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Grain Quality Winter Grain Crops The Ute Guide (GRDC)
Grain Legume Handbook 2008 edition
Vetch Variety Sowing Guide 2009 (SARDI)
Vetch in South Australia & Victoria (Pulse Australia, GRDC)
Vetches in southern Queensland (Queensland DPI & F Note 4055)
Namoi Woolly Pod Vetch (NSW DPI Agfact 2.5.9)
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This guide is designed to assist in the recognition of symptoms including those of disease, insect attack and poor nutrition in vetch crops, as well as identifying critical issues of best practice in growing and marketing the crop.

Abnormal symptoms identified in the crop can indicate a physical, nutritional, chemical or disease caused disorder, which can be initially identified using the Symptom Sorter on Page 28 of this guide. The appropriate section of the guide is indicated to seek further clarification and direction as to best practice to manage or avoid the disorder in the future.

It should be noted that varieties and products mentioned in this guide are those available and registered at July 2009 and may change over time.

Image: W Hawthorne, Pulse Australia

Abbreviations

CESAR  Centre for Environmental Stress and Adaptation Research
DAFWA  Department of Agriculture and Food, Western Australia
GRDC  Grains Research and Development Corporation
NSW DII New South Wales Department of Industry and Investment
PaDIL  Pest and Disease Image Library, Museum Victoria
QPIF  Queensland Primary Industries and Fisheries
SARDI  South Australian Research and Development Institute
VDPI  Victorian Department of Primary Industries

Blanchefleur vetch dense stand before lodging.
Vetch is a multi-purpose crop grown mostly as a disease break crop for rotation with cereals in a wide range of soil types from light sands to heavier clay soils. The versatility of vetch allows cropping for grain or hay production, early grazing as green pasture or for dry grazing, hay production or green manure. Vetch is valued for its benefits to following cereal and oilseed crops in the rotation which are usually greater than from other pulses.

Grain vetches have been grown in lower to mid-rainfall cereal areas of southern Australia, and their grain yields have been similar to pea yields in these areas. Note that vetch grain is not used for human consumption and has limited use in pig and poultry rations.

On sandy soils vetches provide better soil protection than peas and provide better stubble holding in the soil. Vetches grow well on loam and clay soils, but they produce best on moderate to high fertility soils.
Vetch types

Vetch (Vicia spp.) is classified broadly as either grain or forage vetches. Grain vetch, or common vetch (Vicia sativa) varieties Morava\(^b\), Rasina\(^b\), Blanchefleur, Languedoc and Cummins are grown for forage, hay, grain and green manure. Grain from common vetches can be used to feed ruminants, as birdseed, or as seed for green manure or forage crops.

Forage vetches are used for hay, green manure or mid to late winter feed for grazing. They are purple vetch (V. benghalensis) variety Popany, or a woolly pod vetch (V. villosa ssp. dasycarpa) varieties Namoi, Capello\(^b\) or Haymaker\(^b\).

Images: W Hawthorne, Pulse Australia; R Matic, SARDI
## Identifying cultivated vetch varieties*

<table>
<thead>
<tr>
<th>Plant part</th>
<th>Common vetch varieties (Vicia sativa)</th>
<th>Wooly pod varieties** (Vicia villosa ssp. dasycarpa)</th>
<th>Purple vetch (Vicia benghalensis)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Blanchefleur</td>
<td>Morava(^{(1)})</td>
<td>Rasina(^{(1)})</td>
</tr>
<tr>
<td>First leaves</td>
<td>1 pair, narrow leaflets</td>
<td>1 pair, narrow leaflets</td>
<td>1 pair, narrow leaflets</td>
</tr>
<tr>
<td>Adult leaves</td>
<td>Hairy, oblong, squarish</td>
<td>Hairy, oblong, large</td>
<td>Hairy, oblong, squarish</td>
</tr>
<tr>
<td>Colour of foliage</td>
<td>Medium green</td>
<td>Medium green</td>
<td>Dark green</td>
</tr>
<tr>
<td>Time to full flowering</td>
<td>Early (100-110 days)</td>
<td>Very early (90-105 days)</td>
<td>Late (110-120 days)</td>
</tr>
<tr>
<td>Stipules (leaf at base of leaf)</td>
<td>Toothed, clasping stem, purple spot</td>
<td>Toothed, clasping stem, large purple spot</td>
<td>Toothed, clasping stem, small purple spot</td>
</tr>
<tr>
<td>Flower stalk</td>
<td>Short</td>
<td>Short</td>
<td>Short</td>
</tr>
<tr>
<td>Flower colour</td>
<td>White</td>
<td>Light purple</td>
<td>Dark purple</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pods</td>
<td>Long-narrow</td>
<td>Long-narrow</td>
<td>Very long-narrow</td>
</tr>
<tr>
<td>Seeds</td>
<td>Light brown, pillow shaped</td>
<td>Brown-grey, pillow shaped</td>
<td>Dark brown, pillow shaped</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Split colour</td>
<td>Orange</td>
<td>Beige</td>
<td>Beige-greenish</td>
</tr>
</tbody>
</table>

*Other cultivated species:* Hungarian vetch (Vicia pannonica); Leaf dense vetches (Vicia palestina); Big leaf vetches (Vicia macrocarpa).

** Capello\(^{(2)}\) and Haymaker\(^{(2)}\) were selected as soft seed, woolly pod vetch varieties with identical characteristics to Namoi.
Variety

The grain vetch varieties most commonly grown are Morava\(^{A}\), a late flowering, rust resistant variety, and Rasina\(^{A}\), an earlier flowering equivalent. Older varieties Languedoc and Blanchefleur are still grown. See the specific Variety Management Packages for each new variety to determine varietal susceptibility to herbicides.

<table>
<thead>
<tr>
<th>Variety</th>
<th>Maturity</th>
<th>Flower colour</th>
<th>Seed size g/100 seeds</th>
<th>Shattering</th>
<th>Forage production</th>
<th>Ascochyta blight</th>
<th>Botrytis</th>
<th>Rust</th>
<th>Hard seed %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Common or grain vetch</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blanchefleur</td>
<td>Early</td>
<td>White</td>
<td>6.6</td>
<td>MS</td>
<td>Moderate</td>
<td>MS</td>
<td>S</td>
<td>S</td>
<td>Low</td>
</tr>
<tr>
<td>Cummins</td>
<td>Early-mid</td>
<td>White</td>
<td>6.1</td>
<td>MS</td>
<td>Moderate</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>Low</td>
</tr>
<tr>
<td>Languedoc</td>
<td>Very early</td>
<td>Purple</td>
<td>6.7</td>
<td>MS</td>
<td>Moderate</td>
<td>S</td>
<td>S</td>
<td>VS</td>
<td>Low</td>
</tr>
<tr>
<td>Morava(^{A})</td>
<td>Late</td>
<td>Purple</td>
<td>8.3</td>
<td>R</td>
<td>High</td>
<td>MR</td>
<td>VS</td>
<td>R</td>
<td>Nil</td>
</tr>
<tr>
<td>Rasina(^{A})</td>
<td>Early</td>
<td>Purple</td>
<td>7.0</td>
<td>MR</td>
<td>Moderate</td>
<td>R</td>
<td>S</td>
<td>R</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Purple vetch</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Popany</td>
<td>Very late</td>
<td>Purple</td>
<td>4.5</td>
<td>MR</td>
<td>High</td>
<td>S</td>
<td>VS</td>
<td>R</td>
<td>Moderate</td>
</tr>
<tr>
<td><strong>Woolly pod vetch</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capello(^{A})</td>
<td>Late</td>
<td>Purple</td>
<td>4.3</td>
<td>R</td>
<td>High</td>
<td>S</td>
<td>VS</td>
<td>R</td>
<td>High</td>
</tr>
<tr>
<td>Haymaker(^{A})*</td>
<td>Late</td>
<td>Purple</td>
<td>4.7</td>
<td>R</td>
<td>High</td>
<td>S</td>
<td>VS</td>
<td>R</td>
<td>Moderate</td>
</tr>
<tr>
<td>Namoi</td>
<td>Very late</td>
<td>Purple</td>
<td>4.4</td>
<td>R</td>
<td>Very high</td>
<td>S</td>
<td>VS</td>
<td>R</td>
<td>Very high</td>
</tr>
</tbody>
</table>

**Note:** *Vicia villosa* ssp. *dasycarpa* varieties, i.e. Namoi not preferred in cropping rotations due to high level of hard seeds. R = resistant; MR = moderately resistant; MS = moderately susceptible; S = susceptible; VS = very susceptible.

**Seed hardness:** <7% low; 7-15% moderate; 15-25% high; >25% very high. * Haymaker\(^{A}\) is also known as Haymaker Plus\(^{A}\).
# Vetch variety sowing guide

## Average annual rainfall zone (mm)

<table>
<thead>
<tr>
<th>Zone</th>
<th>&lt;350</th>
<th>350–400</th>
<th>400–475</th>
<th>475–600</th>
<th>&gt;600</th>
</tr>
</thead>
</table>

## Vetch grain

<table>
<thead>
<tr>
<th>Variety</th>
<th>Rasina&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Rasina&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Rasina&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Cummins</th>
<th>Morava&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Languedoc</td>
<td>Cummins</td>
<td>Cummins</td>
<td>Blanchefleur</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cummins</td>
<td>Blanchefleur</td>
<td>Blanchefleur</td>
<td>Morava&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Languedoc</td>
<td>Morava&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morava&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Vetch hay, silage, green manure

<table>
<thead>
<tr>
<th>Variety</th>
<th>Rasina&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Rasina&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Rasina&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Morava&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Morava&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blanchefleur</td>
<td>Morava&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Morava&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Popany</td>
<td>Popany</td>
<td></td>
</tr>
<tr>
<td>Morava&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Blanchefleur</td>
<td>Popany</td>
<td>Blanchefleur</td>
<td>Capello&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Cummins</td>
<td>Popany</td>
<td>Cummins</td>
<td>Cummins</td>
<td>Haymaker&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Languedoc</td>
<td>Cummins</td>
<td>Capello&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Capello&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Languedoc</td>
<td>Haymaker&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Haymaker&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Variety flowering date differences.

Images: W Hawthorne, Pulse Australia
Seed quality

Quality seed is vital for crop establishment. Check germination percentage and purity before purchasing seed and ask for the test certificate. Germination test retained seed and adjust seeding rates for the desired plant density. Grade to ensure seed is free from weed and crop seed contamination.

Retain seed from the healthiest crop where ascochyta and chocolate spot levels are lowest. Use seed preferably with nil infection. Seed disease testing services are available. Seed-borne inoculum is usually less important than stubble-borne inoculum. Ensure a minimum distance of 400 m of woolly pod vetches from other varieties to reduce the risk of cross-pollination if the crop is to be used for seed. Common vetch varieties are self-pollinated and do not require more than 50 m from the other vetches.

Weathering of crops after ripening and poor storage can substantially reduce germinability of seed.

Germination and vigour may deteriorate in storage if seed is more than one year old, frosted or weather damaged. Good seedling vigour is as important as seed viability and may reduce susceptibility to seedling disease.

Image: T Yeatman, Rural Solutions SA

Good seed is the first step to achieving a good crop.
Paddock selection

Vetches grow well sown after cereal or oilseed crops with adequate surface stubble cover. They provide benefits to the following crop through a disease break and improved soil fertility by increasing nitrogen levels; 56 kg/ha after grain production, 94 kg/ha after hay production and up to 147 kg/ha after green manure (R Matic – 3 years, 5 sites) depending on crop growth and grain yield.

Self-sown vetches from hard seed can cause admixture quality problems. The harder seed of forage vetches is more likely to cause a contamination problem.

Reduce risk of disease by sowing with at least a four year break between vetch crops and not adjacent to vetch, bean or lentil stubbles. Be aware of herbicide residues and plant-back requirements in the rotation, especially after drought conditions.

Select a paddock that will not drift as vetch stubble residues lack bulk and provide only partial protection to the soil after harvest. Vetch stubble should either not be grazed or grazed with caution to ensure adequate stubble cover is maintained to minimise risk of wind and water erosion on sandy soils and sloping paddocks. Vetch holds the soil better than field peas through having more surface roots.

Images: T Yeatman, Rural Solutions SA; W Hawthorne, Pulse Australia

PADDOCK SELECTION AND ROTATION
Place in rotation

Vetches fit well with cereals and canola. Grass-free crops reduce cereal root diseases. Vetch should not be grown more than once within five years in the same paddock to minimise the risk of disease.

Vetch benefits to cereal rotations

Increase yields of following cereal crops.

Allow an extended phase of cropping.

Decrease many cereal diseases – grass-free vetch crops break the life cycle of root diseases, cereal cyst nematode and take-all.

Control weeds – forage use, grass-selective herbicides or green/brown manuring can be used with vetches to control competitive weeds which are difficult to control in other crops, eg brome grass and barley grass.

Allow for crop topping to prevent herbicide-resistant weeds from setting seed.

Available soil nitrogen maintained or improved.

Well adapted to no-till, standing stubble systems aimed at improving soil sustainability.

Be aware of herbicide residues and plant-back requirements.
PADDOCK SELECTION AND ROTATION
**Climate requirements**

**Rainfall:** Vetches are grown in districts with above 300 mm annual rainfall. Purple vetch (e.g. Popany) is later maturing requiring over 450 mm annual rainfall. Together with peas, vetches are quite versatile and are the best adapted pulse to lower rainfall areas.

Grain vetches are valued for their adaptability to a similar, but wider range of rainfall to field peas.

**Temperatures:** Vetches are less tolerant of frost during podding than other pulses. Frost can cause loss of flowers, pods or grain. Vetches tolerate temperatures higher than other winter pulse crops, but are very sensitive to hot dry conditions during flowering and podding. Flowers can abort when temperatures exceed 32 °C. Early sowing and an extended flowering period reduce this risk.

*Images:* W Hawthorne, Pulse Australia

![Withered flowers following hot dry conditions during flowering.](image)

Later maturing varieties can take advantage of longer seasons, while earlier varieties avoid an early finish.
Soil requirements

Vetches are grown successfully on a wide range of soil types, varying in both texture (sandy loams through to clays) and preferring alkaline soils (pH_{water} 6 to 9). Vetches have poor tolerance to waterlogging, but perform better on more acidic soils and hard-setting soils than peas. Popany and Namoi are more tolerant than the grain (V. sativa) types.

On acidic soils (pH_{water} <6) vetches often nodulate poorly. Use of granular inoculums and application of lime may make some acidic soils suitable for growing vetches. Foliar nutrients (iron, manganese, zinc) may need to be applied on highly alkaline soils (pH_{water} >8). Good yields have come from paddocks with pH_{water} as low as 5.4 where aluminium and manganese levels were low.

Root growth may be poor reducing crop growth and drought tolerance in hard-setting soils and soils susceptible to hard pans and compact sub soils, or highly acidic or alkaline subsoils. Stony and uneven soils create harvest difficulties.

Application of lime to make acidic soil suitable for growing vetch.

