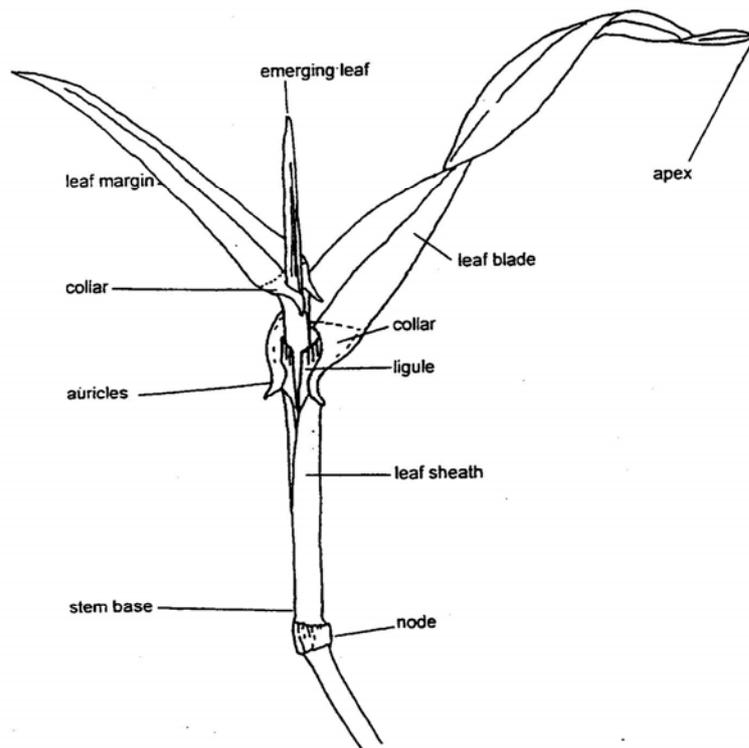
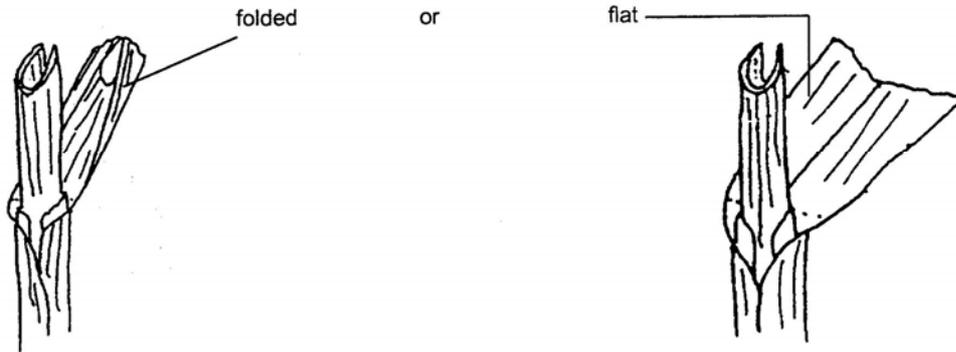


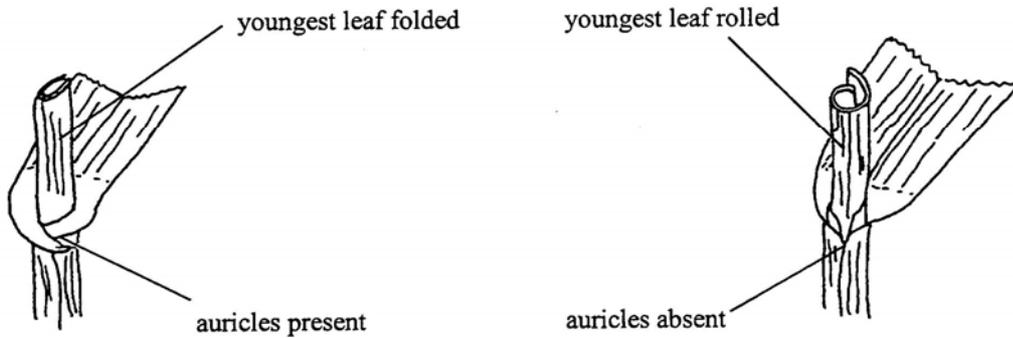
Figure 11 Parts of a grass plant.

The most useful characteristics to use when identifying grass weeds are;

Leaf blade: is it folded or flat?

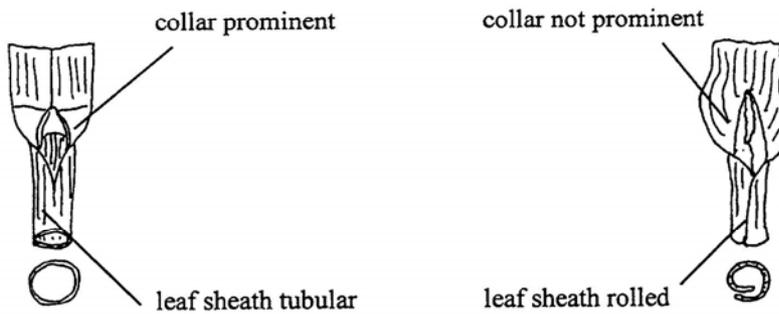


Emerging leaf: (youngest leaf) is it folded or rolled?



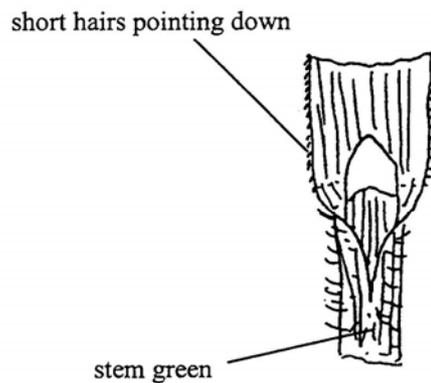
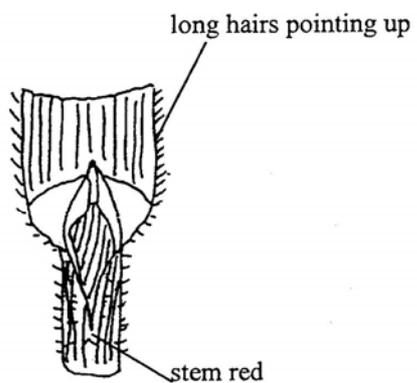
Auricles: (claw like teeth at the base of the stem) are they present or absent?

Collar: (base of the leaf blade) is it prominent (different in colour from the leaf blade) or not prominent (not greatly different in colour and texture from the leaf blade).



Leaf sheath: is it tubular (no joins) or rolled for some of its length (overlaps)?

Hairs: are they present, and what is their density, length and direction pointing?



Stem base: what is the colour of the stem?

Weed Identification

Leaf | Flower, fruit, seed, root | General, stem, cotyledon | ID Editor

LEAF:

Arrangement  Flat

Features  Rolled

Colour

LEAF/BLADE:

Tip

Sides

Base

Surface

Size

PETIOLE:

Features

Length

GRASS:

Ligule

Auricles

Collar

Sheath

Leaf bud

Weed Identification

Leaf | Flower, fruit, seed, root | General, stem, cotyledon | ID Editor

LEAF:

Arrangement  Large or overlapping

Features

Colour

LEAF/BLADE:

Tip

Sides  Tuft of hairs

Base

Surface

Size

PETIOLE:

Features

Length

GRASS:

Ligule

Auricles

Collar

Sheath

Leaf bud

Weed Identification

Leaf | Flower, fruit, seed, root | General, stem, cotyledon | ID Editor

LEAF:

Arrangement  Base reddish

Features  Flattened

Colour

LEAF/BLADE:

Tip

Sides

Base

Surface

Size

PETIOLE:

Features

Length

GRASS:

Ligule

Auricles

Collar

Sheath

Leaf bud

Weed Identification

Leaf | Flower, fruit, seed, root | General, stem, cotyledon | ID Editor

LEAF:

Arrangement  Hairy ring

Features

Colour

LEAF/BLADE:

Tip

Sides

Base

Surface

Size

PETIOLE:

Features

Length

GRASS:

Ligule

Auricles

Collar

Sheath

Leaf bud

Weed Identification

Leaf | Flower, fruit, seed, root | General, stem, cotyledon | ID Editor

FLOWER:

Colour

Type  Angular

Arrangement  Cylindrical

Time  Flattened Winged

Features

FRUIT:

Size  Kidney

Features  Lumpy

SEED:

Shape  Oval Egg

Features

Colour

Size

ROOT:

Type  Tear

Weed Identification

Leaf | Flower, fruit, seed, root | General, stem, cotyledon | ID Editor

FLOWER:

Colour  Awns or spines

Type  Grooved

Arrangement

Time

Features

FRUIT:

Size

Features  Hairy

SEED:

Shape  Pappus

Features  Ridged

Colour

Size  Rough Warty Dimpled

ROOT:

Type  Shiny

 Smooth

FEATURES TO LOOK FOR IN IDENTIFYING NARROW LEAF WEEDS

IN Paddock SITUATIONS

Look at the weeds between the rows of crops so as not to get confused with the cereal plant.

SEEDS

Dig up the plants and look for the seeds which are often still attached in the roots. This will help in distinguishing between grasses such as Silvergrass (*Vulpia* spp.), Bulbous Meadow Grass (*Poa bulbosa*), Phalaris (*Phalaris* sp), Ryegrasses (*Lolium* spp) and Toadrush (*Juncus bufonius*). The seed will help distinguish between:

- Great brome and Soft brome - Large seed, long awn and small seed no awn.
- Wild oats and cultivated oats - Dark coloured seed and light coloured seed.
- Barley grass and Barley - Seeds with long awns and seeds without awns.

HAIRS

View leaf blades from many angles looking into strong light. This will help in assessing the hairiness of the leaf and the position, length and direction in which the hairs point. Using the light will also aid in determining the texture of the leaf surface and will assist in picking up the ligule.

POINTS TO REMEMBER

RED BASES

Grasses with red bases include Spiny burrgrass, Annual ryegrass and sometimes Silvergrass.

Young annual ryegrass has a shiny leaf back and no auricles. Older ryegrass has auricles. The emerging leaf of annual ryegrass is rolled and squashed flat so may appear to be folded

PHALARIS SPECIES

All phalaris species are hairless and have a dull leaf surface. Identifying different *Phalaris* species can be difficult. Some points to remember are:

- Both *Phalaris paradoxa* and *Phalaris aquatica* bleed red from the base of the plant when squeezed with a finger-nail.
- If the plant does not bleed it is *Phalaris minor*.

CEREALS

The following saying may help identify cereal crop species. The saying refers to the auricles and hairs on the collar of the cereals.

**Barley is big and bare
Wheat is wee and whiskery
Oats have none.
(Triticale is the same as wheat)**

COMMON MISTAKES IN NARROW LEAF WEED IDENTIFICATION

WILD OATS AND PHALARIS

Wild oats and phalaris may be mixed up if no hairs are seen on the wild oats. Check for the seed in the roots and squeeze the base of the plant with your finger nail. A red mark will be left if it is perennial phalaris or paradoxa grass and a green mark if it is lesser canary grass or wild oats.

RYEGRASS, SILVERGRASS, POA BULBOSA AND TOADRUSH

These four plants may often be miss-identified. Ryegrass has a shiny back to the leaf, silvergrass and poa bulbosa have the same shine on both leaf surfaces. The leaves of silvergrass are much longer than poa bulbosa and the end of the leaf is pointed. Poa bulbosa leaves end in a hood. Toadrush is a very small plant and the seed case may often be observed on the tip of the first leaf. Toadrush has no ligule and develops green stripes at the base of the leaf sheath as the plant matures.

OATS, WILD OATS AND BEARDED OATS

Oats, wild oats and bearded oats are all difficult to distinguish without the seed present. Oats has a pale seed whilst bearded and wild oats have dark coloured seeds. The collar on wild oats is not as pronounced as in bearded oats.

GREAT BROME, SOFT BROME AND RED BROME

Brome grasses often get confusing. Great brome has purple stripes on the leaf base and long hairs on the leaf blade margin. Red brome has a reddish base to the stem and short hairs on the leaf blade margin and soft brome looks similar to great brome but does not have the purple stripes on the base of the stem. Soft brome is generally hairier than great brome. Great brome seed is large, up to 7 cm long including the awn. Red brome seed is smaller than great brome seed, up to 4 cm long including the awn, and soft brome seed has only a short awn and may be confused with ryegrass seed.

WEED ASSOCIATIONS

Local knowledge helps in building the weed spectrum that you will find in your area. Use other weeds in the paddock to point you in the right direction. Many weeds are found together in situations where waterlogging, pH, soil texture and salinity are common. Some examples are listed below.

Acid soils prone to waterlogging over winter; capeweed, toad rush, loose strife, phalaris and crassula are common.

Lighter textured, acidic soils; capeweed, geraniums, sorrel, ryegrass and silvergrass may be found.

Mallee alkaline sands; brome grass, ryegrass, capeweed, caltrop, skeleton weed, and medics

Wimmera grey clays; fumitory, deadnettle, rough poppy, musk, bedstraw, mustards,

Experience will help you build on your knowledge of weeds that are found to commonly occur together. Use your peers to assist in identifying weeds. Keep a record of the weeds you find in your paddocks and monitor them so they don't get out of hand. Knowing what weeds are present in your paddocks will allow for appropriate weed management strategies to be developed.

COLLECTING SPECIMENS FOR IDENTIFICATION

If you are unable to identify the weed in question, the plant may be collected and delivered or posted to your nearest Department of Agriculture office for correct identification. In order for the specimen to arrive in good condition and to assist in rapid identification, please observe the following steps.

