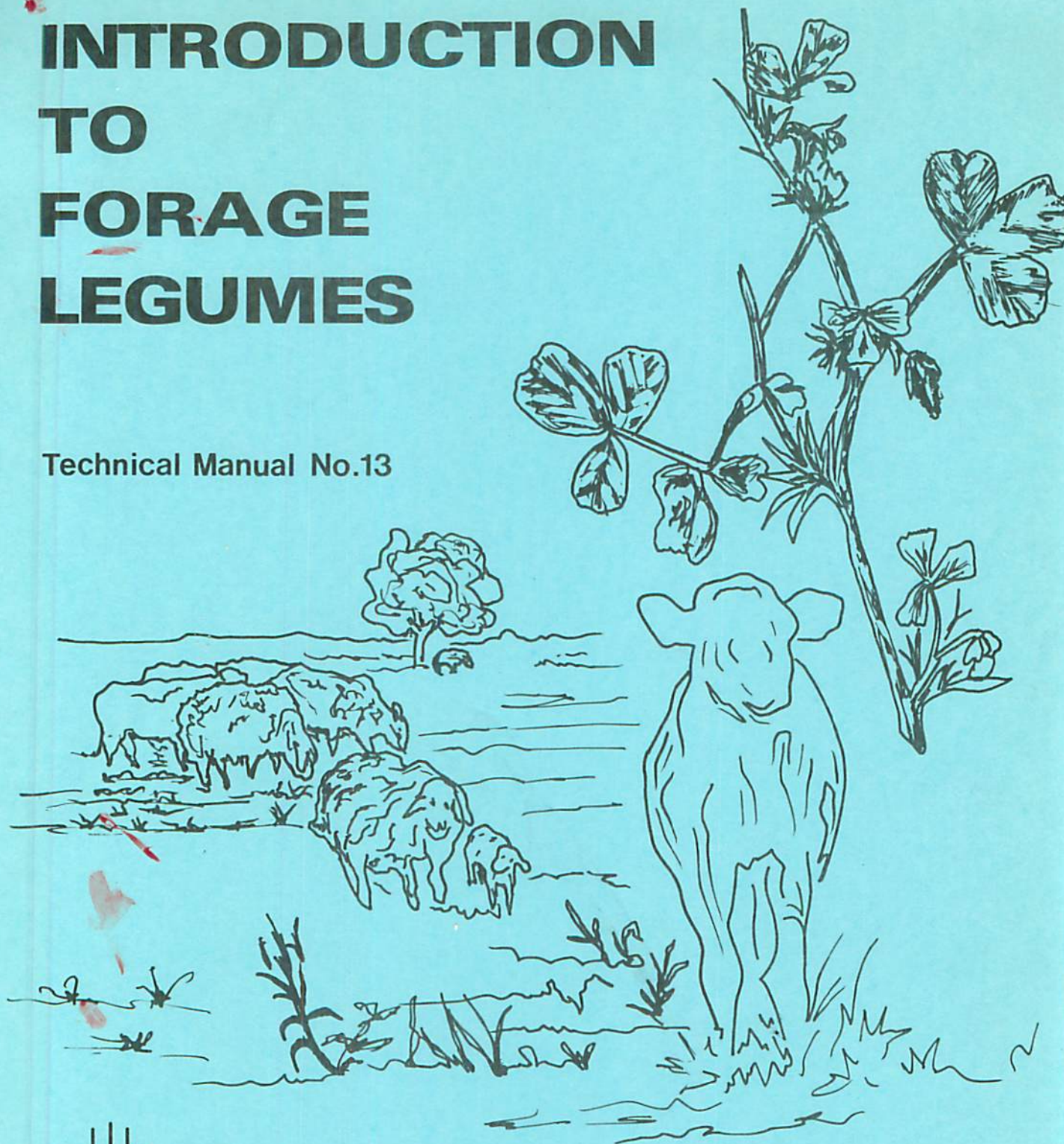


# INTRODUCTION TO FORAGE LEGUMES

Technical Manual No.13



INTERNATIONAL CENTER FOR AGRICULTURAL RESEARCH IN THE DRY AREAS (ICARDA)

Box 5466, Aleppo, SYRIA

**Introduction  
To  
Forage Legumes**

**The International Center for Agricultural Research in the Dry Areas**

**ICARDA - 1986**

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## BOTANY OF LEGUMES

Nearly all important forage plants belong to the grass (Gramineae) and legume (Leguminosae) families. Grasses and legumes are not only important as producers of forage for animals, but also play an even more important role in soil and water conservation in natural grasslands as well as cultivated lands.

### THE LEGUME FAMILY

Legumes are very important in agriculture for two reasons:

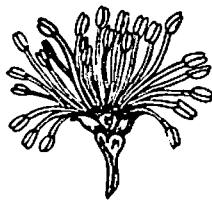
- 1) They are a major source of protein for man and his livestock.
- 2) They add nitrogen to the soil and increase its fertility.

Nitrogen is fixed by the nodule-bacteria on the legume roots. Legume forage is rich in protein, carotenoids, calcium, phosphorus and vitamins A and D.

### LEGUME SUB - FAMILIES

The leguminosae is divided into three sub-families:-

- 1) Mimosoideae: Plants with regular very small flowers grouped in spikes or heads. This sub family includes some important fodder shrubs and trees as Acacia , Lagonychium and Leucaena.

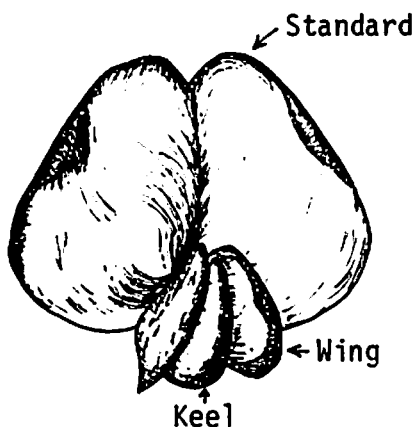


Memosa flower



Cesalpinoideae flower

- 2) Cesalpinoideae: Flowers irregular but not of the butterfly type. Cassia and Delonix are among the important fodder shrubs and trees of this sub-family (Tropical plants).
- 3) Papilionideae: Flowers of butterfly type. Most forage legumes belong to this sub-family.

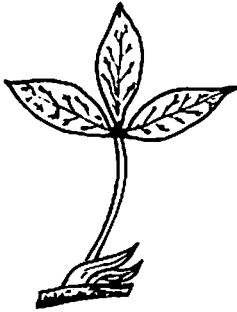


Papilionaceous flower

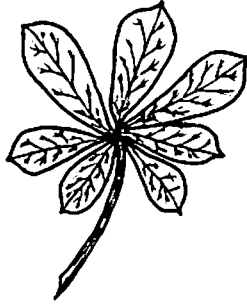
### CHARACTERISTICS OF LEGUMES

Legume plants are characterized by the following features:

1. Roots: taproots, either extreme or branching. Nodule for N-fixation are found usually on the roots of inoculated plants.
2. Leaves: The leaves are compound, that is, composed of two or more leaflets (pinnate, digitate, etc., and sometimes have tendrils). Each leaf has a pair of small stipules which may sometimes be as large as or larger than the leaflets.
3. Stems: The stems are herbaceous, sometimes woody, upright, creeping or climbing (viny) by means of tendrils.



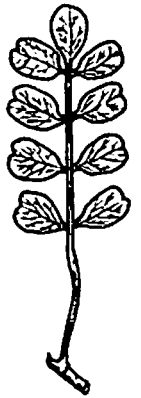
Trifoliate leaf



Digitate leaf

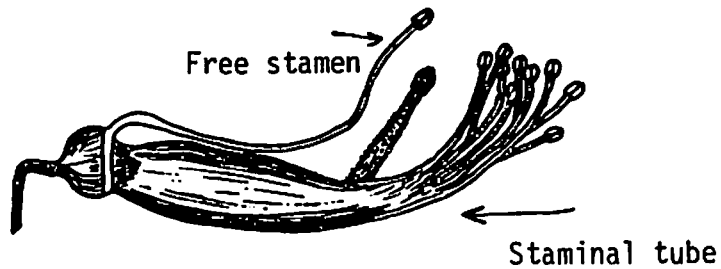


Paripinnate leaf

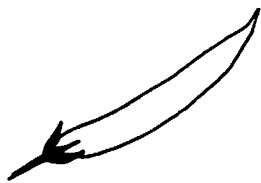


Imparipinnate leaf

4. Flowers: in sub-family Papilionoideae are composed of five petals known as a standard, two wings, and a keel. It is said to be "Papilionaceous" because of its butterfly shape. Two petals are fused to form the keel. There are ten stamens, either all united or nine united (staminal tube) and one free.

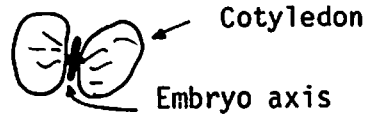


5. Fruits: The fruit is a legume, or pod, containing one to many seeds.





6. Seeds: Consist of a seed coat enclosing two fleshy cotyledons and an embryo axis.



### LIFE CYCLE

Legumes may be classified as:

- 1) Summer annuals, growing during summer season.
- 2) Winter annuals.
- 3) Biennials (two years).
- 4) Perennials, persisting for more than 2 years.

Most legumes reproduce by seed only. A few such as white clover are propagated by both seed and stolons. Certain crown-forming plants like alfalfa can be propagated vegetatively by crown divisions.

### GERMINATION

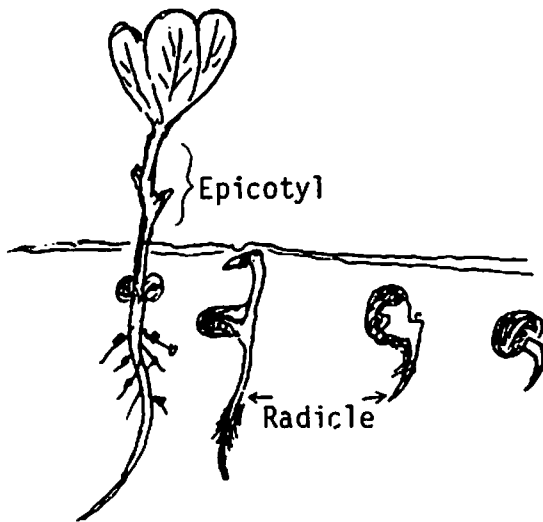
In legumes, there are two types of seed germination:

Epigeal germination: where the cotyledons are raised above the soil surface as a result of the elongation of hypocotyl. Examples are clovers and medics. The converse is true with hypogeal germination where the cotyledons remain under soil surface and the shoot is raised above soil by elongation of the epicotyl.