Images: A Harding, Rural Solutions SA
CROP ESTABLISHMENT

Vetches can be sown using conventional cereal sowing equipment as well as small seed boxes.

Sowing vetch early, even dry before the seasonal break has the advantage of promoting early seedling establishment and growth. Vetch is well suited to no-till, reduced tillage and stubble retention systems.

Sow into friable soil. The smaller seed of vetches means that it is important to ensure good seed-to-soil contact and emergence. Exposed seed may not germinate.

The surface retention of cereal stubble does not affect vetch germination or growth and may improve establishment on hard-setting, surface-crusting soils. It is important to keep adequate plant residue on the surface to protect the soil from moisture loss and erosion during establishment, growth and after harvest.

Sow vetch and cereal together from separate seeder boxes to ensure uniform output along the row.

Images: W Hawthorne, Pulse Australia
Sowing rate and plant density

A lower plant population reduces the risk of foliar disease in a less bulky crop. Lower seeding rates can reduce crop or forage yield potential. Sowing overlaps (e.g. headlands) can exacerbate disease development. Use lower plant densities 40–50 plants/m² in rainfall areas <350 mm of rainfall per year and higher seeding rates 60–70 plants/m² in >500 mm of annual rainfall areas. For hay production use a 1:1 or 1:2 cereal:vetch mix.

Seeding rate (kg/ha) = Plant density (plants/m²) x 1000 seed wt (g) ÷ Emergence percentage¹.

¹NOTE: The number of seeds that emerge is often less than the seeds sown due to non-viable seed, seedlings with poor vigour, disease, herbicide damage or poor soil structure.

Plant density and common seeding rates for vetch.

<table>
<thead>
<tr>
<th>End use</th>
<th>Common vetch varieties</th>
<th>Purple vetch varieties</th>
<th>Woolly pod vetch varieties</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Plant density (plants/m²)</td>
<td>Sowing rate (kg/ha)</td>
<td>Plant density (plants/m²)</td>
</tr>
<tr>
<td>Grain – southeastern Australia</td>
<td>40–60</td>
<td>40–50</td>
<td>60</td>
</tr>
<tr>
<td>Grain – WA*</td>
<td>40–60</td>
<td>50*</td>
<td></td>
</tr>
<tr>
<td>Green manure</td>
<td>60–70</td>
<td>50–60</td>
<td>65</td>
</tr>
<tr>
<td>Hay</td>
<td>50–70</td>
<td>50–60</td>
<td>60</td>
</tr>
<tr>
<td>Grazing – southeastern Australia</td>
<td>50–70</td>
<td>50–60</td>
<td>65</td>
</tr>
<tr>
<td>Grazing pasture – Qld**</td>
<td>50–70</td>
<td>50–60</td>
<td>65</td>
</tr>
<tr>
<td>Grazing pasture – NSW**</td>
<td>40–60</td>
<td>40–50</td>
<td></td>
</tr>
</tbody>
</table>

* WA target a plant population of 40 to 60 plants/m² (up to 50 kg/ha), higher rates being used where higher grain yields expected.

** Seeding rates where seed set is the target for regeneration next year.
**CROP ESTABLISHMENT**

**Time of sowing**

Sowing time can depend on whether aiming for grain or forage production. Early sowing is important for early plant vigour and to maximise forage production. Sow vetches for seed/grain and hay production at a similar time to sowing wheat.

Early sowing increases the risk of yield loss through frost damage or leaf disease resulting from excessive foliage growth. Later sowing or grazing early sown crops runs the risk of lower grain yield due to high temperatures and dry conditions during flowering and pod fill. Sowing time, variety choice, soil texture and compaction, stubble cover and row spacing can help influence the risk of frost damage to grain.

<table>
<thead>
<tr>
<th>Rainfall zone (mm)</th>
<th>Optimum sowing date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>For grain yield</td>
</tr>
<tr>
<td></td>
<td>Early varieties</td>
</tr>
<tr>
<td>&lt;250</td>
<td>Mid-late April</td>
</tr>
<tr>
<td>250–300</td>
<td>1st to 2nd week May</td>
</tr>
<tr>
<td>300–375</td>
<td>3rd week May</td>
</tr>
<tr>
<td>375–450</td>
<td>4th week May to 1st week June</td>
</tr>
<tr>
<td>&gt;450</td>
<td>1st to 4th week June</td>
</tr>
</tbody>
</table>
Sowing depth

Seed should be sown at a depth of 2–4 cm as for wheat in a similar rainfall district. Sowing can be deeper on lighter soils. Some vetch is top-dressed onto dry soil and buried by trampling of sheep, so sowing depth is very shallow. Shallow sown vetch is more prone to damage by soil-active herbicide.

When dry sowing, sow at 4–8 cm to ensure good moisture conditions before germination, and to protect applied inoculum from high temperatures near the soil surface. If the opening rains are delayed some weeks, deep sown crops can be slower to establish and grow when soil temperatures fall.

Vetch cotyledons remain below the soil surface and only the shoot pushes through, so re-shooting is possible if the initial shoot is damaged by insects or vermin.

Wheel tracking

Row placement can be important. Consider ‘tram lining’ and controlled traffic to avoid physical damage to the crop from machinery that provides potential ‘hotspots’ for disease.

(Right) Sowing in furrow with presswheels to promote good even establishment.
(Below) Vetch can be no-till sown using conventional seeding machinery.
**CROP ESTABLISHMENT**

**Row spacing**

Generally sown on cereal row spacing for grain production. Vetch plus cereal mixes for forage are sown together or in alternate rows. Sowing into standing cereal stubble supports the canopy and minimises lodging at harvest. Some growers use medium-wide row spacing (25–36 cm) to suit trash clearance, intra-row weed control or to allow more air movement between the rows in the belief that foliar disease risk is reduced.

Some vetch is top-dressed onto dry soil and trampled in by sheep such that there is no row spacing.

The height to bottom pods is often increased with wider row spacing or with higher seeding rates. Weed control can be more difficult with wider row spacing unless no-till sown with adequate stubble cover, or shielded sprayers are to be used.

*Images: W Hawthorne, Pulse Australia*
Inoculation

In established pea and vetch growing districts inoculation may not be essential if vetch, peas, lentils or faba beans have been grown during the past five years. Alkaline, self-mulching grey clays contain high numbers of rhizobia which ensure good nodulation without the need for seed inoculation. If inoculating use Group E rhizobium (Group F can be used if necessary).

Inoculant can be applied either on seed, in-furrow by water injection or in granular form. Inoculate vetches every time they are sown in waterlogged and acidic soils, particularly on poorly structured red brown earths and in colder, wetter areas where conditions for survival of rhizobia are poor.

Use of fungal seed dressing is seldom beneficial. Thiram + thiaubendazole is registered in vetches for seedling root rots (*Fusarium* spp. and *Pythium* spp.). It can minimise the risk of introduction of disease into new vetch areas. Apply the seed dressing first and then inoculate immediately before seeding.

Do not mix inoculants and seed dressing together unless the inoculant label specifies compatibility. Preferably do not use fungicide seed dressings with seed applied inoculant in acid soils as maximum numbers of rhizobium are needed. Granular and other forms of inoculum may assist in rhizobial survival, particularly in acid soils, when sown dry or fungicide seed treatments are used.

(Above) Peat inoculum can be applied with a low pressure applicator into the auger which then mixes the inoculant and seed.

(Above) Inoculum can be applied in one of several formulations.
Rolling

Surface rolling or prickle chaining flattens clods and ridges caused by sowing or press wheels, and presses rocks and sticks into the soil leaving a flat surface to allow the header comb or forage harvester to cut close to ground level. This reduces harvest losses, machinery wear and contamination in the seed or forage sample. Rolling is best done with a rubber-tyred roller, with moist soil that is not too wet or dry.

Rolling should be carried out post-sowing pre-emergence. It may have to be delayed until the crop has emerged if the soil is prone to hard setting, crusting or eroding on sandy or sloping country. Emerging shoots can be broken off if rolling when plants are just at emergence.

If rolling post-emergence, do so in warm conditions of an afternoon or a warmer day when plants are limp and not brittle from cold or frosty conditions. Avoid rolling two weeks before or after applying a post-emergent herbicide. Rolling vetches post-emergence could increase the possibility of leaf diseases early, aiding the early spread of disease later within the crop.

Image: W Hawthorne, Pulse Australia

Surface rolling or prickle chaining leaves a flat surface to allow the header comb or forage harvester to cut close to ground level.
# Vetch Growth Stage Scale

(Pea scale – AJ Biddle and CM Knott 1998)

<table>
<thead>
<tr>
<th>Development phase</th>
<th>Growth stage (GS)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>00 Germination</td>
<td>GS 000 Dry seed GS 001 Imbibed seed GS 002 Radicle apparent GS 003 Plumule and radicle apparent GS 004 Emergence</td>
<td></td>
</tr>
<tr>
<td>10 Vegetative</td>
<td>GS 101 First node GS 10(X) X node GS1(N) N, Last recorded node</td>
<td>First leaf fully unfolded with one pair leaflets X leaf fully unfolded with more than one pair of leaflets, complex tendril N – any number of nodes on the main stem with fully unfolded leaves according to cultivar</td>
</tr>
<tr>
<td>20 Reproductive</td>
<td>GS 201 Enclosed buds GS 202 Visible buds GS 203 First open flower GS 204 Pod set GS 205 Flat pod GS 206 Pod swell GS 207 Pod fill GS 208 Green wrinkled pod GS 209 Yellow wrinkled pod GS 210 Dry seed</td>
<td>Small flower buds enclosed in terminal shoot Flower buds visible outside terminal shoot A small immature pod Pods swollen but still with small immature seeds Green seeds fill the pod cavity Seed rubbery Pods dry and brown, seed dry and hard</td>
</tr>
<tr>
<td>30 Senescence</td>
<td>GS 301 Lower pods dry and brown, seed dry, middle pods yellow and wrinkled, seed rubbery, upper pods green and wrinkled, desiccant application stage GS 302 Lower and middle pods dry and brown, seed dry, upper pods yellow and wrinkled, seed rubbery, pre-harvest stage GS 303 All pods dry and brown, seed dry, dry harvest stage</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Crop affect</td>
<td>Plant symptoms</td>
</tr>
<tr>
<td>----------------------</td>
<td>--------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Scattered plants</td>
<td>Wilting</td>
<td>Premature death</td>
</tr>
<tr>
<td></td>
<td>Yellow/pale green</td>
<td>Leaves distorted</td>
</tr>
<tr>
<td></td>
<td>Stunted</td>
<td>Premature death</td>
</tr>
<tr>
<td>Patches</td>
<td>Poor emergence</td>
<td>Plants chewed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Brown/grey</td>
<td>Stem and leaf spotting</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yellow/red</td>
<td>Stunted</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Premature death</td>
</tr>
<tr>
<td></td>
<td>Pale green</td>
<td>Leaf and pod spotting</td>
</tr>
<tr>
<td></td>
<td>Stunted</td>
<td>Leaves/stem distorted</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wilting</td>
<td>Leaves distorted</td>
</tr>
<tr>
<td></td>
<td>Physically damaged</td>
<td>Stems, leaves and pods</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highly alkaline soil</td>
<td>Yellowing</td>
<td>Young leaves yellow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tip death</td>
</tr>
<tr>
<td></td>
<td>Patches</td>
<td>Plants chewed</td>
</tr>
<tr>
<td></td>
<td>Stunted</td>
<td>Black leaf edges</td>
</tr>
<tr>
<td>Acidic soil</td>
<td>Yellow/red</td>
<td>Stunted</td>
</tr>
<tr>
<td>Symptom</td>
<td>Cause</td>
<td>Page</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Low-lying areas</td>
<td>Grey</td>
<td>75</td>
</tr>
<tr>
<td>Yellow/red</td>
<td>Black leaf edges</td>
<td></td>
</tr>
<tr>
<td>Frost</td>
<td>Waterlogging</td>
<td>77</td>
</tr>
<tr>
<td>General</td>
<td>Poor emergence</td>
<td>20</td>
</tr>
<tr>
<td>Tip death</td>
<td>Seed sown too deep</td>
<td></td>
</tr>
<tr>
<td>Stunted</td>
<td>Young leaves yellow</td>
<td>53</td>
</tr>
<tr>
<td>Leaf spotting</td>
<td>Group F herbicide damage</td>
<td></td>
</tr>
<tr>
<td>Leaves distorted</td>
<td>Zinc deficiency</td>
<td>71</td>
</tr>
<tr>
<td>Leaf spotting</td>
<td>Clopyralid herbicide damage</td>
<td>55</td>
</tr>
<tr>
<td>Pale green</td>
<td>Leaves distorted</td>
<td>59</td>
</tr>
<tr>
<td>Leaf spotting</td>
<td>Downy mildew</td>
<td>40</td>
</tr>
<tr>
<td>Yellow/red</td>
<td>Tip death</td>
<td>65</td>
</tr>
<tr>
<td>Grey/brown</td>
<td>Leaf spotting</td>
<td>36</td>
</tr>
<tr>
<td>Leaf spotting</td>
<td>Ascochyta blight</td>
<td>38</td>
</tr>
<tr>
<td>Leaf spotting</td>
<td>Chocolate spot</td>
<td>42</td>
</tr>
<tr>
<td>Leaf spotting</td>
<td>Rust</td>
<td>37</td>
</tr>
<tr>
<td>Leaf spotting</td>
<td>Alternaria</td>
<td>76</td>
</tr>
<tr>
<td>Physically damaged</td>
<td>Leaf, stem and pods damaged</td>
<td>51</td>
</tr>
<tr>
<td>None obvious</td>
<td>Pods chewed</td>
<td>86</td>
</tr>
<tr>
<td>Pod spotting</td>
<td>Oedemas</td>
<td>109</td>
</tr>
</tbody>
</table>

**Symptom Sorter**
Controlling established foliar diseases with fungicides in vetch is very difficult. Effective disease management relies on selection of a variety with the most suitable profile of disease resistance, most suitable paddock, clean seed, best agronomic practices and canopy management, as well as the use of fungicides.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Best practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paddock history</td>
<td>A minimum four years break between vetch crops.</td>
</tr>
<tr>
<td>Paddock hygiene</td>
<td>Select paddocks at least 500 m from last year’s crop stubble. Avoid sowing adjacent to bean, field peas or lentil stubbles.</td>
</tr>
<tr>
<td>Variety</td>
<td>Select a variety with suitable disease resistance for your district.</td>
</tr>
<tr>
<td>Seed health</td>
<td>Use seed from crops that were disease free, especially at podding. Laboratory seed tests can confirm disease levels. Use seed with less than 10% chocolate spot or 5% Ascochyta.</td>
</tr>
<tr>
<td>Sowing time</td>
<td>Do not sow too early. Early emergence leads to excessive vegetative growth, early exposure to disease and early canopy closure, increasing foliar disease.</td>
</tr>
<tr>
<td>Sowing rate</td>
<td>Higher than ideal seeding rates and plant populations lead to a dense crop canopy and increased disease risk.</td>
</tr>
<tr>
<td>Row spacing</td>
<td>Wider rows can delay canopy closure, reducing the risk of chocolate spot. Any increased lodging may increase the chance of foliar disease.</td>
</tr>
<tr>
<td>Canopy management</td>
<td>Delay sowing, reduce seeding rates, or else graze or cut early sown crops.</td>
</tr>
<tr>
<td>Fungicide application</td>
<td>Success is dependant on monitoring, correct disease identification, coverage and timeliness of sprays with the correct fungicide. Seed: To reduce transmission of disease (helps control Ascochyta, Botrytis and seedling root rots). Foliar: Most effective when applied before or at first signs of disease before rain. Protection lasts 10–12 days. Subsequent new growth is unprotected.</td>
</tr>
<tr>
<td>Aphid control</td>
<td>Early detection and control can reduce virus spread. Summer weed control, crop density, stubble and minimal bare soil reduce the presence of aphids.</td>
</tr>
<tr>
<td>Harvest management</td>
<td>Early harvest reduces disease infection on the seed. Windrow or desiccate to enable earlier harvest.</td>
</tr>
</tbody>
</table>
Infection sources for major vetch diseases

<table>
<thead>
<tr>
<th>Disease</th>
<th>Stubble</th>
<th>Seed</th>
<th>Soil</th>
<th>Aphids</th>
<th>Volunteer seedlings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ascochyta blight</td>
<td>***</td>
<td>**</td>
<td>_</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td>Chocolate spot</td>
<td>***</td>
<td>*</td>
<td>***</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td>Rust</td>
<td>**</td>
<td>_</td>
<td>*</td>
<td>_</td>
<td>***</td>
</tr>
<tr>
<td>Seed-borne viruses</td>
<td>_</td>
<td>**</td>
<td>_</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Non seed-borne viruses</td>
<td>_</td>
<td>_</td>
<td>_</td>
<td>***</td>
<td>***</td>
</tr>
</tbody>
</table>

- Nil  
- Minor  
- Moderate  
- Major  

Disease prediction to assist disease risk management

PreDicta™ B
A management tool to reduce yield losses associated with disease. PreDicta™ B is a DNA based test which determines which soil-borne pathogens pose significant risk before crops are sown. The tests relevant to vetches measure soil inoculum levels of rhizoctonia bare patch and stem nematode.

