

White Blister

White Blister is a disease caused by the fungus-like *Albugo candida* (*Albugo*) and has most recently been known to affect broccoli and cauliflower crops in southern Australia. Races of *Albugo* can affect most brassica and crucifer plants. The disease creates white blisters and swellings on leaves and heads of affected plants and can devastate infected crops, with up to 100 per cent losses being reported.

The bottom line

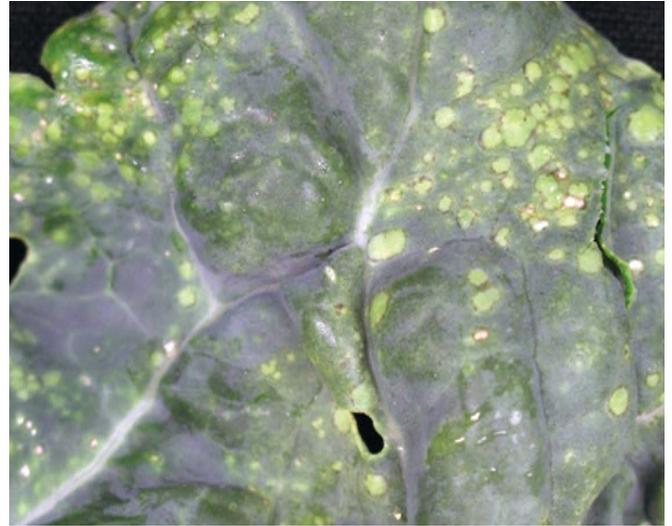
- ▶ White Blister symptoms include white 'blisters' that appear on the leaves and green parts of affected plants
- ▶ Long periods of plant dampness encourage the disease to develop
- ▶ To prevent a major infection, check young plants regularly
- ▶ Crop planting and rotation practices can limit the disease
- ▶ Fungicides will be most effective protecting unaffected crops

What is White Blister?

Often referred to as 'White Blister Rust', or 'White Rust', Albugo is not in fact a true rust fungus so is more accurately called 'White Blister'.

In 2001-02, a type of White Blister known as 'Race 9' ravaged Victorian broccoli and to a lesser extent cauliflower crops, before rapidly spreading to the rest of southern Australia. Queensland however, was not affected. Although there had been previous reports of White Blister affecting crucifer crops, this was the first major outbreak on broccoli and cauliflower recorded in Australia.

Worldwide, there are approximately 17 named races of White Blister with different races affecting different types of plants. White Blister tends to thrive in environments with temperatures ranging from six to 24 degrees celsius. Continually wet leaves (ie. from irrigation, rain or fog) also promote the development and spread of the disease.



Upper leaf surface cauliflower

How do you spot White Blister?

Blisters

An early symptom of the disease is white 'blisters' which appear on the underside of a plant's leaves, with a light green or yellow discolouration on the upper leaf surface. These blisters become more noticeable as the infection progresses. This symptom mainly affects parts of brassica plants such as broccoli or cauliflower that contain chlorophyll (the green parts). The white blisters contain masses of white powdery spores which can be released at any time of the day or night, allowing the wind to disperse the spores and the disease to be spread.

Abnormal growths

A more serious infection involving the disease growing throughout the plant's tissue is indicated by abnormal growth such as distorted plant parts or galls (lumps or unusual growths on a plant's stem or leaves). This type of infection is much more difficult to control as it is systemic (located internally within the plant), possibly from the seedling stage. The abnormal growths also house a spore that can be spread via seed and crop debris. Plants affected at seedling stage may look taller than uninfected plants due to the abnormal growth.

How do you contain the disease?

White Blister can be transmitted through infected produce, seedlings and seed or via spores which can be left behind in soil, carried by wind, rain and irrigation splash. Accidentally dropped or self-sown broccoli or cauliflower seeds and seedlings are also likely to transmit the disease. Although there is no data to confirm it, brassica weeds such as wild radish and turnip are also strongly suspected to be carriers for the disease.

Minimise ways in which disease can spread on-farm

There are a number of good hygiene practices that can help reduce the impact of a disease even before an infection is detected. Known as 'on-farm biosecurity', the basic philosophy is 'prevention is better than cure' and involves minimising the possibility of infected material being spread accidentally by workers, removal of off-shoot material such as volunteer seedlings or by residual spores lingering on machinery or bins.

For seedling nurseries, in addition to regular seedling inspections, you can:

- Grow varieties with 'strength' against White Blister disease
- Produce seedlings away from areas of crop production
- Ensure registered sprays are applied to prevent infection as the disease can remain latent within the plant for six to 37 days
- Establish a seedling pick up and return point that is separate to the seedling production area
- Remove volunteer seedlings from the nursery area
- Ensure staff and visitors adhere to nursery hygiene practices

For growers, in addition to regular inspections of crops, you can:

- Establish a designated meeting place for visitors which will minimise the need for access to paddocks
- Ensure no soil or organic matter is brought onto the property on people's shoes or clothing
- Ensure all equipment such as bins or crates and machinery has been cleaned with a high pressure washer prior to entering the farm
- Remove volunteer plants and weeds around any crops, regardless of the likelihood of infection



Shoot massive

Crop positioning

White Blister spreads through spore movement between plants, either carried by wind or water. Proactive crop planting and rotation habits can minimise the effect of the disease, particularly for brassica growers.