1. Dig up some representative plants (5 to 10), including roots (don't just pull up the weed).
2. Place the plants in a plastic bag with some wet tissue or paper towel.
3. Store the plants in a cool place out of the sun. A small esky is ideal.
4. Record the following information:
 - Collectors name, postal address and phone/fax number
 - Date of collection
 - Location (nearest town)
 - Soil type (including texture, salinity and pH)
 - Associated plants
 - Weed characteristics including;
 - Distinctive smell
 - Colour
 - Growth habit.
5. Plants can be kept in good condition in the crisper of the fridge for up to a week if they are stored in plastic bags. Do not freeze plant material as it is impossible to identify once it has been defrosted.

DELIVERY OF PLANTS

1. By hand;

- Plant the specimen in a pot or container and keep it well watered.

2. By post;

- Fresh specimens.
 - Place the specimen in a plastic bag with some damp tissue or paper towel - store in a cool place out of the sun (plants will keep for up to a week in the fridge. Remember not to freeze the plant material).
 - Post early in the week so the plant does not sit in the mail over the weekend.
- Dried specimens.
 - Press the plants with moderate pressure between sheets of newspaper until dry. Mount the specimen on card and post it flat.

Specimens should be posted on Monday or Tuesday. This will ensure that they arrive in good condition, towards the end of the week, and will not sit in a warm post office over the weekend and deteriorate.

Taking photocopies of the plant can help with recording growth habit. However, it is best to have fresh specimens.

If you require information about control of the plant, detailed information including paddock history (12 months), proposed use, soil type and the density of the infestation are required. Often this information is best obtained over the phone or through a personal visit.

For identification of plant specimens, post them to your local district agronomist or to your state herbarium, as listed in the appendix.

IDENTIFICATION OF AGRICULTURAL WEEDS WORKSHOP

APPENDICES

1. BROADLEAF WEEDS KEY
2. NARROWLEAF WEEDS KEY
3. STATE HERBARIUM LISTINGS

Broad-leaved Weeds Key

Broad leafed weeds key

Key to the identification of broad leafed weeds in their early growth stages

To use the broad leafed weeds key closely observe the seed-leaves (cotyledons), first and second leaves and work seedling through the key. Descriptions relating to cotyledons are in *italics*. Descriptions in **bold** relate to the shape of the cotyledon or leaf. Once a tentative identification has been made turn to the listed page for positive identification.

Page numbers prefixed with CW refer to the *Crop Weeds* book. All other page numbers refer to this book.

Cotyledons

<i>club-shaped</i>	go to page 32
<i>diamond-shaped</i>	go to page 30
<i>do not emerge</i>	go to page 30
<i>heart- or kidney-shaped</i>	go to page 33
<i>none</i>	go to page 30
<i>oval</i>	go to page 34
<i>round</i>	go to page 32
<i>spear-shaped</i>	go to page 31
<i>tiny (less than 2 mm long)</i>	go to page 33
<i>triangular</i>	go to page 30
<i>Y-shaped</i>	go to page 30

LEGUMES KEY (Cotyledons emerge, first leaf single, second leaf trifoliolate) go to page 37

Cotyledons Y-shaped Yellow burrweed CW66

Cotyledons none

first leaf trifoliolate, brown flecks Soursob CW126

Cotyledons diamond-shaped

first leaves diamond-shaped

margin minutely toothed, star-like hairs *Malcolmia* 70

pimpley surface, hairless Common iceplant CW37

first leaves oval, prominent centre vein Willow herb 107

Cotyledons triangular

base entire, no petiole Pimpernel CW140

base notched, petiole long

first leaf round, margin lobed and undulating Bladder ketmia 105

..... Small-flowered mallow 106

Cotyledons do not emerge

first leaf a pair of leaflets (sometimes three)

leaflets spear-shaped Vetch CW112, 96, 100, 102

leaflets oval, apex pointed, large, hairless, glossy,

stipules variable, terminal tendril short, spear-shaped Broad/faba bean 97

leaflets heart-shaped, margin slightly toothed, stipule broad Pea 92

leaflets club-shaped, apex notched, stipule spear-shaped Lentil 83

leaflets replaced by a tendril, stipules broad, leaf-like Semi-leafless field pea 92

first leaf 5–7 leaflets

leaflets oval, margin toothed, apex pointed, hairy Chickpea 81

Cotyledons round

hairless

apex and base indented, petiole long, prominent veins Field bindweed CW96

apex indented

first leaf oval

first leaf three lobed, single, long hairs on upper surface Parsley piert CW143

first leaves oval, 4-6 in a whorl Field madder 116

first leaves spear-shaped

margin irregularly lobed Chicory 57

apex and base round, petiole short

first leaves oval, margin toothed Wall rocket 67

first leaves palm-like White lupin 84

hairs on cotyledons and/or petiole

petiole present

apex indented

leaves emerging in pairs

oval, fine hairs, small lobes on margin Stagger weed CW124

oval, scattered stiff hairs on warts, lobed Dwarf nettle 119

leaves alternate, long scattered hairs, margin slightly toothed Twining toadflax 117

apex round

leaves oval, hairy

margin smooth Common heliotrope CW70

margin lobed

petiole sparsely hairy Wild sage 103

petiole long, woolly hairs Horehound CW123

leaves single, oval, hairy, margin lobed

petiole absent

apex round

leaves elongated club-shaped Creeping cudweed CW54

Cotyledons spear-shaped

apex round

leaves wedge-shaped, succulent, stems red Pigweed 114

leaves spear-shaped or linear

hairless, leaves very long and thin Scorzonera 61

downy hairs, mid-rib depressed Ribwort CW132

prominent central vein, tinged with red Redshank 113

first leaf oval

margin deeply lobed and toothed Coriander 52

margin undulating, emerging opposite, hairy Winged sea lavender 111

margin smooth, second leaf triangular, base indented Threecornered Jack CW134

leaves triangular/diamond, apex indented Redroot amaranth CW38

apex round-pointed

first leaves spear-shaped

apex round, hairless, in pairs Corn spurry CW91

apex pointed

stem pink/white, cotyledons <10 mm long Hogweed CW136

stem red, cotyledons >10 mm long

leaves emerging singularly Tree hogweed CW137

leaves emerging in pairs, margin undulating False caper 80

first leaves deeply divided, hairy, strong smell Bifora 51

apex pointed

first-leaf divided, deeply lobed

dull blue-green, stem red Smallflower fumitory CW116

light green, stem green Denseflower fumitory CW114

- first leaf spear-shaped, apex pointed**
 - hairy
 - hairs on upper surface, few on lower surface Flaxleaf fleabane 58
 - densely hairy all over Poached eggs CW58
 - hairless
 - third leaf lobed Rough poppy CW129
- first leaf oval**
 - apex round, base indented, second leaf triangular Lesser Jack CW135
 - apex pointed, some hairs
 - margin lobed, sparse hairs Longhead poppy CW128
 - margin smooth
 - moderately hairy
 - leaf dull blue-green, petiole short Silverleaf nightshade CW146
 - leaf green, petiole long Quena CW147
 - scattered hairs upper surface and petiole Small-flowered opium poppy 110
- first leaves spear-shaped** Flaxleaf fleabane 58

Cotyledons club-shaped

apex pointed

first leaf spear-shaped

- margin toothed, leaves spreading Tangled burr daisy CW42
- margin may be toothed, leaves erect Pale goodenia CW120

apex round-pointed

first leaf oval, apex pointed

- margin irregularly spiny
 - scattered long stiff hairs Safflower 53
 - short hairs on upper surface and margin Saffron thistle CW48
- margin toothed, scattered long hairs Peppercress 69

apex round

- first leaf single, long petiole, second leaf trifoliate SEE LEGUMES KEY page 18

first leaf spear-shaped

margin lobed

- first two leaves emerging in pairs, white hairs Capeweed CW40
- leaves alternate, downy, glandular Night-scented stock 71
- margin smooth, sparse hairs Buck's horn plantain CW130
- margin toothed and spiny, long hairs Star thistle 54

first leaf club-shaped, apex round

margin toothed

- stiff hairs on upper surface Catsear CW55
- few hairs Hairy hawkbit CW57
- margin smooth, hairless, first two leaves in pairs London rocket CW85
- margin spiny, long hairs, leaves single Spear thistle CW50

first leaf oval

- apex pointed, hairless, frosted appearance Sorrel CW138

apex round

- margin undulating, second leaf oval, hairless Curled dock CW139
- margin smooth, second leaf triangular, indented base Threecornered Jack CW134

- first leaf round, deeply divided and lobed, apex pointed** Coriander 52

apex flat

- first leaf spear-shaped, margin toothed and spiny** Star thistle 54

apex indented

first leaf club-shaped

- apex pointed, margin slightly toothed, short woolly hairs Hardhead thistle CW39
- apex round-pointed, margin toothed, long hairs both surfaces Maltese cockspur 55
- St. Barnaby's thistle 56

- apex round
 - leaf margin toothed, small scattered hairs Prickly lettuce CW56
 - leaf margin irregularly lobed, hairless Muskweed CW81
- first leaf spear-shaped**
 - covered in short hairs, margin uneven Night-scented stock 71
 - glossy appearance, margin irregularly toothed and lobed Chicory 57
- first leaves oval, 4–6 in a whorl, apex pointed** Field madder 116

Cotyledons heart- or kidney-shaped

base indented, petiole long

- first leaf round, margin deeply lobed** Cutleaf cranesbill CW119
- first leaf triangular, margin slightly lobed** Buckwheat 112

base smooth

first leaf club-shaped, hairy petiole and leaf

- margin deeply lobed, apex pointed, Ward's weed CW78
- margin lobed to deeply lobed Wild turnip CW72
- margin unevenly toothed Charlock CW84

first leaf oval

hairless

- margin slightly serrated, apex round Sand rocket CW80
- margin irregularly toothed/lobed, apex pointed Canola 64

hairy

margin toothed and lobed

- hairy both surfaces, warts, scattered hairs on petiole Indian mustard 63
- short stiff hairs, veins prominent, rough to touch Wild radish CW82
- short petiole, purplish veins and leaf Buchan weed 68
- margin toothed, short stiff hairs, prominent veins Turnip weed CW83
- margin lobed, bristly, warty appearance Wild turnip CW72
- margin undulating, wrinkled surface White mustard 73

Alternative key to heart-shaped cotyledons

cotyledons classic heart-shaped

- stem below cotyledon tastes of radish Wild radish CW82
- stem below cotyledon does not taste of radish Indian mustard 63

cotyledons squarish heart-shaped

apex slightly indented

- stem below cotyledon tastes of turnip Turnip weed CW83
- stem below cotyledon has no distinct taste Buchan weed 68

apex deeply indented

- stem below cotyledon has no distinct taste Charlock CW84

cotyledons heart-shaped, almost indented at base

- stem below cotyledon tastes of turnip Wild turnip CW72
- stem below cotyledon has no distinct taste
 - petiole and stem with stiff hairs White mustard 73
 - petiole almost hairless Canola 64

Cotyledons tiny, 2 mm or less in length

cotyledons round, apex round

- first leaves oval, succulent** Dense crassula CW98
- first leaves elongated, club, hairy** Creeping cudweed CW54

cotyledons oval

apex pointed

first leaf oval, apex pointed

- long hairs on upper surface Mouse ear chickweed CW90
- hairless, succulent Australian crassula CW99

- apex round*
- first leaves spear-shaped**
 - apex pointed, hairy, leaves in pairs, <10 cm high Common cotula CW52
- Cotyledons oval, greater than 3 mm in length**
- apex indented*
- hairy*
- first leaf club-shaped**
 - apex appears indented, hairy Corn gromwell CW67
 - apex round, scattered hairs Prickly lettuce CW56
 - first leaves oval**
 - opposite, lobed, scattered stiff hairs, warty Dwarf nettle 119
 - alternate, long petiole, frosty appearance Squirting cucumber 77
- hairless*
- veins prominent*
- first leaf club-shaped** St. Barnaby's thistle 56
- veins not prominent*
- first leaves oval**
 - apex indented or flat, hairless, prominent veins Hare's ear CW79
 - apex pointed
 - leaves in whorls of four to five Cleavers 115
 - leaves alternate
 - margin smooth to undulating Ball mustard 72
 - margin toothed and spiny, scattered long hairs Soldier thistle 60
 - margin toothed
 - few scattered hairs Indian hedge mustard CW88
 - woolly hairs both surfaces Maltese cockspur 55
 - margin spiny
 - covered in dense long woolly hairs Stemless thistle CW59
 - covered in short woolly hairs Maltese cockspur 55
 - apex round
 - small hairs on both surfaces, margin slightly toothed Blue mustard 66
 - first leaves round, apex round, margin toothed and lobed**
 - base indented
 - veined, short hairs on lower surface Camel melon CW100
 - veined, short hairs, long petiole Prickly paddy melon CW102
 - base round, veined, hairs on upper surface Hedge mustard CW86
 - first leaves club-shaped**
 - hairy*
 - margin toothed
 - veins prominent, quite hairy Pincushion 78
 - veins not prominent, small scattered hairs Prickly lettuce CW56
 - margin spiny, slightly toothed, warty Ox tongue CW61
 - margin smooth
 - leaves in whorls of four or five Threehorn bedstraw CW144
 - leaves in whorls of six, sometimes five Cleavers 115
- apex flat*
- first leaves oval**
 - margin toothed, apex round Wall rocket 67
 - margin lobed, irregular purple blotches on upper surface White ball mustard 65
 - margin smooth, apex flat to notched, prominent veins, hairless Hare's ear CW79
 - first leaves round**
 - apex round, slightly toothed, few spines, sparse hairs Common sowthistle CW64
 - first leaves triangular**
 - apex round, undulating, hairless, prominent veins Turnsole CW103