Images: M Ramsey, formerly SARDi; W Hawthorne, Pulse Australia

Ascochyta blight.
Chocolate spot.
Rust.
Virus.
# DISEASE MANAGEMENT

## Vetch diseases and potential for cross infection from other pulses

<table>
<thead>
<tr>
<th>Disease</th>
<th>Vetch</th>
<th>Lentils</th>
<th>Field peas</th>
<th>Faba beans</th>
<th>Chickpeas</th>
<th>Lupins</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ascochyta blight</strong></td>
<td>*</td>
<td>**</td>
<td>*</td>
<td>**</td>
<td>**</td>
<td>*</td>
</tr>
<tr>
<td><em>Ascochyta fabae</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Botrytis grey mould</strong></td>
<td>**</td>
<td></td>
<td>*</td>
<td>*</td>
<td>**</td>
<td>*</td>
</tr>
<tr>
<td><em>Botrytis cinerea</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Chocolate spot</strong></td>
<td>**</td>
<td>*</td>
<td>**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Botrytis fabae</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rust</strong></td>
<td>**</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Uromyces viciae-fabae</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sclerotinia stem rot</strong></td>
<td>**</td>
<td></td>
<td>*</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td><em>Sclerotinia spp.</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Stem nematode</strong></td>
<td>*</td>
<td>*</td>
<td>**</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td><em>Ditylenchus dipsaci</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Virus: non-persistent</strong></td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td><em>AMV, BBWV, BYMV, CYVV and PSbMV</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Virus: persistent</strong></td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td><em>BLRV, BWYV, SbDV and SCSV</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Root rots</strong></td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td><em>Fusarium sp.</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Phoma sp.</strong></td>
<td>*</td>
<td>*</td>
<td>**</td>
<td>*</td>
<td>**</td>
<td>*</td>
</tr>
<tr>
<td><em>Pythium sp.</em></td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td><strong>Rhizoctonia sp.</strong></td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
</tbody>
</table>

* This disease occurs on this crop but has not caused major damage.  
** This disease has caused major damage on this crop.  
Not a host.  
# Strain differs between crops.
# Fungicide guide

## Seed

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Products# (May 2009)</th>
<th>WHP</th>
<th>Ascochyta blight</th>
<th>Chocolate spot</th>
<th>Botrytis grey mould</th>
<th>Rust</th>
<th>Seedling root rots</th>
</tr>
</thead>
<tbody>
<tr>
<td>thiram + thiabendazole</td>
<td>P-Pickel T®, Fairgro®, Reaper® TT</td>
<td>Not required</td>
<td>Not required</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>✓*</td>
</tr>
</tbody>
</table>

## Foliar

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Products# (May 2009)</th>
<th>WHP</th>
<th>Ascochyta blight</th>
<th>Chocolate spot</th>
<th>Botrytis grey mould</th>
<th>Rust</th>
<th>Seedling root rots</th>
</tr>
</thead>
<tbody>
<tr>
<td>mancozeb</td>
<td>Rainshield®, Penncozeb®750DF, Manzate®DF</td>
<td>14 days</td>
<td>28 days</td>
<td>✓**</td>
<td>✓**</td>
<td>✓**</td>
<td>–</td>
</tr>
<tr>
<td>carbendazim</td>
<td>Howzat®, Carbend®, Bavistin®, Boomer®, Spin Flo®</td>
<td>28 days</td>
<td>28 days</td>
<td>–</td>
<td>✓***</td>
<td>✓***</td>
<td>–</td>
</tr>
</tbody>
</table>

# Representative of many for most chemicals.

- Disease controlled or suppressed.
- ✓ Chemical registered for use on this crop.
- No control. Withholding period (WHP) after application until grazing or harvest.
- *** = high efficacy; ** = medium efficacy; * = low efficacy; – = no effect

Go to PUBCRIS APVMA for full list of registered products: [www.apvma.gov.au](http://www.apvma.gov.au)

Check State registration for each product before use.
**Program spraying with fungicide**

If not using a resistant variety a fungicide may be needed in seed production crops, high rainfall regions, wet years or high disease risk situations.

<table>
<thead>
<tr>
<th>Critical period</th>
<th>Disease</th>
<th>Fungicide</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First critical period</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early vegetative (6–8 weeks after emergence)</td>
<td>Ascochyta blight</td>
<td>–</td>
<td>Mancozeb</td>
</tr>
<tr>
<td></td>
<td>Rust</td>
<td>–</td>
<td>Mancozeb</td>
</tr>
<tr>
<td></td>
<td>Rust plus Ascochyta blight</td>
<td>Mancozeb + carbendazim</td>
<td>Early fungicide application can restrict early development and spread of disease. Use the lower rate on crops up to 20 cm in height. Use the higher rate for dense crops or if disease pressure is severe.</td>
</tr>
<tr>
<td><strong>Second critical period</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before canopy closure (13–16 weeks after emergence)</td>
<td>Ascochyta blight and/or rust plus</td>
<td>Chocolate spot</td>
<td>Mancozeb</td>
</tr>
<tr>
<td></td>
<td>Chocolate spot</td>
<td>–</td>
<td>Carbendazim or mancozeb + carbendazim</td>
</tr>
<tr>
<td></td>
<td>Chocolate spot plus Ascochyta blight</td>
<td>Mancozeb or carbendazim</td>
<td>Before canopy closure is recommended. If ascochyta is detected, and/or chocolate spot appear in the crop canopy, and rain or high humidity are likely, apply fungicide if crop has sufficient yield potential.</td>
</tr>
<tr>
<td><strong>Third critical period</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>End of flowering when pods are filling (15–20 weeks after emergence)</td>
<td>Ascochyta blight and/or rust plus</td>
<td>Chocolate spot</td>
<td>Mancozeb</td>
</tr>
<tr>
<td></td>
<td>Chocolate spot plus Ascochyta blight and/or rust</td>
<td>Mancozeb + carbendazim</td>
<td>If ascochyta or rust is present, rain is likely or new spots of chocolate spot or rust appear on unprotected leaves on the upper third of the plant, apply fungicide if the crop has sufficient yield potential.</td>
</tr>
<tr>
<td></td>
<td>Chocolate spot</td>
<td>–</td>
<td>Carbendazim</td>
</tr>
</tbody>
</table>

Observe all withholding periods.
**Ascochyta blight** (*Ascochyta fabae*)

**Description**

Dark leaf spots which show through both sides, becoming grey with age.

Leaf spots circular, becoming elongated; pale centres may fall out leaving holes in leaf; tiny black fruiting bodies develop within lesions.

Stems develop elongated, dark, sunken lesions; stems may split and break causing plants to lodge.

Pods develop black, sunken lesions, which can penetrate the pod and infect the developing seed. Badly infected seeds have brown or black stains.

First appears on leaves of seedlings when wet cold conditions occur, usually well before flowering. Progresses to infect upper leaves, flowers, stems and pods.

Infection on mature pods leads to seed staining, especially when late rains occur pre-harvest. Can develop on pods of windrowed crops.

Widespread in southern Australia.

**Management**

Grow varieties with resistance; sow disease-free seed; use crop rotation; sow away from vetch and bean residues (including self-sown plants). Apply fungicide during seedling stages 6–8 weeks after sowing. Spray before an average infection of one lesion per plant develops and rainfall is likely during the next week. A late fungicide application after flowering and no new growth is occurring assists in preventing seed staining.

Images: M Ramsey, formerly SARDI
Chocolate spot/grey mould  (*Botrytis fabae and B. cinerea*)

**Description**

Major disease in all bean growing areas. Infects plants at any stage but worse after flowering; defoliates plants and reduces pod set.

Favoured by temperatures 15 to 25°C and high humidity (70% +) for 4 to 5 days. Very rapid build-up (aggressive stage) during warm, humid conditions late in the season. Worse in early sown and dense crops, and heavy wet soils. Fluffy, grey fungal growth produces masses of spores on fallen leaves and petals under wet conditions.

Spots initially pinhead-sized circular, reddish-brown on leaves and flowers; initially spots on one side of leaf only, most obvious as ‘chocolate spots’ early in the season. Spores are wind blown so tends to be in the upper canopy. Spots expand rapidly under suitable conditions, blackening and killing large areas of leaf; infection can spread into stems.

Flowers turn brown and are killed, reducing pod set.

Pods develop reddish-brown, pinhead-sized spots. Pods may split allowing infection of seed, which may be covered in small reddish-brown spots. Severe infection can result in complete crop failure.

*(Above) Chocolate spot damage.*

*(Right) Pods covered in brown spots.*
Management

No varieties have resistance. Manage the canopy by delaying sowing; using crop rotation and sowing away from bean, lentil and vetch residues (including self-sown plants). Check the crop every seven days when temperatures below 15°C. Check every three days when 15-20°C and humidity over 70%. Fungicide application may be futile if disease has developed unchecked and the crop is bulky and lodged, preventing fungicide penetration into the canopy.

Less than 350 mm/year

- graze crop to reduce canopy size if required, or
- apply a protective fungicide only if disease risk is high in a seed production crop and humidity in the crop is likely to be high for at least a week, especially if signs of infection are present.

More than 450 mm/year

- graze crop to reduce canopy size if required, or
- apply a protective fungicide if disease is present or risk is high in a grain production crop and humidity in the crop is likely to be high for at least a week.
- Repeat (10–21 days in severe cases) before rain, as determined by unprotected growth, rain since last application and expected rain. Last spray when flowering ceased and no new growth expected.

Images: W Hawthorne, Pulse Australia; M Ramsey, formerly SARDI
DISEASE MANAGEMENT

Root rots (*Fusarium*, *Phoma*, *Rhizoctonia* and *Pythium* spp.)

**Description**
Plants are stunted and often die in patches. Leaves yellow and wilt before dying. Crown and stem bases are brown to black. Roots are blackened and root system severely reduced. Lateral roots are short with tips rotted and often pointed if *Rhizoctonia*. *Rhizoctonia* is favoured by weed and plant growth before sowing, sandy infertile soils and is more common if sown no-till.

**Management**
Control plant growth for at least several weeks prior to sowing. Ensure adequate nutrition. Shattering the soil below seed level at seeding will reduce *Rhizoctonia*. Avoid situations where wet, cold weather with poor soil structure and free surface water. Also close rotations of vetch, faba beans or other pulses, especially field peas and chickpeas.

Images: T Bretag, formerly VDPI; M Ramsey, formerly SARDI

**Rust (Uromyces viciae-fabae)**

**Description**
Rust is the most important disease of vetch in Australia. Severe infection causes premature defoliation, resulting in reduced seed size.

Can occur earlier in the season than in other pulses. Initial infection as creamy coloured spore masses on leaves; replaced by orange–brown pustules surrounded by a light yellow halo; severely infected leaves wither and drop off.

Rust pustules on stems are similar but often larger than on leaves, and become darker as plants mature. Isolated rust pustules may develop on the pods.

Occurs late season, during warm humid conditions through grain filling. Most prevalent in long season districts and warmer areas, e.g. northern NSW. Occasionally causes significant crop losses in southern areas.

Can develop very quickly under favorable conditions. Above 20°C the rust cycles every 10 days.

**Management**

Use a resistant variety.

Sow away from vetch and bean residues and self-sown plants remaining after sowing.

Where broad-spectrum fungicides are used as treatments for the other diseases, separate rust control is unlikely to be needed unless the product used does not control rust (e.g. carbendazim).

Graze the canopy to reduce susceptibility. Grazing rust infected plants has caused abortion in pregnant stock.

**Images:** R Matic, SARDI; M Ramsey, formerly SARDI

(Above) Rust pustules on leaflets.

Vetch plant covered in rust pustules.
**DISEASE MANAGEMENT**

**Sclerotinia stem rot** *(Sclerotinia sclerotiorum and S. trifoliorum)*

**Description**

Affects isolated plants at any stage of growth. Plants wilt and collapse.

Infects stems, leaves or pods; young plants develop a slimy-wet rot at ground level.

Plants have a blackened base covered with fluffy, white fungal growth and are easily pulled from the soil.

Sclerotones (2 to 5 mm in diameter) form on the surface and in the centre of stems. Sclerotones are white at first, then turn black and hard.

Occurs where a high number of pulse and oilseeds in the rotation; high seeding rates; cool wet conditions.

**Management**

Once established in a crop is difficult to control. Lower seeding rates, wider row spacing and good weed control give a more open crop less prone to disease. Rotation with cereals will decrease soil inoculum level.

*Sclerotinia* stem rot causes a soft watery rot with white cottony growth. Black resting bodies (sclerotia) often form inside the stem later in the season.

*Typical signs of Sclerotinia in lentils.*

Images: T Bretag, formerly VDPI; J Davidson, SARDI
Stem nematode (*Ditylenchus dipsaci*)

**Description**
Is not a recognised problem in vetch. It is a host but relatively tolerant compared to peas, oats and canola.
Patches of malformed and stunted plants.
Leaves curled with water-soaked spots.
Stems sometimes die back, turning reddish brown from the base and stopping at a leaf.
Herbicide damage can produce similar symptoms.
Only occurs in parts of South Australia.
Is worse in wet conditions.

