Evaluation of fungicides for the control of downy mildew (*Peronospora parasitica*) in canola

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Abstract

Downy mildew, caused by *Peronospora parasitica* Pers. ex Fr., is an important disease of canola that has implications during early seedling establishment. The fungus invades young seedlings and severe infection results in premature defoliation. In worst cases, the systemic infection may even kill the seedlings. Current commercial varieties of canola are very susceptible to downy mildew. Therefore, efficacy of various fungicides was tested for the control of downy in a growth chamber. Four fungicides, Jockey® (a.i. 167 g/L fluquinconazole), Aliette (a.i. 800 g/kg fosetyl), Coppox (a.i. 500g/kg copper oxychloride) and Benlate (a.i. 500 g/kg benomyl) were evaluated as seed dressings, each at 2 g a.i./kg seed. In an another experiment, Axiom MZ 720 (a.i. 640 g/kg mancozeb, 80 g/kg metalaxyl) was tested either as a seed dressing at 2 g a.i./kg or as a combination of seed dressing and foliar spray applied at 5, 7 and 15 days after inoculation or one day before inoculation. None of the fungicides except Jockey® tested in the first experiment were effective as a seed dressing to provide protection against downy mildew. However, Axiom MZ 720 as a seed dressing provided protection for only one week. The foliar spray of Axiom MZ 720 was not effective in providing protection if sprayed after inoculation. However, when it was applied as a foliar spray a day before the inoculation, it provided excellent control of downy mildew by completely inhibiting the disease development. Therefore, the control of downy mildew by foliar application of Axiom MZ 720 before the onset of the infection seems promising under growth chamber conditions and needs to be further tested under field conditions.

Keywords: oilseed rape, chemical control, downy mildew, disease severity, management

Introduction

Downy mildew (*Peronospora parasitica* Pers. Ex Fr.) is a serious disease affecting almost all the cruciferous crops world-wide including canola (*Brassica napus* L.). In the United Kingdom, this disease is also the most frequently recorded disease of winter oilseed rape (Gladders 1987). In Western Australia, this disease has been of sporadic occurrence but its incidence and severity has greatly increased over the past few years throughout the canola growing regions. Current commercial canola varieties have very little resistance to downy mildew. There are reports of control of downy mildew in vegetable brassicas with fungicides (Brophy and Laing 1992; Davies and Wafford 1987; Jensen *et al.* 1998). However, the information on the control of downy mildew on rapeseed is scanty (Puzari and Saikia 1997). These observations prompted the present investigations to evaluate various fungicide treatments for the control of downy mildew in canola.

Materials and methods

Two preliminary experiments were conducted in a growth chamber to screen various fungicides for the control of downy mildew in canola.

Experiment I

Four fungicides were applied as seed dressings, each at 2 g a.i./kg seed to canola seeds cv. Karoo:

- Jockey® (a.i. 167 g/L fluquinconazole)
- Aliette (a.i. 800 g/kg fosetyl)
- Coppox (a.i. 500 g/kg copper oxychloride)
- Benlate (a.i. 500 g/kg benomyl)

The untreated seed served as a control. The treated and untreated seeds were sown in pots (12 seeds/pot) at a depth of two centimetres. Ten-day old seedlings were inoculated by placing a 20 µl drop of a conidial suspension of downy mildew (2×10^5 conidia/ml) on either side of the cotyledon. Plants were kept under high humidity after inoculation. The experiment was conducted at 16°C with a 16 hour photoperiod. The experimental design was a complete randomised block with four replications. The plants were rated for the severity of downy mildew on a 0–9 rating scale three weeks after

inoculation using the method of Nashaat and Rawlinson (1994). Mean disease severity score for each treatment was calculated.

Experiment 2

In the second experiment, Axiom MZ 720 (a.i. 640 g/kg mancozeb, 80 g/kg metalaxyl) was tested either as a seed dressing at 2 g a.i./kg or as a foliar spray applied at 5, 7 and 15 days after inoculation or as a combination of seed dressing and foliar spray applied at 5, 7 and 15 days after inoculation or as a foliar spray applied one day before inoculation. The foliar application was applied to run-off at a rate of 1 g of product/Litre. The experimental design, method of inoculation and disease assessment was similar as described in experiment one except that the plants were rated twice (1 and 3 weeks after inoculation) for the severity of downy mildew.

The data for both the experiments were analysed by analysis of variance using Genstat Release 6.1 (Lawes Agricultural Trust, Rothamsted Experimental Station, United Kingdom). Least significant differences (Fisher's protected L.S.D.) were calculated following significant *F*-tests.

Results and discussion

Among the fungicides tested as seed dressing in the first experiment, the disease severity was significantly reduced by Jockey® compared with the control and other treatments (Figure 40). However, the disease severity was still very high with this treatment. In the second experiment, the seed treatment with Axiom MZ 720 provided substantial control only for one week, however, it failed to provide significant protection for a longer duration (Figure 41). Disease severity of downy mildew with the seed dressing or combination of seed dressing and foliar spray treatments of Axiom MZ 720 (1 g/L) was significantly lower than that of the foliar spray treatments above and control 3 weeks after inoculation. However, disease severity was still very high with these treatments. Disease control with these treatments was at similar level at 3 weeks to other fungicides tested in the first experiment. In contrast, no disease developed for up to 6 weeks if Axiom MZ 720 was sprayed one day before inoculation. It appears that this fungicide is unable to eradicate established infection, however, it is likely to provide good protection against the disease if sprayed before the onset of the disease.

