Canadian Agronomist

DIGGING INTO RESEARCH

Blackleg plus Verticillium stripe increases yield loss

CATEGORY disease | *March 28, 2023*

In small plots and greenhouse conditions, blackleg severities on 2 canola hybrids were generally higher when *Leptosphaeria maculans* was co-inoculated with *Verticillium longisporum* than when *L. maculans* was applied alone.

Blackleg disease, caused by *L. maculans*, has been an important disease in western Canada for many years, and is controlled primarily with resistant varieties. Verticillium stripe, caused by *V. longisporum*, was recently identified across the Prairies, and is a disease of concern in canola.

A research study was conducted by the University of Alberta to examine possible yield interactions between blackleg and Verticillium stripe, and to also establish the relationship between blackleg severity and the yield of blackleg resistant canola hybrids in small plots and commercial fields.

A small plot trial was established at the Crop Diversification Centre-North at Edmonton, Alberta and conducted over 2 years in 2019 and 2020. This trial evaluated the relationship between blackleg severity and yield in plots inoculated with isolates of *L. maculans*. Two blackleg-resistant canola hybrids, '45H31' and 'CS2000', were grown.

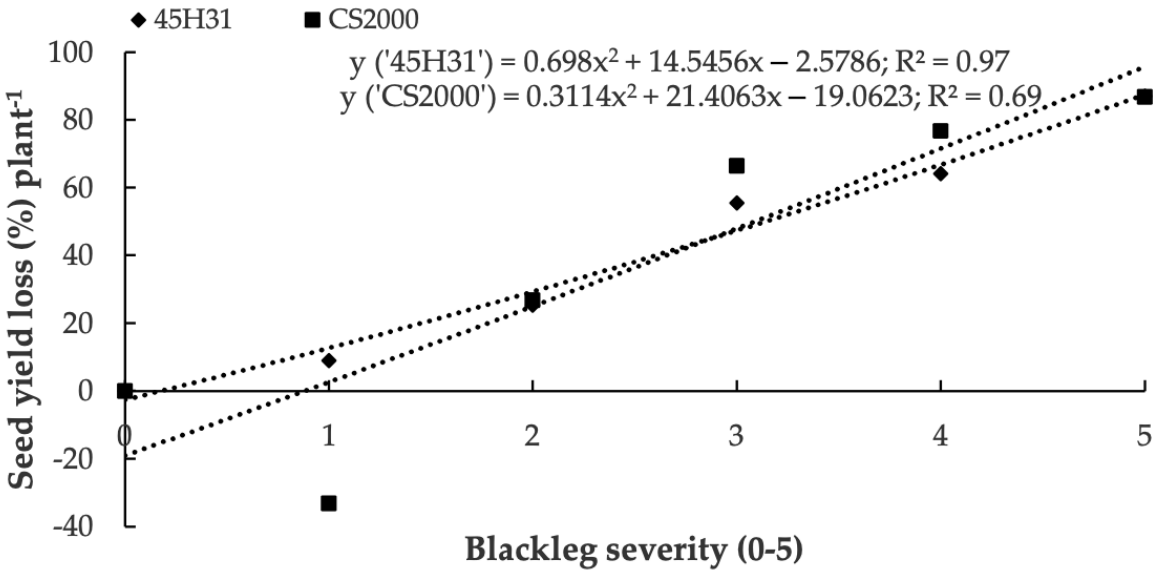
Researchers evaluated blackleg yield loss in 9 commercial canola fields in the County of Wetaskiwin and 3 fields in the County of Lacombe, Alberta in 2019. Plants within a 1 square metre area at 5 locations in each field were sampled, assessed for blackleg severity, and yield. All varieties were rated blackleg resistant.

Blackleg/Verticillium stripe interactions were evaluated at CDC-North in small plots in 2020 and 2021. Canola hybrids '45H31'and 'CS2000' were grown, and the plots were inoculated with both *L. maculans* and *V. longisporum* in various ratios. A non-inoculated control treatment was also included. Plots were rated for disease severity, and yield was calculated. Similar protocols were used in greenhouse experiments.

Correlating blackleg severity to yield

Generally, blackleg severity in the field plots was low, and never exceeded a mean rating of 2.4 for either hybrid. This is likely the result of both varieties being rated resistant to blackleg. Very mild disease ratings of 1 (0-1 scale) resulted in a small increase in yield compared to no disease, but yields decreased dramatically as disease severity increased to 2 or higher.