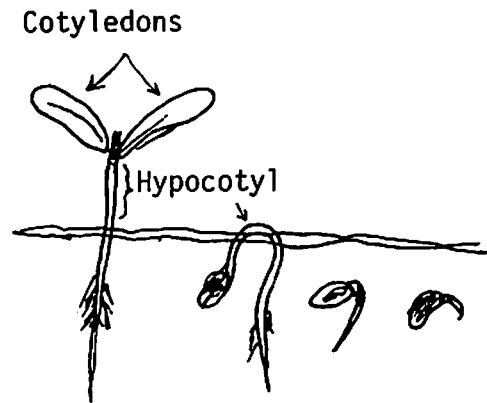
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Foot note: Epicotyl: Part of the embryo axis below the cotyledons.  
Hypocotyl: Part of the embryo axis above the cotyledons.

Hypogeal Germination

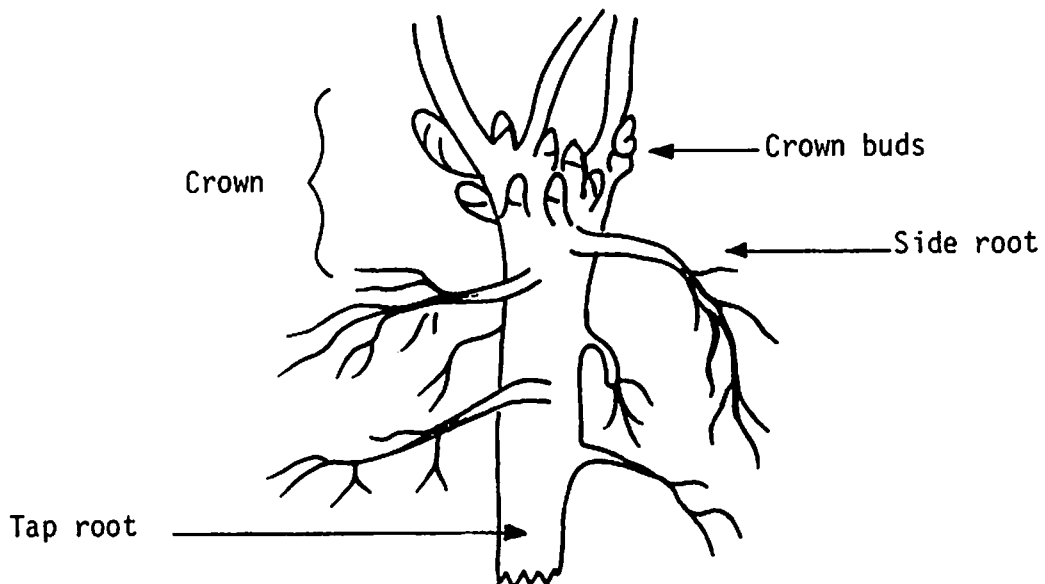


Epigeal Germination

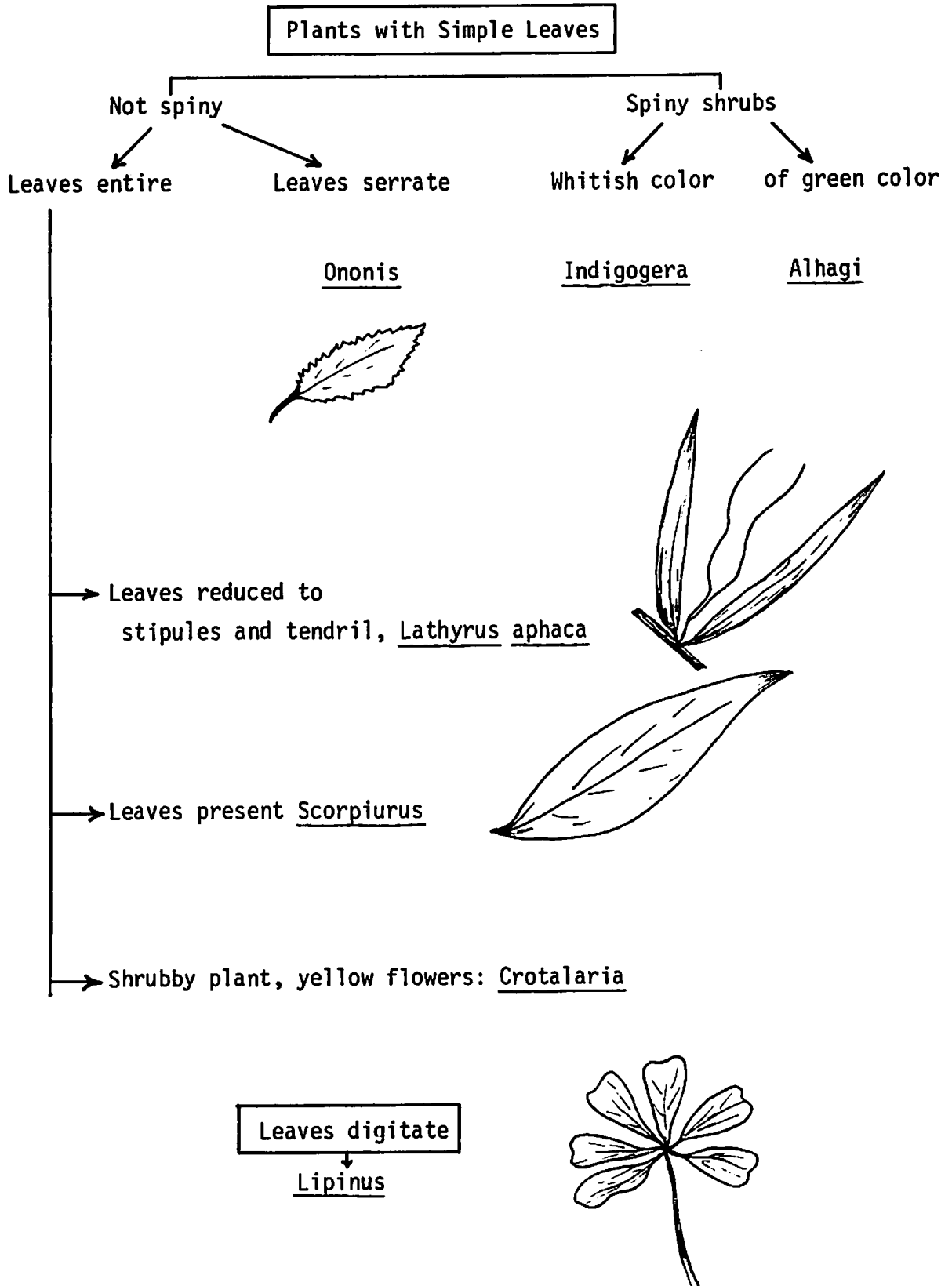


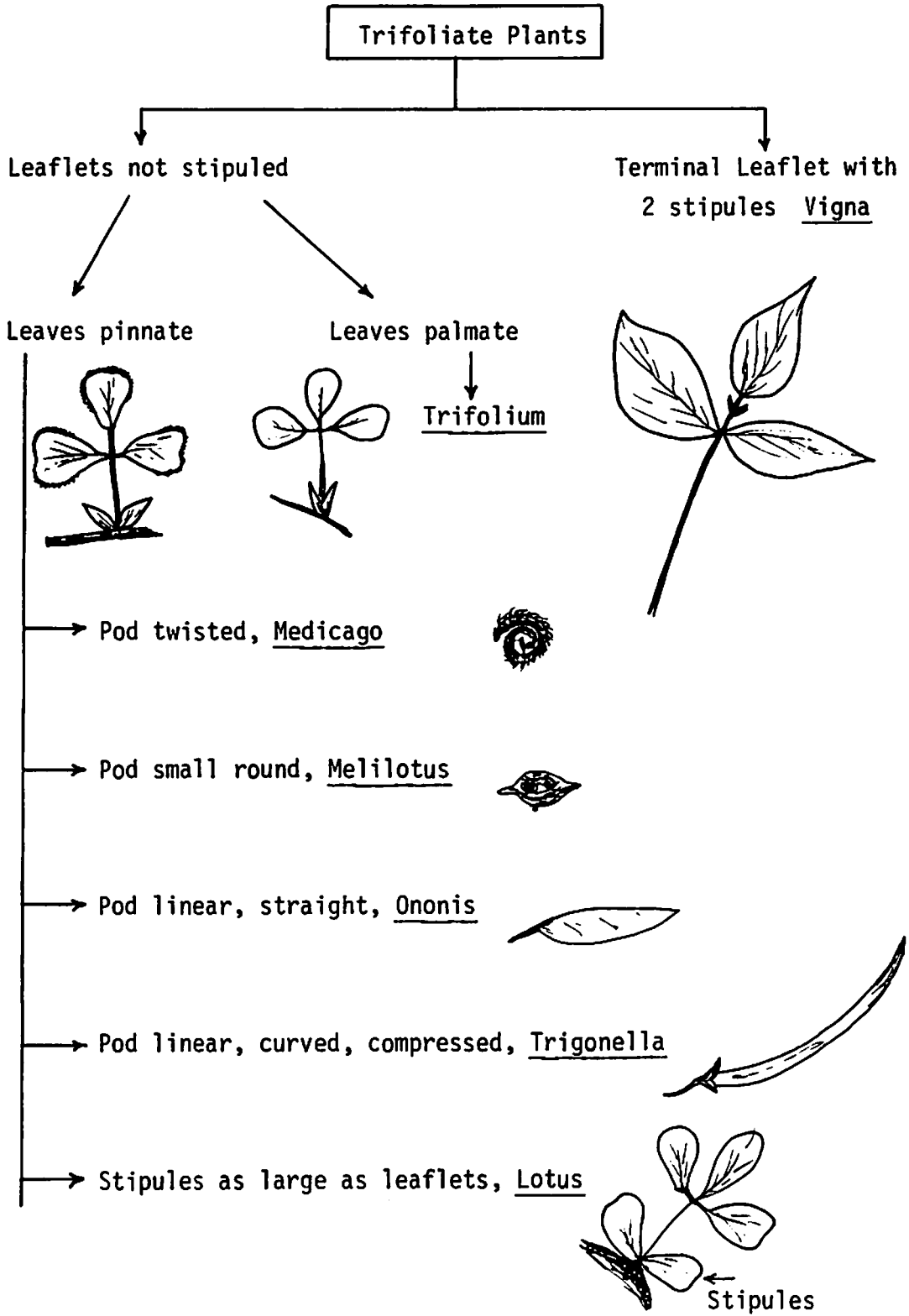
CROWNS AND CROWN BUDS

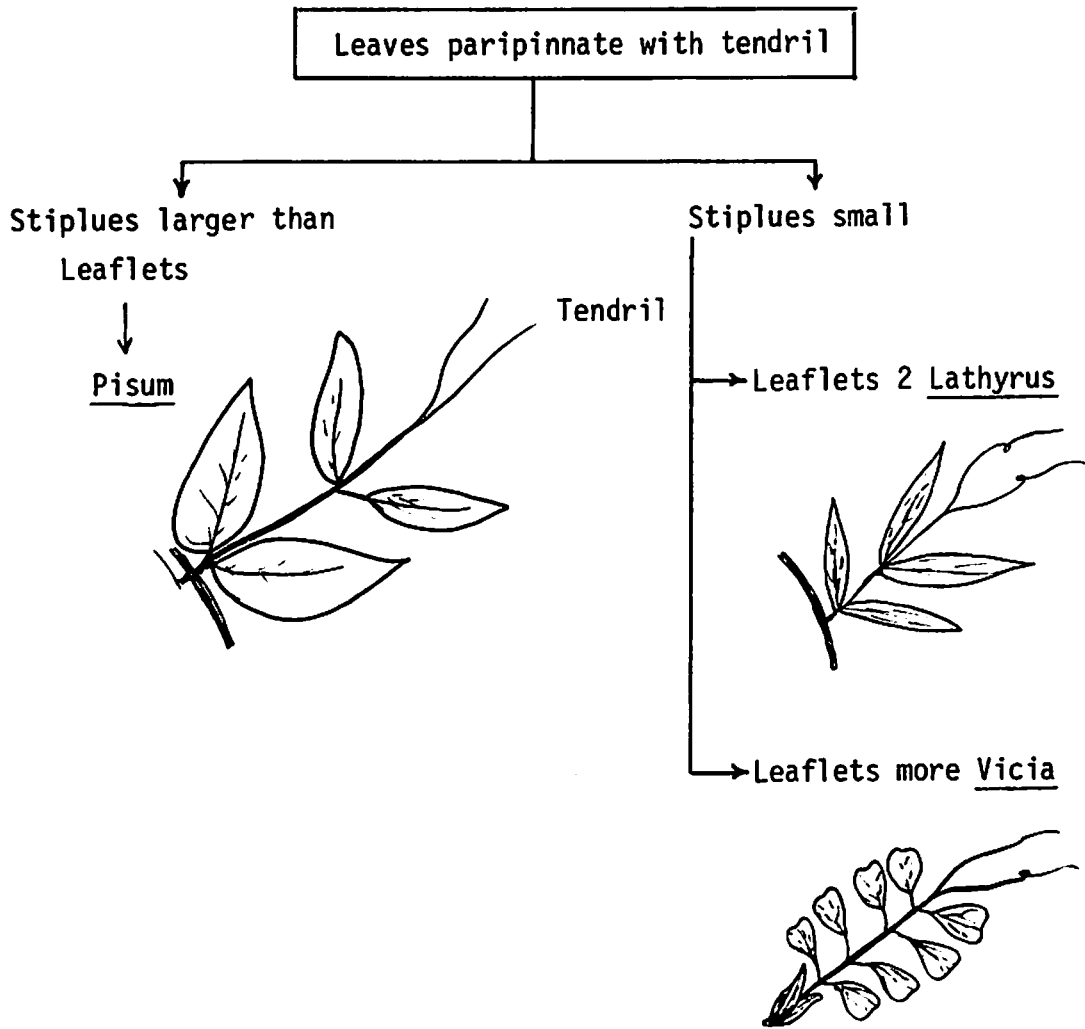
Legumes which tiller produce tillers from buds found on the crown region near the soil surface. Crown buds form periodically, depending on the species and frequency of defoliation. Alfalfa, clover, birdsfoot, trefoil, sweet clover, and others reproduce by means of crown buds. Second growth in some legumes arises from buds on the stems and not from crown buds.



DIAGRAMATIC CLASSIFICATION OF LEGUMES









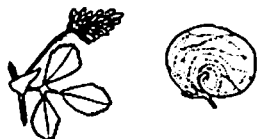
ANNUAL MEDICS  
Medicago species

DESCRIPTION : Low - growing herbaceous legumes  
Leaves trifoliate, pinnate, with dentate leaflets  
Flowers small, yellow, in short racemes  
Pods spirally twisted, sometimes spiny.

Key to the Identification of Medics

A. Burrs spineless

a- Burrs single-seeded, blackish, flowers 10-50, crowded on a long stalk



M. lupulina (Black medic)

aa- Burrs many-seeded, less than 10 flowers.

1. Coils over-lapping, burr cup-shaped



M. scutellata (snail)

2. Burr lozenge shaped, coils concave,  
distinct veins on outer margins



M. rugosa (Gama)

3. Coils flat with thin edge, seeds small with network.

M. orbicularis (Button)



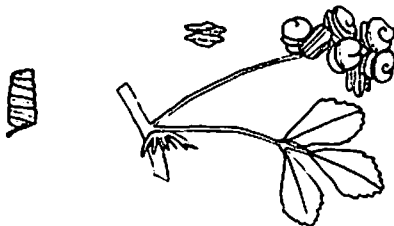
4. Burrs small, 3-5mm diameter 2-4mm high, stipules hairy on both sides

M. minima var brevispina (Goldfield)



5. Burrs 4-8mm diameter x 2-10mm high, edge of burr smooth, 4-12 flowers on long stalk

M. tornata var tornata (Disc)



6. Burrs as above but edge with indentations, coils with many curved radiating veins

M. polymorpha var brevispina (Burr)



7. Burr as above but veins few, straight. Upper leaf surface hairy

M. truncatula (Cyfield barrel)





8. Burr small 2-3 coils, burr edge with herringbone indentations

M. noeana



AA. Burrs Spiney, Seeds Yellow or Brown

1. Burr coiling clockwise (from top)

M. truncatula (Barrel cv. Cyprus, Hannaford)

2. Burr coiling anticlockwise, leaves with a mark

- a- Leaves with large basal mark, edge of coil with 4 ridges and 3 grooves

M. arabica (spotted medic)



- aa- Leaves with large central red mark, burrs with short spines  
1-4 flowers on a stalk



M. truncatula (Jemalong barrel)

3. Burr coiling anticlockwise, leaves without mark

- a- Adjacent coils not in contact at all or loosely pressed