**Management**
Sow nematode-free seed. Use Predicta™ B to assess soil status before sowing.
Do not introduce through infected straw/hay.
Avoid rotations of susceptible crops and weeds e.g. oats, wild oats, peas, vetch, and some broad leaf weeds e.g. bedstraw that increase nematode populations.

Characteristic malformed and stunted plant with curled leaves in *Vicia faba*.

*Image: A Dube, formerly SARDI*
Controlling viruses

Virus disease is not regarded as significant in vetch. Some viruses are seed borne, but most rely on living plant tissue to survive between seasons (green bridge).

AMV, BBWV, BYMV, CYVV and PSbMV are “non-persistent”, aphids losing their infectivity soon after feeding on healthy plants so aphids usually only spread them over short distances.

BLRV, BWYV, SbDV and SCSV (yellowing or luteoviruses) are “persistent”, the aphids remaining infected for life. These viruses can be spread by aphids over long distances. The relatively long feeding time needed for the aphid to transmit the virus makes them responsive to control by insecticides.

Virus symptoms can include yellowing, leaf mottles or mosaics, stunting and tip distortion. Symptoms can easily be mistaken for herbicide damage, nutrient deficiencies, salinity effects or other abiotic factors. It is difficult to diagnose a virus just on field symptoms. Growers are advised to seek expert advice. Crop patches or rings which increase over time often indicate the presence of a virus. Presence of aphids may indicate symptoms are caused by virus.

1. Seed-borne viruses can be controlled by sowing virus-free seed (<0.1% seed infection in high risk areas, <0.5% seed infection in low risk areas). Infection can come from infected neighbouring crops.

2. Minimise aphid landing sites. Avoid bare soil as aphids land in crops where there is a clearly defined contrast in colour between bare soil and green foliage. Ensure good crop establishment, retain standing cereal stubble and produce a dense canopy.

3. Minimise herbicide stress, as stressed plants are more attractive to aphids.

4. Control in-crop weeds (potential sources of virus) and/or vectors early.
Mosaic viruses: *Bean yellow mosaic virus* (BYMV), *Clover yellow vein virus* (CYVV), *Pea seed-borne mosaic virus* (PSbMV), *Broad bean wilt virus* (BBWV)

**Description**
Mosaic of dark green patches over pale green leaves, leaves mildly to severely distorted or with uneven surface. Little or no plant stunting.
Upper leaves cupped and erect, occasionally dead and blackened.
BYMV is widespread and common; other viruses are localised or less common. Transmitted from other infected legumes by aphids.

**Management**
Use disease-free seed. Prevent establishment of aphids in the crop.
Avoid planting near infected crops and pasture e.g. lucerne, medic and clovers.
Sow dense crops or avoid bare ground through having stubble cover.

Tip death caused by *Clover yellow vein virus*.
DISEASE MANAGEMENT

Yellowing viruses: *Bean leafroll virus* (BLRV), *Subterranean clover redleaf virus* (SCRLV), *Beet western yellows virus* (BWYV), *Subterranean clover stunt virus* (SCSV)

**Description**
Early infected whole plants are stunted and often die prematurely.

Late infection only affects the top of branches (‘top yellows’).

Leaves turn yellow, and become stiff later. Sometimes leaf edges are rolled upwards and leaflets come together giving leaves an upright appearance.

Causes major yield losses in parts of northern and central NSW.

BLRV is the most common and damaging virus.

Transmitted by aphids from neighbouring infected grain and pasture legumes, particularly lucerne.

**Management**
Use disease-free seed.

Prevent establishment of aphids in the crop.

Avoid planting near infected crops and pasture e.g. lucerne, medic and clovers.

Sow dense crops or avoid bare ground through having stubble cover.

Premature death of some vetch lines infected with *Bean leafroll virus* and *Subterranean clover redleaf virus*.

*Image: M Schwinghamer, NSW DII*
DISEASE MANAGEMENT

Rust affected crop.
Image: R Matic SARDI
Vetches do not compete well with weeds initially because of their lack of early plant vigour and insufficient plant populations to compete with early weeds. Tall, bulky and lodged crops compete well against weeds that emerge later.

It is essential to plan your weed control strategy before sowing. Delayed sowing to achieve several weed kills before sowing is not an option in most areas as vetch needs to be sown early. Application of pre-emergent herbicide is useful, and for broadleaf weeds the only option. Most grass weeds can be controlled either pre or post-emergence. Take care to apply the herbicide at the right growth stage of both vetch and weed.

Vetches provide a valuable opportunity to use alternative weed control practices to those used in cereal and oilseed phases. The opportunity to use grass herbicides, alternative herbicides and herbicide groups, as well as making hay, brown or green manuring or crop topping, assists in reducing the soil seed bank and hard to control weeds. Crop topping or desiccation may reduce vetch yield, but reduces the seed set of weeds, allowing minimal or no movement of the weed population towards herbicide resistance.
Effective weed control

Ensure a low seed bank of weeds. Only post-planting pre-emergence herbicides are registered to control broadleaved weeds. No-till farming results in fewer incorporated weed seeds and earlier, less staggered germinations. Apply post-emergent grass herbicides while canopies still allow adequate spray coverage of weeds. Controlling smaller weeds will usually result in more effective, more reliable and cheaper control with lower rates of herbicide.

Weeds such as bedstraw and bifora once limited the planting of vetch, but a limited number of herbicides now enable control of these weeds. Poor early crop competition can also result in ryegrass infested crops, but crop topping, harvesting as forage or green/brown manuring helps make vetch a more robust part of a rotation. The control of vetch in other pulse crops still largely relies on pre-season seed bank management.

- Control weeds as early as possible.
- Control when weeds and the crop are at the correct growth stage.
- Do not spray when weeds or the crop are under stress.
- Check the ‘rainfast’ period prior to rain.
- Do not spray in windy conditions over 15 km/hr.
- Use the right nozzle output and droplet size to ensure adequate coverage.
- Ensure the sprayrig is properly cleansed of damaging residual chemicals.
- Check the withholding period for grazing and harvest.

Grass weeds can compete strongly and allow a lot of increased seed set if left uncontrolled.

Image: T Yeatman, Rural Solutions SA
Most post-sowing pre-emergent (PSPE) herbicides can cause damage. In most cases this is due to product solubility and sowing too shallow, accumulation of herbicide into furrows from press wheels or an uneven soil surface. Herbicide applied to dry soil followed by heavy rainfall can wash into the root zone.

Herbicide crop injury symptoms can easily be confused with symptoms produced by other causes, such as from frost, disease, nutrient deficiencies or toxicities. Correctly diagnosing the cause of a specific set of symptoms can be difficult. Symptoms of crop damage from herbicides do not always mean there will be a loss in grain yield. Herbicide damage often predisposes plants to leaf disease which may be more damaging.

To reduce the risks of herbicide damage when using soil active products PSPE:

• Sow at 5 cm or deeper.
• Apply herbicide to a level soil surface (e.g. after prickle chaining, rolling).

• Ensure rolling after press wheels levels the furrow enough.
• Avoid applying herbicide post-sowing to dry soils in front of heavy rainfall.
• Choose the right rate for your soil type (lower rates for lighter soils).
• Apply herbicide incorporated by seeding (IBS) or a split application.

Herbicide damage greatly affecting a vetch crop.
Tolerance of vetch species to a range of herbicides

Although there is a range of grass herbicides that are able to be applied to vetch, only flumetsulam is registered for post emergent application for broadleafed weeds. The vetch groups vary in their tolerance to various herbicides, with Popany often being most tolerant and of late enough maturity to be able to recover from any herbicide effects.

<table>
<thead>
<tr>
<th>Species</th>
<th>Herbicides</th>
<th>PSPE</th>
<th>PE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Flumetsulam (Popany only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diuron (NR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Metribuzin (NR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Simazine (NR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grass herbicides e.g. Pendimethalin (NR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Imazethapyr (NR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Imazethapyr (NR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common</td>
<td>Nil</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Woolly pod</td>
<td>High</td>
<td>High</td>
<td>Nil</td>
</tr>
<tr>
<td>Purple</td>
<td>High</td>
<td>High</td>
<td>Medium</td>
</tr>
</tbody>
</table>

NR = not registered
Herbicide damage effects and symptoms in vetch

**Group B  Inhibitors of the enzyme ALS**

<table>
<thead>
<tr>
<th>Sulfonylureas (SUs)</th>
<th>Triazolopyridines</th>
<th>Imidazolinones (IMIs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical name</td>
<td>Trade name*</td>
<td>Chemical name</td>
</tr>
<tr>
<td>metsulfuron</td>
<td>Ally®</td>
<td>flumetsulam</td>
</tr>
<tr>
<td>chlorsulfuron</td>
<td>Glean®</td>
<td>metosulam</td>
</tr>
<tr>
<td>iodosulfuron</td>
<td>Hussar®</td>
<td>florasulam</td>
</tr>
<tr>
<td>triasulfuron</td>
<td>Logran®</td>
<td>Florasulam + MCPA ester</td>
</tr>
<tr>
<td>sulfosulfuron</td>
<td>Monza®</td>
<td></td>
</tr>
<tr>
<td>mesosulfuron + mfenpyr</td>
<td>Atlantis®</td>
<td></td>
</tr>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

*Representative products of many for most chemicals.

**Description**

Visual symptoms appear 5 to 8 days after spray application or where there are residues in the soil. Seedlings may emerge and grow for several weeks before plants become stunted with shortened internodes. New foliage is yellow to red to purplish, progressing throughout the plant. Leaf curl may be apparent. Growth of lateral roots may be reduced.

**Management**

Follow plant-back periods as indicated on label where high pH calcareous soils (pHCaCl2 >7.5). A Group B herbicide can result in more significant crop damage when applied where Group B residues exist. Cold, wet conditions, conditions that stress and prevent the plant recovering, zinc deficiency and compacted soil (e.g. wheel tracks) can be contributing factors. Grass herbicides can strip residues from the spray boom and tank.

Yellow new leaflets from iodosulfuron.

*Image: T Yeatman, Rural Solutions SA*
**Group C** Inhibitors of photosynthesis

<table>
<thead>
<tr>
<th>Triazines</th>
<th>Triazinones</th>
<th>Ureas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical name</td>
<td>Trade name*</td>
<td>Chemical name</td>
</tr>
<tr>
<td>atrazine</td>
<td>Gesaprim®</td>
<td>metribuzin</td>
</tr>
<tr>
<td>simazine</td>
<td>Gesatop®</td>
<td></td>
</tr>
<tr>
<td>terbutryn</td>
<td>Igran®</td>
<td>bromoxynil</td>
</tr>
</tbody>
</table>

*Nitrile*  *Phenyl-pyridazine*

*Representative products of many for most chemicals.

**Description**
Visual symptoms appear as weeds emerge (where soil applied) or 4 to 6 days after spray application to emerged weeds. Symptoms develop rapidly but require light. Rapid yellowing and necrosis beginning at the edge of leaves leads to their desiccation and burnt appearance. Interveinal chlorosis or veinal chlorosis can occur. Tolerant plants (crops) often recover.

**Management**
Follow plant-back periods as indicated on the label where soils are alkaline and calcareous, leachable with low organic matter, or of lighter texture. Duplex soils with shallow sand over heavy clay also present a risk of damage. Damage is most likely from herbicide leaching into seed furrows after heavy rainfall in ridged soils and where there is shallow sowing.

Images: R Matic, SARDI
Group D  Inhibitors of cell division

<table>
<thead>
<tr>
<th>Dinitro-anilines (DNAs)</th>
<th>Benzamides</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical name</td>
<td>Trade name*</td>
</tr>
<tr>
<td>pendimethalin</td>
<td>Stomp®</td>
</tr>
<tr>
<td>trifluralin</td>
<td>Trifluralin®</td>
</tr>
<tr>
<td>trifluralin + oryzalin</td>
<td>Yield®</td>
</tr>
</tbody>
</table>

*Representative products of many for most chemicals.

Description
Visual symptoms appear as the crop emerges with intermittent emergence along drill rows as a result of shortening and thickening of the hypocotyl.

Seeds germinate, but shoots are unable to emerge. Emerging leaves in affected plants may be twisted and distorted.

Roots can be shortened and thicken.

Management
Avoid sowing seed into the layer of herbicide treated soil. This results from the seeder set-up resulting in variable depth of sowing, or sowing too fast throwing herbicide treated soil onto adjacent furrows.

Symptoms are often worse where wet cold conditions and slow germination and emergence.

(Right) A normal seedling left, and trifluralin affected seedling right.

Images: C Preston, University of Adelaide
Group F  Inhibitors of carotenoid biosynthesis

<table>
<thead>
<tr>
<th>Nicotinanalides</th>
<th>Picolinamides</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical name</td>
<td>Trade name*</td>
</tr>
<tr>
<td>Diflufenican</td>
<td>Brodal®</td>
</tr>
<tr>
<td>Picolinafen</td>
<td>Sniper®</td>
</tr>
</tbody>
</table>

*Representative products of many for most chemicals.

**Description**
White/yellow spots/bands may develop within three to four days after application (two days in bright sunny weather).

Plants turn light green and whole leaves turn yellow to cream colour for 4–6 weeks.

Effects disappear as new growth develops with no long term effects.

**Management**
Effects are worse when applied to crops suffering stress such as frost, cold wet conditions or high temperatures soon after spraying.
**Group G**  Inhibitors of protoporphyrinogen

<table>
<thead>
<tr>
<th>Diphenylethers</th>
<th>Triazolinones</th>
<th>Pyrimidindiones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical name</td>
<td>Trade name*</td>
<td>Chemical name</td>
</tr>
<tr>
<td>oxyfluorfen</td>
<td>Goal®</td>
<td>carfentrazone</td>
</tr>
<tr>
<td></td>
<td>Spark®</td>
<td>Butafenacil</td>
</tr>
<tr>
<td></td>
<td>Striker®</td>
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</tr>
<tr>
<td><strong>N-diphenylphthalamides</strong></td>
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</tr>
<tr>
<td>flumioxazin</td>
<td>Pledge®</td>
<td></td>
</tr>
</tbody>
</table>

*Representative products of many for most chemicals.

**Description**
Numerous white spots on the leaves from the droplets of herbicide contact within one or two days of application.

May lead to desiccation and death in vetch although grasses and cereals generally recover.

**Management**
Ensure that herbicide drift does not occur onto faba bean crops, especially where fine droplets are targeted for the use of products as indicated by the label.

(Above)
Carfentrazone affected leaves.

Oxyfluorfen affected leaves.