- apex pointed*
 - cotyledon veins prominent*
 - first leaf round**, apex pointed, base notched, lobed, hairless Sharp buttercup CW141
 - cotyledon veins not prominent*
 - cotyledons with a petiole*
 - first leaf diamond**
 - slightly toothed, small hairs, strong smell Clammy goosefoot CW95
 - first leaf oval**
 - apex pointed
 - margin toothed, star like hairs Malcolmia 70
 - margin smooth
 - leaves alternate, veins prominent, short hairs Blackberry nightshade CW148
 - leaves opposite, fine hairs on petiole and leaf base Chickweed CW92
 - apex round
 - hairy, veins prominent, margin very slightly lobed Ground cherry 118
 - cotyledons no petiole*
 - first leaves oval**, hairy, strong odour Sunflower 59
 - apex round-pointed*
 - first leaves oval/diamond**
 - apex round, petiole short, warty, hairy, slightly toothed Blue mustard 66
 - first leaves oval**, apex pointed, hairy, margin undulating Redshank 113
 - apex round*
 - hairy*
 - base notched*
 - first leaf oval**, lobed, prominent veins, long hairs Long storksbill CW117
 - first leaf deeply divided**, lobed, fine hairs Common storksbill CW118
 - base smooth*
 - margin smooth*
 - first leaf oval**, apex pointed, may be lobed long hairs Paterson's curse CW68
 - first leaf triangular**, apex round, toothed, long hairs Ivyleaf speedwell CW145
 - margin spiny*, **first leaves spear-shaped**, hairy Night-scented stock 71
 - hairless*
 - base notched*
 - first leaf oval**, lobed, prominent veins, small hairs Deadnettle CW122
 - base smooth*
 - first leaves palm-like** Lupins 84, 85
 - first leaves oval**
 - apex pointed
 - hairy
 - margin spiny and scalloped Saffron thistle CW48
 - margin spiny, leaves alternate Slender thistle CW46
 - margin lobed to toothed, leaves opposite Indian hemp 75
 - hairless
 - margin toothed
 - teeth backward pointing Dandelion 62
 - cotyledon slightly toothed* Evening-primrose 109
 - margin spiny and scalloped Saffron thistle CW48
 - margin smooth, leaves opposite Linola 104
 - apex flat to indented
 - margin smooth, leaves opposite Caustic weed 79
 - apex round
 - hairy
 - margin smooth, hairs on both surface Shepherd's purse CW74

- margin spiny, hairs both surface
 - leaf with white spots Variegated thistle CW62
 - leaf with no spots Slender thistle CW44
- margin toothed and spiny, hairs upper surface Prickly sowthistle CW63
- hairless
 - margin toothed or spiny
 - teeth backward pointing Skeleton weed CW49
 - teeth forward pointing Dandelion 62
 - margin slightly lobed
 - cotyledon upper surface pimpled* Hoary cress CW76
 - cotyledon upper surface smooth* White ball mustard 65
 - margin smooth
 - leaves in pairs Hyssop loosestrife CW125
 - leaves single Cutleaf mignonette CW142
- apex round-pointed, leaves opposite, prominent central vein Willow herb 107
- first leaf club-shaped**
 - apex pointed, surface uneven, hairless Bladder soapwort CW93
- apex round
 - margin spiny, slightly toothed, warty, hairy Ox tongue CW61
 - margin smooth, hairs on upper surface Stinkwort CW53
- first leaf diamond, apex pointed, blue-green bloom, pimples** Fat hen CW94
- first leaf triangular**
 - apex pointed, short hairs lower surface, whitish Bathurst burr CW65
- first leaf pinnate, oval apex pointed, long hairs** Caltrop CW149
- first leaves spear-shaped, apex pointed**
 - hairy
 - leaves opposite
 - second pair of leaves lobed Common cotula CW52
 - second pair of leaves not lobed Mallee catchfly 76
 - leaves alternate, hairs long Globe chamomile CW60

LEGUMES KEY

(first leaf single, second leaf trifoliate)

first leaf kidney-, heart- or spade-shaped

second leaf, central leaflet stalk longer than side ones

hairy

leaflets heart-shaped, apex toothed, small hairs Woolly burr medic CW104

leaflets round to wedge-shaped, apex pointed Strand medic 86

hairless, leaflets heart-shaped

apex toothed, **first leaf kidney-shaped** Burr medic CW105

apex smooth, **first leaf heart-shaped** Hexham scent CW107

second leaf centre stalk same length as side ones

petiole on cotyledon short

leaflets heart-shaped, hairy

margin smooth, long petiole, **first leaf heart-shaped** Hare's foot clover CW108

petiole on cotyledon long

leaflets round, hairy

apex pointed, **first leaf kidney-shaped** (oval cotyledon, long petiole, hairy)

..... Subterranean clover CW110

first leaf round/oval

second leaf central leaflet stalk longer than side ones

leaflets hairless

small irregular light coloured blotches on leaf

apex indented Fenugreek 95

apex pointed Murex medic 88

leaflets hairy both surfaces

leaflets wedge-shaped to oval, margin toothed at free end Barrel medic CW106

leaflets oval, margin toothed all over Snail medic 91

leaflets hairy on lower surface only, margins toothed Gama medic 89

stipule tapers to a point, leaf margin toothed, veins straight Lucerne 90

second leaf central leaflet stalk same length as side ones

hairless

margin spiny, apex pointed

prominent veins, no leaf markings Woolly clover CW111

margin toothed

leaflets oval, prominent veins

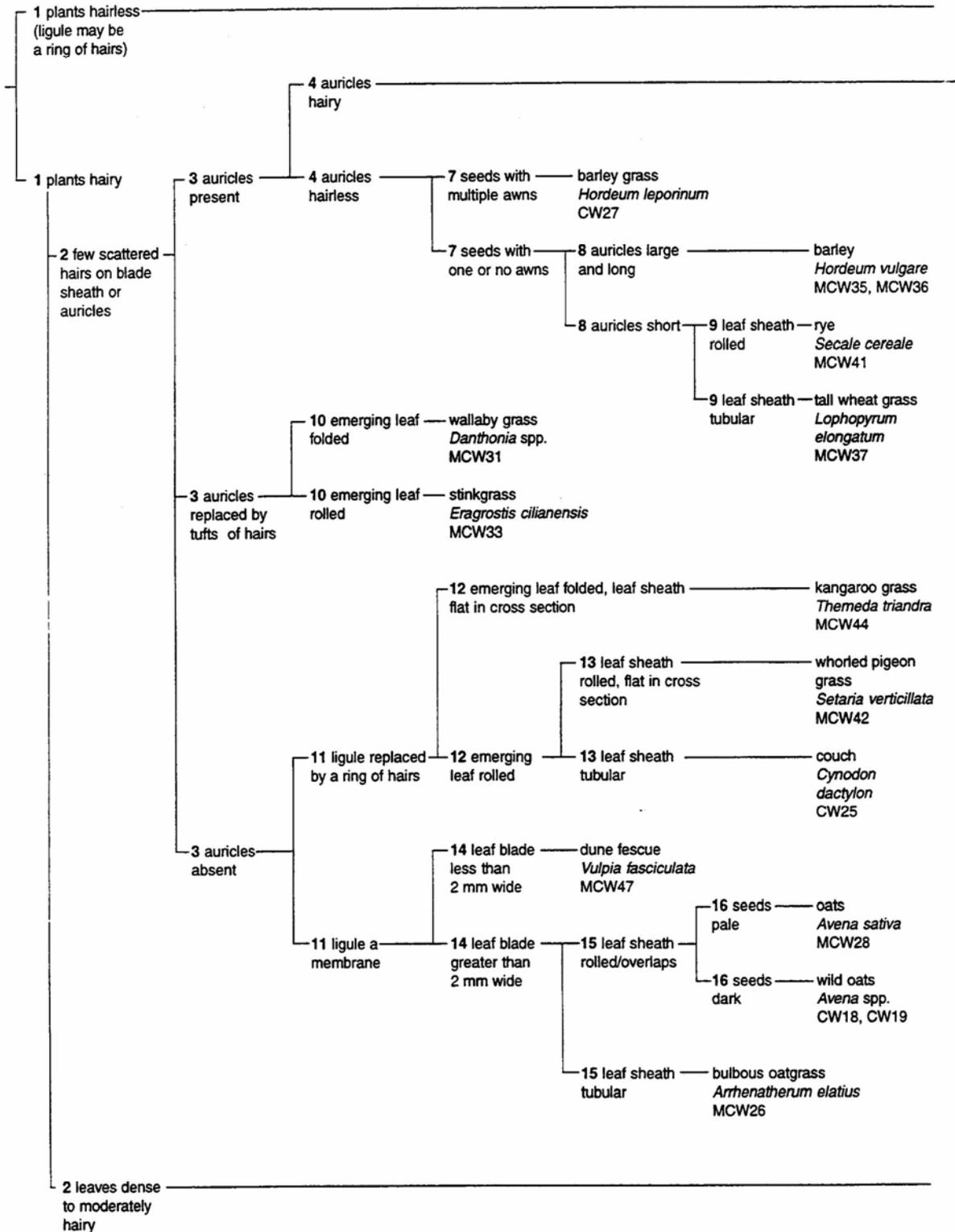
white crescent on leaflets Cluster clover CW109

leaflets heart-shaped

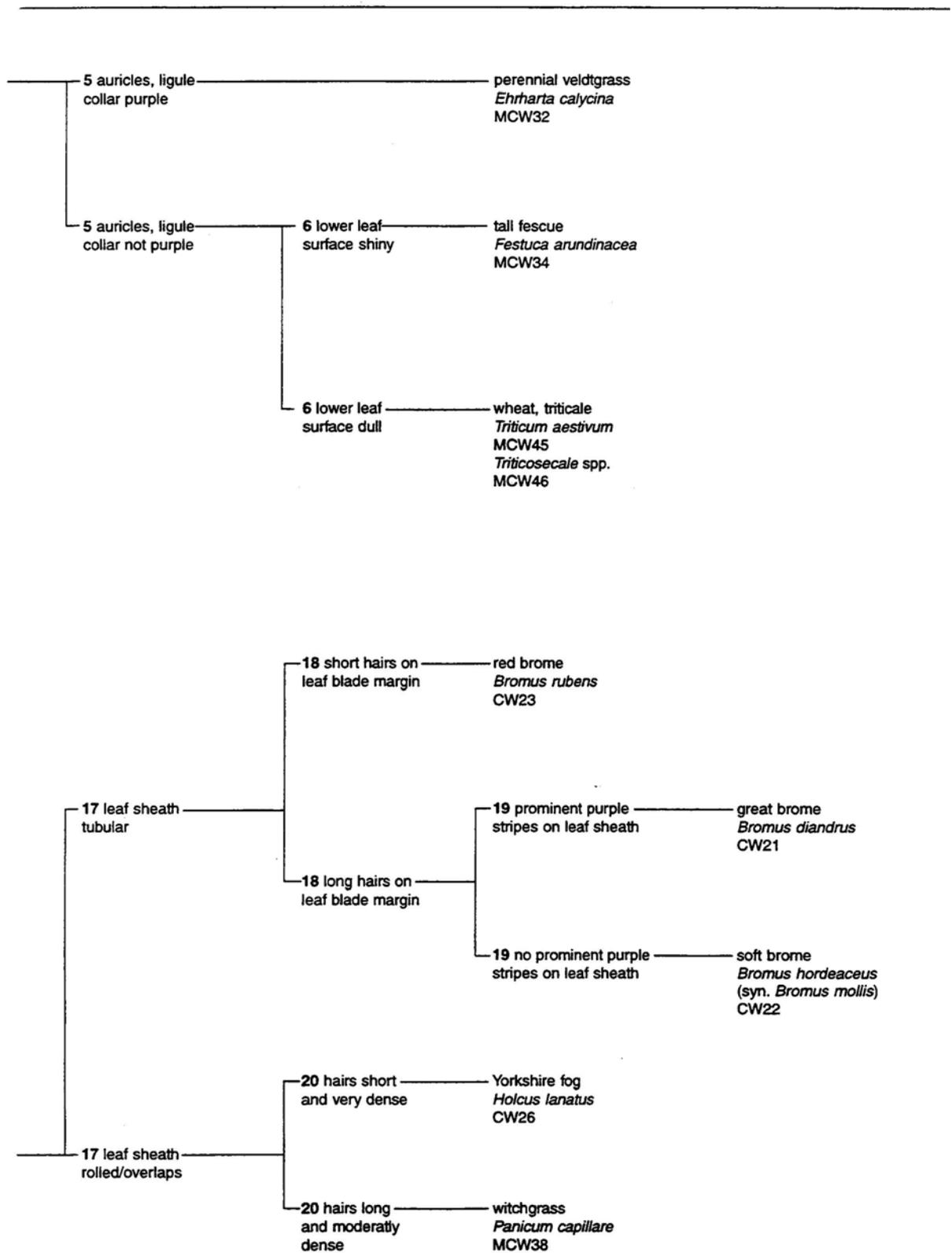
variable red/pink markings Balansa clover 94