1. Wide spaces between coils, edge of coil thick and shiny when green, pod small

M.parecox (Little-leaf burr medic)

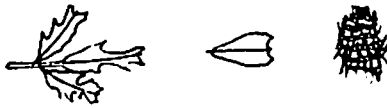
2. Coils in loose contact, upper surface of leaf hairy

M.minima var minima (Goldfields medic)



3. Coils in loose contact, leaf hairless, some leaves with deeply cut edge

M.laciniata (Cut-leaf medic)



4. Coils loose, leaves hairless, wing petals longer than Keel-Burr spines:

medium : M.polymorpha var polymorpha

long : M.polymorpha var vulgaris



var vulgaris    var polymorpha

5. Burrs cylindrical, coils loose, spines perpendicular to coils-leaves somewhat deeply cut

M.rotata



aa- Coils firmly pressed together

1. Burrs with long, thin curved spines, without indentations between spine bases



M.littoralis var littoralis (Stand m.)

2. Burr spines short, mature burr hairless, 3-5 flowers on a stalk longer than the adjacent leaf stalk

M.littoralis (Harbingar medic)



3. Burr spines short or longer, mature burr hairy, 1-4 flowers on a stalk shorter than leaf stalk



M.truncatula

cv. Ghor



cv. Borung

+ Spines short thick cv. Borung

++ Spines long, leaves with a yellow mark cv. Ghor

4. Burr hairy, short spines, leaves small, hairy

M.rigidula (Tifton medic)



AAA. Burrs spiny, Seeds Black or Dark Brown

1. Burr globular or round 10 mm or more wide, covered with long entangled spines. Leaves with a purple-yellow mark

M.intertexta (Calvary medic)



2. Burrs short cylindrical, stipules divided into equal parts

M.muricoleptis

3. Burr short, stipules divided into unequal parts

M.granadensis

Barrel Medic, Medicago truncatula

Hairy stems and leaves,  
Leaflets oval with truncated  
tops. 1-2. (4) flowers/stalk.  
Lobes of calyx very long, up  
to tip of pitules. Pods barrel  
shaped, 3-7 coils.

Mostly widely used in  
Australia.

Commercial cultivars:

Jemalong; Leaves with a  
central purple mark.

Cyfield; pods spineless,  
edge with characteristic  
indentations.

Hannaford; pod coil clockwise.

Cyprus; similar in  
appearance to Hannaford, but  
earlier in flowering.

Borong; flowers in three  
clusters. Pods small.

Ghor; pods large, spiny,  
coiling anticlockwise. Very early  
variety.



Strand medic, M.littoralis

Hairy plants, 1-3 flowers on a stalk shorter than corresponding leaf stalk. Pods hairless, shiny, 4-5 coils. clockwise, with long slender spines.



Cultivars : Harbinger

Has 4-5 flowers/stalk that is longer than leaf stalk. 3-4 coil/pod, anticlockwise, short spines.

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Disc medic, M.tornata

Sparcsly hairy plants. 4-10 flowers per stalk longer than leaf stalk. Pods coil anticlockwise, cylindrical or disc shaped.