Images: T Yeatman, Rural Solutions SA
## Group I Disruptors of plant cell growth

<table>
<thead>
<tr>
<th>Phenoxy carbolic acids</th>
<th>Benzoic acids</th>
<th>Pyridines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical name</td>
<td>Trade name*</td>
<td>Chemical name</td>
</tr>
<tr>
<td>2,4-D amine</td>
<td>Many</td>
<td>dicamba</td>
</tr>
<tr>
<td>2,4-D ester</td>
<td>Many</td>
<td></td>
</tr>
<tr>
<td>MCPA amine</td>
<td>Many</td>
<td></td>
</tr>
<tr>
<td>MCPA ester</td>
<td>Many</td>
<td></td>
</tr>
<tr>
<td>MCPB</td>
<td>MCPB®</td>
<td></td>
</tr>
<tr>
<td>2,4-DB</td>
<td>Trifolamine®</td>
<td></td>
</tr>
</tbody>
</table>

*Representative products of many for most chemicals.

### Description

Visual symptoms appear within 3 to 4 days of application. Plants start to twist and appear misshapen with downward bending and twisting of stems and petioles. Stems swell especially at nodes, elongation, leaf cupping and curling.

This is followed by yellowing at the growing point, reduced growth, wilting and necrosis.

Leaves may be mottled.

Death occurs slowly over 3–5 weeks.

Clopyralid residues occur where a dry season follows application.

### Management

Delay seeding if there might be residues from pre-sowing application.

Observe plantback limitations.

Ensure that herbicide drift does not occur onto vetch crops.
**Group J** Inhibitors of fat synthesis

<table>
<thead>
<tr>
<th>Thiocarbamates</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chemical name</strong></td>
<td><strong>Trade name</strong>*</td>
</tr>
<tr>
<td>tri-allate</td>
<td>Avadex®</td>
</tr>
</tbody>
</table>

*Representative products of many for most chemicals.

**Description**
Visual symptoms appear underground or as the crop emerges with reduced or poor seedling emergence.

Shoots, if emerged, are often swollen and bright green.

Roots are often pruned, leaving stubby root knobs.

**Management**
Ensure seed is not sown into the band of herbicide in the soil. Effects are worse when wet, cold conditions slow germination and emergence.

*(Above)* Visual symptoms appear as the crop emerges.

*(Left)* Root and shoot effects of tri-allate affected vetch seedling right, compared with a normal seedling left.

*(Right)* Root and shoot effects of tri-allate.

Images: C Preston, University of Adelaide
**Group K Inhibitors of cell division and very long chain fatty acids**

<table>
<thead>
<tr>
<th>Chloroacetamides</th>
<th>Chemical name</th>
<th>Trade name*</th>
</tr>
</thead>
<tbody>
<tr>
<td>metolachlor</td>
<td>Dual®</td>
<td></td>
</tr>
</tbody>
</table>

*Representative products of many for most chemicals.

**Description**
Visual symptoms appear as the crop emerges with reduced or poor seedling emergence. Seedlings are malformed and twisted, with transitory crop yellowing. In most cases weeds do not appear.

**Management**
Ensure seed is not sown into the band of herbicide in the soil.

Effects are more severe in light-textured soils with low organic matter, in waterlogged conditions, where crops are stressed from lack of moisture or lack of nutrients, and when frost occurs within 10 days of application.

(Above, right) Malformed and twisted seedling.

(Above) Visual symptoms appear as the crop emerges.

(Left) Malformed and twisted seedling affected by metalochlor right, compared with a normal seedling left.

*Images: C Preston, University of Adelaide*
**Group L** Inhibitors of photosynthesis (photosystem I)

<table>
<thead>
<tr>
<th>Bipyridyls</th>
<th>Chemical name</th>
<th>Trade name*</th>
</tr>
</thead>
<tbody>
<tr>
<td>paraquat</td>
<td>Gramoxone®</td>
<td></td>
</tr>
<tr>
<td>diquat</td>
<td>Reglone®</td>
<td></td>
</tr>
<tr>
<td>diquat + paraquat</td>
<td>Spray.Seed®</td>
<td></td>
</tr>
</tbody>
</table>

*Representative products of many for most chemicals.

**Description**

Visual symptoms appear within hours of application with spots of dead tissue on otherwise healthy leaves. There may also be wilting and inter-veinal yellowing followed by browning and blackening of the leaf edges.

Plants shrivel up within four days of application if damage is severe.

Signs are often worse on one side of the plant or stem.

Effects disappear as new growth develops.

**Management**

Ensure that herbicide drift does not occur onto vetch crops.

Images: T Yeatman, Rural Solutions SA
**Group M**  Inhibitors of amino acid synthesis

<table>
<thead>
<tr>
<th>Glycines</th>
<th>Chemical name</th>
<th>Trade name*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>glyphosate</td>
<td>Credit®, Roundup®, Touchdown®</td>
</tr>
</tbody>
</table>

*Representative products of many for most chemicals.

**Description**

Symptoms are most obvious at growing points within five to seven days of application.

Plants are stunted (growth stopped until recovery or death) with leaves turning yellow to red, followed by browning.

There may be some twisting of plants.

Plants look flaccid and tend to lie on the soil surface.

**Management**

Ensure that herbicide drift does not occur onto vetch crops.

*Images: T Yeatman, M Wurst, Rural Solutions SA*
Chemical leaf spotting

**Description**
Grey or brown spots on leaves, which do not necessarily show through both sides.

Herbicide (e.g. Group A) applied at high temperature with oils or surfactants added.

Leaf burning from trace element foliar applications.

From frost or high temperatures soon after spraying.

**Management**
Be alert to label restrictions for temperature, frost, water rates, droplet size, additives and adjuvants.

Typical Group A plus adjuvant spotting and leaf necrosis in chickpeas.

*Image: V DPI*
WEED MANAGEMENT
Avoiding and managing herbicide resistance

Key points on resistance:
1. Weed numbers – the higher the numbers the greater the risk of resistant weeds being present.
2. Each herbicide application will increase the proportion of resistant individuals in the population.
3. Resistance is generally not reversible (particularly for Group A and B herbicides).
4. The proportion of resistance in subsequent populations is not increased after the use of a herbicide if seed set is prevented.
5. Resistance occurs quickest where there is repeated use of only a limited number of weed control methods.

Management tactics

<table>
<thead>
<tr>
<th>Tactic</th>
<th>Management</th>
<th>Practical issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deplete weed seed bank in the soil</td>
<td>Burn residues</td>
<td>Increase erosion risk on some soils</td>
</tr>
<tr>
<td></td>
<td>Invert seedbank by ploughing</td>
<td>Only practical in deep soils</td>
</tr>
<tr>
<td></td>
<td>Autumn tickle</td>
<td>Useful to increase weed germination</td>
</tr>
<tr>
<td></td>
<td>Delay sowing</td>
<td>Only practical in years with an early break</td>
</tr>
<tr>
<td></td>
<td>No-till seeding</td>
<td>Keeps seed on surface from germinating</td>
</tr>
<tr>
<td>Control seedling weeds in the target area</td>
<td>Fallow and cultivate pre-sowing</td>
<td>Can increase germination of dormant weed seeds</td>
</tr>
</tbody>
</table>

Herbicides

- Knockdown herbicides
- Double knockdown
- Pre-emergent herbicides

Herbicides

- Glyphosate or paraquat plus spike for difficult to control weeds
- Glyphosate followed by paraquat three to four days later
- Trifluralin (Group D) + Dual® Gold (Group K) or Avadex® (Group E) mix
**Tactic** | **Management** | **Practical issues**
--- | --- | ---
Selective post-emergent herbicides | Group A herbicides applied when weeds small and actively growing  
Clearfield™ system  
Atrazine and simazine application to triazine tolerant varieties |  

Non-selective post-emergent herbicides | Glyphosate application to Roundup Ready® varieties  
Glufosinate application to InVigour® varieties |  

Crop competition | Sow early using narrow row spacing  
Ensure correct sowing depth and good seed-soil contact for rapid and even emergence |  

Stop weed seed set | **In-crop weed management**  
Cut for hay | This may be the best longer-term option where there are high numbers of resistant weeds  
Windrow | Will reduce seed set  
Crop topping | Apply Roundup Power Max® or paraquat to kill surviving plants/stop seed set |  

Prevent viable weed seeds being added to seed bank | Weed seed collection at harvest | May be impractical; slowing harvest, demand on header power, disposal of weed seeds  
Weed seed destruction at harvest | Not yet available; greater power requirement; degree of effectiveness |  
Narrow header rows | Enables header rows to be burnt |  

Prevent introduction of viable weed seed | Sow weed-free seed  
Clean farm machinery and vehicles  
Prevent introduction in hay and grain |  

**WEED MANAGEMENT**
Vetch should be self sufficient for nitrogen if well nodulated. Rates of 5–10 kg/ha of “starter” N to aid establishment may be useful on lighter and slightly acid soils.

Phosphorus removal is about 4 kg P per tonne of grain. Apply phosphorus to replace grain or forage removal and soil tie-up to maintain available P levels. More is required on soils such as calcareous soils with a higher buffering index.

Soil tests are best able to indicate P availability.

Use tissue testing to monitor the availability of trace elements. Zinc is required for vetch on alkaline soils. Manganese is sometimes required for vetch on highly alkaline soils or under fluffy soil conditions. Foliar applications of iron may be needed for vetch grown on highly alkaline and wet soils. Vetch may respond to molybdenum in soils that are deficient.
As for other crops, vetch needs an adequate supply of both the major and minor nutrients for growth and to maximise yield. When grain is harvested from the paddock, nutrients are removed in the grain in the following amounts.

**Guide to nutrient removal in one tonne of vetch grain.**

<table>
<thead>
<tr>
<th>Major nutrients (kg)</th>
<th>Minor nutrients (g)</th>
<th>Grain</th>
<th>Grain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen N</td>
<td>Copper Cu</td>
<td>44</td>
<td>8*</td>
</tr>
<tr>
<td>Phosphorus P</td>
<td>Zinc Zn</td>
<td>3.8</td>
<td>26*</td>
</tr>
<tr>
<td>Potassium K</td>
<td>Manganese Mn</td>
<td>10*</td>
<td>12*</td>
</tr>
<tr>
<td>Sulphur S</td>
<td></td>
<td>1.5*</td>
<td></td>
</tr>
<tr>
<td>Calcium Ca</td>
<td></td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Magnesium Mg</td>
<td></td>
<td>1.2*</td>
<td></td>
</tr>
</tbody>
</table>

*Field pea values, estimated to be similar for vetch.

**The main deficiencies encountered in vetch are:**

- **Nitrogen**: When nodulation is poor or ineffective (e.g. in acid soils)
- **Phosphorus**: On high production or calcareous ground with inadequate history of phosphorus input
- **Zinc**: On many alkaline soils with high lime content
- **Manganese**: On many alkaline soils high with lime content

**Toxicity**

Vetch is affected by high salinity and boron levels encountered in sub-soils in many areas in the southern cropping zone in Australia. They are also very sensitive to aluminium and manganese toxicity which often occur on acidic soils generally unsuitable for vetch.
## A guide to nutrient deficiencies

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>Old to middle leaves</th>
<th>Middle to new leaves</th>
<th>New leaves to terminal shoots</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEFICIENCY</td>
<td>N</td>
<td>P</td>
<td>S</td>
</tr>
<tr>
<td>Chlorosis</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Mottled</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Interverinal</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>On margins</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Necrosis</td>
<td>Complete</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distinct areas (including spotting)</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Margins</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tips</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Pigmentation within necrotic or chlorotic areas</td>
<td>Purple</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Dark green</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brown</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Red</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Malformation of leaflets</td>
<td>Rolling in of margin</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Wilting</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Twisting</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Malformation of leaves</td>
<td>Cupping</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Umbrella formation</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malformation of stems and roots</td>
<td>Internode shortening</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Petiole collapse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Root distortion</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Symptoms of Nutrient Disorders – Faba Beans & Field Peas, Snowball and Robson (1991), University of Western Australia. * = mild*
Copper deficiency

Description
Older to middle leaves become mottled yellow to brownish pink, with dead tissue around the edges and tips. Light yellow-green spots form on the leaf.
Plants are shortened with wilting and puckering distortion of new leaflets. Shrivelling of the leaf tip and aborted flowers.
It is worse on highly alkaline soils, very infertile siliceous sands and soils with a low zinc fertiliser history.

Management
Leaf tissue tests will determine the plant’s copper status at sampling.
Apply copper at seeding in fertiliser, by liquid injection, on the seed or as a foliar application.

Characteristic copper deficient leaves in field peas, right; and copper adequate leaves, left.

Images: A Robson, University of Western Australia
Iron deficiency

**Description**
Often appears in young plants. Is related to soil type where there is a high lime content in cold, wet conditions. Plants often recover as conditions warm.

Deficiency shows up as chlorotic leaves and poor growth. New leaves and young growth become yellow, causing smaller and unfolded leaves. Chlorotic leaves roll along their margins of barely opened leaflets. Deficiency then spreads to older leaves and young growth stops. Stems become slender and shortened.

**Management**
Iron deficiency can be transient and foliar iron applications may not necessarily be absorbed into the leaf if symptoms are severe.

Avoid high pH calcareous soils.

*(Left) Chickpea plants showing iron deficiency.*

*New leaves and young growth turn yellow.*

*Images: T Bretag, formerly VDPI; W Hawthorne, Pulse Australia*
Manganese deficiency

Description
Common on highly alkaline calcareous soils. Worse on fluffy soils with wheel tracks not as badly affected.

Yellowing between the veins of younger leaves, often in specks. Purple spotting of fully and partially opened new leaves and even unopened leaves. Many affected new leaves show distortion as if the margins are growing at different rates, resulting in twisted leaves.

Deficiency late in the season may lead to discolouration, splitting and deformity of seed.

Management
Leaf tissue tests will determine the plant’s manganese status at sampling.

Apply manganese at seeding in fertiliser, by liquid injection, on the seed or as a foliar application.

Images: N Wilhelm, SARDI; A Robson, University of Western Australia

Typical yellowing between the veins of young leaves.

(Above) Young leaves showing typical yellowing between veins with mottling on the young and middle leaves in faba beans.

Degrees of manganese deficiency in new leaves and new growth in faba beans.
Potassium deficiency

Description
Older leaves exhibit deficiency symptoms first. Initially shows as stunted growth, particularly if compared with other areas of the paddock with soil of higher potassium levels (e.g. burnt windrows).

Lower leaves exhibit greying leaf margins and eventually shrivel and die. Also cupping of leaves and some purple blotching across leaves.

Management
Determine availability of potassium with a soil test.

Apply potassium in fertiliser.

Apply clay and organic matter to sandy soils to increase the capacity to hold nutrients such as potassium.

Apply potassium as a foliar application 6 to 8 weeks after sowing.

Image: W Hawthorne, Pulse Australia

Potassium deficient faba beans severely stunted and leaf edges of older leaves blackened with slight curling of leaves, right; normal plants, left.
Zinc deficiency

Description
Older to middle leaves become mottled yellow to brownish pink, with dead tissue around the edges and tips.

Plants are shortened with wilting and distortion of older leaflets.

Worse on highly alkaline soils, very infertile siliceous sands and soils with a low zinc fertiliser history.

