Agriculture Notes

Temperate Pulse Viruses: Cucumber Mosaic Virus (CMV)

Updated: August 2006
AG1207
ISSN 1329-8062

Angela Freeman and Mohammad Aftab, Horsham

Cucumber mosaic virus (CMV) has the widest host range of any known plant virus and is distributed worldwide. The host range includes a large number of horticultural crops, temperate pulses, pasture and forage legumes and weed species. CMV causes severe disease in lentils, chickpeas and lupins. In areas where large aphid populations occur, crop losses can be high due to reduced herbage production and seed yield. The virus is transmitted by a large number of aphid species and it is seed transmitted in many pulse species.

Host range

The host range of CMV is wide and not restricted to Fabaceae. All major pulse crops grown in southern Australia are hosts of CMV (chickpeas, lentils, lupins, field peas, faba beans) as well as minor pulse crops such as grasspea, dwarf chickling and narbon beans. Many pasture and forage legumes grown in the cropping regions, such as lucerne, vetch, medics and annual and perennial clovers, are also hosts.

During our studies in Victoria and South Australia, a number of weed hosts were identified in crops and on roadsides including bifora, prickly lettuce, common sowthistle, Indian hedge mustard, burr medic, snail medic and barrel medic.

CMV has two subgroups, subgroup 1 tending to occur in subtropical and tropical areas and subgroup 2 tending to occur in temperate zones. CMV infections in legumes in southern Australia have been found to be subgroup 2.

Symptoms

Symptoms of CMV on temperate pulses and pasture legumes are as follows:

- Lentils develop chlorosis, leaf distortion and stunting of the plant (Figure 1). Symptoms of CMV and AMV are similar on lentils.
- Lupins develop reduced internodes, bunchy appearance, chlorosis and stunting (Figure 2).
- Symptoms on faba beans vary from symptomless to systemic necrosis and plant death but are generally mild and difficult to observe.
- Kabuli chickpeas develop leaf chlorosis and stunting of the plants. Symptoms of CMV and alfalfa mosaic virus (AMV) are similar on chickpeas.

Figure 1. Lentil chlorosis, yellowing and stunting (on left hand) and healthy on right hand

Figure 2. Narrow leaf lupin develops bunchy appearance, chlorosis and stunting

- Desi chickpeas develop leaf chlorosis, reddening and stunting of the plants (Figure 3).
- Field peas may develop leaf chlorosis and mild stunting of the plant but generally symptoms are mild and difficult to observe.
- Grass peas and narbon beans develop a mild mottle and down turning of the leaves.
- Lucerne develops a bright mosaic on the leaves (Figure 4).
- Clover species tend to develop down curling of the leaves and slight stunting.

Economic importance

CMV is of economic importance in a range of crops worldwide. In WA, the high levels of CMV infection in lupin crops and subsequent yield losses of up to 60% have resulted in the development of integrated management packages to control the disease (∗see reference).

We have surveyed chickpea, faba bean, field pea and lentil crops in south eastern Australia for CMV from 2000-2004. More lentil crops were found infected with CMV than any other crop type and the within crop incidence of the virus was usually higher than in the other crops and sometimes reached economically significant levels. Generally CMV infection rates were low in the other crops, although frequency of infected crops was higher in chickpeas than in faba beans or field peas.

The percentage of infected lentil crops and the within crop incidence was much higher in SA than in Victoria. In Victoria, each year 7-26% of lentil crops were infected with CMV and the within crop virus incidence was 1-7%. In SA, the percentage of lentil crops infected was 9% (2004) to 100% (2001), and with within crop virus incidence was 1-21%.

In field experiments in WA, CMV infection in Matilda lentils was shown to diminish shoot dry weight by 72-81%, seed yield by 80-90% and individual seed yield by 17-25%.

Transmission

CMV is transmitted in a non-persistent manner by more than 80 aphid species. The spread of the virus is generally over short distances and aphids only remain infective for periods from a few minutes up to a few hours. During our surveys of the Wimmera cropping region over a number of years the following aphid vectors of CMV were found: lucerne blue green aphid (*Acyrthosiphon kondoi*), cowpea aphid (*Aphis craccivora*), foxglove aphid (*Aulacorthum solani*), ornate aphid (*Myzus ornatus*), green peach aphid (*Myzus persicae*), cabbage aphid (*Brevicoryne brassicae*), sowthistle green aphid (*Hypermyzus lactucae*) and sowthistle brown aphid (*Uroleocon sonchi*).

CMV is transmitted via seed in a number of host species. In Victoria, we have surveyed pulse seedstocks and found that 7% of lentil seed samples tested and 9% of faba bean seed samples had up to 0.2% and 0.1% CMV infection respectively. In WA, seed transmission experiments showed seed transmission rates for CMV of up to 1% in lentils, 2% in chickpeas and 0.8% in narbon beans and for the first time, showed that CMV is seed transmitted in field peas and faba beans. CMV is also seed transmitted in a range of annual pasture and forage legume species at rates of 0.05 to 8.8 %.

Figure 3. Desi chickpeas develop chlorosis and reddening

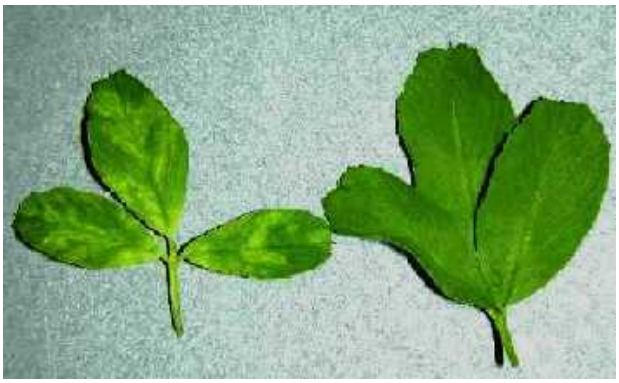

Figure 4. Lucerne bright mosaic (left) and healthy on right

Management

CMV is spread by sowing infected seed or by movement of aphid vectors from infected plants to healthy plants. Low levels of seed infection in pulses may lead to spread of CMV during years with high rainfall and subsequent early build up of large aphid populations. Chemical control of aphids is not an effective method for controlling CMV. Sowing healthy seed, managing weeds and other cultural practices to minimise CMV spread are recommended.

Growing crops adjacent to infected lucerne or pasture will increase the risk of crop infection.

Some seed companies sell lentil seed, which has been tested for CMV and AMV. Commercial seed testing companies will also test legume seedlots for seedborne viruses such as CMV. If farmers retain their own seed it should be selected from crops which do not have virus symptoms or evidence of aphids.

More information

*Jones RAC (2000) Virus research 71, 171-183.

Jones RAC, Coutts BA (1996) Annals of Applied Biology 129, 491-506.

Latham LJ, Jones RAC (2001) Australian Journal of Agricultural Research 52, 397-413.

Latham LJ, Jones RAC, Coutts BA (2004) Australian Journal of Agricultural Research 44, 57-63.

Latham LJ, Jones RAC, McKirdy SJ (2001) Australian Journal of Agricultural Research 52, 683-697

Acknowledgement

Thanks to Wendy Bedggood for assistance in preparing this Note.

The previous version of this note was published in August 2005.