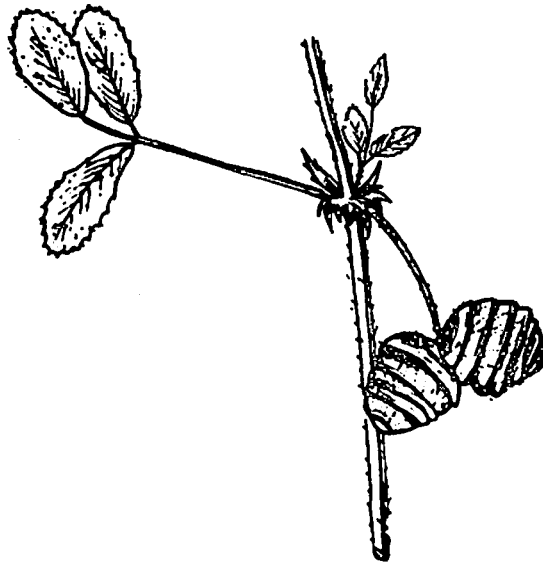


Cultivars : Tornafield

7-10 flowers and pods/stalk. pods with 2-3 loose coils, spineless.

Snail medic, M. scutellata

Semi-erect plants, densely hairy except upper leaf surfaces. 1-2 flowers on a stalk shorter than leaf stalk. Pods consist of 5-6 cup-shaped, spineless coils.



---

Burr medic, M. polymorpha

Hairless plants, leaflets wide and flat at top, sometimes with purple flecks. 2-8 flowers/stalk. Wing petals longer than keel. Pods with 2-6 coils, spiny or spineless



var brevispina spineless or  
short spines

var polymorpha medium-long  
spines

var vulgaris long spines

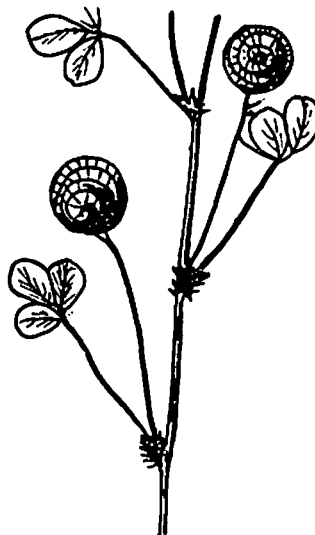


var vulgaris

var brevispina

Button medic, M. orbicularis

Hairless plants. Leaflets with round, dentate tips. 1-5 flowers/stalk. Wing petals shorter than keel. Pods discoid, spineless with 3-7 coils. Seed round with reticulation.



---

Calvary medic, M. intertexta

Plants with few hairs. Leaflets with round, finely toothed upper margin, and a purple mark.

1-7 flowers per stalk equal or longer than leaf stalk. Pods spherical, larger, covered with intermeshing spines.





PERSIAN CLOVER

Trifolium resupinatum



DESCRIPTION: Annual winter legume  
Stems erect or decumbent  
Leaves trifoliate, palmate  
Flowers small, purple, turned upside down with keel upwards  
and standard downwards.  
Fruit-head much inflated  
Variable species. Sometimes tall with large leaves and  
thick stems. var majus . Sometimes small slender var. minus.

ADAPTATION: Best adapted to low-lying, heavy, wet soil in areas of mild  
winters with rainfall above 450 mm.  
Moderately resistant to salinity and flooding.  
Seeds hard, the crop volunteers readily.

MANAGEMENT: For dryland seeding, plough after first rains.  
Prepare seedbed well by disc harrow and cultipacker.

Early seeding is preferable. Seeding rate 10-15 kg/ha in 20-40cm rows. Shallow seeding. Apply superphosphate at 60-100 kg  $P_2O_5$ /ha at seeding. Graze when 20-30cm high. Allow enough growth at flowering time for reseeding. Watch for bloat.

For hay, cut at flowering time.

VARIETIES : Maral (diploid variety).  
Giant Persia Faral (retraploid variety)

UTILIZATION: Can be grown in rotation with other crops in dryland farming - Useful for pasture and hay, alone or in combination with ryegrass.

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BERSEEM CLOVER

Trifolium alexandrinum



DESCRIPTION : Winter annual legume

Stems tall, erect, hollow, glabrous

Leaves narrow, elliptical leaflets, slightly hairy

Flowers white to cream-coloured in dense cylindrical to conical heads.

Corolla not persistent.

CULTIVARS & TYPES : A. Single-cut type or Fahli, no crown buds, branches freely along the stems, becomes bushy in thin stands.

One cut per season.

B. Multi-cut type, a well-developed crown with buds, from 2-several cuts/season.

Miskawi, Khadrawi; local Egyptian cultivars, from 4-6 cuts/season.

Saidi, local Egyptian cultivar, 2-3 cuts, stems branch at the top parts only.

Baali, old Egyptian type, 1-2 cuts/season, Hustler, Nile; U.S. varieties, several cuts/season.

CULTURE &  
MANAGEMENT

: See detailed subject on separate sheet.

---

LARGE HOP CLOVER

Trifolium campestre



DESCRIPTION : Annual winter legume  
Stems glabrous, slender  
Leaves trifoliate, pinnate, short-petioled  
Stipules narrow, lanceolate  
Flowers yellow in lax-flowered heads, short peduncles

ADAPTATION : Adapted to areas of moderately cold winter and 300 mm rainfall.  
Valuable pasture plant for eroded soils.  
Grows very little in winter. Generally useful for grazing.

CULTURE & MANAGEMENT : See Persian clover.  
Seed rate 3-5 kg/ha.

UTILIZATION : Of potential for seeding fallow in cereal areas  
Also useful for reseeding substeppic ranges.

WOOLY CLOVER

Trifolium tomentosum



DESCRIPTION : Annual winter legume  
Small prostrate plant  
Leaves trifoliate, palmate  
Heads short-peduncled, densely woolly, inflated.

ADAPTATION : Requires mild winters and 250-400 mm rainfall.  
Suitable for calcareous alkaline soils.

CULTURE &

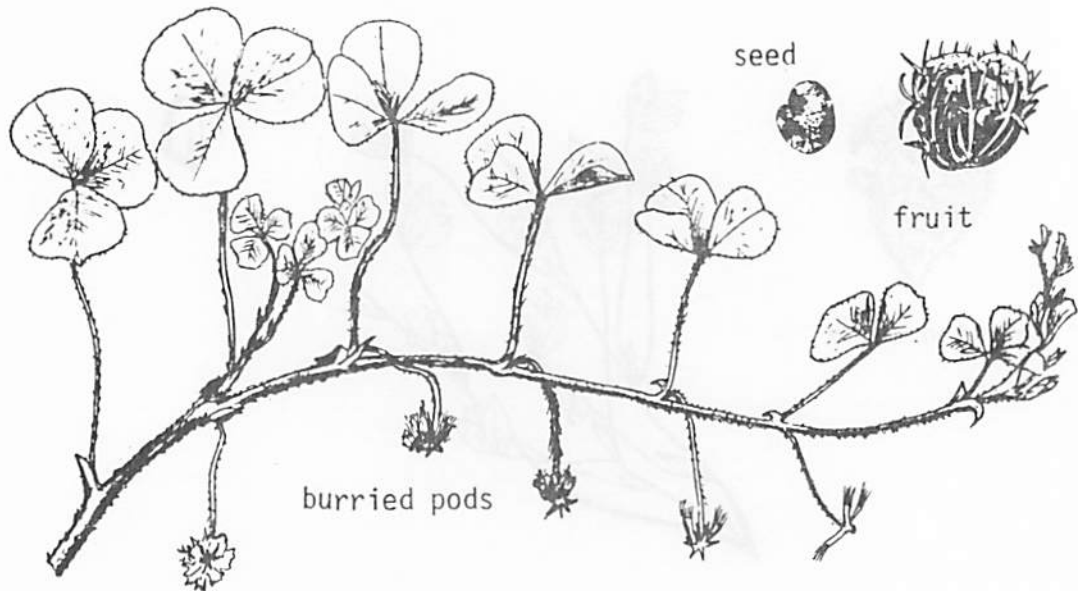
MANAGEMENT : See Persian clover.

UTALIZATION : Could be useful for replacing fallow in rainfed cereal rotations. Also of potential for reseeding under low rainfall.

UTILIZATION : Useful for replacing fallow in rainfed areas, because it is a self-seeding annual.  
Also useful for reseeding in substeppe areas.

SUBTERRANEAN CLOVER

Trifolium subterraneum



DESCRIPTION : Prostrate annual winter legume, 15-30cm high.  
Leaves trifoliate, palmate  
Flowers white, in heads  
Pods are fibrous  
Pods are burried after fertilization.

VARIETIES : Several Australian cultivars : 'Dwalganup' for 300-475 mm rainfall; 'Clare' and others for 475-700 mm.  
Australian cultivars 'Clare' and to a lesser extent 'Mt. Barker' and 'Wooenellup' have given good results on alkaline calcareous soils in NE and N.Africa in dryland seedings. On acid soils "Geraldton' and other varieties are successful.

ADAPTATION : Generally adapted to high rainfall areas above 400mm on neutral or acid soils. Some varieties like 'Clare' are adapted to alkaline soils.

CULTURE &

MANAGEMENT : See Persian clover.

Seed rate 5 - 10 kg/ha. Lower rates in mixture.

UTILIZATION : Mostly utilized in S.Australia for pasture mixtures grown in rotation with rainfed cereals on acid soils.

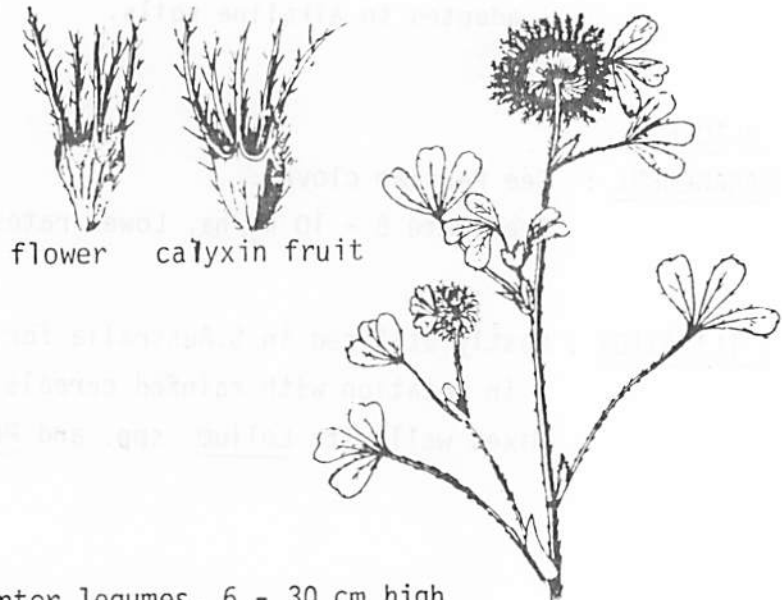
Mixes well with Lolium spp. and Phalaris tuberosa.

