

Impact of a New Strain of Blackleg on the Canola Industry in Western Canada

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Canola is the major oilseed crop grown in the Prairie Provinces in Canada and its coverage area is expanding. Blackleg, caused by the fungus *Leptosphaeria maculans* is the most serious disease of canola/rapeseed in the prairies, and may cause major crop losses in some years. It is also an economically important and serious disease of canola (*Brassica napus* L.) in Australia, France, Germany, USA and the United Kingdom (7, 9, 10). The infections of blackleg may occur on cotyledons, leaves, stems and pods. Stem canker is the most serious symptom, as it can girdle the stem, causing plant lodging leading to yield loss. Three disease prevention methods -- crop rotation, genetic resistance and seed treatment with fungicide have proven to be effective.

Leptosphaeria maculans isolates can be categorized into four pathogenicity groups (PGs) on the basis of the interaction phenotypes (IP) on the differential canola cultivars Westar, Glacier, and Quinta (8, 1) by using a standard screening protocol in the greenhouse. Isolates in PG1 are weakly virulent as they generally cause superficial lesions on the leaves. However, isolates in PG2, PG3, and PG4 are highly virulent because they can produce stem canker at the base of the canola plant, causing significant yield loss. In Manitoba, *L. maculans* population consists mainly of PG2 (virulent on cv. Westar; avirulent on cvs. Glacier and Quinta) and a few PG1 isolates (avirulent on all three differentials) (5, 6). PG3 isolates (virulent on cv. Westar and Glacier; avirulent on Quinta) are found in Europe, Australia, USA and eastern Canada. The existence of PG3 in western Canada had not been established until its isolation in 2002 (4).

The Oilseed Pathology Lab in the Department of Plant Science, University of Manitoba monitors the pathogenic variability of blackleg isolates obtained from Manitoba each year. In 2002, the blackleg-resistant cv. Q2, was found to be severely infected in Roland, Manitoba.

Methods and Materials:

The canola stubble collected from a co-op trial plot (Roland, Manitoba) and a farm in East Selkirk (60 km northeast of Winnipeg, Manitoba) was isolated for the blackleg fungus. Small pieces of stubble were cut from the pseudothecia-forming section and surface sterilized with 1% sodium hypochlorite solution for 3 to 5 min and then rinsed in sterile distilled water. V8 agar medium containing 1% streptomycin sulphate was used to culture the isolates under continuous cool-white fluorescent light for 14 days. Pure cultures of the pathogen were isolated and characterized as *L. maculans* by means of colony morphology, pycnidia, and microscopic observations of pycnidiospores. Pycnidiospores that formed on V8 plates were flooded with 10 ml of sterile distilled water and then harvested by filtering through sterilized Miracloth and kept at -20°C . The isolates were passed once through cv. Westar to maintain their virulence. The PG test was performed with the three differential cultivars. Two additional cultivars, Q2 (resistant to PG2 isolates) and Defender (moderately resistant to PG2 isolates), were included for comparisons. Twelve 7-day-old cotyledons of each differential cultivar grown in Metro Mix were wound inoculated with a 10- μl droplet of pycnidiospore suspension (1×10^7 pycnidiospores per ml). Inoculated cotyledons were maintained in the greenhouse ($16/21^{\circ}\text{C}$ night/day and a 16-h photoperiod). The experiment was repeated twice. Disease severity on cotyledons was assessed 12 days post-inoculation by using a 0 to 9 scale (11).

Results and Discussion:

All five isolates from Roland and East Selkirk were highly virulent on Glacier (6.4 to 7.7), Q2 (7.1 to 8.2), and Defender (7.2 to 8.4), but intermediately virulent on Quinta (4.5 to 5.4). This clearly indicated that these isolates were of PG3. Isolates of PG2 have been predominant in Manitoba for the past 25 years, and highly virulent isolates belonging to PG3 had not been documented previously. To our knowledge, this is the first report of the presence of PG3 in *L. maculans* in Manitoba. This is a highly alarming

situation, as the varieties grown in the prairies are bred and screened for PG2 only. Now, with the presence of the PG3 strains in the field, it might cause devastation of the canola crop. So, it is important first to understand the extent of the spread and prevalence of the PG3 strain, and second, to develop canola varieties with resistance to PG3 isolates.

In 2003, plant pathologists, agricultural extension officers, and growers from all three Prairie Provinces plus the State of North Dakota, USA have sent in to our lab canola stubble from 70 fields. This stubble is from 14 canola varieties that have been classified as resistant (R) or moderately resistant (MR). We have already obtained 160 isolates and are in the process of conducting the PG differential test in the greenhouse to determine the prevalence of the pathogen in the prairies. Many cultivars from canola seed companies were also sent to us to be evaluated for resistance to the new strain. Some European cultivars such as Cando and Elite were found to be resistant to PG3 (2, 3) and our hope is that Canadian cultivars have a similar genetic background while being resistant or moderately resistant to PG2. Through the greenhouse tests we are carrying out we will be able to (a) isolate and identify PG3 strains; (b) understand the prevalence of the new strain in the Prairie Provinces; (c) find fields that are heavily contaminated with the new strain, and these locations may be used to screen existing canola cultivars and new lines from breeders for resistance to the new strain; and (d) identify from greenhouse tests cultivars that carry cotyledon resistance to PG3 strains.

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