

## From destruction to 7 million tonnes: how blackleg management enabled the Australian canola industry

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Over the past 50 years the Australian canola industry has become the second most valuable crop in Australia behind wheat, with this success driven by the management of blackleg disease, caused by the fungal pathogen, *Leptosphaeria maculans*. Management of this disease relies on genetic, fungicide and cultural control strategies, however with the evolutionary potential of the blackleg pathogen, the industry is constantly required to monitor the disease and adapt to changes when necessary.

Blackleg initially destroyed the fledgling canola industry in the early 1970s. Over the next 20 years blackleg management was achieved through identifying resistant germplasm and then recurrent selection to produce commercially viable cultivars that combined disease resistance, agronomic adaptability, and suitable oil quality. However, in the late 1990s as the canola area increased, so did blackleg severity, and once again economic losses occurred, although not to the same extent of the 1970s.

Research showed that the increased losses were due to increased inoculum loads from canola residue and from the pathogen overcoming genetic resistance. This increased disease pressure was controlled via the adoption of DMI fungicides and the use of new major gene resistance sources. However, in 2003, the new major gene resistance was overcome by the pathogen resulting once again in crop destruction. Since then, considerable investment has been made to monitor both the genetics of the pathogen and the host to strategically manage the disease.

All canola cultivars are now screened for their major gene complement and this knowledge is provided to canola growers. Using a network of 32 disease monitoring sites across the country, the effectiveness of the major gene resistance is monitored, and advice provided to growers when there are major changes detected, such as resistance genes being overcome. In addition, all cultivars are screened for their combination of major gene and quantitative resistance in field disease nurseries, each cultivar is labelled with a blackleg resistance rating. Growers can use all this information to select appropriate cultivars for their regions or make fungicide application decisions within the growing season.

Changes in farming practices such as earlier sowing and stubble retention, have led to dramatic changes in disease epidemiology, including the rise of upper canopy infection (infection of the upper branches and stems, flowers and pods). Whilst management advice for controlling upper canopy infection is still evolving as new information is learnt, most crops are now treated with fungicide during the reproductive growth stage to control blackleg upper canopy infection.

Whilst fungicides have become an integral part of the management of blackleg disease, the continual use of these chemistries is leading to selection of fungicide resistance and therefore understanding how to minimise the risk of resistance evolving or managing the impact when it does, is crucial moving forward.

Since blackleg disease is a stubble-borne disease, increased canola intensity should lead to increased blackleg disease and therefore yield loss. However, due to successful breeding of genetic resistance and the management strategies highlighted above, the Australian canola industry continues to thrive.