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CUPPED CLOVER

Trifolium cherlei



DESCRIPTION : Annual winter legumes, 6 - 30 cm high  
Flowers heads globular, white  
Seeds hard.

ADAPTATION : Adapted to areas of mild winters, rainfall 300-450mm  
Prefers light calcareous alkaline soils.

VARIETIES : Beenong and Yamina are varieties developed in Australia  
from Mediterranean material.

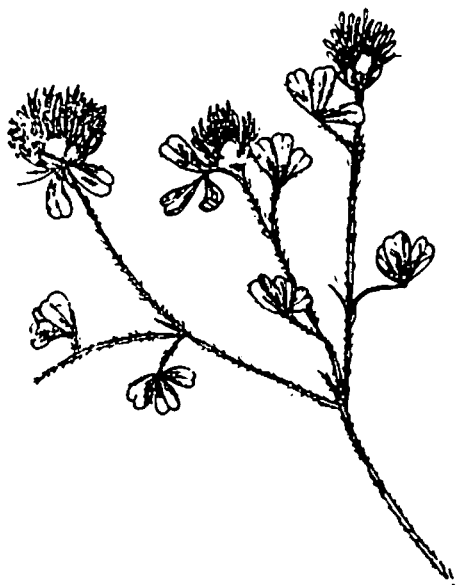
CULTURE &

MANAGEMENT : See Persian clover.

UTILIZATION : Could be useful as a replacement for fallow in rainfed areas  
grown to cereals. It is a self-seeding annual.  
Also useful for reseeding range areas.

ROSE CLOVER

Trifolium hirtum



DESCRIPTION : Winter annual legume, 8-40 cm high  
Stem upright or prostrate  
Flower heads globular, pubescent, crimson coloured  
Seed are hard.

ADAPTATION : Mild winters, rainfall 300-450 mm.  
Prefers light calcareous alkaline soils.

CULTURE & See Persian clover.

MANAGEMENT :

VARIETIES : Kondinin, Hykron, Troodas, Olympus and Sirint are varieties developed in Australia from material collected from the Mediterranean.

UTILIZATION : Could be useful for replacing fallow in rainfed cereal rotations. Successfully used for reseeding rangeland in winter rainfall areas of U.S.A.

BALL CLOVER  
Trifolium nigrescens

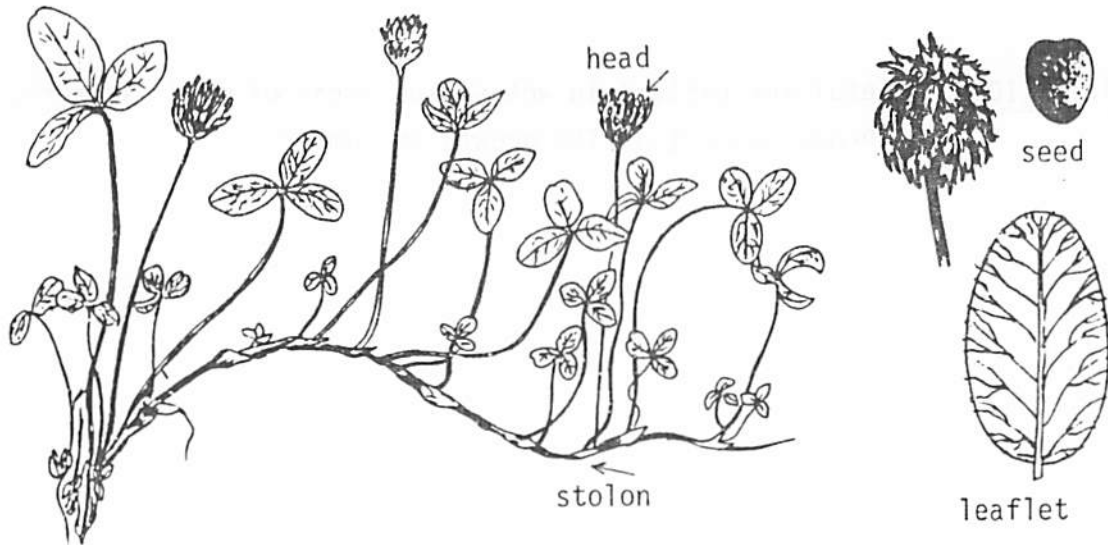


DESCRIPTION : Annual winter legume  
Stems glabrous  
Flowers white, long pedicelled, thus forming a lax umbel-  
like head. Florets reflex, or turn down when head matures.  
Trifolium stellatum also has white flowers but the plant  
is covered with white hairs.

ADAPTATION : Has a wide range of adaptation in areas of mild winters,  
but is fairly cold tolerant.  
It is a prolific seeder that persists under low soil  
fertility levels.  
Useful for pasture but grazing season is short.

CULTURE & See Parsian clover  
MANAGEMENT : Seed rate 4-7 kg/ha.

STRAWBERRY CLOVER  
Trifolium fragiferum



DESCRIPTION : Perennial legume  
Creeping stems, erect leaf peduncles  
Leaves trifoliate, palmate, leaflets entire  
Flowers white, late turning pink  
Fruit-head inflated woolly, looking like a strawberry fruit.

ADAPTATION : Adapted to high rainfall areas (above 500 mm)  
Resistant to cold.  
Prefers clay soil  
Withstands poor drainage and moderate salinity and alkalinity.

CULTURE & MANAGEMENT : See Persian clover  
Seed rate 10-15 kg/ha. Lower rates are used when grown in mixture with perennial grasses. It can also be established by vegetative cuttings.

VARIETIES : Salina and Palestine (U.S. varieties)  
Tarwi and O'Conner (Australian varieties)  
Local ecotypes are also found in many countries.

UTILIZATION : Useful for pasture in wet-saline areas of mild summers.  
Produces most of its growth in summer.

---

Vetches, Vicia spp.

Description

Winter annual legumes. Viny, herbaceous stems (except V.faba and V.narbonensis which have erect thick stems). Leaves parpinnate with tendrils (except V.ervilia). Standard petal notched. Stigma hairy towards tip. Legume flattened, many seeded.

Simplified Key To Common Species

A. Leaves without tendrils, flowers white

V.ervilia (Bitter vetch)

AA. Leaves with tendrils

B. Flowers 1-2 in leaf axils

C. Leaflets broad (1-4 x 1-2 cm)

V.narbonensis (Narbon vetch)

CC. Leaflets narrow, up to 9 mm wide

D. Leaves with 4-8 pairs of leaflets

1. Leaflets oval shaped. 1-9 mm wide

V.sativa (Common vetch)

2. Leaflets linear oblong, calyx teeth of equal size,

V.sativa subsp angustifolia

(narrow-leaf vetch)

3. Leaflets linear, calyx teeth unequal

V.monantha (Bard vetch)

DD. Leaves with 3-7 pairs, leaflets 1-3 mm wide

V.peregrina (Broad Pod vetch)

BB. Flowers many in a raceme

C. Raceme shorter than corresponding leaf, flowers white

V.annonica (Hungarian vetch)

CC. Raceme longer

1. Leaflets 5-8 pairs V.atropurpurea (Purple vetch)

2. Leaflets 3-12 (6-10) pairs

+ plant densely hairy V.villosa (Hairy vetch)

++ Plant less hairy, flowers, pale violet or white.

V.villosa subsp dasycarpa (Woollypod vetch)

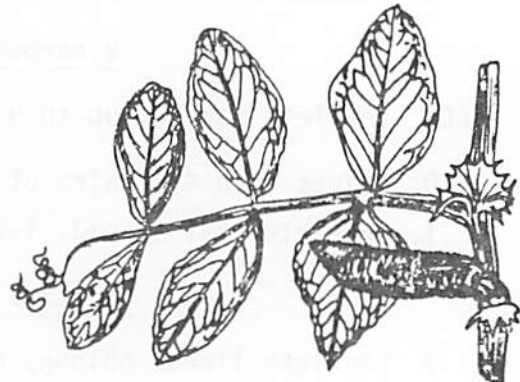
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#### NARBON VETCH

V.narbonensis

#### Description

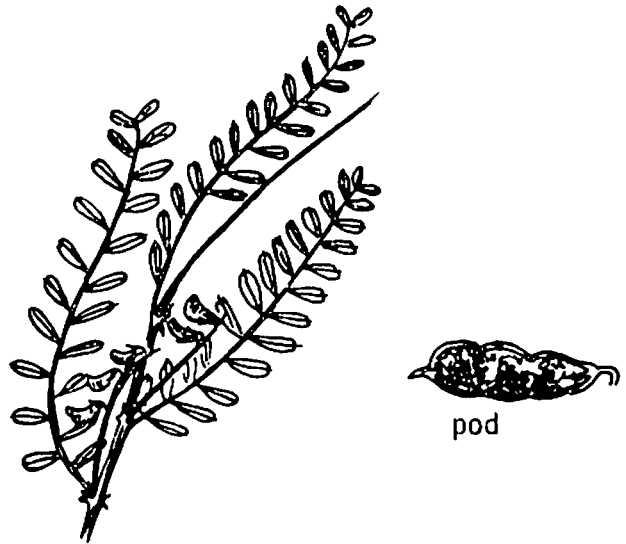
Stems thick, 30-40 cm high, erect to decumbent. Lower leaves 1-paired, large elliptical leaflets. Flowers purplish-violet with light and dark spots. Pod glabrous 1cm broad with finely toothed margins. Variable.



BITTER VETCH

Vicia ervilia

Stiff erect herb, lacking tendrils. Flowers 2-4 together, small white violet-striped. Pod narrow.



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HAIRY VETCH

Vicia villosa

Annual or biennial 30-45 cm high. Stem viney, densely hairy. Leaves with 6-10 leaflet pairs. Leaflets linear or narrow, covered with hairs. Flowers blue. Pod smooth or hairy, narrow at base and tip.