Narrow-leaved Weeds Key

Key to vegetative features of narrow leafed weeds

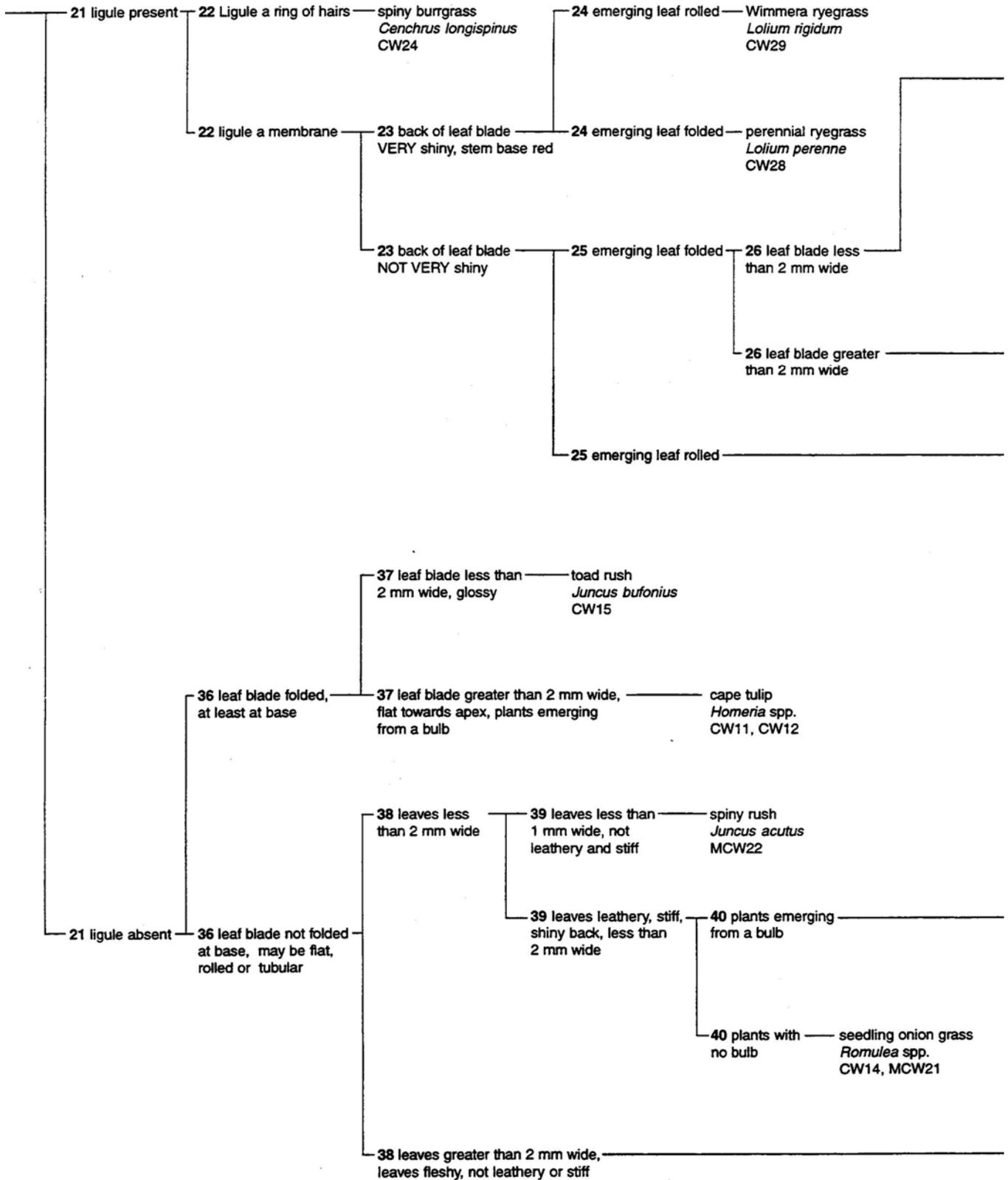


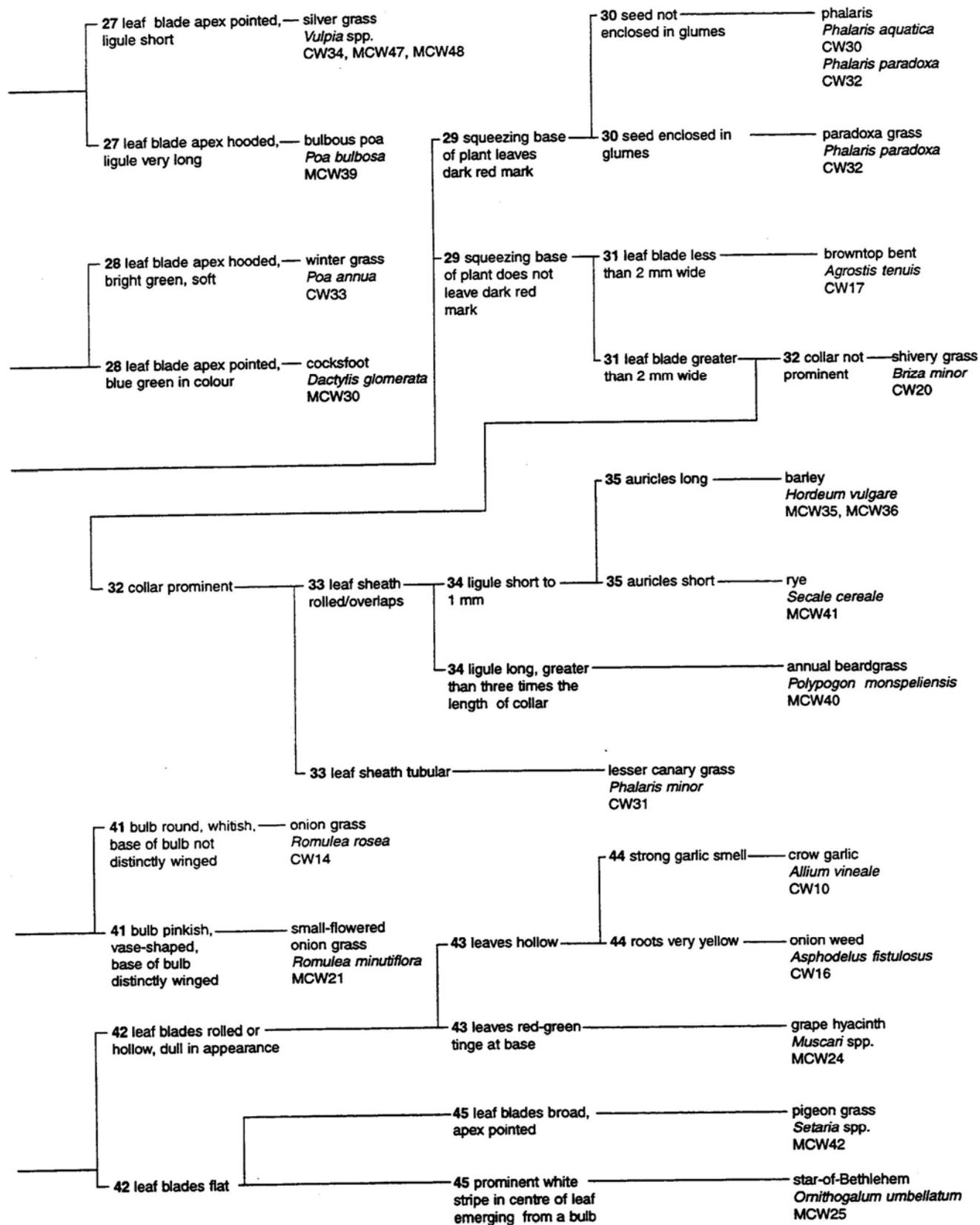
LEGEND MCW – More Crop Weeds
CW – Crop Weeds



Key to vegetative features of narrow leaved weeds continued/...

[1 plants hairless (ligule may be a ring of hairs) continued/...]





ACKNOWLEDGMENTS

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Michael Moerkerk
Weeds Agronomist

WEED CONTROL

Herbicide Classification

Herbicides are classified based on their:

1) MODE OF ACTION

14 Groups from A to N

2) ENTRY METHOD

Root, Leaf (Shoot), Cut Stump, Injection

3) MOVEMENT

Contact or translocated

4) SELECTIVITY

Selective or non selective

5) RESIDUAL ACTIVITY

Residual or non residual.

For example

Glyphosate is a Group M, leaf absorbed, translocated, non selective and non residual herbicide.

HERBICIDE GROUPS

GROUP A

FOPS, DIMS and DENS

Selective, mainly leaf absorbed, translocated, short residual herbicides
Grass (POACEAE) killers
Annual Ryegrass may be resistant to them

FOPS

Verdict - haloxyFOP
Fusilade FluaziFOP
Targa – QuizalaFOP
Correct - PropaquizaFOP

Kill a wide range of grasses
Won't kill Silver Grass
Apply when grasses are young
Expensive
Verdict also controls Erodium (GERANIACEAE)

DIMS

Sertin – SethoxyDIM
Select – ClethoDIM

Kills Annual Ryegrass and Wild Oats
Sertin is cheaper than FOPS

DENS

Axial - PinoxaDEN

Kills Annual Ryegrass, Wild Oats and Phalaris.

GROUP B

Sulphonyl ureas
Translocated, leaf and root absorbed herbicides
Variable selectivity, and residual activity

Ally - Metsulfuron
Oust - Sulfometuron
Eclipse – Metosulam
Glean – Chlorsulfuron
Logran - Triasulfuron

GROUP C

Non selective, mainly root absorbed, translocated, residual controllers of seedlings.

Atrazine
Simazine
Diuron

GROUP D

Selective, root absorbed, poorly translocated, residual controllers of grasses that often require incorporation into the soil.

Treflan – trifluralin
Stomp – pendimethalin

GROUPS E,F,G,H,J and K

Specialty Herbicides

GROUP I

Hormone herbicides
Selective, leaf absorbed and translocated
Picloram has a long residual others are relatively short

2,4-D
MCPA
Dicamba
Garlon - triclopyr
Lontrel - clopyralid
Grazon – triclopyr + picloram
Mixtures

GROUP L

Non selective, leaf absorbed, contact, non residual herbicides

Spray.Seed
Gramoxone – Paraquat
Reglone – Diquat

GROUP M

Non selective, highly translocated, leaf absorbed, non residual

Roundup – glyphosate

GROUP N

Non selective, translocated, leaf absorbed, non residual

Basta

PLANT FAMILIES AND HERBICIDES

Herbicides are generally more effective on some families of plants than others.

Poaceae

Grasses

Preferred herbicides

Roundup

Spray.Seed

Atrazine, Simazine

Verdict, Fusilade, Targa, Correct – No Silver Grass control

Asteraceae or Compositae

Thistles, Capeweed, Daisies

Preferred herbicides

Lontrel

Roundup

Diuron

Fabaceae

Peas, Clovers, Medics, Lupins, Taylorina, Acacias

Preferred herbicides

Ally, Oust, Glean, Logran

Lontrel

Roundup is weak on this family

Brassicaceae

Radish, Turnip, Mustard

Preferred herbicides

2,4-D and hormone herbicides

Roundup

Eclipse, Logran and Glean (post em). Ally is variable.

Lontrel has little effect

Solanaceae

Nightshades, Tomato, Potato, Afghan Thistle

Preferred herbicides

Lontrel

Roundup

Hormone herbicides

Rosaceae

Blackberry

Preferred herbicides

Ally

Roundup

Garlon, Grazon

Oxalidae

Soursobs, Four O'clock, Oxalis, Wood Sorrels

Preferred herbicides

Ally, Glean, Logran

Roundup

Diuron

Polygonaceae

Docks, Sorrel, Doublegee

Preferred herbicides

Ally, Glean

Roundup

Dicamba

Geraniaceae

Storksbills, Erodium, Pellargonium

Preferred herbicides

2,4-D and hormone herbicides

Spray.Seed

Verdict (is very selective for some species)

Roundup is weak.

Chenopodiaceae

Fathen, Goosefoot(Mintweed), Salt bush, Prickly Saltwort

Preferred herbicides

Roundup

Atrazine

Hormone herbicides

Caryophyllaceae

Chickweeds, Catchfly, Spurreys

Preferred herbicides

Roundup

Spray.Seed

Atrazine

Juncaceae

Rushes

Preferred herbicides

Roundup

Other Monocots – Alliaceae, Araceae, Asparagaceae, Iridaceae, Liliaceae.

Flowering bulbs, Arum Lilly, Watsonias, Cape Tulip, Bridal Creeper

3 and 6 petal flowers.

Preferred herbicides

Roundup (but not for Arum Lilly)

Ally, Glean (but not for Watsonias)

The Susceptibility of Plant Families to Common Herbicides

Dicotyledons

Monocotyledons

	Asteraceae	Brassicaceae	Caryophyllaceae	Chenopodiaceae	Fabaceae	Geraniaceae	Lamiaceae	Oxalidaceae	Polygonaceae	Rosaceae	Solanaceae	Alliaceae	Araceae	Asparagaceae	Iridaceae	Juncaceae	Poaceae
Glyphosate	***	**	***	***	*		**	**	**	**	***	**		**	**	***	***
Spray.Seed	**	**	***	***	*	***					***		*				***
Basta	**	**	***	**	**	**	?				?						***
Ally		*	**	***	***	*	**	***	***	***	***	***	***	***	V		
Glean		*	**	**	***	*	***	***	***	*	**	**	***				*
Oust		*	**	***	***	*	?	***	***	***	***	?	**	?	?		*
Eclipse		***															
Fops						V											***
Dims																	V
Atrazine	**	**	***	***		*	*				*						***
Diuron	***		***	**		*		***			*						*
Treflan																	**
Lontel	***				**						***						
2,4-D	**	***		**	*	***	*				**		**		V		
Dicamba					***	**			***		*						
Garlon	**			**	**		*			***	*				*		

*** = good control. V = variable, some species controlled. ? = unknown.

Grass Characters

	Ryegrass	Wild Oats	Silver Grass	Toad Rush	Other grass
Blade	0.5-5mm wide Shiny on one side, Hairless Flat	3-6mm wide Dull Hairless Flat	0.5-3mm wide Shiny both sides, Hairless Flat or rolled	0.2-2mm wide Shiny both sides. Hairless. Channelled. Arise from base or stem.	± Broad ± Hairy
Ligule	Membrane.	Membrane.	None.	None.	± Rim of hairs
Auricles	Small.	None.	None.	None.	± Large auricles.
Sheath	Split.	Split.	Split.	None.	± Not split.
Seed	2-3 mm long. Pale. No awns.	10 mm long black. Awns.	1-2 mm long. Pale. Awns.	Tiny. No awns	
Other	Often red base			Angular stems	

Broad-leaved Characters

	Asteraceae	Brassicaceae	Fabaceae	Geraniaceae	Oxalidaceae	Polygonaceae
Leaves	Lobed or toothed	Lobed	Trifoliolate or pinnate	Lobed	Trifoliolate	Arrow or entire
Cotyledons	Long oval	Heart to round	Oval	Indented base, on stalk		Long skinny
Flower	Daisy/thistle	4 petal	Pea	5 petal	Trumpet	Small
Seed	Parachute	Round	Round	Corkscrew	Tiny	Triangular
Petiole base	Normal	Normal	Stipules	Normal	Normal	Membrane
Seed case	Composite disk	Pod	Pod	Cluster of several seeds	Pod	Spines, wings or bare
Taste					Sour	Bitter

The Susceptibility of Grasses and Grass-like Weeds to Common Herbicides.