Management
Leaf tissue tests will determine the plant’s zinc status at sampling.

Apply zinc at seeding in fertiliser, by liquid injection, on the seed or as a foliar application. Soil applied zinc should be re-applied every 2–7 years depending on soil type.

A response to applied zinc requires adequate phosphorus levels to be present.

(Above) Stunted zinc deficient faba beans with smaller leaves, right.

(Right) Middle to older leaves become mottled with reddish brown spots.

Zinc deficient field pea leaves, right; zinc adequate leaves, left.

Images: D Lewis, formerly SARDI; W Hawthorne, Pulse Australia; A Robson, University of Western Australia
Nodulation failure

Description
Plants become yellow or pale green with restricted growth, especially during cold, wet periods through the seedling stages. Oldest leaves are the worst affected.

There are few or no nodules on the roots or nodules lack red pigmentation inside.

Plants can appear normal until flowering on soils with moderate to high nitrogen levels when they become pale green. Older leaves are affected most and first.

Management
As a salvage operation, apply nitrogen needs of affected crops with N fertiliser if economic. Ensure future crops are adequately inoculated with viable Group F inoculum.

In assessing the effectiveness of nodulation, the more nodules and the earlier the infection (i.e. on the tap and crown roots) the better. Nodules need to be pink to be effective.

<table>
<thead>
<tr>
<th>Nodule score</th>
<th>Distribution and number of effective nodules</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Crown/Tap root</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0.5</td>
<td>0</td>
</tr>
<tr>
<td>1.0</td>
<td>0</td>
</tr>
<tr>
<td>1.5</td>
<td>0</td>
</tr>
<tr>
<td>2.0</td>
<td>Few</td>
</tr>
<tr>
<td>2.5</td>
<td>Few</td>
</tr>
<tr>
<td>3.0</td>
<td>Many</td>
</tr>
<tr>
<td>4.0</td>
<td>Many</td>
</tr>
<tr>
<td>5.0</td>
<td>Many</td>
</tr>
</tbody>
</table>

Legume nodulation rating

Images: T Yeatman, Rural Solutions SA
Drought

Description
Lack of growing season rainfall can lead to poor establishment, growth and very short crops resulting in difficulties harvesting.

A dry spring after adequate rains in winter can lead to poor yields with poor grain fill and smaller grain.

Warm, windy weather with dry conditions in spring can result in reduced flower set, poor grain fill, smaller grain and low yield.

Management
Sow early in the sowing period in early maturing areas. Sow earlier maturing varieties.

Retain stubble cover from previous crops (standing or mulch) to minimise moisture loss.

Control summer weeds.

Affected grain crops may be more profitable if cut for hay or silage.

Images: T Yeatman, Rural Solutions SA; W Hawthorne, Pulse Australia
**Frost**

**Description**
Vetch plants can tolerate frost during vegetative stages, but severe frosts can deform stems and cause lodging.

Frost during flowering and podding can cause significant yield loss and damage to grain. Plants drop flowers and abort setting pods. Immature grain is prevented from further development. Leaf edges, flowers, pods and immature seeds may be black. Stems and leaves can blister and distort.

Milder frosts blacken developing seeds with all seeds in a pod not necessarily affected. Pods are puffy and the outer layer of skin tends to lift producing a mottled appearance. In severe frost, stems weaken and bend (split). Plants are generally not killed. Grain that is nearly mature may become discoloured and distorted.

**Management**
Avoid sowing for grain in areas particularly prone to severe frost damage. Choose sowing dates or variety maturity to reduce the risk of frost. Roll or clay sandy surfaced soils. Maintain adequate nutrition. Sowing in a north-south direction and sowing down hill to channel cold air away may reduce frost risk. Wider row spacing may increase frost risk.

Affected grain crops may be more profitable if cut for hay or silage.

Images: W Hawthorne, Pulse Australia; M Ramsey, formerly SARDI
Hail

Description
During the vegetative stage hail can shred leaves and slow crop development. Stems can be severely bruised or cut off completely. Stem breakage or bruising is often on one side.

Later, it can remove flowers and pods or flatten crops making them hard to harvest and pods can shatter in mature crops reducing yields severely.

Hail usually damages a swathe through the crop.

Management
Offset risk in prone areas with a range of crops and varieties maturing at differing times.

Invest in adequate hail insurance.

Affected grain crops may be more profitable if cut for hay or silage.

Images: T Bretag, formerly VDPI; Grain Legume Handbook

(Left) Hail has caused the bruising and laceration of stems.

(Right) Hail damage flattened and curved the pod in field peas leaving white spots on the outer skin.
Lodging

Description
Vetches lodge naturally, being weak stemmed and tall. They have an increased foliar disease risk when lodged early during flowering. Ascochyta infected crops lodge earlier because of stem lesions.

Lodging at flowering can shade flowers leading to flower abortion and reduced seed set through disease or less light. Severe lodging near harvest makes vetches slower and more difficult to harvest, leading to greater grain or forage losses.

Weather conditions before harvest determine degree of lodging at maturity. Shorter, earlier varieties may lodge less than those taller and with a longer growing season.

Management
Accept that all varieties are prone to lodging.

Sow later to match sowing time with the environment in which it is grown, so as not to grow excessive bulk.

Harvest early, prior to wet or windy weather as delays lead to even greater lodging. Crop lifters are required for grain harvest, and harvest direction may have to be adjusted to pick up the lodged crop.

Images: T Yeatman, Rural Solutions SA; W Hawthorne, Pulse Australia

A lodged crop.

Namoi vetch crop in mallee showing lodging and height.
Waterlogging

**Description**
Plants can show symptoms of iron and/or nitrogen deficiency.

Plants can appear to survive waterlogging, but quickly die after the soil dries.

Root systems are shallow and blackened with root rots.

Woolly pod and purple vetches are more tolerant to waterlogging than common vetch.

**Management**
Avoid poorly drained soils and areas prone to waterlogging.

Improve drainage and movement of water away from the vetch paddock.

Sow early to ensure emergence and adequate growth before water lays.

Delay sowing in higher rainfall areas.

Sow into raised beds or into hilled soil.
Weather damaged grain

Description

Weather damage is a general term to describe visible damage to the seed coat or kernel due to some form of weather event prior to harvest. Weather damage may lead to poor colour, loose seed coat, sprouting, wrinkling or other defects.

Wrinkled seed – arises from stress during the maturation phase that causes damage to the seed coat. The seed coat must be significantly indented into the kernel as coarse rather than soft waves.

Loose seed coat – is caused by weather conditions such as rain near harvest or poor handling or harvesting techniques. It results in breakage or cracking of the seed coat that might be separated from the kernel or about to separate.

Shrivelled seed – arises from some form of stress during the maturation phase. Seed coats may be wrinkled, significantly indented into the kernel and tightly adhere to the kernel. Grains are often smaller than the majority of the sample.

Management

Desiccate or windrow vetch and harvest as early as possible for grain.

Grow vetch as a forage crop and harvest as hay or silage to avoid weather damage at grain harvest.

Images: R Matic, SARDI
Weather damaged forage

Rain can cause loss of cut forage quality prior to baling through loss of colour, stock feed value and mould. Forage too wet can severely affect silage quality. Time of cutting, windrowing, tedding, conditioning, chopping and promptness of baling or ensiling at the correct moisture can help avoid adverse weather damage.

Mould
The growth of mould in warm, moist conditions can adversely affect appearance and colour, palatability, feed value and may become toxic to stock.

Discolouration
Discolouration can indicate factors that affect the value of the hay or silage to end-users.

Loss of feed value
Palatability, digestibility and energy value can all be reduced by weather damage.
INSECT PESTS — Aphids

Bluegreen aphid (Acyrthosiphon kondoi)

Description
Aphids are a major pest of vetch. Adults are 3 mm long, may have wings; vary from grey-green to blue-green; have two long siphuncles that extend beyond the base of the abdomen. They are normally found on the upper part of the plant, particularly on growing points. Nymphs are similar but smaller in size.

Adults and nymphs suck sap causing misshapen leaves, yellowing and stunting. Honeydew and black sooty mould can occur with high numbers. They can vector plant virus diseases.

Management
This pest is more common in cooler months, but check all stages of the crop.

Apply an aphicide when necessary to avoid economic damage. A border spray can provide sufficient control earlier in the season when aphids move into crop edges.

Biocontrol
Aphid diseases, aphid wasp parasites, ladybird beetles, hoverflies and lacewings.

Images: SARDI; DAFWA
Cowpea aphid (*Aphis craccivora*)

**Description**
Adults are shiny black, up to 2 mm long and may have wings. Nymphs are dull grey. All stages have white and black legs. They form dense colonies on the growing points of a single plant before moving onto other surrounding plants.

Heavy infestations deform leaves, growing points and stunt plants. Very dense colonies may cause visible wilting and severe yield loss. Honeydew and black sooty mould can occur with high numbers. They can spread many plant viral diseases.

**Management**
Check all crop stages especially during flowering. Apply an aphicide when necessary to avoid economic damage. A border spray can provide sufficient control earlier in the season when aphids move into crop edges.

**Biocontrol**
Aphid diseases, aphid wasp parasites, ladybird beetles, hoverflies and lacewings.

Images: M Ramsey, formerly SARDI; SARDI; R Matic, SARDI

(Above) Non-winged adults, nymphs and cast skins. (Left) Infestation on faba bean growing tips.
INSECT PESTS — Moths and caterpillars

Cutworms (common cutworm or bogong moth, black cutworm, brown or pink cutworm and herringbone cutworm)  
(*Agrotis infusa, Agrotis ipsilon, Agrotis munda* and other *Agrotis* species)

**Description**

Larvae are hairless and appear greasy, have dark heads and usually darkish coloured bodies. They are up to 50 mm long, curl up and remain still if disturbed. Larvae live and pupate in the soil and emerge at night to feed at or near ground level, on the leaves or stem. Large larvae often cut through the stems of young seedlings, hence the name “cutworms”.

*A. infusa* (common cutworm or bogong moth) larvae are black, green-brown or grey. They are sporadic pests that cause damage in late winter and early spring. Moths vary from dull dark-brown to black and have a wingspan of 30–50 mm. Moths emerge in late spring or early summer and are often observed entering houses and buildings for shelter over summer.

Images: SARDI; DAFWA
A. munda (brown or pink cutworm) larvae are greyish-green to brown without distinct markings, becoming darker as they mature. Moths are light to dark brown with a wingspan of 30–40 mm and have one or two generations per year. Forewings have a grey-brown pattern and hindwings are whitish. Moths of other Agrotis species are usually a dull brown-black in colour. Herringbone cutworm larvae have diagonal markings along their body.

**Management**
Check crops from emergence through to establishment. Damage is often patchy. Larvae are usually just beneath the soil surface during the day and emerge to feed at night. Check the base of healthy or recently damaged plants adjoining damaged, bare or thin areas.

**Biocontrol**
Orange caterpillar parasite, two-toned caterpillar parasite, orchid dupe, caterpillar fungal diseases, spiders and *Bacillus thuringiensis* (Bt).
Brown pasture looper (*Ciampa arietaria*)

**Description**
Larvae are up to 25 mm long, dark brown to grey with a yellow line along the back either side of a conspicuous dark band. A red colouration surrounds the spiracles (breathing holes) on the sides of their body. Larvae move with a looping action except when mature. Moths are 20 mm long and are pale dusty-brown with grey and brown streaking on the forewings. Wings are held over the body at rest. One generation occurs per year.

Larvae feed on leaves, usually from July to October. Older larvae can move in large numbers into crops from adjoining pastures, resulting in severe defoliation.

**Management**
Check crops after establishment particularly around the perimeter of the crop. High numbers can be found on broadleaf weeds, particularly capeweed.

**Biocontrol**
Glossy shield bug, spined predatory shield bug and caterpillar egg parasites.

Images: SARDI; DAFWA
Looper caterpillar \textit{(Chrysodeixis sp.)}

**Description**
Larvae have a predominantly green body that tapers towards the head. Newly hatched larvae have dark heads. Older larvae have white lines running the length of the body and are up to 35 mm long. Larvae move with a distinctive looping action and have two pairs of abdominal prolegs. Moths are up to 40 mm long, mottled grey or brown with distinct silvery and irregular shaped markings on the forewings. Several generations occur from autumn to spring.

Larvae feed on leaves leaving large holes.

**Management**
Larvae may be noticed when checking for other pests but do not require special attention.

**Biocontrol**
Glossy shield bug, spined predatory shield bug, tachinid flies, orange caterpillar parasite, two-toned caterpillar parasite, orchid dupe, \textit{Bacillus thuringiensis} (Bt) and \textit{Nuclear polyhedrosis virus} (NPV).

\textbf{Images: DAFWA; P Reid, QPIF}
Native budworm and corn earworm or cotton bollworm
(*Helicoverpa punctigera* and *Helicoverpa armigera*)

**Description**
Larvae of both species grow to 40 mm long with considerable colour variation (usually shades of brown, green and orange) with lines and bands running along the length of the body. The body is sparsely covered with small bumps, bristles and long, stiff black hairs. Newly hatched larvae are 1–2 mm in length, light in colour with tiny dark spots and dark heads. As larvae develop they become darker and the darker spots more obvious. Both species of *Helicoverpa* have four pairs of abdominal prolegs in addition to a pair of anal prolegs.

Larvae typically feed high up on plants with their heads buried in buds, flowers, fruiting parts and seeds. Less serious damage occurs when larvae chew on leaves. Larvae of all sizes damage seed pods.

*H. armigera* have white hairs around the head; medium larvae have a saddle of darker pigment on the fourth abdominal segment (see photo) and dark coloured legs. *H. punctigera* have black hairs around the head; medium larvae have no saddle and light coloured legs.

**Size categories**
- Large (23 mm plus)
- Medium (7–23 mm)
- Small (3–7 mm)
- Very small (1.5–3 mm)

**Eggs**
Note: False legs, size and colour variation in caterpillars.

**Images:** SARDI; L Turon & M Cahill, QPIF
Moths have a wing span of 30 mm, forewings are buff olive to red brown with dark spots and blotches near the edge. *H. punctigera* are pale with a uniform dark band along the lower edge of the hindwing, while *H. armigera* have a small light or pale patch in the dark band.

Eggs are 0.5 mm in diameter and change colour from white when laid, to brown and then to black before hatching. *H. punctigera* is more common in the southern region than *H. armigera*.

**Management**

Eggs are most commonly laid on the top third of the plant and growing points. Closely monitor crops for larvae from budding and flowering through to maturity. A sweep net should be used from early flowering and throughout podding in pulse crops. Insecticide sprays need to be applied prior to larvae entering pods.

**Biocontrol**

On larvae – glossy shield bug, spined predatory shield bug, damsel bug, assassin bug, tachinid flies, orange caterpillar parasite, two-toned caterpillar parasite, orchid dupe, Bt, NPV, caterpillar fungal diseases, lacewings and spiders. On eggs – damsel bug, caterpillar egg parasites, ladybird beetles, lacewings and spiders.

*Helicoverpa* damage to beans (right).