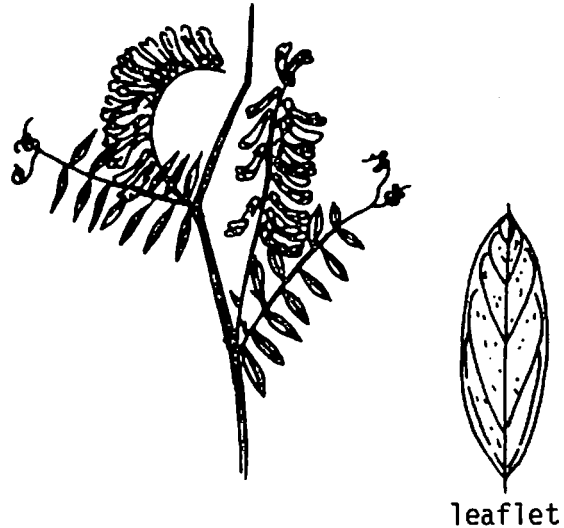




WOOLLYPOD VETCH

Vicia villosa subsp. dasycarpa

Similar to V.villosa, but plant smooth, pod also smooth or slightly hairy. Varieties: Lana, Aubarn, Oregon (U.S.)



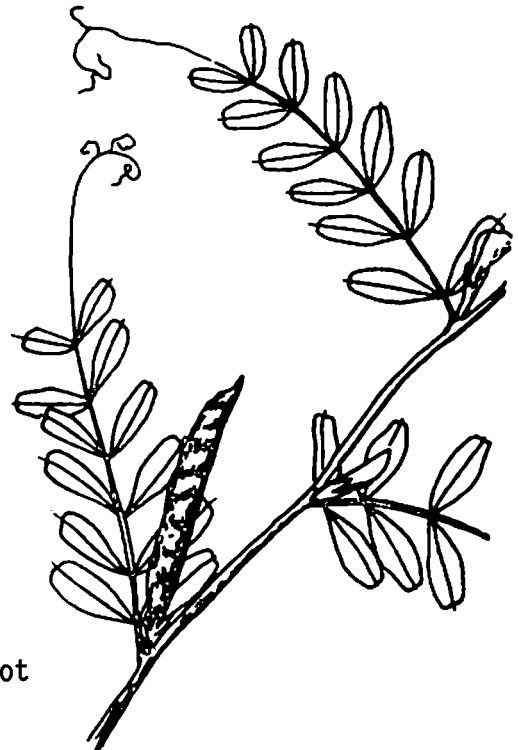
COMMON VETCH

Vicia sativa

Leaves with 4-8 pairs leaflets. Stipules dentate. Flowers violet 1-2 per leaf axil. Pod long, narrow, glabrous.

Cultivars: Willamette, U.S. variety Warrior, U.S. variety resistant to vetch bruchid and root-knot nematode, local varieties too.

Narrow-leaf vetch, V.angustifolia is a subspecies of V.sativa. It has narrow linear leaves, acute or retuse. Pods are black and not constricted between the seeds.



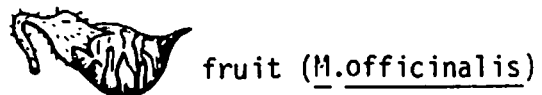
SWEETCLOVERS

Melilotus spp

Description : Biennial or winter annual legumes  
Short or tall, erect stiff stems  
Strong deep tap roots  
Leaves trifoliate, pinnate, toothed around margins  
Flowers small, yellow or white in long racemes.  
Pods small ovoid, 1-(rarely 2-3) seeded  
Coumarin-smelling herbs

Key to Species

- A. Flowers small (2.5 mm), pod olive green when ripe  
M.indicus (Annual Yellow sweetclover).
- B. Flowers larger, pod brown when ripe
1. Flowers white M.alba (white Sweetclover)
  2. Flowers yellow M.officinalis (Yellow sweetclover)



ADAPTATION : Drought and temperature resistant. Annuals more adapted to dry lands than biennials. Minimum rainfall is 300 mm for annuals and 400 mm for biennials. Most adapted to heavy alkaline soils. Moderately tolerant to salinity.

CULTURE & MANAGEMENT : Requires a firm, well prepared seedbed; by ploughing, harrowing and cultipacking. Drill seeding in early fall is preferred. Rows 30-40 cm wide. Seeding rate in high rainfall areas 10-15 kg/ha. Lower rates for lower rainfall. Responds to phosphorus application. Add 40-50 kg/ha  $P_2O_5$  at seeding.

UTILIZATION: Useful for green manure, soiling, hay and silage . Causes less bloat than alfalfa. Coumarin causes bitter taste and may decompose into toxic substances in poor hay. Best quality hay from flowering plants.

VARIETIES : In U.S. :

M.officinalis : Madrid, Goldtop, Yuken (Biennials)

M.alba : Denta (biennial, low coumarin)  
Arctic (biennial, winter hardy)  
Hubam, Floranna (annuals)

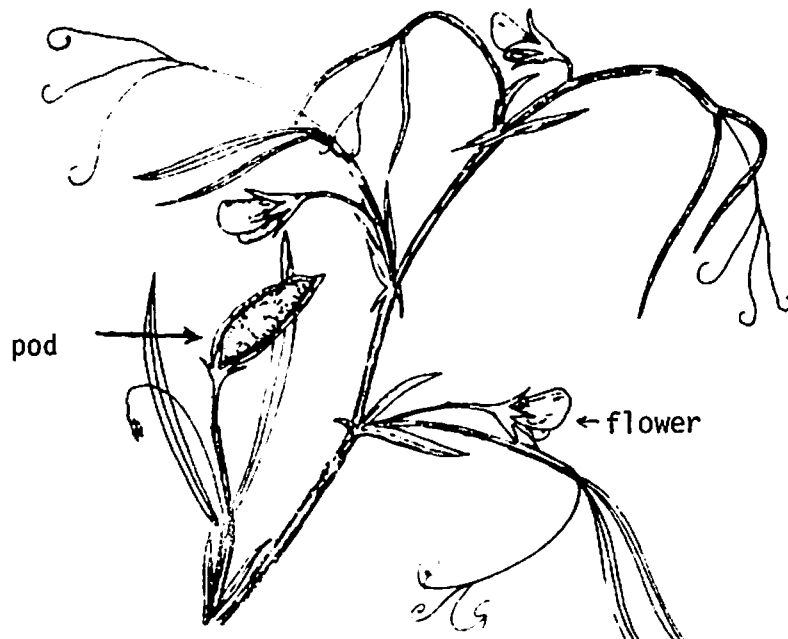
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Lathyrus spp.

DESCRIPTION : Annual winter legumes, some perennial species.  
Stems weak, generally winged or angled.  
Leaves typically 1-paired with tendril, sometimes leaves reduced to one pair of leaf-like stipules. Leaflets with parallel venation.  
Flowers red, blue or yellow.  
Style has a thin line of hairs on the inner surface.  
Pods compressed, dehiscent.

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CHICKLING VETCH  
Lathyrus sativus



DESCRIPTION : Distinguished by its rather large flowers.  
Standard violet-blue, keel and wings purplish.  
Leaves with a single pair of leaflets. Leaflets linear.

Pods short broad. Upper margin winged.  
Seeds angled, smooth yellowish, large.

ADAPTATION : Adapted to winter rainfall of 350 mm or above  
Grows best under irrigation  
Adapted to wide range of soils; Prefers clay alkaline  
soils. Fairly resistant to cold temperature.

CULTURE &

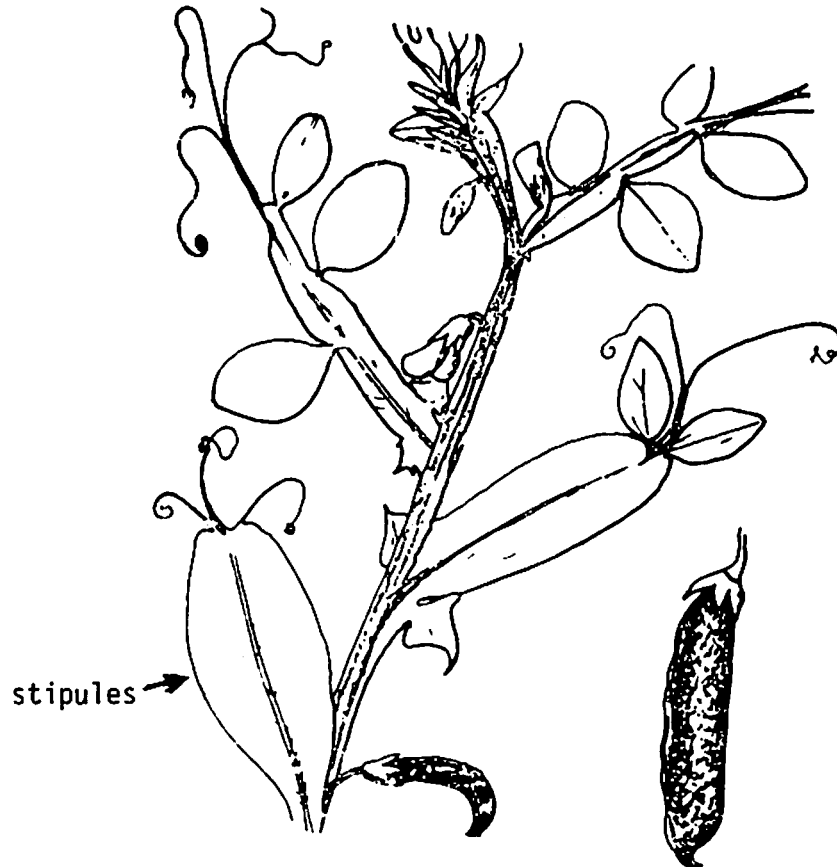
MANAGEMENT : Seedbed preparation requires ploughing (15-20cm deep)  
and harrowing.  
Plant with a grain drill or broadcast. Drilling in rows  
30-50 cm apart. Apply 60 kg P<sub>2</sub>O<sub>5</sub>/ha at seeding. Seed  
rate 120-160 kg/ha. For hay mixture with oats or  
barley use 50 kg/ha vetch and 30-50kg barley or oat.

UTILIZATION : Useful for cover crop, green manure, pasture, hay and  
silage . For pasture graze at flowering or earlier.  
For hay harvest when companion cereal is in dough stage.