	Annual Poa	Annual Ryegrass	Barley Grass	Barley	Brome	Cereal Rye	Couch	Darnel	Fescue	Kikuyu	Lesser Canary Grass	Lovegrass	Oat	Onion Grass	Paspalum	Phalaris	Silver Grass	Wheat	Wild Oat	Winter Grass	Toad Rush	Triticale	Yorkshire Fog
2,2-DPA	Pre/Po	Pre/Po	Pre/Po	Pre/Po	Pre/EPo	Pre/EPo	Po	Pre/Po	Pre/EPo	Po	Pre/Po		Pre/Po		Po		Pre/Po	Pre/Po	Pre/Po	Pre/Po		Pre/Po	Po
Achieve	Po	EPo			Po			EPo					Po						Po	Po			
Amitrole	Po	Po	Po	Po	Po	Po	Po	Po	Po	Po	Po		Po		Po	Po	Po	Po	Po	Po		Po	Po
Atrazine	Pre/EPo	Pre/EPo	Pre/EPo	Pre/EPo	Pre/EPo	Pre/EPo		Pre/EPo	Pre				Pre/EPo				Pre/Po	Pre/EPo	Pre/EPo	Pre/EPo	Pre/EPo	Pre/EPo	Pre/EPo
Avadex		Pre			Pre			Pre					Pre						Pre				
Basta	Po	Po	Po	Po	Po	Po	Po	Po			Po		Po		Po		Po	Po	Po	Po		Po	
Dims	V	Po	Po	Po	Po	Po	Po	Po	Po	Po	Po		Po					Po	Po			Po	
Diuron	Pre/EPo	Pre/EPo	Pre/EPo		Pre/EPo			Pre/EPo									Pre					Pre/EPo	
Dual	Pre	Pre						Pre												Pre	Pre		
Duet/Yield		Pre						Pre			Pre		Pre			Pre	Pre		Pre				
Fops		Po		Po	Po	Po		Po	Po	Po	Po		Po		Po			Po	Po			Po	Po
Glean		Pre/Po	Pre/EPo		Pre/EPo			Pre/Po	Pre		Pre			Po									
Glyphosate	Po	Po	Po	Po	Po	Po	Po	Po	Po	Po	Po	Po	Po	Po	Po	Po	Po	Po	Po	Po	Po	Po	Po
Kerb	Pre/Po	Pre/Po	Pre/EPo	Po	Po	Po		Pre/Po			Pre/Po		Pre/Po				Pre/Po	Po	Pre/Po	Pre/Po		Po	Pre/EPo
Linuron	Pre/EPo																				Pre/EPo		
Logran		Pre/EPo	Pre/EPo					Pre/EPo			Pre			Pre								Pre	
Metribuzin	Pre/EPo	Pre/EPo			Pre/EPo			Pre/EPo													Pre/EPo	Pre/EPo	EPo
Oust	Pre/EPo	Pre/EPo		Pre/EPo	Pre/EPo	Pre/EPo		Pre/EPo			Pre/EPo		Pre/EPo				Pre/EPo	Pre/EPo	Pre/EPo	Pre/EPo	Pre/EPo		Pre/EPo
Pemdimethalin	Pre	Pre			Pre			Pre									Pre			Pre			
Select	EPo	Po	Po	Po	Po	Po		Po			Po		Po				EPo	Po	Po	Po		Po	
Simazine		Pre	Pre	Pre	Pre	Pre		Pre	Pre									Pre/EPo		Pre/EPo	EPo	Pre/EPo	
Spray.Seed	Po	Po	Po	Po	Po	Po		Po			Po		Po	V			Po	Po	Po	Po	Po	Po	
Trifluralin	Pre	Pre	Pre		Pre			Pre			Pre		Pre				Pre		Pre	Pre			

EPo = Early post-emergence control. Po = Post-emergence control. Pre = Pre-emergence control.

V = variable

Identification Key for Common Grasses and Grass-like Weeds 1

	Leaf blade length x width mm	Leaf surface	Leaf hairiness	Leaf cross section	Ligule type	Auricles type	Sheath type	Sheath hairiness	New leaf	Seed length x width mm	Seed colour	Seed features	Other features
Cereals													
Barley (<i>Hordeum vulgare</i>)	40-400 x 5-20	Dull	Hairless to slightly hairy. No hairs near collar.	Flat to twisted	Short membrane	Very large, clasping	Rolled & overlapping	Hairless or scattered hairs	Rolled	4-8 x 2-5	Yellow	Straight awn	Leaves twist clockwise
Cereal Rye (<i>Secale cereale</i>)	75-300 x 10-20	Dull, rough to touch	Hairless	Flat to twisted	Short rim < 1 mm	Small	Rolled & overlapping	Hairless	Rolled	5-7 x 2-3	Yellow	No awns.	Prominent veins on sheath
Oat (<i>Avena sativa</i>)	150-700 x 5-12	Dull, rough to touch	Hairless to slightly hairy	Flat to twisted	Short jagged membrane	None	Rolled & overlapping	Hairless to slightly hairy	Rolled	10-15 x 2-5	Yellow	No awns or straight awns	Leave twist anticlockwise
Triticale (<i>Triticum X secale</i>)	30-300 x 10-20	Dull	Hairless to slightly hairy	Flat to twisted	Short.	Medium, maybe with hairs	Rolled	Hairless to slightly hairy	Rolled	8-12 x 2.5-4	Yellow	No awns	Sheath often bluish green at base
Wheat (<i>Triticum aestivum</i>)	30-300 x 10-20	Dull	Hairless or a few hairs near collar.	Flat to twisted	Fringed membrane	Large	Rolled & overlapping	Hairless or a few hairs near collar	Rolled	6-7 x 2-5	Yellow	No awns	Leaves twist clockwise
Annual Poa (Winter Grass <i>Poa annua</i>)	5-140 x 1-5	Light green	Hairless	Canoe like, hooded, wrinkled	Membrane >2 mm	None	Rolled & overlapping, keel, striped, flattened	Hairless	Folded	< 1 mm	Pale.	No awns	Striped sheath
Barley Grass (<i>Hordeum leporinum</i>)	40-200 x 1.5-12	Light green. Bluish tinge.	Hairy on lower leaves.	Twisted	Short membrane	Large, encircle stem.	Rolled & overlapping	Hairless or a few fine hairs.	Rolled	5-10 x 2-4	Pale.	Awned	Strong clockwise twist
Brome Grasses													
Great Brome (<i>Bromus diandrus</i>)	80-400 x 4-8(20)	Dull	Hairy on upper surface	Twisted	Fringed membrane 4-6 mm	None	Tubular, often with basal purple stripes.	Hairy or hairless	Rolled	20-40 x 1-2	Brown	Awns 35-60 mm	Seedlings have purple tinge. Collar is lighter green.
Rigid Brome (<i>Bromus rigidus</i>)	100-200 x 3-6	Dull	Hairy on both sides	Twisted	Membrane ~2 mm	None	Tubular	Hairy on lower leaves	Rolled	30-50 mm	Brown	Awns 35-50 mm	
Soft Brome (<i>Bromus hordaceus</i>)	100-300 x 2-10	Dull. Light green	Hairy on both sides	Twisted	Ragged membrane, ~2mm	None	Tubular	Hairy on lower leaves	Rolled	12-22 x 3.5-6	Yellow /brown	Awns 5-10 mm	

Identification Key for Common Grasses and Grass-like Weeds 2

	Leaf blade length x width mm	Leaf surface	Leaf hairiness	Leaf cross section	Ligule type	Auricles type	Sheath type	Sheath hairiness	New leaf	Seed length x width mm	Seed colour	Seed features	Other features
Couch (<i>Cynodon dactylon</i>)	10-160 x 1-5	Dull. Grey green.	Hairless or sparsely hairy	Flat or folded	Rim of hairs	None	Split but tubular at base	May have hairs on lower portion	Folded	< 1 mm		No awns.	Perennial with rhizomes and stolons.
Fescue (<i>Festuca</i> species)	100-750 x 3-12	Dull. Dark green.	Hairless or a few hairs near the collar	Flat	Short membrane	Large and encircle the stem		Hairless	Rolled	Small.		No awns	Perennial tussock.
Kikuyu (<i>Pennisetum clandestinum</i>)	10-300 x 2.5-7	Bright green.	Hairless or wart based hairs	Flat or folded	Hairy ring.	None	Overlapping	Usually hairy.	Folded	Very small		No awns	Perennial with rhizomes and stolons.
Lesser Canary Grass (<i>Phalaris minor</i>)	20-300 x 3-13	Dull. Ridged	Hairless. Rough edge and surface.	Flat	Large 8-10 mm long.	None but base of blade is winged	Tubular	Hairless.	Rolled	1 mm	Brown	No awns	
Lovegrass (<i>eragrostis curvula</i>)	250-350 x 1-5	Dull dark green to blue green	Hairless or hairy	Flat	Hairy ring	None		Hairless or hairy	Rolled	Small <1 mm	Cream to dark orange brown	Translucent	Perennial tussock.
Onion Grass (Guildford Grass <i>Romulea rosea</i>)	50-400 x 1-2	Shiny	Hairless	Cylindrical, solid		None	None	Hairless	Solid	Small.	Red-brown	Shiny, dimpled and angular	Has bulbs.
Paspalum (<i>Paspalum dilatatum</i>)	60-600 x 3-15	Wavy edges, prominent midrib.	Hairless apart from a few near the collar	Flat to slightly folded	Large membrane 2-4 mm long	None	Tubular	Hairless apart from a few near the collar	Rolled	Small 2-3 mm		Shiny and flattened	Often has a purplish tinge
Phalaris (<i>Phalaris aquatica</i>)	20-500 x 2-14	Dull bluish green, often striped	Hairless	Flat	Large membrane 3-12 mm	None but base of blade is winged	Split	Hairless	Rolled	Small	Light brown	No awns. Smooth and shiny.	Perennial with runners. Collar often lighter colour
Puccinellia		Red at base			Membrane >2 mm	None			Folded				

Identification Key for Common Grasses and Grass-like Weeds 3

	Leaf blade length x width mm	Leaf surface	Leaf hairiness	Leaf cross section	Ligule type	Auricles type	Sheath type	Sheath hairiness	New leaf	Seed length x width mm	Seed colour	Seed features	Other features
Ryegrasses Annual Ryegrass (<i>Lolium rigidum</i>)	30-150 x 1-5	Shiny on one side,	Almost hairless	Flat	Small membrane 1.5 mm.	Variable from none to long. Often shrivelled.	Slightly overlapping and split to the base	Hairless	Folded	Small, 2-3 mm long.	Pale. Brown to yellow grey	No awns.	Often red/purple base of sheath and seedling. Glumes almost as long as the spikelet.
Italian Ryegrass (<i>Lolium multiflorum</i>)	60-220 x 2-10	Shiny on one side,	Hairless	Flat	Jagged membrane, 4 mm long.	Large and narrow.	Rolled & overlapping	Hairless	Rolled	Small, 3-6 mm long.	Pale. Brown to yellow grey	Awned	Often red/purple base of sheath. Glumes less than half the length of the spikelet.
Perennial Ryegrass (<i>Lolium perenne</i>)	30-200 x 2-6	Shiny on one side,	Hairless	Flat	Small membrane 1-2 mm.	Large	Split to base	Hairless	Folded	Medium 4-8 mm long	Pale. Brown to yellow grey	No awns	Glumes about half the length of the spikelet.
Darnel (<i>Lolium temulentum</i>)	50-400 x 2-15	Shiny on one side,	Hairless	Flat	Small membrane	Narrow	Rolled & overlapping	Hairless	Folded	Small, 3-6 mm long.	Pale. Brown to yellow grey	No awns	Glumes as long or longer than the spikelet.
Silver Grasses Rat tailed Fescue (<i>Vulpia myuros</i>)	20-150 x 0.5-3mm wide	Shiny both sides,	Tiny hairs on top or hairless	Flat or rolled	Membrane, 0.5-1 mm	Tiny	Rolled & overlapping	Hairless	Rolled	Small, 1-2 mm long.	Pale.	Awns.	Top leaf sheath covers part of the seed head.
Sand Fescue (<i>Vulpia fasciculata</i>)	10-140 x 0.5-3	Shiny both sides,	Tiny hairs on ribs. May appear hairless	Flat or rolled	Membrane, 0.5 mm	None	Rolled & overlapping	Hairless	Rolled	Medium, 4-12 mm long	Pale	Awned. Awn twice as long as the seed.	
Squirrel-tailed Fescue (<i>Vulpia bromoides</i>)	10-150 x 0.5-3 mm	Shiny both sides,	Tiny hairs on top or hairless	Flat or rolled	Membrane 0.3-0.5mm	None	Rolled & overlapping	Hairless	Rolled	Small, 2-4 mm	Pale	Awned	Seed head held clear of top leaf sheath. Base maybe reddish.