Images: A Mayfield, Allan Mayfield Consulting; DAFWA; C Palmer
Balaustium mite (*Balaustium medicagoense*)

**Description**

Adults grow up to 2 mm long, are variable in colour but mainly dark red-brown, with characteristic short stout hairs covering the body. They have eight red coloured legs. Newly hatched nymphs have six legs and are bright orange in colour.

Mites feed on the leaves of plants by probing into the surface cells with their mouth parts, and sucking out sap. Leaves may become bleached with high mite numbers, but plants are usually able to outgrow the damage. In severe cases plants will be retarded or die.

Crops sown into paddocks with high levels of broad leaf weeds, especially capeweed will be most at risk from mite damage.

**Management**

Check crops from March to early December, particularly in paddocks with a history of chemical treatments for redlegged earth mites. They have been shown to be more tolerant than RLEM to a range of synthetic pyrethroids and organophosphates.
**Blue oat mite** (*Penthaleus* _spp._)

**Description**
Adults are 1 mm long and have eight red-orange legs. They can be identified by their dark blue-black bodies with a distinct oval red-orange spot on the back. They generally feed singularly. This pest is active from autumn to late spring and is widely distributed across southern Australia.

Feeding causes a silver or white discolouration of leaves and distortion or shriveling if severe. Mites are most damaging to emerging crops, greatly reducing seedling survival and development.

**Management**
Check paddocks prior to sowing in autumn and throughout winter. Examine plants for damage and search for mites on leaves and on the ground, especially in late sown crops.

Some *Penthaleus* species are more tolerant than RLEM to a range of synthetic pyrethroid and organophosphate insecticides.

**Biocontrol**
The French anystis mite is an effective predator but limited in distribution. Snout mites also prey upon this pest and help keep populations in check.
Clover mite or bryobia mite (*Bryobia* spp.)

**Description**
Adults are about 0.75 mm in length, have an oval shaped and flattened body. They have a brown to fawn-orange body and eight pale orange legs. The front legs are 1.5 times the length of their body. They are most active in warm conditions in autumn, spring and early summer. They are generally found in low numbers over the winter period. Summer rains followed by warm mild autumns give them the best conditions for survival and increase.

These mites feed on the upper surfaces of the leaf by piercing cells and sucking out the contents. They cause distinct whitish grey feeding trails on cotyledons and leaves. Attack on newly emerged leaves can result in discoloured leaves, which fail to grow.

**Management**
Mites are difficult to find in wet conditions. Check during the warmer part of the day when they are most active. Look for damage and their presence on clovers and *Brassica* weeds before sowing. Examine crops at emergence. Control summer weeds early in paddocks to be cropped to prevent the build up of mites.

If in large numbers, incorporation of insecticide with herbicide immediately prior to sowing is more effective than spraying when the crop is emerging and has very little cover of green material. Organophosphate based chemicals reportedly control *Bryobia* better than synthetic pyrethroids. Chemical rates commonly used to control RLEM are generally not effective against *Bryobia* mites.
Redlegged earth mite infestation on vetch.

Image: R Matic SARDI
Redlegged earth mite (*Halotydeus destructor*)

**Description**
Adults are 1 mm long and have eight red-orange legs. Adults and nymphs have a velvety black body. Newly hatched mites are only 0.2 mm long, pinkish-orange with six legs. Redlegged earth mites are generally active from autumn to late spring feeding in large groups up to 30 individuals. They are found in southern Australia, but not northern NSW.

They also feed on a range of weed species including Paterson’s curse, ox-tongue and capeweed. Feeding causes a silver or white discolouration of leaves and distortion or shrivelling in severe infestations. Affected seedlings can die at emergence with high mite numbers.

**Management**
It is especially important to inspect crops regularly in the first three to five weeks after sowing. They will drop to the ground and seek shelter if disturbed during feeding. They will crawl into cracks in the...
Mites are best detected feeding on the leaves in the morning or on overcast days. In the warmer part of the day redlegged earth mites tend to gather at the base of plants, sheltering in leaf sheaths and under debris. Foliage sprays applied once the crop has emerged are generally an effective method of control.

**Biocontrol**
At least 19 predators and one pathogen are known to attack earth mites in eastern Australia. Minimise the chemical impact on predator species by choosing a spray that has least impact and by reducing the number of chemical applications.

The French anystis mite is the most effective predator but is limited in its distribution. Snout mites will also prey upon this pest and help keep populations in check.

Using cultural control methods can decrease the need for chemical control. Rotate crops or pastures with non-host crops or cultivation to reduce numbers.

Redlegged earth mite and typical leaf damage.

*Image: R Matic, SARDI*
Lucerne flea (*Sminthurus viridis*)

**Description**
Adults and nymphs are yellow-green, and can have dark markings. Adults are up to 3 mm in length, wingless and globular in shape. They spring off vegetation when disturbed using a special organ under the body. Mostly found on loam and clay soils. Although a serious pest of young crops, they can also damage older crops. They work up plants from ground level leaving distinctive transparent “window” damage on the leaves. A severe infestation may remove all green material. They are present from autumn to spring. Numbers tend to peak in late spring. They are favoured by high humidity and moisture, a mild autumn and winter and a wet spring the previous year.

**Management**
Regularly check for damage from autumn to spring. Control is generally achieved with organophosphate insecticide. They are more tolerant to a range of synthetic pyrethroids. When mites are also present, use a product to control both pests. A border spray will stop invasion from neighbouring paddocks. Treat approximately three weeks after lucerne flea first infests the crop. This will allow over-summering eggs to hatch but prevent adults laying winter eggs. Damage is worse following a weedy crop or pasture in which lucerne flea have not been controlled. Control is recommended the season prior to sowing faba beans.

**Biocontrol**
Pasture snout mites and spiny snout mites prevent outbreaks of this pest when in sufficient numbers.

*Images: CESAR; A Mayfield, Allan Mayfield Consulting*

Adult.

Lucerne flea damage.
Onion thrips, plague thrips and western flower thrips
(Thrips tabaci, Thrips imaginis and Frankliniella occidentalis)

Description
Adults are 2 mm long, cigar-shaped and range in colour from yellow-orange to dark grey. They have tiny, narrow wings carried over the back. Nymphs are similar in shape, pale yellow to orange-yellow, wingless and smaller in size. Species differentiation is extremely difficult in the field.

Adults and nymphs pierce plant tissue and suck sap. Their impact on crops is minimal, even with occasionally high numbers. Damage can occur in dry weather during flowering.

Flower buds can be badly damaged causing flowers and very small pods to shed.

They cause whitish blotches on leaves. Black flecks on leaves (excreta), can be easily rubbed off. Can cause reddening of leaf petiole and veins in beans.

Management
Check seedling and flowering crops. Shake flowers over a white surface or container to dislodge thrips.
All pest populations are regulated to some degree by the direct effect of other living organisms. A wide range of beneficial organisms can be grouped into three categories:

- **Parasites** – organisms that feed on or in the body of another, the host. Most eventually kill their host and are free-living as an adult (parasitoids) e.g. aphid wasp parasites.
- **Predators** – mainly free-living insects that consume a large number of prey during their lifetime e.g. shield bugs, lacewings, hover flies, spiders, predatory mites and predatory beetles.
- **Insect diseases** – include bacterial, fungal and viral infections of insects.

Integrated pest management (IPM) in its simplest form, is a management strategy in which a variety of biological, chemical and cultural control practices are combined to provide stable long-term pest control.

A key component of any IPM program is to maximise the number of beneficial invertebrates and incorporate management strategies other than pesticides that will help to keep pest insect numbers below an economic threshold.

Correct identification and regular monitoring is the cornerstone of IPM. When monitoring crops for insects, it is important to also check for the presence of, and record the build-up or decline in, the number of these beneficials to make the best insect control decisions.

Integrate other pest management practices together with the use of insecticides only where necessary to maximise the number of beneficial organisms. This will result in the better control of insect pest populations and a reduced reliance on the use of insecticide.
Beetles

- Carabid beetle, adult.
- Common ladybird, adult.
- Transverse ladybird, adult.

Bugs

- Damsel bug, adult.
- Damsel bug, nymph.
- Glossy shield bug, adult.
- Glossy shield bug, nymph.
- Assassin bug, adult.
- Spined predatory shield bug, nymph.

Images: SARDI; CESAR; J. Wessels, QPIF; DAFWA

BENEFICIAL ORGANISMS
BENEFICIAL ORGANISMS

Flies

- Tachinid fly, adult.
- Hover fly, adult.
- Hover fly, larva.

Lacewings

- (Above) Green lacewing, adult.
- (Right) Brown lacewing, adult.

- Lacewing, nymph.

Mites

- Snout mite next to redlegged earth mite and lucerne flea.
- French anystis mite attacking a redlegged earth mite.

Images: SARDI; DAFWA; CESAR
Caterpillar wasps

*Helicoverpa* larva being parasitised by an orange caterpillar parasite wasp.

Wasp larva on noctuid caterpillar.

*Telenomus* wasp parasitising *Helicoverpa* eggs.

*Trichogramma* wasp.

Two-toned caterpillar wasp parasite.

Banded caterpillar wasp parasite.

Orchid dupe.

Braconid wasp (*Microplitis demolitor*) parasitising a caterpillar larva.

Aphid wasps

*Aphidius ervi* on bluegreen aphid.

*Trioxys complanatus* wasp.

Parasitised aphid (mummy on left).

Aphid mummy with parasite exit hole.

**BENEFICIAL ORGANISMS**
Insect diseases – viral and fungal

*Bacillus thuringiensis* (Bt) infected *Helicoverpa* larva

Noctuid larva showing typical v-shaped infection from *Nuclear polyhedrosis virus* (NPV).

Diseased aphids with parasitised aphid mummy (right).

Fungal diseased aphid.

Images: R Teakie, QPIF; DAFWA
BENEFICIAL ORGANISMS

Image: W Hawthorne, Pulse Australia
Description
The reticulated slug or grey field slug *D. reticulatum* is variable in colour, often light grey to fawn with dark brown markings. Slugs can grow to 50 mm long. A distinctive feature is that it secretes milky-white mucus when disturbed. It will reproduce at any time of the year if conditions, especially moisture, are suitable. Soils that retain moisture are most likely to harbour slugs. This species is mainly surface active.

The black keeled slug *M. gagates* is usually black with a sharp ridge or keel down the back, most obvious when the slug is disturbed and its body contracts. Slugs grow 40–60 mm in length. Is of relatively greater importance in drier areas, such as South Australia and western Victoria. It tends to burrow and feed on germinating seed embryos both on the soil surface and below the ground. Plants may fail to emerge, be eaten to ground level or irregular areas may be removed from leaves.
**Management**
Check paddocks before seeding or crop emergence, especially those with heavy soils or previous slug problems. Monitor slug numbers by placing refuges that retain moisture, such as tiles, on the soil surface at a number of sites across the paddock. Count the number under these refuges in mornings after moist conditions. To assess direct activity, crops should be checked on moist nights as they are emerging.

**Biocontrol**
Carabid beetles can play an important role in suppressing slug populations.
**Round or white snails** (*Theba pisana* and *Cernuella virgata*)

**Description**

Occur on alkaline soils across southern Australia.

White Italian snail *T. pisana* has a white coiled shell up to 30 mm in diameter, mostly with broken brown bands in the line of the spiral, although some are all white. The umbilicus is semi-circular or partly closed.

Vineyard or common white snail *C. virgata* has a white coiled shell up to 20 mm in diameter, mostly with continuous brown bands in the line of the spiral, although some are all white. Umbilicus is open and circular.

Feed on green plant material and dead organic material. Leaves are shredded by rasping mouthpart of *T. pisana* and emerging crops may be defoliated. Contamination of grain can clog harvesters and affect marketability. They over-summer off the ground on stubble, posts, etc and especially on green weeds and can become a major contaminant of grain.

<table>
<thead>
<tr>
<th>Snail</th>
<th>Snails over 7 mm/m²</th>
<th>Bait required kg/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Round or white snails</td>
<td>Less than 80</td>
<td>5</td>
</tr>
<tr>
<td>Conical snails</td>
<td>No threshold established</td>
<td>5</td>
</tr>
</tbody>
</table>

*Theba pisana*, note partly closed umbilicus.

Images: SARDI
**Management**

Concentrate monitoring between January and April. Control tactics include stubble management (January and February), burning when fire restrictions permit and baiting in early April. Continue monitoring through the growing season to detect any snail movements, particularly from the edges of paddocks.

*Cernuella vergata*, note open circular umbilicus and continuous brown markings.

Rasping damage.

Images: DAFWA; SARDI
Pointed or conical snails (*Cochlicella acuta* and *Cochlicella barbara*)

**Description**

Occur on alkaline soils across southern Australia.

Pointed or conical snail *C. acuta* has a fawn, grey or brown conical shell up to 18 mm long. The ratio of the shell length to its base diameter is always greater than two.

Small pointed or small conical snail *C. barbara* has a fawn, grey or brown conical shell up to 10 mm long. The ratio of the shell length to its base diameter is always two or less. Most abundant in high rainfall areas.

Both species feed on dead organic material. Seedlings may be eaten by *C. barbara* to ground level when in high numbers and the very small shells can contaminate grain. They over-summer in leaf litter at the soil surface or just below surface and under stones and stumps, but can be found on posts and vegetation. Numbers increase in the pasture phase of cropping rotations.
Management
Concentrate monitoring between January and April. Threshold numbers for control for *C. barbara* in faba beans have not been established. Control tactics include stubble management (January and February), burning when fire restrictions permit and baiting in early April.

Continue monitoring through the growing season to detect any snail movement, particularly from the edges of paddocks.

Biocontrol
Sarcophagid parasitic fly *Sarcophaga penicillata*.

Conical snail infestation.
Salinity

**Description**
Plants are stunted with yellowish discolouration followed by bright red pigmentation. Nodulation is poor or not present. Where severe, seedlings fail to emerge.

Where the water table rises after establishment, the crop stops growing, leaves drop and plants die.

**Management**
Avoid sowing on areas at risk.
Do not irrigate with saline water.
Vetches tend to be open or self-pollinated, so do not necessarily require insect pollinators to maximise seed set. Honey producing bees do not like working grain (common) vetches like Morava or Rasina, which are considered to be unsuitable for honey production as the bees do not like working the flowers.

Improved grain yield is possible if the bees are operated as a pollination service, rather than for honey production, similar to what occurs with faba beans. Apiarists must place their hives throughout the crop, not in a paddock corner.

Bees do however work woolly pod vetch flowers (e.g. Namoi) and produce good honey. Purple vetches are intermediate in their attractiveness to bees and honey production.

Bees must be removed or housed when insecticide or fungicide is used. Use and time chemicals wisely, use integrated pest management (IPM) and inform apiarist prior to application. Growers will only put up with bee hives through their crop if there is a yield benefit or honey production to pay for the apiarist’s service.
Vetch can be grown for forage, especially if a forage type or as a flexible option between grain and forage to handle risks of frost, drought or weeds. Vetches sown for forage are grown to produce bulkier crops, flowering later to achieve optimum forage quality and yield when grazing or as ‘green or brown manure’, baled or ensiled.

