Department of Primary Industries
Department of Regional NSW

# Managing viruses in pulse crops in 2021

**Pulse crops are far more vulnerable to virus infection than cereals. More than 20 viruses are considered to be of economic importance to pulse crops worldwide. 2020 proved a challenging year for viruses in pulses.**

**This guide aims to explain what happened in 2020 and outline management practices growers can employ in 2021 to reduce the impact on crops.**

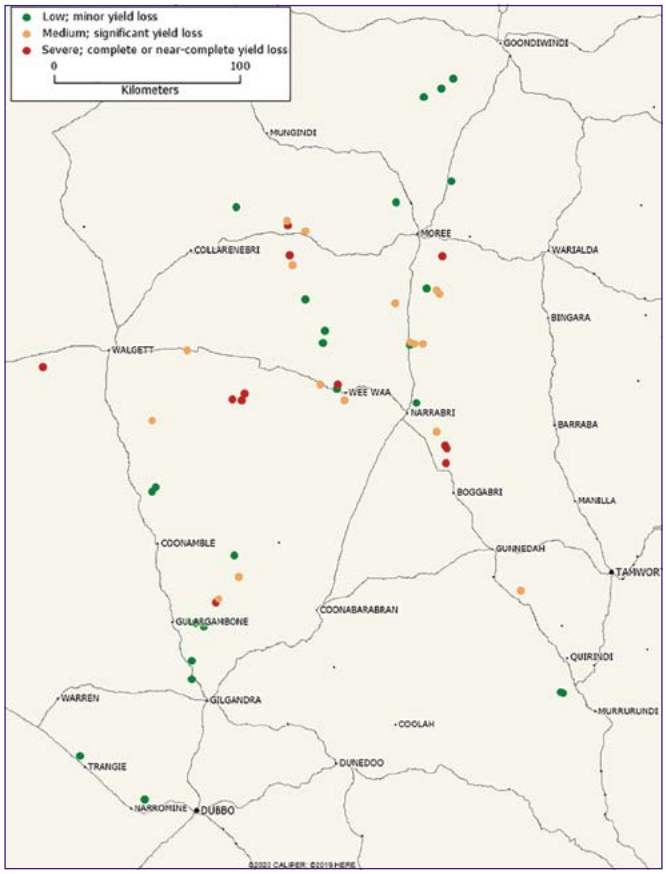
## Key points

- Curative control of viruses is not possible.
- Virus control strategies will differ between crops and virus species.
- All major pulse viruses require an insect vector (mostly aphids) for plant transmission.
- Some viruses can survive in the seed, but most require a 'green bridge' for transmission between cropping seasons.
- Viruses do not survive in stubble or soil.
- Pulse viruses are not host crop specific.
- 63% of faba bean plants tested in 2020 were positive for *Bean yellow mosaic virus* (BYMV).
- 90% of narrow-leafed lupin plants tested in 2020 were positive for *Cucumber mosaic virus* (CMV).
- Testing of several lupin seed lots harvested in 2020 had dangerously high CMV levels.
- Narrow-leafed lupin crops which had high levels of virus in 2020 should not be used for seed.

Bean yellow mosaic virus: *causes stunting and plant death in faba beans.*
**Photo:** *Anna Madden, July 2020*

## 2020 – observations

Significant rainfall in north-west NSW in January and February 2020 triggered the emergence of medics and other pasture legumes allowing a build-up of aphids, and subsequently virus prior to the emergence of faba bean crops. These aphids, mainly cowpea and pea aphids, carried BYMV into the emerging crops. As a consequence of the extended drought leading into 2020 most faba bean crops were planted in bare ground. These conditions favoured aphids.




**Survey 2020:** *distribution of viruses in faba beans illustrating the severity of the impact on crop yield.*

Co-infections of BYMV and *Alfalfa mosaic virus* (AMV) caused particularly severe symptoms in faba beans.

Virus levels were low in chickpeas. AMV was found in several chickpeas that were bordering virus-infected faba bean crops. Chickpeas are resistant to BYMV.

### Faba beans

- While previous surveys indicated that *Bean leafroll virus* (BLRV) was the most important virus because of its impact on yield, BYMV was always the most frequently identified virus throughout northern NSW.
- In previous years BYMV appeared late in the season and would only cause mosaic symptoms on the top leaves of the plant. However, in 2020 infections occurred very early and resulted in serious symptoms including stunting, necrosis, deformation and even plant death.
- The search for high levels of BYMV resistance in faba bean varieties has been unsuccessful so far, but screening of germplasm collections is continuing.
- There are no indications that transmission of BYMV in faba bean seed occurs at significant levels.