Identification Key for Common Grasses and Grass-like Weeds 4

	Leaf blade length x width mm	Leaf surface	Leaf hairiness	Leaf cross section	Ligule type	Auricles type	Sheath type	Sheath hairiness	New leaf	Seed length x width mm	Seed colour	Seed features	Other features
Tall Wheat Grass (<i>Thinopyrum elongatum</i>)	30-250 x 5-70	Dull	Hairless or a few hairs	Flat or rolled	Membrane with rim of short hairs.	Small	Tubular	Hairless or a few hairs.	Rolled	Medium, 10-12 mm long.	Pale yellow brown	Awnless	
Toad Rush (<i>Juncus bufonius</i>)	45-140 x 0.2-1.5	Shiny both sides.	Hairless.	Channell ed. Arise from base of stem.	None.	None	None.		From base sheathing with papery edges	Tiny. 0.3-0.5 mm long.	Light brown, shiny, smooth, hairless	No awns	Angular solid stems
Wild Oats Bearded Oat (<i>Avena barbata</i>)	100-300 x 3-6	Dull	Usually hairless but young leaves may have hairs.	Flat or twisted.	Large membrane.	None	Rolled & overlapping	Hairless or hairy.	Rolled	Large, 12-20 mm long	Black or dark brown.	Twisted awns	Leave twist anticlockwise
Wild Oats (<i>Avena fatua</i>)	100-300 x 3-15	Dull	Hairless or hairy	Flat or twisted.	Large membrane.	None	Rolled & overlapping	Hairless or hairy.	Rolled	Large, 12-20 mm long	Black or dark brown.	Twisted awns	Leave twist anticlockwise
Ludo Wild Oat (<i>Avena sterilis</i> ssp. <i>ludoviciana</i>)	100-300 x 3-18	Dull	Hairless or hairy	Flat or twisted.	Membrane.	None	Split		Rolled	Large.	Black or dark brown.	Twisted awns	Leave twist anticlockwise
Yorkshire Fog (<i>Holcus lanatus</i>)	40-200 x 3-10	Dull	Very hairy	Flat	Jagged membrane	None	Rolled & overlapping	Hairy	Rolled	Small	Yellow brown dark tip.	Shiny and hairy.	Sheath often has stripes

Common Broad-leaved Weeds of Southern Australia

Dicotyledons

Asteraceae

Capeweed
Cotton Fireweed
Cotula
Dandelion
English Daisy
Flatweed
Fleabane
Jersey Cudweed
Jo-jo
Noogoora Burr
Ox-tongue
Potato Weed
Prickly Lettuce
Safflower
Saffron Thistle
Skeleton Weed
Slender Thistle
Sowthistle
Spear Thistle
Starwort
Stinkwort
Sunflower
Variegated Thistle

Brassicaceae

Canola
Charlock
London Rocket
Mustards
Peppercress
Sand Rocket or Lincoln Weed
Shepherd's Purse
Swinecress
Turnip Weed
Turnips
Wild Radish

Caryophyllaceae

Chickweed
Corn Spurrey
Four-leaved Allseed
French Catchfly
Mouse-eared Chickweed

Chenopodiaceae

Crumbweed
Fat Hen
Goosefoot
Prickly Saltwort

Fabaceae

African Scurfpea (Taylorina)
Bean
Brooms

Chickpea
Clover
Dolichos Pea
Furze - Gorse
Hexham Scent (Melilots)
Lentil
Lotus
Lucerne
Lupin
Medic
Pea
Serradella
Trefoil
Vetch

Geraniaceae

Corkscrews
Erodium
Geranium
Storksills

Lamiaceae

Dead Nettle
Horehound
Lavender
Mintweed
Pennyroyal
Stagger Weed
Wild Sage

Oxalidaceae

Four O'clock
Oxalis
Soursob
Wood Sorrel

Polygonaceae

Bindweed
Docks
Doublegee - Spiny Emex
Knotweed
Redshank (Persicaria)
Sorrel
Tree Hogweed
Wireweed

Rosaceae

Blackberry

Solanaceae

Afghan Thistle
African Boxthorn
Apple-of-Sodom
Kangaroo Apple
Nightshade
Potato
Thornapple
Tomato

Common Grass and Grass-like Weeds of Southern Australia.

Monocotyedons

Araceae

Arum Lily

Asparagales (Alliaceae, Asphodelaceae & Asparagaceae)

Bridal Creeper

Leek

Onion

Onion weed

Three-cornered Garlic

Iridaceae

Cape Tulip

Onion Grass - Guildford Grass

Watsonia

Juncaceae

Common Rush

Spiny Rush

Toad Rush

Poaceae

African Lovegrass

Barley

Barley Grass

Barnyard Grass

Brome

Canary Grass

Cereals

Cocksfoot

Couch

Crabgrass

Fescue

Hairgrass

Johnson Grass

Kikuyu

Maize

Millet

Oats

Pampas Grass

Paspalum

Phalaris

Poa - Winter Grass

Rhodes Grass

Rye

Ryegrass

Shivery Grass- Blowfly Grass

Silver Grass - Squirrel & Rat-tailed Fescue

Sorghum

Sourgrass

Summer Grass

Veldtgrass

Wheat

Wild Oat

Windmill Grass

Yorkshire Fog

Typical Herbicide Description

Glyphosate CT

ACTIVE INGREDIENT: GLYPHOSATE 450 g/L
CHEMICAL GROUP: M. Phosphonate or Glycine

FORMULATION: Water soluble.
RELATED HERBICIDES: None

GENERAL DESCRIPTION:

Glyphosate is the most widely used herbicide ever developed.

It is a non selective, leaf absorbed, translocated herbicide. Its main uses are for total vegetation control (eg. before planing crops or in industrial areas) and controlling the seed set of annual weeds. It is particularly effective on perennial weeds. It is of low toxicity to mammals, birds and fish. It presents virtually no environmental hazard.

Some plants have become resistant to glyphosate.

TOXICITY

Mammalian toxicity - low.

Acute oral LD50 - 2814-5000 mg/kg [for comparison salt is about 3000 mg/kg]

Acute dermal LD50 - > 5000 mg/kg

Skin - slightly to moderately irritating (formulated product)

Eye - severely irritating (formulated product). Will damage eyes.

Vapour inhalation - N.E.L. 12.2 mg/L air

Chronic oral toxicity - > 2000 ppm over 90 days

300 ppm over 2 years.

Birds - almost non toxic.

Fish - almost non toxic to slightly toxic.

Invertebrates (eg. Marron) - low.

Bees - low toxicity.

TOXICITY SYMPTOMS

Glyphosate does not usually cause any symptoms because of its low toxicity. Some of the formulating agents may irritate eyes and skin causing a rash if the product is misused. Gastrointestinal discomfort, nausea, vomiting and diarrhoea have been reported and are probably caused by the surfactants in many formulations.

In sulfite sensitive people skin reactions have been reported following dermal exposure. Respiratory reactions have been reported after eating food or inhaling medications containing sulfiting agents as preservatives. People with asthma may be more prone to these reactions.

FIRST AID:

Contact a doctor or Poisons Information Centre on 13 11 26.

If Swallowed - Contact a doctor immediately. Rinse mouth with water. Give a glass of milk or water. Do not induce vomiting. Contact a doctor or Poisons Information Centre.

NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

If on Skin - Remove contaminated clothing. Wash skin thoroughly with soap and water.

If in Eyes - Flush with water for 15 minutes. Contact a doctor immediately.

If Inhaled - Remove patient from contaminated area to fresh air.

Advice to doctor.

Do not induce vomiting owing to possible irritant side effects. If further treatment advice is required, contact 1800 033 111

PROTECTIVE CLOTHING:

Wear safety goggles when handling concentrate.
Avoid breathing spray mist.

MODE OF ACTION

Glyphosate is slowly absorbed through the foliage and translocated to growing parts of the plants. It inhibits an enzyme in the shikimic acid pathway which reduces the supply of aromatic amino acids (phenylalanine, tryptophan and tyrosine) and consequently stops protein synthesis. It also affects potassium metabolism. Affected plants turn yellow because no new green chlorophyll is produced. Absorption of glyphosate is reduced in plants with waxy, thick or dehydrated cuticles. Thus, water stressed plants absorb less glyphosate. Surfactants, oils, ammonium, sodium or potassium ions increase absorption but have a variable effect on phytotoxicity because of their variable effects on translocation.

Glyphosate absorption is increased at high relative humidity and at high spray concentrations (low water volumes). Under low relative humidity conditions, at the time of application, additional surfactant often improves efficacy. Rain within 6 hours of application will wash glyphosate off the foliage. Most of the herbicide is washed off by the first 4 mm of rain. Translocation in the plant parallels the movement of assimilates. Good growing conditions result in good absorption, translocation and phytotoxicity. Temperature has little effect apart from its indirect effect on growth.

About twice the normal rate of glyphosate is required to kill plants suffering mild water stress and 10 times the normal rate is required for severely stressed plants.

PLANT SYMPTOMS

Typically, young growth becomes yellow 7 to 14 days after application followed by older growth and then death of the plants. On broadleaved perennials there is often interveinal yellowing, sprouting of secondary buds and compact new growth that looks like 'witches brooms'. These grow for a period then yellow and die as glyphosate is translocated from within the plant to these new sites of growth. This may occur many months after treatment.

SECONDARY EFFECTS

Glyphosate affects the growth regulating hormone (IAA) in plants. This stimulates the growth of secondary buds and causes abnormal growth.

Perennial broad leaved plants often produce growth that looks like a 'witches broom'. It has been reported to affect Rhizobium symbiosis with legumes. Field trials in Australia indicate that this is not likely to cause problems with normal application rates and use patterns.

COMPATIBILITY:

Glyphosate combines (chelates) with di and trivalent ions. Copper, zinc, manganese, calcium and magnesium seriously reduce the effectiveness of glyphosate. This chelation is related to pH and acidifiers can be used to reduce problems with hard water. Slightly salty water and phosphates have little effect on glyphosate activity.

Plant hormonal herbicides, like 2,4-D, generally reduce the absorption and translocation of glyphosate. Spraying oils, non-ionic wetting agents, ammonium sulphate and ammonium nitrate are usually compatible with glyphosate. On some perennial plants, these adjuvants may increase the efficacy of glyphosate considerably. On annual plants it is usually more cost effective to use extra glyphosate rather than adjuvants. Glyphosate increases the absorption of imazethapyr (Spinnaker) Starke and Oliver 1998.

ENVIRONMENTAL FATE

Glyphosate is inactivated on contact with clay particles. This bonding is so strong that glyphosate appears to be non residual and does not move through the soil. Microflora degrade glyphosate under both aerobic and anaerobic conditions at variable rates. This results in a half life ranging from a few days to over a year. Chemical and photolytic degradation are usually negligible though some photolytic degradation has been reported in water.

There is little risk of Glyphosate contaminating water unless it has been applied directly to streams or washed off foliage hanging over streams.

In flowing irrigation channels, up to 50% of the glyphosate applied directly to the water has moved 2 to 10 Km downstream.

Glyphosate is not degraded by the higher plants or animals. It is not accumulated in the tissues of land or aquatic animals. It is accumulated in plant tissues and especially in the storage organs such as tubers, bulbs, rootstocks and rhizomes.

Glyphosate is expected to have little or no lasting effect on ecosystems because of its strong binding to clay, low mobility, low volatility, rapid degradation by common micro organisms and low toxicity to animal systems.

HERBICIDE RESISTANCE

In 1996, annual ryegrass populations tolerant to glyphosate were discovered in Australia. Practices to reduce the development of herbicide resistance should be integrated into systems reliant on glyphosate.

Crops tolerant to glyphosate can be produced by genetic engineering.

APPLICATION METHODS AND TIPS

Glyphosate is applied by hydraulic nozzles or CDA (Controlled Droplet Application) equipment mounted on air craft or ground vehicles for broadcast application. It is usually mixed with water. Its low toxicity (to the operator) makes it ideal for directed application using hand held equipment.

Various wick type applicators have been developed for applying concentrated glyphosate solutions.

Glyphosate is most effective when applied on warm, sunny days when the plants are growing vigorously.

Drought or nitrogen stressed plants are difficult to kill with glyphosate.

Plants covered with dust are often hard to kill because the glyphosate attaches to the clays before entering the leaf.

If plants have been heavily grazed or defoliated they should be allowed to regrow until the root:shoot ratio is around 1 before application of herbicide or the rate of herbicide may need to be increased to achieve effective control.

Whilst glyphosate is not regarded as a soil residual herbicide, it appears to reduce germination of grasses for a few days after spraying. This may be due to direct contact of the herbicide on surface seeds.

Glyphosate reacts with calcium and other di and tri valent ions in water. 50 ppm calcium will reduce activity (Shea and Tupy, 1984). The ions form a complex chelate type structure with glyphosate which reduces absorption (Thelen et al, 1995). This antagonism may be reduced by adding crystalline sulphate of ammonia at a rate of 1 kg per 100 L of water.

Do not store in galvanised or mild steel containers.