Sowing for forage is often early, so disease management is important. Seeding rates for forage are higher than for grain, or vetch can be sown in a mixture with oats or triticale to provide greater bulk and early vigour. When harvesting vetch as forage, additional erosion, soil compaction and nutrient loss implications need be considered.

It is able to be used in a pasture phase or to graze early and later use as a green manure, hay or as a grain crop.

Vetch makes good hay.

Hay quality and price is similar to clover or field pea hay.

Images: R Matic, SARDI; T Yeatman, Rural Solutions SA; W Hawthorne, Pulse Australia
Vetch forage for livestock

Vetch is a valuable protein source for livestock diets. It contains 280–300 g crude protein per kg, 16–19 g lysine per kg and 14–15 mega joules of energy. It can be used without limit in the diet of ruminants and up to 20% of the diet of pigs.

Vetch hay and silage is an excellent, reliable and cost effective protein source, especially for milk production. Hay contains 180–240 g/kg crude protein and 9–11 MJ dry matter digestible energy.

Quality

– Vetch hay and silage quality and price are similar to clover or field pea hay.
– Forage quality slowly diminishes after flowering as bulk increases and seed fill progresses.
– Slashers or rotary type mowers are preferred for forage cutting operations. Conventional cutter-bar type mowers are prone to blockages from the vining growth.
– Conditioning or super-conditioning helps dry pods and stems faster to minimise weather damage and loss of leaf during baling or ensiling.
– Unlike cereals, frosted vetch does not have to be cut for forage immediately to preserve forage quality.
– Measure vetch forage quality with a FEEDTEST® or a NSW DII Feed Quality Service test.

<table>
<thead>
<tr>
<th></th>
<th>Metabolisable Energy (Mj/Kg DM)</th>
<th>Crude protein (%)</th>
<th>Dry matter digestibility (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vetch forage (e.g. hay)</td>
<td>8.0–11.0</td>
<td>12–20</td>
<td>60–70</td>
</tr>
<tr>
<td>Cereal hay</td>
<td>7.5–9.0</td>
<td>6–12</td>
<td>55–75</td>
</tr>
<tr>
<td>Pea straw</td>
<td>6.0–7.0</td>
<td>&lt;5.0</td>
<td>35–50</td>
</tr>
<tr>
<td>Cereal straw</td>
<td>5.0–6.5</td>
<td>&lt;4.0</td>
<td>35–50</td>
</tr>
</tbody>
</table>

Individual samples can test differently than ranges indicated. Vetch hay is very similar to field pea hay measured by FEEDTEST® on a dry matter basis, and ranges have been: Metabolisable Energy (ME) from 5.1 to 12.5Mj; crude protein (CP) from 4.5 to 23.1%; and digestibility (DMD) from 38.0 to 81.8%.
Desiccation and crop topping

**Desiccation** to ensure even ripening of the crop and to ‘brown off’ late weed growth allowing earlier and easier harvest. Desiccation advances maturity up to 10 days.

Spray once grains have reached physiological maturity; grain moisture is about 30%, usually 20–30 days after the end of flowering. The lower 75% of pods are turning black and seeds are firm with thin and leathery shells.

Harvest 5 to 10 days after desiccation. Observe all withholding periods to avoid chemical residues in grain.

**Crop topping** timed to control seed set in escape weeds, normally ryegrass, also matures vetch earlier. Earlier maturing varieties allow optimal timing and good control of weed seed set with minimal effect on yield. Crop topping too early, particularly in later maturing varieties, risks loss in yield and increased numbers of seeds with poor quality (darkened seed coats or small, green, immature seeds).

Crop top as late as possible (i.e. dough stage of the ryegrass), when 50% or more vetch seeds within the pods have changed from green to yellow.

Avoid using coloured foam markers which may stain vetch seed through the pods.

Vetch crop opportunity to winter clean and crop top ryegrass in spring to reduce the soil bank of seed for future years.

Image: T Yeatman, Rural Solutions SA
Weed wiping

Weed wiping can used with some success in vetch to prevent seed set of ryegrass and other tall weeds that stand above the lodged crop. Vetch crops might however be too tall or bulky for the ryegrass for it to be a reliable option.

Windrowing

Windrowing vetch crops for uniform ripening and earlier grain harvest could be considered impractical if windrows lack bulk and could be blown around in strong winds when left to dry. So cut wide swathes and place them into a bulky windrow and roll them immediately after using a ‘cotton wheel roller’ to compact the windrow.

Windrowing directly in front of the harvester to reduce snail contamination in the sample can be successful, but does not assist uniform and early crop ripening.

The advantages of windrowing for grain harvest are:

- Uniform maturity of the crop for harvest.
- Earlier harvest at higher grain moisture content.
- Early harvest to avoid seed staining from late rains.
- Easier harvest with fewer losses where lodged.
- Less pod splitting and shattering if rain.
- Lower cutter bar height enabling lowest pods to be harvested.
- Late maturing weeds dried to enable earlier harvest.
- Better crop survival should harvest be delayed.
- Reduced snail contamination in the sample if windrowed late directly in front of the harvester.

Image: W Hawthorne, Pulse Australia

A wickwiper can provide valuable control of ryegrass seed set.
HARVESTING

Harvest timing

Grain
Harvest once the upper pods turn brown and the stems are brittle enough to feed through the harvester. There are often still a few green parts scattered in the crop. Moisture content of the grain should be less than 13% at harvest to meet receival standards for storage. If too dry, cracking may occur with down graded quality as a consequence. Windrowing, desiccation or crop topping enables even earlier grain harvest. The lower pods are more prone to shatter than higher ones.

Forage
Time harvest for forage to maximise forage yield without sacrificing forage quality.
Cut in the flowering-small pod stage to maximise forage CP, ME and NDF digestibility.
Dry matter yield increases with later cutting but metabolisable energy, crude protein and digestibility decrease as the vetch grain fills.

(Above) Vetch crop close to maturity.
(Left) Pods on an early flowering variety.

Images: W Hawthorne, Pulse Australia
**Tips for harvesting**

Harvesting problems are often associated with severe lodging, short crops with little growth and their pods close to the ground, or excessive harvest speed. Either crop lifters or a Draper type pick-up front is needed to harvest the grain crop from windrows.

- Harvest as soon as the vetch is mature.
- Harvest early in the day or into evening; humidity reduces seed shatter. Avoid damp, cool conditions.
- Vetch just ripe for harvest can be harvested under warmer conditions than vetch that has been left mature for some time.
- A flex front is ideal for vetch.
- Crop lifters may be required with lodged vetch.
- Avoid excessive harvest speed to minimise feeding problems.
- Use a dessicant for early harvest or if summer weeds would otherwise prevent timely harvest.
Harvesting for quality

Despite vetch not being a product for human food markets, its feed and seed markets demand a quality sample without cracking, staining, de-hulled seeds or insect damage. Visual appearance is still important, and early harvest is critical to achieve a quality product. Vetches thresh readily, so minimise seed damage and losses during harvest by not over-threshing and harvesting early morning, at low drum speed and with adequate concave clearance.

Axial or rotary harvest drums cause less seed damage. Use maximum wind and sieve settings for the grain size, and try to use draft to remove trash. Where summer weeds, desiccation would be invaluable, otherwise increase drum speed so they don’t block the machine. The rake at the back of the sieve may need to be turned off to stop weeds entering the returns.

Harvesting for seed

Choose an area of a paddock where there has been minimal disease, pest and weed infestation to ensure maximum germination and minimal weed and disease carryover. Ensure headers, bins, augers and other equipment are free of grain and weed contaminants. The middle of the crop is likely to be the best area for seed production as weed and insect problems are usually worst at the edges.

The small seed of vetches makes them less prone to mechanical damage.
HARVESTING
Vetch grain is not used for human consumption. Vetch grain is mainly used as seed to sow as a seed/grain, forage, hay or green/brown manure crop. Varieties like Morava and Rasina are protected by PBR and cannot be sold or traded farmer to farmer as sowing seed.

Grain from common vetch (Vicia sativa) varieties like Rasina, Morava, Blanchefleur, Languedoc and Cummins are used to feed all ruminants and can safely comprise up to 100% of the diet of sheep and beef cattle rations. Grain vetch is also exported into limited birdseed markets.

Grain vetches Languedoc, Blanchefleur, Cummins, Rasina and Morava contain 1.6%, 1.2%, 1.2%, 0.85% and 0.65% of toxin gamma-glutamyl beta-cyanoalanine (GBC) respectively. These toxins reduce growth rates and feed intake of poultry, adversely affecting the metabolism of laying hens and may reduce growth rates and feed intake of pigs. GBC can give rise to favism, a sometimes fatal haemolytic disease in humans.

Up to 15% of the protein in pig grower rations (55–100 kg body weight) could be provided by grain vetch, a proportion equivalent to the amount of faba beans that can be included in pig grower rations.

Images: W Hawthorne, Pulse Australia
# Vetch market broad categories

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<tr>
<th>Type</th>
<th>Variety</th>
<th>Generalised grain uses</th>
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<tbody>
<tr>
<td>Common (grain) vetch</td>
<td>Rasina®, Morava®, Languedoc,</td>
<td>Ruminant feeds</td>
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<tr>
<td>(Vicia sativa)</td>
<td>Blanchefleur, Cummins</td>
<td>Sowing seed for forage</td>
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<td>Limited birdseed markets</td>
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<td>Purple vetch</td>
<td>Popany</td>
<td>Sowing seed for forage</td>
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<tr>
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<tr>
<td>Woolly pod vetch</td>
<td>Namoi, Capello®, Haymaker®</td>
<td>Sowing seed for forage</td>
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<tr>
<td>(V. villosa ssp. dasycarpa)</td>
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Vetch hay and silage is valued either as pure vetch or a cereal-vetch mixture as a stock feed for its protein, energy and digestibility. Dairy markets are particularly interested. Dairies prefer pure vetch hay to blend into rations.

Vetch grain for sowing commands prices generally higher than for most pulse grains.
Grain vetch national receival standards

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<tr>
<th></th>
<th>Maximum moisture content (%)</th>
<th>Minimum purity (%)</th>
<th>Maximum defective plus poor colour (%)</th>
<th>Screen size for defective (mm)</th>
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<th>Foreign material maximum in total (%)</th>
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<td>Vetch grain receival standard</td>
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<td>97</td>
<td>5</td>
<td>–</td>
<td>1</td>
<td>3</td>
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<tr>
<td>Vetch grain receival standard</td>
<td>0.5% (0.3% soil)</td>
<td>1 per 200 g</td>
<td>15 per 200 g</td>
<td>See footnote for weeds and amounts allowable</td>
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Defective grain: not of the specified type, broken, damaged and split, grub eaten, sprouted, affected by mould.

Poor colour: excessive seed coat discolouration – includes Ascochyta lesions.

Foreign material: includes unmillable material and all foreign vegetable matter (includes cereals, wild oats, oilseeds, other legumes and weed seeds other than nominated foreign weeds listed in standards).

Unmillable material: includes soil, stones, metal and non-vegetable matter.

NB: Vetch as a “foreign seed” contaminant grain in other pulses has strict limits. See “Appendix B, Foreign Seeds”, of Pulse Standards. Vetches and tares are a Type 3b contaminant and restricted to 2 seeds total per 200 g pulse sample.
Defective grain

Description
Cracked, broken and discoloured grain greatly affects classification and market appeal. Appearance of the sample is extremely important for human consumption markets.

Cracked and broken grain – Broken or loose seed coats and broken grain can easily occur during harvest or poor grain handling.

Poor grain colour (seed or kernel) – Can be caused by premature ripening due to heat, drought or disease stress, harvesting immature seed (“green kernel”), delayed harvest, rain at harvest, disease, frosting and a dry hot finish. Prolonged wet weather pre-harvest may lead to poor colour, loose seed coat or wrinkled grain.

Management
Minimise disease, especially ascochyta blight, chocolate spot and rust. Manage crop to lessen affect of frost or a dry finish. Crop top or desiccate at the right time.

Harvest as soon as ready, before rain and before grain moisture is too low. Harvest carefully and handle grain to minimise grain damage.

Store in good storage conditions. Do not store grain for long periods for human food markets.

(Above right) Grain affected with storage moulds.

(Above) Green immature Namoi vetch grain left, and normal grain right.
Commercial buying and selling arrangements (current as of June 2009)

Varieties may not be covered by Plant Breeders Rights (PBR). Many have different types of seed purchase agreements, royalty/marketing or levy arrangements that affect marketing and sale of seed. Check varietal arrangements and restrictions with the seed agent before purchase.

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<th>Variety</th>
<th>PBR</th>
<th>Licensee or agency</th>
<th>Commercial partner</th>
<th>Seed supplying agents</th>
<th>Market restriction</th>
<th>Broad market type</th>
<th>EPR per tonne (incl GST)</th>
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<td>PlantTech</td>
<td>PlantTech</td>
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<td>Growers, Seed merchants</td>
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<td>Growers, Seed merchants</td>
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<td>None</td>
<td>None</td>
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<td>Seedmark</td>
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<td>Seed Tech &amp; Marketing</td>
<td>Seedmark</td>
<td>Seedmark</td>
<td>None</td>
<td>Forage vetch (Woolly pod)</td>
<td>Seed royalty</td>
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Source: Pulse Australia June 2009.
Belt shifters are recommended as vetch can be damaged by augers. Minimise handling grain to limit physical damage. Run augers full and at a slower speed than for cereals. Avoid dropping the vetch from great height.

Do not allow “pockets” of moisture to develop in storage. Sound sheds and silos are suitable storages. Bunkers need to be waterproof. Silo bags should only be considered as short term, temporary storage as discolouration of grain can occur, moisture can be difficult to handle, odours arise and bags can be holed by vermin, birds or pests.

Store seed and grain at no more than 13% moisture, unless aerated. Moving moist grain on a warm, windy, dry day between two silos will reduce moisture content by 1–2%. Dry them, cool them, store them in the dark, and sell them as quickly as possible.

Where grain insects are detected, fumigate with phosphine in a sealed silo. Extra costs are imposed at delivery points if live insects are found in a load. Grain hygiene is critical. Contaminants such as insects, weeds or other grains are undesirable. Animal excreta, rodent carcasses, mouldy grain and odours are unacceptable. Check regularly for insects or mould.

Image: W Hawthorne, Pulse Australia

Belt shifter to move vetch grain with minimal damage.

Air movement in the bin during cold (A) and warm (B) periods.
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**Bold numbers** *indicate an image*
To deliver superior pulse varieties faster, Pulse Breeding Australia (PBA) focuses on:

- excellent leadership and communications;
- accessing elite germplasm and enabling technologies;
- accessing reliable market signals;
- ensuring rapid adoption of newly released varieties;
- a principled and cost effective breeding process;
- by sharing germplasm, technologies and intellectual property across all states, PBA delivers to Australian growers new pulse varieties that have better disease resistance, are higher-yielding and are adapted to Australian conditions.

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