**Bean yellow mosaic virus:** *healthy faba beans on the left versus virus affected plants on the right.*

**Photo:** *Joop van Leur*

**Survey results:** *proportion of faba bean plants surveyed found with viruses in northern NSW, 2020.*

| Symptom type | Tested plants | Plants with virus (%) | | | |
|---|---|---|---|---|---|
| | | BYMV | AMV | BLRV | Luteovirus[1] |
| Randomly collected | 359 | 44.3 | 13.1 | 1.1 | 7.5 |
| No symptoms | 407 | 49.9 | 6.4 | 0.2 | 2.0 |
| Not specified virus symptoms | 279 | 58.4 | 15.4 | 2.5 | 9.0 |
| Plant necrosis | 329 | 81.8 | 26.4 | 0.3 | 2.4 |
| Plant stunting | 194 | 66.0 | 5.2 | 12.9 | 7.2 |
| Leaf mosaic | 234 | 88.9 | 11.5 | 0.0 | 3.8 |
| Total plants tested | 1802 | 62.7 | 13.3 | 2.1 | 5.0 |

[1] Luteoviruses other than BLRV

Note: Minor incidences – *Subterranean clover stunt virus* (7 of 325 plants tested), *Clover yellow vein virus* (1 of 991 plants tested) and *Cucumber mosaic virus* (4 of 682 plants tested)

## Lupins

- The main virus in lupins in 2020 was CMV. Testing of live plants showed high CMV levels, with 90% of samples testing positive.
- Some plants had no visual symptoms but still tested positive to the virus.
- CMV can be seed-transmitted in narrow-leafed lupins at high rates.
- All narrow-leafed lupin varieties are CMV susceptible, but a number of varieties are moderately resistant to CMV seed infection.
- Co-infection of CMV with AMV occurred in some paddocks and caused severe symptoms.
- Albus or broadleaf lupins are not affected by CMV but can get other viruses such as BYMV.

**High incidence of CMV:** *found in narrow-leafed lupin crops in several NSW regions in 2020.*

**Photo:** *Mark Richards*

# Facts about viruses

## Transmission

There are two ways that viruses can be transmitted from plant to plant.

### Persistent transmission

Persistent transmission requires the virus to be ingested by an insect vector during feeding, then passed through its body and lodged in its salivary glands before transmission can occur.

This process takes more than a day. **Once the insect is infectious, it remains so for the rest of its life**. Very few aphid species prevalent in pulses are capable of persistent transmission and tend to colonise the host plants they have infected. Pea, cowpea and green peach aphids are capable of persistent transmission, and can transmit BLRV and *Turnip yellows virus* (TuYV).

**Survey results:** *presence of viruses collected from plant samples other than faba bean in northern NSW, in 2020.*

| Virus | Plants with virus (%) | | |
|---|---|---|---|
| | Chickpea | Lentils | Lupins |
| Plants tested | 1329 | 1161 | 227 |
| BYMV | 0.0 | 0.2 | 1.3 |
| AMV | 5.5 | 12.7 | 28.6 |
| BLRV | 0.3 | 2.7 | 0.9 |
| Luteovirus [1] | 1.1 | 0.3 | 0.0 |
| CMV | 1.1 | 34.6 | 90.3 |

[1] Luteoviruses other than BLRV

### Non-persistent transmission

Non-persistent transmission occurs when an insect vector lands on a virus-infected plant, makes a brief probe acquiring the virus on its mouth-parts within seconds, and then transmits it immediately when probing a healthy plant.

The aphid loses the virus after it probes a healthy plant once or twice. The insect does not infect further plants until it probes another infected plant. Non-persistently transmitted viruses include BYMV, CMV and AMV.

## Mirids

A theory was circulating in 2020 that mirids may transmit virus. Greenhouse experiments conducted by Zorica Duric in 2020 showed this not to be the case.

## Aphicide seed treatments

The effectiveness of seed treatment with aphicides to control virus infection differs between viruses. **Persistently transmitted viruses**, like BLRV or TuYV, require a relatively long feeding period and a systemic insecticide seed treatment can provide protection during early growth when plants are most vulnerable.

**Non-persistently transmitted viruses**, like BYMV, CMV or AMV, only require a brief probing to transmit virus and the insecticides used for seed treatment act too slowly to prevent infection. However, they may help in slowing the multiplication of aphids in the crop during early stages of plant growth and subsequent spread of the virus by wingless aphids.

**Wingless aphids:** *transmit viruses.*

**Photo:** *Zorica Duric*

## 2021 – reducing risk

**Virus control strategies are all based on preventing infection, particularly during the early growth stages of the crop. Strategies will differ between crops and virus species.**

- Weed and volunteer legume crop plants within or near crops are key virus sources and should be controlled before the crop emerges. A major summer host for BLRV and AMV is lucerne.
- Minimise the number of incoming virus vectors (aphids).
- Sow virus-free narrow-leafed lupin seed. Seed can be commercially tested and growers of lupins are advised to test seed for CMV.

**Severe symptoms:** *Bean yellow mosaic virus in faba bean resulting in total yield loss in this plant.*

**Photo:** *Joop van Leur*

- Testing of over 30 faba bean seedlots harvested in 2020 (including seed from severely virus infected paddocks) has so far not shown evidence of BYMV seed transmission in faba bean seed. However, growers are advised to use good quality faba bean seed as early plant vigour will help in establishing ground cover quickly which will deter the landing of migrating aphids.
- Consider using an insecticide seed dressing: Imidacloprid is registered for use on faba bean, field pea, lentil and lupin seed and could reduce colonisation of the crop by aphids during early plant growth.
- Sow crops into standing stubble to deter aphids.
- Establish and maintain a uniform, healthy plant stand using seed with good vigour can help limit aphid pressure. Aphids love to attack weak plants and crops where the plant stand is not uniform.

**Viruses:** *abbreviations*

| Abbreviation | Virus |
|---|---|
| AMV | *Alfalfa mosaic virus* |
| BLRV | *Bean leafroll virus* |
| BYMV | *Bean yellow mosaic virus* |
| CMV | *Cucumber mosaic virus* |
| TuYVw | *Turnip yellows virus* |

## Further information

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