Adjuvants

Pulse may increase the activity of glyphosate on broad leaved species but often reduces its activity on grasses. It may also improve the rainfastness on some species. It usually shows greatest benefit on large broadleaved species such as Bracken, Blackberry and Gorse.

PROPERTIES:

Water solubility at 25 C. - 1.16 g/100 mL;

Oil solubility - Not soluble in oils.

Octanol:Water ratio at 25 C. - at pH 5;

Vapour Pressure at 25 C. - Non volatile.

Dissociation constant - pKa

Melting point - C.

Molecular weight -

Half life in water - days at pH5 and 35 C.

Combustible.

Other Information:

Only store in Stainless steel, aluminium, fibreglass or plastic lined containers. Do not expose glyphosate to galvanised or mild steel containers or pipes. It will react, producing hydrogen gas, which may form an explosive mixture capable of causing serious personal injury.

GLYPHOSATE

Trade Name	Manufacturer
Roundup CT	Monsanto
Glyphosate 450	Davison
Glyphosate CT	Nufarm
Trigger	Artfern
Wipe-out 450	Farmoz

2. Concentration of Active Constituent : 450 g/L

4. Poison Schedule : 5

6. Colour : Blue

7. Flammability : Non flammable.

8. Dangerous Goods Class :

10. Mixtures Compatibility :

2,4-D ester (eg Ester 800)	Glean (chlorsulfuron)
Ally (metsulfuron-methyl)	Logran (triasulfuron)
atrazine (flowable)	simazine (flowable)
dicamba (Banvel)	Insecticides - refer label

Do NOT mix with:- Wettable Powder formulations.

Tank mixes with residual type herbicides such as substituted ureas, triazines, or others may decrease the activity of glyphosate. The addition of crystalline ammonium sulphate will assist to overcome the antagonism with triazines.

11. Registered Crop(s) : Pre-plant to all crops and pastures.

12. Effect of Soil Texture on Herbicide : Not relevant.

13. Effect of Soil pH on Herbicide : No effect.

14. Effect of Soil Organic Matter on Herbicide : Not relevant.

15. Mode of Action : Foliar translocation, root uptake is precluded by soil inactivation of glyphosate. Inhibits amino acid and protein synthesis. Post-emergent, non selective.

18. Rates Selection : Lower rate grasses prior to tillering, broadleaf weeds under 10-15 cm diameter/high.

Higher rates for grasses after tillering, broadleaf weeds over 10 -15 cm diameter/high and perennial weeds.

19. Crop Damage (Crop Tolerance) : Not relevant.

20. Effect on Crop : Not relevant.

21a. Effect on Clover Species : Sub. clover - when applied in spring as a 'pasture topping' operation it can reduce seed set. In paddocks with low clover seed reserves, regeneration of plants the following season may be reduced. Established plants can be killed at 1 L/ha.

21b. Effect on Medics : Burr medic - very sensitive when the plant has abundant green leaf. Seedlings are sensitive. Tolerant when fully dormant (eg dry summer conditions).

21c. Effect on Lucerne : Effects on established plants have been variable. At rates recommended on established pastures for 'pasture-topping' the effect on lucerne is generally acceptable. At increasing rates of product adverse effects on plants have been observed with unacceptable damage frequently occurring.

22. Soil Moisture at Application :

DRY - Decreased efficacy as plants stressed.

MOIST - Good result.

WATERLOGGED - Can 'stress' weeds and hence slow or reduce result.

23. Frost Effects : Frost preceding application can reduce efficacy, allowing plants to regrow.

24. Frost Free Days Required After Application : Not relevant.

25. Effect of Application Water Quality on Herbicide :

Saline Water - no problem if monovalent cation. Avoid hard water with di- and tri-valent cations.

Soil Colloids - can reduce efficacy due to tie-up of active ingredient. Avoid using excessively dirty water.

26. Recommended Water Volume : 30 - 100 L/ha boom.

27. Nozzle Type : Flat fan.

28. Recommended Nozzle Pressure : 240 - 280 kPa (35 - 40.6 psi).

29. Recommended Filter Size :

30. Recommended Wetter : Non-ionic surfactant

Activator 90 - 125 ml/100 L. Le-wett - 300 ml/100 L. Agral 600 - 300 ml/100 L. Nufarm Surfactant -

300 ml/100 L. BS 1000 - 200 ml/100 L. Plus 50 - 400 ml/100 L. Howet - 200 ml/100 L. Turbo - 300 ml/100L.

31. Other Additives : Ammonium Sulphate (Boost or Liase). Must be free of metallic contaminants or the enhancement of glyphosate will not occur.
 32. Rain Fastness : 6 hours.
 33. Time Interval Before Effect is Noticed : 2 - 4 days annuals, 7 - 10 days perennials. Cool or cloudy weather following application may delay appearance of visible effects.
 34. Plant Symptoms : Visual symptoms develop slowly and are:
 1. Wilting, chlorosis and necrosis of young foliage which slowly spreads to older foliage.
 2. The regrowth of perennial plants may be distorted with wrinkled or deformed leaves.
 35. Effect of Herbicide/Disease Interaction on Crop : Not relevant.
 36. Withholding Period : None.
 37. Plant-Back Period : No plant-back period, but at least 1 day delay recommended before planting to allow complete translocation of the herbicide within the plant. Observe 2,4-D, Banvel, and Glean plant-backs periods if tank mixed.
 38. Spray Tank Clean-Up : Flush with water.
 39. Other Comments : If there is a lot of organic matter on soil surface, problems with microbial toxins and nutrient tie-up may be encountered. Emerging plants may be affected. Do NOT hold spray mixtures in galvanised or unlined steel containers (except stainless steel) for extended periods. Product or spray solutions react with galvanised or unlined steel containers or spray tanks producing hydrogen gas that may form a highly combustible gas mixture that can flash or explode if ignited by open flame, spark, welder's torch, lighted cigarette or other ignition source.
- Numbered data from "Crop Herbicide Information"
courtesy of A.J. Chambers, Vic. Dept of Food & Agric.

References:

Starke R.J. and Oliver L.R. (1998) Weed Science 46:652-660.

Acknowledgments:

Collated by HerbiGuide. Phone 08 98444064 for more information.

Typical Material Safety Data Sheet (MSDS) - Glyphosate

Sipcam Pacific Australia Pty. Ltd.

A.C.N. 073 176 888

Suite 11, 23 – 31 Gheringhap Street

Geelong, Victoria, 3220

GLYPHOSATE 450 HERBICIDE

Not classified as hazardous according to the criteria of Worksafe Australia.

I IDENTIFICATION

Product Name: Sipcam Glyphosate 450 Herbicide

Other Names: None.

Product Code: None.

UN No: None allocated

Hazchem Code: None allocated

Dangerous Goods Class: None allocated

Sub Risk Class: None allocated

Packaging Group: None allocated

Poison Schedule: S5

Chemical Family: Water solution of herbicide and surfactant. Glyphosate is N-phosphonomethyl glycine

Uses: Non selective herbicide.

Physical Appearance & Properties

Appearance & Odour: Yellow viscous liquid. Odourless to slight amine odour.

Melting/softening point: Approximately 0°C.

Boiling point and vapour pressure: Approximately 100°C at 100kPa.

Volatile materials: Water component.

Flashpoint: Does not burn.

Specific gravity: No data.

Solubility in water: Completely soluble.

Corrosiveness: Not corrosive. pH 4.0-4.5

Ingredients

Chemical Entity	CAS No	Proportion, %	Worksafe Exposure Limits	
			STEL, mg/m3	TWA, mg/m3
Glyphosate, isopropylamine salt	38641-94-0	45	not set	not set
Non hazardous detergent	secret	3-10	not set	not set
Water	7732-18-5	to 100	not set	not set

This is a commercial product whose exact ratio of components may vary. Trace quantities of impurities are also likely.

II HEALTH HAZARD DATA

Health Effects:

No specific data is available for the product for chronic exposure symptoms. The ingredients are not listed as carcinogenic in Worksafe's document "Exposure Standards for Atmospheric Contaminants in the Occupational Environment" (May 1995).

Acute Effects:

Swallowed: Data suggests that this product should present no significant problems to typical persons if used as intended.

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Product: Sipcam Glyphosate 450 Herbicide

Phone: (03)5223 3746

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Material Safety Data Sheet

Glyphosate Herbicide

Eye: This product is mildly irritating to the eyes. It is likely to cause mild discomfort such as watering and redness of the eyes. However, this should quickly disappear once exposure is over.

Skin: This product may be mildly irritating to skin. However, it is unlikely to cause any more than mild transient discomfort. It is also unlikely to cause any lasting effects.

Inhalation: Data suggests that this product should present no significant problems to typical persons if used as intended.

For Glyphosate, isopropylamine salt:

LD50 Oral (Rat) >5000mg/kg

LD50 Dermal (Rat) >5000mg/kg

First Aid:

If poisoning occurs, contact a Doctor or Poisons Information Centre. Phone 13 1126 from anywhere in Australia.

Eyes: If product gets in eyes, wash material from them with running water. If they begin watering or reddening, take special care in washing thoroughly.

Skin: If product gets on skin, thoroughly wash contacted areas. No further measures should normally be required unless irritation is noticed. If irritation persists, seek medical attention.

Inhalation: No first aid measures normally required. However, if vapours or mists have been inhaled, and irritation has developed, remove to fresh air and observe until recovered. If irritation becomes painful or persists more than about 30 minutes, seek medical advice.

Advice to Doctor: Treat symptomatically. Note the nature of this product.

III PRECAUTIONS FOR USE

Exposure Standards:

A time weighted average (TWA) concentration for an 8 hour day, and 5 day week has not been established by Worksafe Australia for any of the major ingredients in this product. There is a blanket limit of 10mg/m³ for dusts or mists when limits have not otherwise been established. The nature of this product makes it unlikely that this level will be approached in normal use. The ADI (Acceptable Daily Intake) for Glyphosate is set at 0.3mg/kg/day. The

corresponding NOEL (No-observable-effect-level) is set at 30mg/kg/day. Values taken from Australian ADI List, May 1998.

Engineering Controls:

In industrial situations, concentration values below the TWA value should be maintained. Values may be reduced by process modification, use of local exhaust ventilation, capturing substances at the source, or other methods. If you believe air borne concentrations of mists, dusts or vapours are high, you are advised to modify the process or environment to reduce the problem.

Personal Protection:

Respiratory Protection: It is usually safe to not use a dust mask or respirator protection on account of this product. However, if the product is being used in dusty or confined conditions, use of a mask or respirator may be preferred. For help in selecting suitable equipment, consult AS/NZS 1715.

Protective Gloves: Impermeable elbow length PVC gloves should be worn when you are using this product, to prevent irritation. For help in selecting suitable equipment, consult AS 2161.

Eye Protection: When preparing product for use, wear face shield or goggles. Consult AS1336 and AS/NZS 1337 for advice on Industrial Eye Protection.

Clothing: When using controlled droplet applicator, wear protective waterproof clothing and impervious footwear. Consult AS2919 for advice on Industrial Clothing and AS/NZS2210 for advice on Occupational Protective Footwear.

After use and before eating, drinking or smoking, wash hands, arms and face thoroughly with soap and water. After each day's use, wash gloves, face shield and goggles.

IV SAFE HANDLING INFORMATION

Storage & Transport

No special storage and transport requirements. This product has no UN classification. This product is a S5 Poison. Observe all relevant regulations regarding sale, transport and storage of this class of product. Containers should be kept closed in order to minimise contamination. Keep from extreme heat and open flames, and make sure that the product does not come into contact with substances listed under "Materials to avoid" below.

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Material Safety Data Sheet

Glyphosate Herbicide

Spills & Disposals

In the event of a major spill, prevent spillage from entering drains or water courses. As a minimum, wear overalls, goggles and gloves. Stop leak if safe to do so, and contain spill. Absorb onto sand, vermiculite or other suitable absorbent material. Sweep up and shovel or collect recoverable product into labelled containers for

recycling or salvage. After spills, wash area preventing runoff from entering drains. If a significant quantity of material enters drains, advise emergency services. Full details regarding disposal of used containers, spillage and unused material may be found on the label. If there is any conflict between this MSDS and the label, instructions on the label prevail. Dispose of only in accord with all regulations.

Fire & Explosion Hazard

There is no risk of an explosion from this product under normal circumstances if it is involved in a fire.

Flashpoint: Does not burn.

Flammability limits: Not applicable. This product does not burn.

Extinguishing Media: This product does not burn. Use extinguishing media suited to the materials that are burning.

Special Fire Fighting procedures: When fighting fires involving significant quantities of this product, wear safety boots, non-flammable overalls, gloves, hat, goggles and respirator. All skin areas should be covered.

Unusual Fire & Explosion Hazards: Fire decomposition products from this product may form toxic and corrosive mixtures in confined spaces. Likely to decompose only after heating to dryness followed by further strong heating.

Stability: This product is unlikely to spontaneously decompose.

Polymerisation: This product is unlikely to spontaneously polymerise.

Decomposition Products: Carbon dioxide, and if combustion is incomplete, carbon monoxide and smoke.

Nitrogen, and under some circumstances, oxides of nitrogen. Oxides of phosphorus. Water. Likely to decompose only after heating to dryness followed by further strong heating.

Materials to avoid: No particular incompatibilities.

V OTHER INFORMATION

This MSDS is prepared in accord with the Worksafe Australia document "National Code of Practice for the Preparation of Material Safety Data Sheets", 1994.

Contact Points: AUSTRALIA

Police and Fire Brigade: Dial 000

If ineffective: Dial 1100 (Exchange)

For emergency response: Dial 1800 033 111

National Poisons Information Centre: Dial 13 1126 (from anywhere in Australia)

Please read all labels carefully before using product.