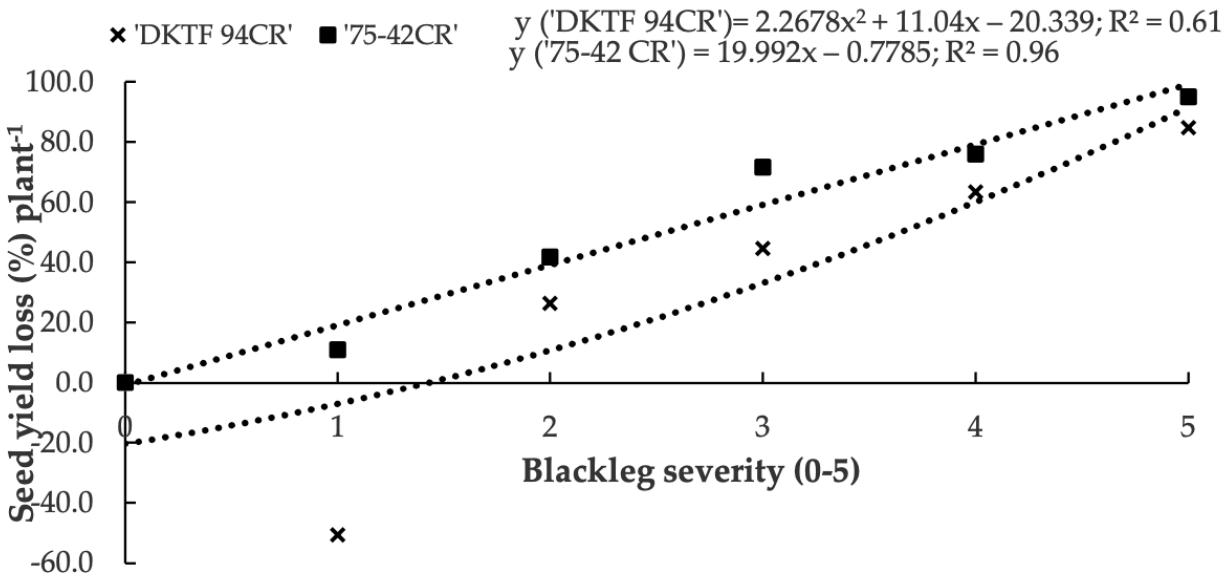
Relationship between blackleg severity and yield loss in the canola hybrids '45H31' and 'CS2000' under field conditions at Edmonton over 2 years in 2019 and 2020



Source: Hwang et al. 2023

In the commercial fields, the two varieties reacted to blackleg disease slightly differently. The hybrid DKTF 94CR had a slightly higher blackleg rating of 2.9, while 75-42CR had ratings of 2.7. While the ratio of blackleg rating to yield differed between hybrids, at higher blackleg severity ratings above 2, both had similar yield losses as disease severity increased.

Relationship between blackleg severity and yield loss in the canola hybrids 'DKTF 94C' and '75-42CR' sampled in 12 commercial fields around Lacombe and Wetaskiwin, AB, Canada, in 2019



Source: Hwang et al. 2023.

Blackleg and Verticillium Stripe interacted

At the two commercial sites over two years, blackleg disease severity ranged from 0.1 to 1.6 on '45H31', and from 0.0 to 1.3 on 'CS2000'. When plots were inoculated with both *L. maculans* and *V. longisporum*, blackleg severity increased. For example, the most severe blackleg ratings of 1.3 to 1.6 was on '45H31' at site 1 in 2020 in treatments inoculated with *V. longisporum* and *L. maculans*.

The mean Verticillium stripe severity ranged from 0.0 to 2.2 on the hybrid '45H31' and from 0.0 to 2.0 on 'CS2000' at the two sites over two years. The highest Verticillium stripe severity was in 2021.

The interaction between pathogens was also seen in Verticillium stripe severity. For example, the most severe Verticillium stripe severity was seen in 3 statistically similar treatments on CS2000 in

2021. These were when V. *longisporum* inoculant was applied alone with a severity rating of 1.6; in the treatment of a 1:3 mix of *L. maculans* and V. *longisporum* with a severity rating of 1.2; and in a treatment of a 1:1 mix of the pathogens with a 0.8 rating.

Yield was not significantly different between treatments, indicating that the disease severity caused by the various treatments was not severe enough to impact yields overall.

In some cases, Verticillium stripe caused greater yield losses than blackleg.

The researchers concluded that that the interaction between *L. maculans* and V. *longisporum* may cause more severe losses in canola, highlighting the need for proactive disease management strategies.

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Photo of canola dual-infected with blackleg and Verticillium stripe. Courtesy Sheau-Fang Hwang.