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Pulse and canola frost identification : the back pocket guide

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FROST

Frost damage reduces crop yield and grain quality. Early identification of symptoms allows timely crop salvage decisions to be made.



Inspect pulse and canola crops between bud formation and during pod growth if right air temperature (recorded 1.2 m above ground) falls below 2° C and there was a frost.

Check low lying, light coloured soil types and known frost prone areas first. Then check other areas.

To identify frost damage

You MUST OPEN *FLOWERS* and *PODS* on plants so that you can clearly see the plant parts that are affected.

A magnifying glass and fine tweezers or a needle can be useful.

Common terms used in this guide:

<i>Bud</i>	Immature flower
<i>Flower</i>	Reproductive organ of a plant
<i>Pod</i>	Fruit or seed case of a legume or canola
<i>Seed</i>	Reproductive unit of a plant containing an embryo

How to use this guide

This field guide will help you identify the common symptoms of frost damage in pulse and canola crops. It also contains pictures of other plant symptoms often confused with frost damage in these crops.

Consult your local agronomist if in doubt.

PULSE AND CANOLA SUSCEPTIBILITY TO FROST DAMAGE

Factors affecting frost damage

Frost damage in crops tends to be patchy, with great variability occurring within paddocks and on the same plant. This is caused by many factors including temperature, soil type, soil moisture, cloud cover, wind speed, position in landscape, crop species, crop nutrition and crop density.

Period of risk

Pulse and canola crops are most susceptible to frost damage around early flowering to late *pod* growth and *seed* fill (see diagram).

Frost damage management to date has focused on avoiding susceptible crop stages coinciding with the period of greatest frost risk in the area.

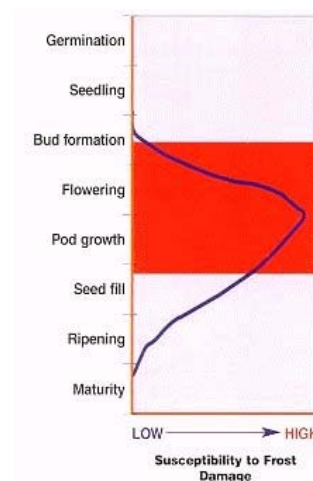
Which parts are susceptible?

Bud, *flowers*, *Pods* and *seeds* can all be affected by frost. In some circumstances all of these parts may be affected on a single plant, as the stages coincide with a damaging frost.

Will the plant recover or compensate?

Time of flowering affects tolerance, and the ability to compensate after the frost has occurred. For example, chickpea often loses early flowers to frost but it can continue flowering as long as water is available, thus compensating for the loss of early flowers.

Canola flowers for a 30-40 day period, so compensatory growth can sometimes occur. A series of consecutive frosts



Susceptibility to frost damage.

Note: Diagram not to scale.

can result in a forced delay of pod set, leading to poor seed fill, especially if a dry finish occurs.

Monitor pod development and seed fill by tagging some reference plants and checking them a few days later for development or senescence (dying).

LUPIN

Tolerance

Lupins have a low tolerance to frost and are generally unable to compensate after flowering.

Symptoms

- In the vegetative phase, leaves are scorched and withered.
- **Flowers** and developing **seeds** in **pods** are shriveled or killed completely.
- It is often difficult to detect external damage to the **pod**.



*Scorched/withered
leaves and pods*



Scorched and withered leaves



Shriveled seeds in the pod. Unaffected on right.

FABA BEANS

Tolerance

Faba beans have a medium tolerance to frost due to thick *pod* walls which provide insulation to the developing *seeds*.

Symptoms

Growing points are sometimes distorted (bent) during early vegetative and flowering stages. This weakens the cells of the stem, allowing disease such as chocolate spot to invade easily.

- *Flowers* are killed by frost, leaving the *flower* stalk.
- White/green mottling and blistering of *pods*.
- Developing *seeds* in the *pod* are shriveled or absent.
- Affected *pods* feel spongy and the *seeds* inside turn dark black.



Remaining flower stalk



Missing faba bean seed



Distorted growing points lead to crookshank distortion and disease invasion

FIELD PEA

Tolerance

Field peas have low tolerance to frost due to thin *pod* walls and exposure of pods to the atmosphere.

Symptoms

- *Flowers* are killed by frost.
- Developing *seeds* in the *pod* are shriveled or absent.
- White/green mottling and blistering of *pods*.
- Affected *pods* feel spongy and the *seeds* inside turn dark black.



White mottling of pod



Blistering of pod

FIELD PEA - DAMAGED SEEDS



Seeds damaged by frost



Seeds are killed and turn a brown/black colour.

CHICKPEA/LENTIL

Chickpea

Tolerance

Chickpeas have low tolerance to frost due to the exposed nature of the *flowers*.

Symptoms

- Leaf margins are bleached.
- *Flowers* are killed.
- Growing points are sometimes distorted (bent) during early vegetative and flowering stages.
- *Pods* may develop, but *seeds* abort.

Even after a frost, chickpeas will continue to flower and set pods well into spring.



Pod killed by frost.

Aborted chickpea flowers.

LENTIL

Tolerance

Lentils are least tolerant to frost injury at flowering due to the exposed nature of the *flowers*, and the small size of *pods*.

Symptoms

- *Flowers* are sometimes killed.
- *Pods* may develop, but *seeds* abort.
- Whole *Pods* can be killed.



Bleached leaf margins.

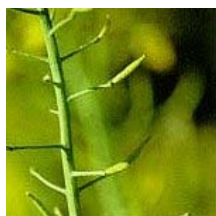
CANOLA

Tolerance

Canola is least tolerant to frost damage from flowering to the clear watery stage (approximately 60 per cent moisture).

Symptoms

- Yellow green discolouration of *Pods*.
- Scarring of external *pod* surfaces.
- Abortion of *flowers*.
- Shriveling of *Pods*.
- *Pods* eventually drop off.
- Shriveling and absence of *seeds*.



Stunted pods which have dropped off.



*Yellow/green discoloration of pods at top.
Healthy at the bottom.*



Canola plant showing various stages of pod loss and flower abortion.

Canola flowers for a 30-40 day period, allowing **pod** set to continue after a frost. Open **flowers** are most susceptible to frost damage, **Pods** and unopened **buds** usually escape. If **seed** moisture content is below 40 per cent when frost occurs oil quality will not be affected.



Missing and shriveled seeds.



Yellow/green discoloration of pods.

OTHER PROBLEMS WITH SIMILAR SYMPTOMS

There are many other problems that are confused with frost damage.

The main ones are those which cause distortion of the plant, absence of the seeds or are unusual in colour. Management and recent environmental conditions should be taken into account when identifying any crop disorder.

It is important to remember that frost damage is quite random and sporadic, and not all plants (or parts of plants) will be affected, whilst most disease, nutrient and moisture related symptoms will follow soil type.



Aphids on canola flower stem.



Sulphur deficiency and aphids. Flower petals retained and pods stunted and yellow/reddening.



Herbicide damage in lupins.

FURTHER INFORMATION

Further information is available from:

Department of Agriculture Western Australia
Dryland Research Institute
(Great Eastern Highway)
MERREDIN WA 6415



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