- Once harvested, destroy the remaining crop and plough or disk the remnants into the ground, which will destroy the spore source and prevent it from dispersing further spores to uninfected crops
- Rotate crops with non-host crops that will not provide sustenance for the spores, effectively starving them and eliminating any live residuals left in the soil (anecdotal evidence suggests that any rotation out to a non-brassica crop will be better than no rotation)
- Align planting rows in the direction of the wind and increase the space between plants and planting rows, to allow plants to dry quickly after watering

Monitor and vary irrigation practices

Long periods of dampness, such as rain, frosts or light sprinkler irrigation on plant leaves can encourage the disease to develop. The spores need water to develop and wet leaf surfaces to infect plants.

- Where possible, the crop needs to be able to dry quickly after watering. Try to water the plants heavily for a short period and avoid watering at night

Applications of phosphorous (P) and potassium (K) have been shown to reduce the susceptibility of radish to White Blister in India, but is less likely to be effective in Australia as it is thought the levels of P and K in Australian fertilisers are already at a satisfactory level. As a general rule, high levels of nitrogen (N) are thought to make plants more susceptible to diseases.

Use of resistant plant varieties

Recent research into broccoli varieties has indicated some varieties are more resistant to White Blister than others. Belstar was the best performing variety in each test, conducted in Tasmania, Victoria and Western Australia, with the lowest White Blister count reported. Incidents of White Blister on broccoli heads were reduced by nearly 80 per cent. Belstar is a winter variety and slow growing in very cold conditions. Viper/Atomic is a summer variety with reported 'strength' against White Blister. Most seed companies now will give a description of the varieties 'strength' against White Blister.

The trials conducted found varieties varied in their susceptibility to White Blister under different climate conditions. Generally higher incidents of disease was reported in Victoria compared to WA and Tasmania, with evidence of the disease appearing in Victoria and Tasmania sooner than WA.

Plant management

White Blister is most devastating on young plants, with the most severe infections being detected early in a broccoli plant's development. Recent trials conducted found a 90 per cent incidence of White Blister in young plants compared to more mature plants. In order to prevent a major infection, it's recommended a pro-active approach be taken, with regular checks made of the broccoli 'button' (the early stage of broccoli head growth).

If a low level of White Blister infection is detected, particularly in broccoli heads, the White Blister lesions can be removed allowing produce to be salvaged. This can be a highly labour intensive operation and is likely to be effective only in low level infections.

To prevent a post-harvest infection from occurring in broccoli, a quick transit and sale is recommended, with produce stored in a cool environment in the interim.

Fungicides

Fungicides containing active ingredients chlorothalonil, strobilurin and metalaxyl-M can be used to protect brassica crops such as broccoli and cauliflower, but should be only sprayed to protect unaffected crops, rather than sprayed to destroy the disease on affected plants, as the fungicides are mainly effective against newly developed incidents of the disease.

Once the disease has been detected, fungicides containing metalaxyl-M can be used to minimise the effects. Although there are options available to limit the disease's impact, a fungicide is likely to be most effective as a preventative measure, rather than a reaction to the disease.

It is also advisable to rotate the fungicides used, as White Blister has been shown to develop resistance to systemic fungicides used repeatedly. Canadian research has suggested White Blister can develop resistance to a fungicide after five consecutive sprays.

Although White Blister has also been referred to as White Rust and White Blister Rust, the two should not be confused. White Blister is not a true rust fungus so fungicides registered for control of rust diseases will not be effective.

Fungicide controls for other fungi such as downy mildew in broccoli and cauliflower crops can provide co-control of White Blister. Registered fungicides which can be used to control downy mildew include the active ingredients mancozeb, metiram and cupric (copper) hydroxide.

Specific recommendations for appropriate chemical solutions can be found at the Australian Pesticides and Veterinary Medicines Authority (APVMA) website. Chemical permits vary from state to state. Up to date chemical solutions can be found by searching for permits current for 'White Blister' on the APVMA web site at <<http://www.apvma.gov.au/permits/permits.shtml>>

Further reading

White Blister of vegetable brassicas – prepared by; Dr Elizabeth Minchinton and Joanna Petkowski, Department of Primary Industries Knoxfield, Victoria; Prof. Richard Falloon, Crop & Food Research, Lincoln, New Zealand

Farmnote 112 '*White Blister control in vegetable brassica crops*', prepared by Rachel Lancaster, Research Officer, WA Department of Agriculture, Bunbury, Western Australia

'*Management strategies for White Blister (rust) in brassica vegetables*' – National Vegetable Levy funded project - VG04013

Management of White Blister in Broccoli And Cauliflower in Queensland, available via <www.growcom.com.au> prepared by Jack Milbank

Images supplied by Department of Primary Industries, Knoxfield, Victoria