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OCHRUS VETCH

Lathyrus ochrus



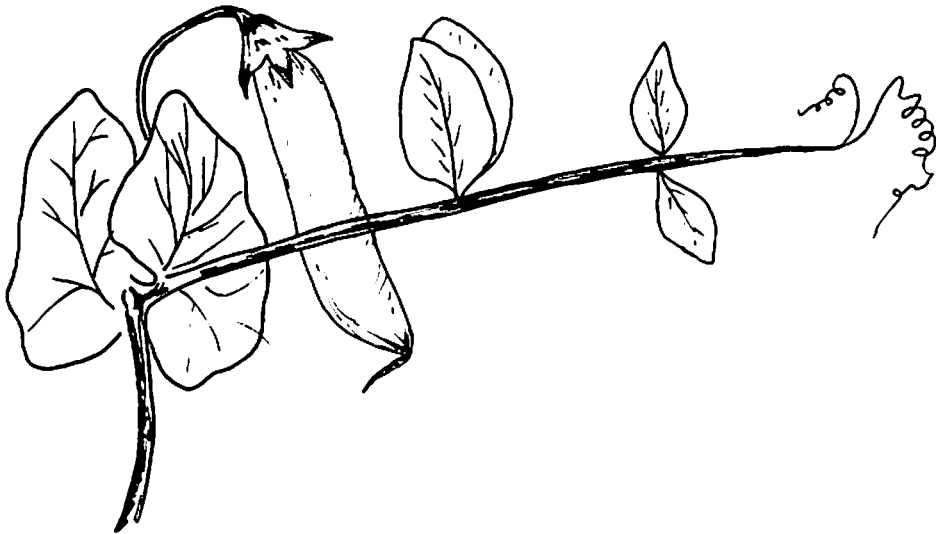
DESCRIPTION : Climbing, winter annual legume.  
Stems winged, 20-70 cm high.  
Leaf petioles with enlarged flat wings, no free stipules.  
Flowers yellow creamy or white.  
Pods flat 30 x 10 cm with wing on back. Seed grey to purplish.

ADAPTATION : Adapted to winter rainfall of 400 mm.  
Produces well under a wide range of soils.  
Collections vary in respect of cold tolerance, but generally not adapted to very cold areas.

- CULTURE & As chickling vetch  
MANAGEMENT : Seed rate 100-140 kg/ha when grown alone.  
UTILIZATION : As chickling vetch.

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FIELD PEA  
Pisum sativum



- DESCRIPTION : Winter annual legume, up to 200 cm high.  
Plant smooth  
Leaves with 1-4 pairs of leaflets and tendril  
Stipules larger than leaflets  
Flowers single, white to pink or purple  
Pods smooth 3-10 cm long.

ADAPTATION : Adapted to winter rainfall of 400 mm and above, fairly cold tolerant. Thrives on fertile deep soil.

CULTURE &

MANAGEMENT : Requires good seedbed. Sown in early fall after first rains. Seeding rate vary from 50-100 kg/ha; the lower rate for mixture with winter cereals. Responds well to phosphorus.

UTILIZATION : Useful as cover crop, green manure, hay and silage. For hay and silage it should be grown with cereals.

VARIETIES : Several. Austrian is most adapted to inland regions.



Coronilla scorpioides



DESCRIPTION : Annual winter legumes.

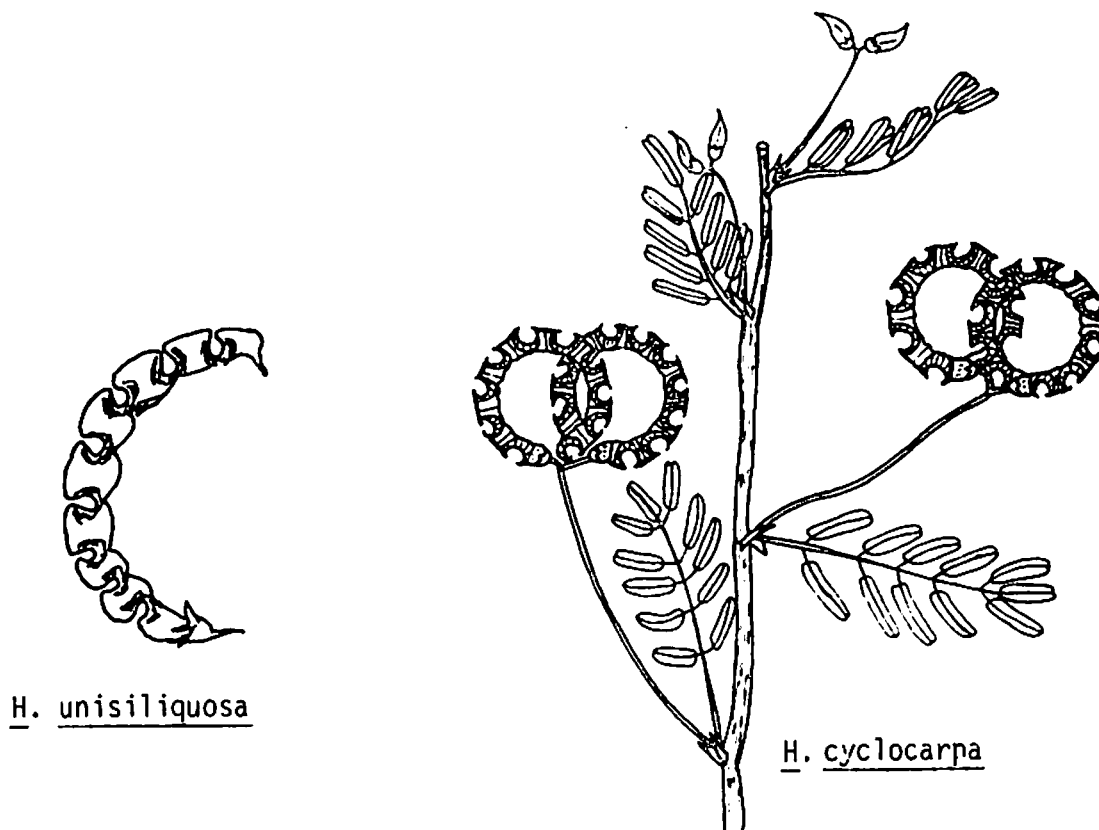
Erect herb, spreading branches, 20-30 cm high.

Leaves 3-foliolate with large terminal leaflet.

Pods narrow, linear, jointed, curved.

VALUE : Very drought resistant plant, but palatability appears to be very low.

Hippocrepis spp.



DESCRIPTION : Annual winter legumes

Stems erect

Leaves with many-paired leaflets

Flowers yellow

Pods ribbon-like, curved, with many circular cuts.

Seeds ring-like.

H.unisiliquosa: Flowers sessile, pods with 5-8 cuts

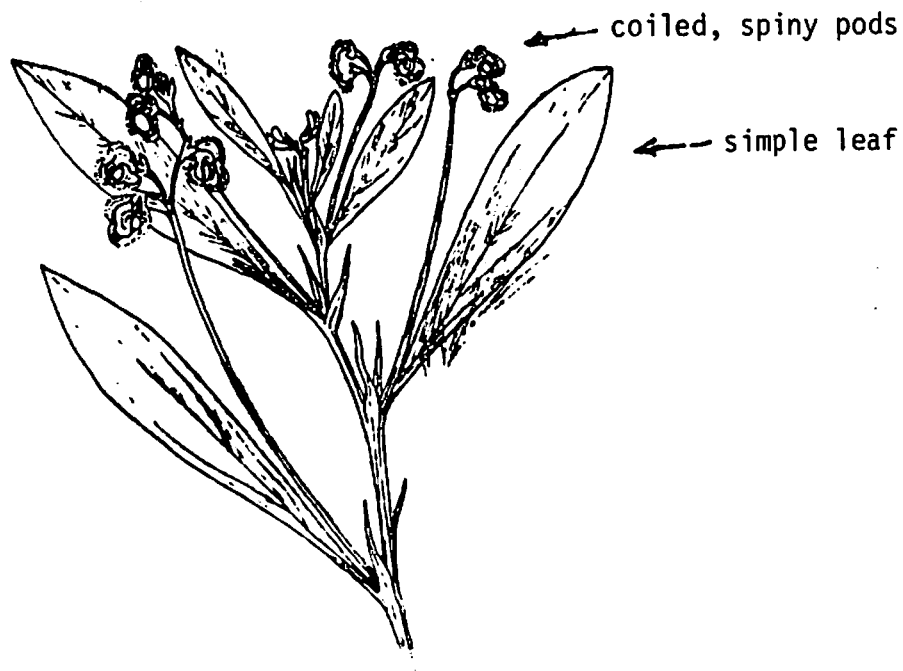
H.bicontorta : Flowers in umbels, pods circular, each cut in the pod has 2 horns.

H.cyclocarpa : Flowers in umbels, legume circular, cuts on the legume without horns.

VALUE :

Potential plants for dryland fallow forage.

Scorpiurus muricata



DESCRIPTION : Annual winter legumes.  
Leaves simple, entire  
Flowers yellow in few-flowered heads  
Pods long twisted, longitudinally furrowed with short spines.  
S.muricata is similar to sulcata but pods loosely coiled  
forming a ring and less spiny.

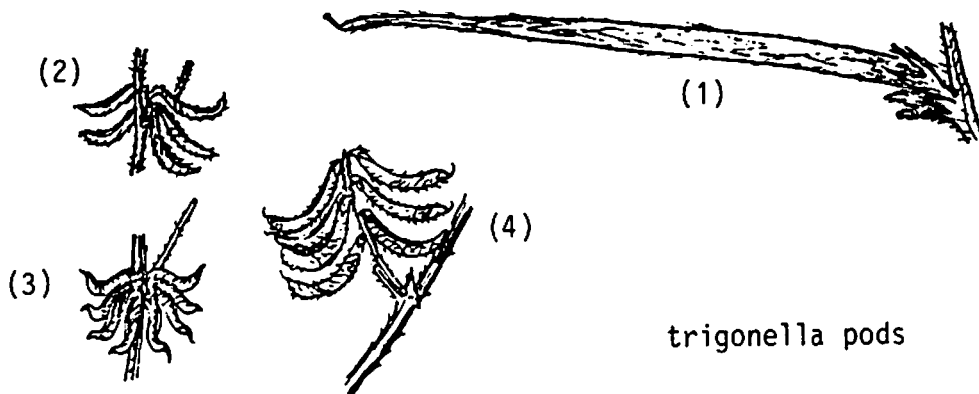
VALUE : Could be useful for dryland fallow.  
Seeds are very hard. Palatable plants.

