Response of commercial varieties of canola (*Brassica napus*) to downy mildew (*Peronospora parasitica*)

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Abstract

Downy mildew, caused by *Peronospora parasitica* Pers. ex Fr., is a serious disease affecting young canola seedlings early in the season in Western Australia. Systemic infection at the seedling stage causes stunting of the plants and occasionally kills the plants if the infection is very severe. To date in Western Australia, there is no suitable chemical control measure for the control of downy mildew and moreover, there is no information available on the level of resistance to downy mildew in current commercial canola varieties. Therefore, eleven commercial varieties of canola (*Brassica napus* L.) were evaluated in a growth chamber experiment for their resistance to downy mildew using a conidial concentration of 2 × 105 conidia/ml. The severity of downy mildew was rated on all seedlings on a 0–9 rating scale. While none of the varieties showed immunity, the disease severity varied among varieties. The varieties with comparatively high resistance were Surpass 501TT, Hyden, Surpass 400, with severity scores ranging between 5.3–6.2, followed by Surpass 300TT, Outback and Beacon, with severity scores in the range of 6.3–6.8. The remaining varieties were found to be highly susceptible with the severity score ranging between 7.1 and 8.7. These results have important implications in breeding for resistance to downy mildew in canola.

Keywords: resistance, downy mildew, breeding, disease severity, oilseed rape.

Introduction

Downy mildew (*Peronospora parasitica*) Pers. ex Fr. has emerged as a serious disease of canola (*Brassica napus* L.) in Western Australia in the past few years particularly at the seedling establishment phase of the crop development. The fungus infects the cotyledons and first true leaves of the young canola seedlings at an early stage and later infects the older leaves. Lesions on the older leaves are in the form of pale or yellow angular necrotic areas on the upper leaf surface with the corresponding white cottony growth of the fungus on the lower leaf surface. Whereas, infection on the cotyledons and first two true leaves causes yellow discoloration of the whole leaves with white fluffy growth of the fungus underneath that leads to premature defoliation of cotyledons and the first two true leaves. Young seedlings remain stunted as a result of heavy infection. However, systemic infection causes the seedlings to shrivel and even causes the death of the seedlings. Currently, in Western Australia, there is no chemical control options for this disease. Moreover, from overseas, there are reports of development of resistant strains of this fungus to systemic fungicides such as metalaxyl (Brophy and Laing 1992; Crute *et al.* 1985). Therefore, breeding for downy mildew resistance is the most important component of downy mildew management strategies. To date, there is no information available on the resistance level of current commercial canola varieties to downy mildew. The objective of present studies was to screen a range of current commercial canola varieties against downy mildew and identify the varieties with the best resistance to downy mildew.

Materials and methods

A field isolate of downy mildew was collected from the Wongan Hills research station and maintained in the growth chamber. Eleven commercial canola varieties were screened for resistance to downy mildew in a growth chamber experiment. Twelve seeds for each canola variety were sown in pots at a depth of 2 cm. Conidial suspension of *P. parasitica* was prepared by washing off the conidia from the cotyledons on which the isolate was maintained (2×10^5 conidia/ml). The cotyledons of ten-day old test seedlings were inoculated by placing a 20 µl drop of conidial suspension on each side of the cotyledon. Plants were kept under high humidity after inoculation. The experiment was conducted at 16°C and 16 hour photoperiod. The experimental design was a complete randomised block with four replications. The disease severity was assessed 21 days after inoculation using a 0–9 rating scale (Nashaat and Rawlinson 1994). Average disease severity score was calculated for each treatment.

Data were analysed by analysis of variance (Genstat Release 6.1, Lawes Agricultural Trust, Rothamsted Experimental Station, UK). Least significant differences (Fisher's protected L.S.D.) were calculated following significant *F*-tests.

Results and discussion

The downy mildew severity varied among varieties, being lowest in Surpass 501TT (Figure 42). In contrast Surpass 600TT and Karoo were the most susceptible varieties with the disease severity score of 8.6 and 8.7 respectively. Since none of the commercial varieties tested exhibited outstanding resistance to downy mildew, more sources of resistance need to be tested. A very high level of resistance to downy mildew (*P. parasitica*) has been reported in some turnip rape (*B. campestris* L.) accessions at the cotyledonous stage (Gröntoft 1993).

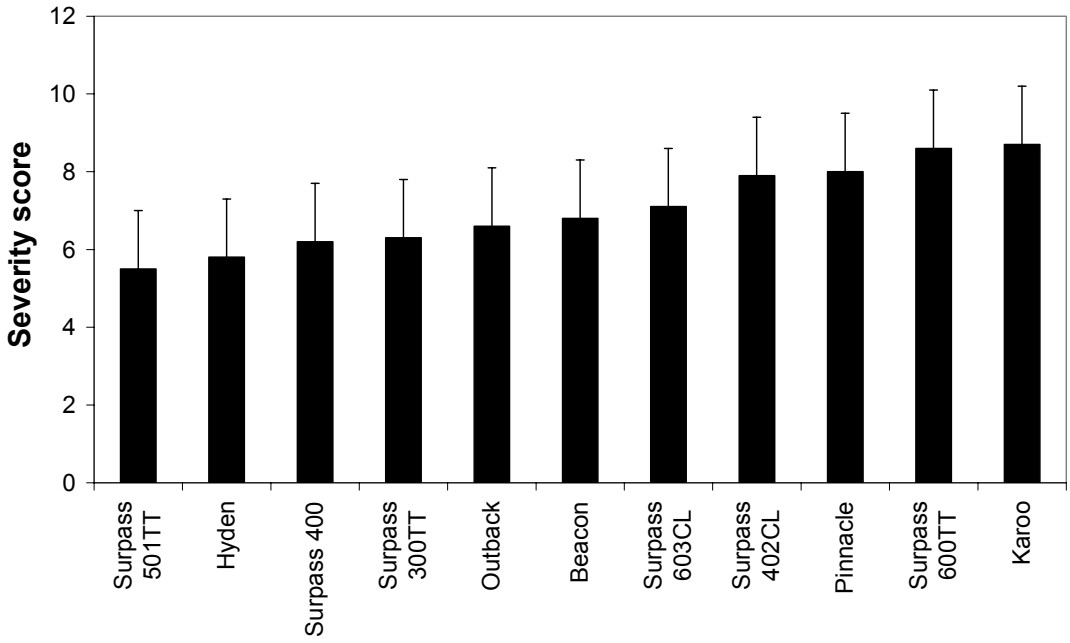

Figure 42: Mean disease severity scores of various commercial canola varieties screened for resistance to downy mildew in a growth chamber.
Vertical bars represent L.S.D. (P<0.05)

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