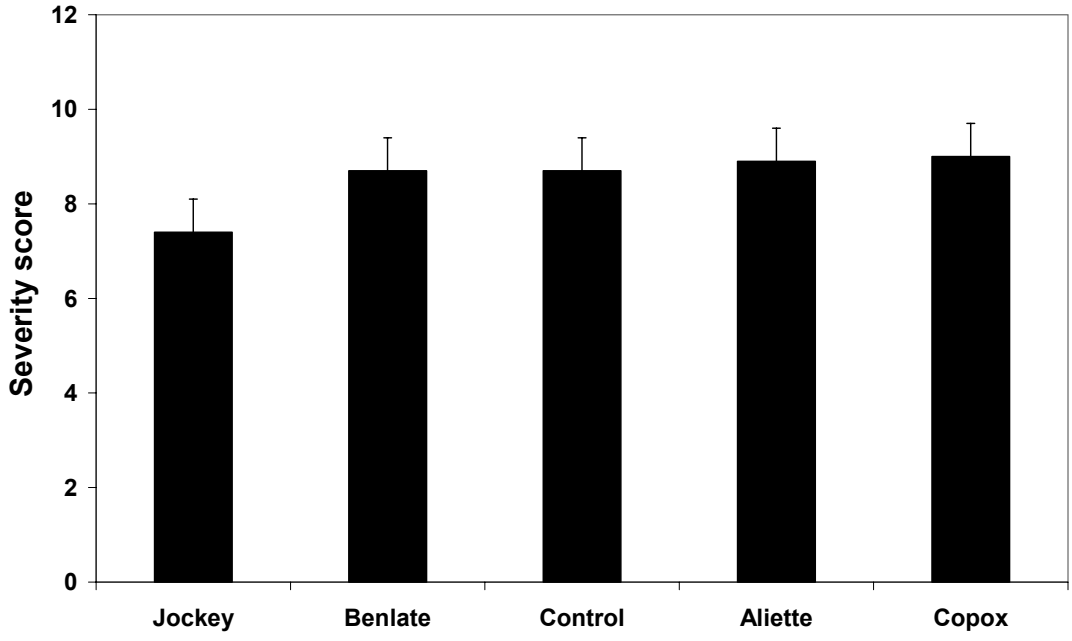

Figure 40: Effect of various fungicide seed dressings on mean severity score of downy mildew on canola cv. Karoo. Vertical bars represent L.S.D. ($P<0.05$)

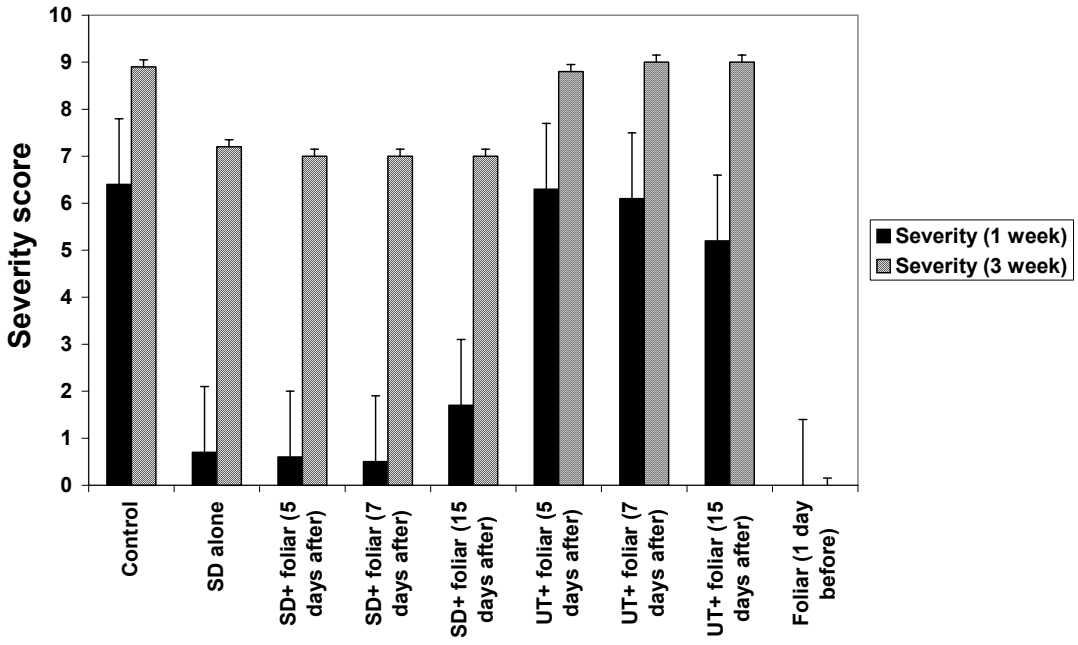

Figure 41: Effect of various treatments of Axiom MZ 720 on mean severity score of downy mildew on canola cv. Karoo. Foliar spray treatments of Axiom MZ 720 were applied 5, 7 and 15 days after and one day before inoculation. SD = seed dressing, UT = untreated seed. Vertical bars represent L.S.D. (P <0.05).

Conclusions

Seed dressing did not provide long term control of downy mildew in canola in growth chamber conditions. Axiom MZ 720 was most effective in providing control if sprayed before the onset of downy mildew. However, this treatment needs to be further tested under field conditions.

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