This MSDS summarises our best knowledge of the health and safety hazard information of the product and how to safely handle and use the product in the workplace. Each user should read this MSDS and consider the information in the context of how the product will be handled and used in the workplace including in conjunction with other products. If clarification or further information is needed to ensure that an appropriate risk assessment can be made, the user should contact this company. The responsibility for products sold is subject to our standard terms and conditions, a copy of which is sent to our customers and is also available on request.

This MSDS prepared by Kilford & Kilford Pty Ltd November, 1998.

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Product: Sipcam Glyphosate 450 Herbicide

Phone: (03)5223 3746

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Typical Plant Description

Annual Ryegrass

Lolium rigidum Gaudin

Family: - Poaceae.

Names:

Lolium is from the Greek word for craft, deceitful or treacherous because Darnel (*Lolium temulentum*) can be toxic and it was believed to be a changed form of wheat.

Annual Ryegrass

Other names:

Wimmera Ryegrass

Merredin Ryegrass

Summary:

A palatable annual grass with leaves that are glossy on one side and with a slender seed head.

Description:

Cotyledons:

One.

Leaves:

Parallel veins. Emerging leaf folded flat in the bud. Red dot at the inside base of the leaves.

Blade - Dark green, 30-150 mm long, 0.5-5 mm wide. Shiny on under side, ribbed on the upper side. Virtually hairless.

Ligule - Membranous, flat topped or rounded, 1.5 mm long.

Auricles - small and shrivelled.

Sheath - Green or purplish, split to the base, becoming loose. Hairless.

Stems:

Tufted, 100-1200 mm tall, erect, stiff, round and hollow with solid nodes. Often have a reddish tinge and purple on the nodes and at the base. Hairless. Sometime bent at the lower nodes. Flattened where seed spikelets alternate up the stem. Occasional roots at the lower nodes especially in wet conditions.

Tillers profusely and becomes prostrate under grazing. All stems produce seed heads.

Flower head:

At the ends of stems. Slender, rigid, straight or slightly curved spike like panicle. 30-300 mm long. 2-20 spikelets are set into hollows alternately on either side of the wavy stem. Main axis rough to touch. Spikelets tend to stay closer to the stem at maturity than in other Ryegrass species.

Flowers:

Spikelets - Parallel sided, flattened, 5-18 mm long. Sunken into the flower stem at maturity. Without stalks.

Awnless or rarely awned. 2-13 flowered often with one empty.

Florets - Lance shaped, bisexual.

Glumes - Outer one is about the same length as spikelets and held close to the stem enclosing the spikelet. First glume, against the stalk, is small except in terminal spikelet. Second glume 5-20 mm long, rounded on the back, thick, 3-9 nerved but usually 5-7 nerved, narrowly egg shaped.

Lemma - Spear shaped, rounded on the back, 3-10 mm long, 3-5 nerved. Tip translucent with tiny hairs. Without awns normally or if present usually 1-1.5 mm long.

Palea - Similar to lemma, keel with tiny teeth.

Awns - Usually awnless or less than 10 mm long.

Stamens -

Anthems -

Breaks above the glumes and between the florets.

Seeds:

Covered with a stiff outer husk. Brown to yellow or greyish. Cylindrical to oval, 5-7 mm long by 1-2 mm wide. Surface grooved, ridged, hairless. 2-3 mg per seed with an average of 2.8 mg.

Roots:

Large fibrous root system.

Key Characters:

Florets lance shaped, not swollen in fruit. Lemmas awnless and more or less round tipped. Glume more than 10 mm long and as long or longer than the spikelet. Grain linear-oblong.

Leaves glossy on one side.

Hairless.

Red dot at the inside base of the leaves.

Biology:

Life cycle:

Annual grass. 75-80% of the seed will germinate on the first or second significant autumn rain. 12-23% of seed germinates after June (McGowan, 1970). Spike initiation occurs after a cold requirement has been satisfied and the day length increases to more than 8 hours. This results in relatively uniform flowering in late-winter/spring. Less than 1% of the seed carries over into the following season.

Ecotypes from different areas can have quite different rates of development. The time taken to spike emergence correlates with the length of the growing season (Gill, 1996).

The rate of development increases as day length increases.

Reproduction:

By seed. Wind pollinated. Outcrossing. Diploid (2n=14)

Flowering times:

Spring to early summer in western NSW.

October to March in SA.

September to November in Perth.

Spring and summer in WA.

Flowering can occur over photoperiods of 8-24 hours, however there is a vernalisation requirement for flowering which tends to synchronise flowering in the field.

Seed Biology and Germination:

1000 seed weight is 2-3 g with an average of 2.8 g.

Seed has an after ripening period of about 8 weeks, but little dormancy. 7-22% of seeds have dark dormancy and won't germinate until they have been exposed to light.

Seeds generally prefer to germinate in dark conditions.

Seed that is still attached to the seed head is less likely to germinate than those that have been dislodged and in contact with the soil. In cereal stubbles up to 20% of the seed may still be attached to the stem. In swathed crops it is much less.

On non wetting soils, conditions suitable for germination may not occur and this results in carry over of seed from one year to the next.

Optimum germination occurs from seeds buried 20 mm deep under field conditions. No seed germinates if buried greater than 100 mm deep, but they will germinate if returned to the surface layers.

The optimum temperature for germination in the light is 27°C and 11°C for germination in the dark. The low temperature optima of buried seeds limits germination after summer rainfall events.

In the field, temperature and light are relatively unimportant in determining germination levels.

Tillage affects the germination pattern. Generally cultivation increases the speed and quantity of emergence but the opposite is occasionally reported. There may be greater Annual Ryegrass seed carry over into the following season in undisturbed (zero tillage) areas.

A single wetting and drying of the seed increases the speed of subsequent germination of Annual Ryegrass seeds. After a dry summer, more of the seed is likely to germinate after planting of the crop.

Vegetative Propagules:

None.

Hybrids:

Wind pollinated and readily forms hybrids with other ryegrass species.

Many ecotypes. Subspecies rigidum has herbaceous glumes shorter than the spikelet. Subspecies lepturoides has indurate glumes longer than the spikelets.

Cultivar Merredin flowers 10-14 days earlier than Cultivar Wimmera.

Allelopathy:

Annual Ryegrass that is infected by Rust fungus produces substances that inhibit the growth of White clover and other plants. (Scott Matner).

Population Dynamics and Dispersal:

Seed productions of 31,000-45,000 seeds/m² were recorded in an irrigated wheat crop (Rerkasem et al 1980).

and 20,000 seed/m² in a pasture (Gramshaw, 1972) Plants surviving herbicide treatments usually set seed and

Davidson (1990) recorded 2500-9000 seeds/m² being produced from survivors of herbicide treatments.

A good stand will produce about a 1000 kg/ha of seed.

Most spread was from intentional planting and the distribution of hay. Spread by seed.

40-80% of seed produces seedlings at the break of the season and the rest normally germinate in several waves over winter and early spring.

Annual Ryegrass plants that germinate 3 days before wheat is 5-8 times more competitive than those that germinate at the same time as the crop and over 10-20 times more competitive than those that germinate 3 days after the wheat.

Cultivation

Annual Ryegrass seed banks tend to decline fastest in uncultivated areas or mouldboard ploughed areas. Tyne or disc cultivated areas tend to maintain Annual Ryegrass infestations.

On heavy soils the maximum emergence occurs on undisturbed areas whereas in light soils a shallow cultivation increases emergence substantially.

Burying seed to 50 mm or more virtually eliminates emergence, providing later workings don't bring it to the surface. A single mouldboard ploughing reduces the seed bank by 98%.

Harrowing at crop emergence can be a useful control technique in some seasons.

Burning

Burning stubbles reduces the seed bank by 66-97%. It is best carried out on ungrazed stubbles soon after harvest before the seed has shed.

Seed Catching at Harvest.

This reduced Annual Ryegrass seed banks by 50-60% in SA experiments. It is more effective if combined with swathing. (Mathews, 1996).

Origin and History:

Mediterranean.

It was deliberately planted as a pasture plant or under sown in crops in most southern agricultural areas from the early 1900's and is still being planted now.

Distribution:

ACT, NSW, QLD, SA, VIC, WA.

Habitats:

Climate:

Temperate.

It prefers hot dry summers and mild wet winters.

It is a common pasture plant in regions with rainfall greater than 300 mm.

Soil:

Prefers heavy soils. Common on sandy, loamy red and heavy grey clays.

Significance:

Beneficial:

Important sown pasture grass for both irrigation and dry land areas.
It early season production makes it a valuable component of pastures in winter rainfall areas.
Palatable fodder and high quality hay.
Does not host Root Lesion Nematodes (*Pratylenchus neglectus* or *thornei*).

Detrimental:

A weed of crops causing yield reductions. It can start competing with cereals for nitrogen by the 2 leaf stage of the crop. Late sown crops are affected more by competition than early sown crops, but in practise these crops generally have much lower levels of infestation.

Several waves of germination (often stimulated by cultivation) make it difficult to control.

In Victoria, it is estimated to cause losses in crops of \$37.4M or 8% of the value of the grain produced (Code, 1990). In WA it is estimated to cause losses in crops of \$117M. In 1989, \$33M was spent on Annual Ryegrass herbicides.

Weed of rotation crops, perennial crops, fallows, gardens, lawns and disturbed areas.

It can carry root disease (Take-all) of cereals but is probably not a major host.

It results in dockage of grain due to contamination by the seed and contamination by the ergot fungus that grows on the seed.

Can cause hay fever and allergies in humans during spring when it releases massive amounts of pollen.

Toxicity:

Annual Ryegrass Toxicity (ARGT) occurs when seed is infected by a bacterium and nematode combination that causes poisoning. The bacteria (*Clavibacter* spp) infects the seed of annual ryegrass and produces corynetoxins. It affects sheep and cattle and occurs from October to April usually. Mortality rates are often very high. In 1989, 900 farms were affected in WA. 187,000 sheep and 500 cattle had died from ARGT over the previous 20 years. In SA, 8000 deaths were recorded in the period from 1955 to 1982.

Annual Ryegrass is also infected by the Ergot fungus (*Claviceps purpurea*) which is toxic. It is mainly confined to the higher rainfall and coastal areas. The main economic loss is from downgrading of wheat and barley grain due to ergot contamination.

Pollen in spring causes asthma and hay fever in people.

Symptoms:

Staggering or swaying gait, collapse, convulsions followed by death within a few days.

Treatment:

Remove stock from infected areas.

Legislation:

None.

Management and Control:

Seed set control. At the flowering stage of Annual Ryegrass, glyphosate CT at 400-600 mL/ha provided 45-90% reduction in seed viability whilst paraquat at 1000 mL/ha was more variable with 20-90% control. At the milk dough stage glyphosate provided 14-76% control and paraquat 64-97% control of seed viability (Mayfield, 1998).

Increasing the seeding rate of the crop reduces the effect of Annual Ryegrass on crop yield and reduces the amount of Annual Ryegrass seed set. Increased seeding rates in combination with herbicides can result in very low levels of weed seed production.

Thresholds:

Densities of 30 or more plants/square metre are usually worth spraying in cereals and lupins. This figure for is based on the Annual Ryegrass and crop both being in the 2-3 leaf stage at spraying. If the crop has more leaves than the weed then this figure should be increased to 100 and if the crop has less leaves than the weed then this

figure should be reduced to 10 or less. Annual Ryegrass, even at high densities, emerging 3-4 weeks after cereals or lupins rarely affects yields. In cereals, the competition is mainly for nitrogen so early spraying is essential to reduce yield losses. In Lupins, the competition is for water late in the season so early spraying is not so important.

The cultivar or variety of cereal variety has little consistent effect the degree of yield loss caused by Annual Ryegrass. Barley is generally but not always affected less by Annual Ryegrass competition. The optimum rate of diclofop for ryegrass control can be calculated using the model developed by Pannell (1990) and presented under the economics section of HerbiGuide. This takes into account the weed density, yield potential and prices of grain, application, and herbicide.

Eradication strategies:

Prevent seed set for 2-3 years.

On light soils tickle cultivate. This is less effective on heavy soils.

Strategies that target the control of seed set can reduce populations fairly quickly. Increase cereal densities to more than 75 plants/m² (150-200 wheat plants/m² is suggested).

Cutting crops for silage before Annual Ryegrass sets seed can virtually eliminates it. Green manuring should be equally effective.

Aim to;

1)increase germination and emergence with shallow early cultivations. Apply some nitrogen before planting to stimulate germination and make them more susceptible to herbicides.

2)decrease survivorship with herbicides, increased crop density and use good crop agronomy. Delay seeding to allow greater emergence and subsequent control by cultivation or knockdown herbicides before planting.

3)reduce fecundity. Use herbicides and good crop agronomy. Don't use wide row spacings. Plant crop seed as shallow as possible. Band fertilisers. Consider rotations that include silage (or early hay), pasture, sorghum, winter fallows and green manures

4)reduce seed rain by seed catching and harvesting early.

5)reduce seed carryover by burning stubbles as soon as possible after harvest.

Herbicide resistance:

Strains resistant to grass selective herbicides (fops and dims), sulfonylurea herbicides, triazine herbicides and glyphosate have developed.

Related plants:

Darnel (*Lolium temulentum*)

Italian Ryegrass (*Lolium multiflorum*)

Perennial Ryegrass (*Lolium perenne*)

Stiff Ryegrass (*Lolium loliaceum*)

Plants of similar appearance:

Barley grass, Brome grass, Fountain grass, Guildford grass, Quaking grass, Sand fescue, Silver grass, Volunteer cereals, Wild oats, Toad rush, Winter grass.

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