FENUGREEK

Trigonella spp.

DESCRIPTION : Annual winter legumes. Coumarin-smelling.  
Stems herbaceous weak to stiff  
Leaves trifoliate, pinnate, leaflets dentate  
Flowers yellow  
Pods narrow, linear, rarely ovoid or broad flat, typically compressed and curved.

- SIMPLIFIED  
KEY :
- A. Flowers single, sessile T. berythea
  - B. Flowers single or double, sessile T. foenum graecum (1)
  - C. Flowers grouped in sessile clusters
    - 1. Pods short of wavy shape T. anguina
    - 2. Pods as long as the stipules of longer
    - + Calyx as long as the corolla T. monspeliaca (2)
    - ++ Leaves deeply dentate T. laciniata
    - +++ Leaves with small teeth T. stellata (3)
  - D. Flowers grouped in peduncled clusters
    - 1. Legumes thin, flat with hairy margins T. arabica
    - 2. Leaves deeply dentate T. laciniata
    - 3. Flowers in umbels T. maritima
    - 4. Flowers in racemes, pod with short pointed tip T. hamosa (4)



FENUGREEK

Trigonella foenum-graecum

DESCRIPTION : Winter annual legume  
Stems erect, branching, up to 50 cm high.  
Leaves trifoliate, pinnate, toothed on upper half.  
Flowers single or double, sessile, white.  
Pods long 6-10 x 3 cm, flat. Seeds green rectangular.

ADAPTATION : Adapted to winter rainfall of 400 mm and above or irrigation. Moderately resistant to cold, drought and salinity.  
Thrives on loamy soil.

CULTURE &

MANAGEMENT : Seedbed preparation as for medics and clovers.  
Sowing can be broadcast or drilling in 30cm rows.  
Seed rate 30 kg/ha under rainfed cropping and 50 kg under irrigation. 60 kg/ha P<sub>2</sub>O<sub>5</sub> at seeding .

UTILIZATION : Suitable for grazing or soiling. Yields 2-3 cuts under irrigation. One cut at flowering for dryland hay. For hay it can be grown in mixture with barley. Very palatable.

COMMON ALFALFA, LUCERNE

Medicago sativa



DESCRIPTION : Perennial legume herb

Stems erect or ascending, much branched from a crown base. Leaves trifoliate, pinnate, leaflets toothed around the upper third. Flowers purple, or grades between yellow and purple, 10-25 flowers per raceme. Pod spiral, 2-3 coils, spineless. Seed kidneyshaped, yellow green.

Yellow-flowered alfalfa, M.falcata, has yellow flowers. Also distinguished by its slightly curved, not coiled pods.

Rhizomatous and Creeping-rooted alfalfa:

Some varieties of common alfalfa are able to produce under-ground stems (rhizomes) from crown buds.

(cvs. Rhizoma, Several, Titon) These are called rhizomatous. Other varieties spread by roots creeping below ground surface (creeping-rooted).

Stem buds develop on such roots.

Examples: Nomad, Rambler and Travois cultivars.

Trifolials (Lotus spp.)

Perennial or annual legumes. Herbs or shrublets. Stems erect to prostrate. Leaves trifoliate, stipules are like leaflets. Flowers single or in heads. Corolla with a peak.

Simplified Key

A. Flowers yellow, Pod narrow

1. Calyx 2-lipped, perennial,  
flowers over 1cm long

L.creticus

2. Calyx bell-shaped, equal teeth  
+ Flowers 6-12 together, tall perennial  
plant

L.pedunculatus

++ Flowers less

a- Calyx teeth as long as tube,  
(perennial)

L.corniculatus

B. Flowers yellow, Pod Swollen, 5-6 mm thick

L.endulis



L. creticus



L. endulis

BIRDSFOOT TREFOIL

Lotus corniculatus

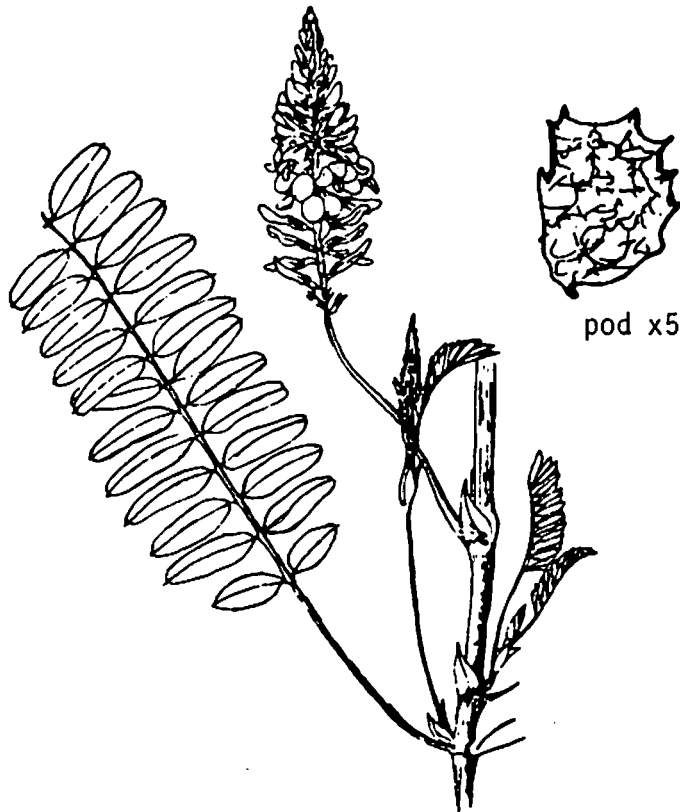


DESCRIPTION : Perennial herbaceous legume  
Stems solid; decumbent or prostrate, glabrous or slightly hairy.  
Leaflets trifoliate, with leaflet-like stipules.  
Flowers yellow, about 5 in each umbel.

BOTANICAL : var major : Tall, erect, stem swollen, leaflets lanceolate.  
VARITIES :  
var tenuifolius: Tall, slender, much branched, leaflets narrow or linear. Umbels with few flowers.

SAINFOINT

Onobrychis spp.





GENERAL CHARACTERISTICS

Annual or perennial herbs

Stems erect, leaves imparipinnate up to 10 pairs.

Flowers white, yellow, red or blue, in racemes.

Pods hard, compressed, round prickly, non-shattering.

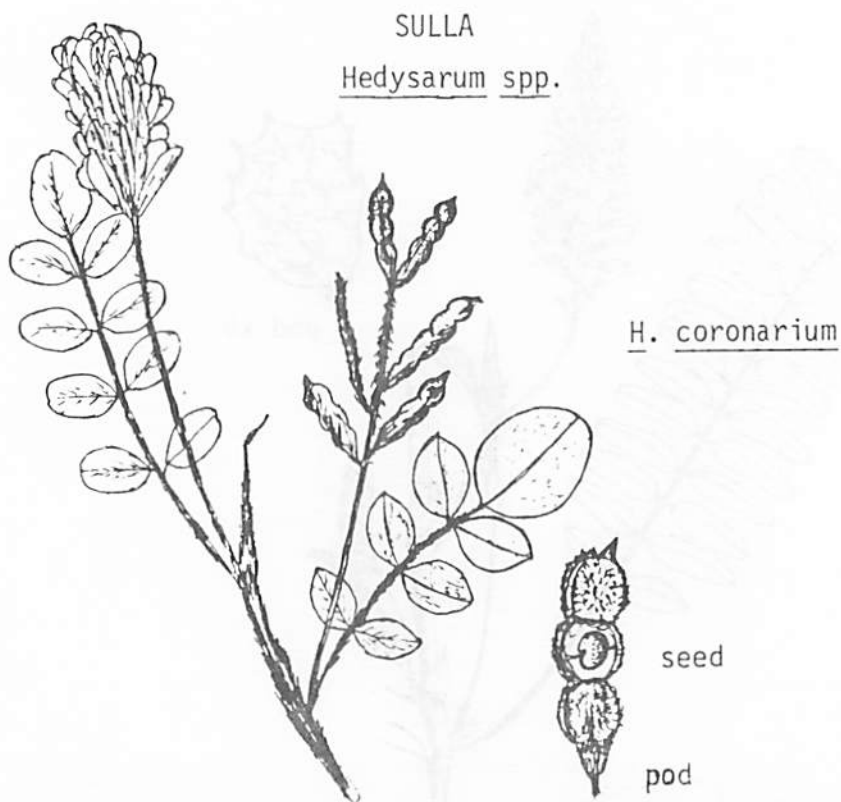
O. sativa (=viciifolia) Perennial with woody stems, 40-80 cm high.

Leaves with 5-7 pairs. Flowers pink. Pods small. 1-seeded.

O. ptolemanica : Soft-hairy perennial herb. Flowers yellow or cream, in long racemes. Pod round, densely woolly.

O. crista-galli: Annual. Leaves with 5-8 pairs of leaflets. Flowers flesh-coloured. Pod glossy egg-shaped, pitted with spiny margin.

O. squarrosa : Annual. Similar to above species, but leaves have 7-11 pairs of leaves.



GENERAL DESCRIPTION

Perennial legumes

Leaves imparipinnate leaves, 3-7 pairs.

Flowers pink or red, in racemes.

Pods of 2-5 orbicular flat joints with hooked prickles.

A distinguishing feature from Onobrychis .

H. spinosissimum Annual, hairy plant, 45 cm high.

Leaflets 2-3 mm broad. Flowers pink or red.

H. coronarium Annual, biennial, sometimes perennial plant, 80-150cm.

Leaflets 10-20 mm broad- Flowers red, pod joints narrow.

MILK VETCH

Astragalus spp.

A very diverse genus with annual and perennial species.

Perennials are shrubs and sub-shrubs. Most of its herbaceous species form an appreciable part of the natural pastures in the Near East . Some shrubby species are a source of gum (tragacanth) which has medicinal and industrial value.

Astragalus leaves consist of many leaflets pairs without tendrils some species also have a terminal leaflet. Flowers are grouped in racemes with few or many flowers. Pods are linear to globular shaped.

Among the species found to be valuable for reseeding in high or low mountain areas, are:

1. Astragalus lopophorus (=siliguosus) which is a perennial short plant, with yellow flowers and egg shaped fleshy pods. A valuable and palatable fodder plant.
2. A.chaborasicus, A perennial small shrub. Flowers purple pink. Pods ovoid, small. Palatable.

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