Fungicide performance against sclerotinia stem rot in winter oilseed rape

By Peter Gladders[1], Faye Ritchie[2] and Pete Berry[3]

[1]*ADAS UK Ltd, Boxworth, Cambridge, CB23 8NN, UK*
[2]*ADAS UK Ltd, ADAS Rosemaund, Hereford, HRI 3PG, UK*
[3]*ADAS UK Ltd, ADAS High Mowthorpe, Malton, N. Yorks, YO17 8BP, UK*

Abstract

The performance of six fungicides for control of sclerotinia stem rot and yield response in winter oilseed rape was investigated at two sites in 2007 using a single early to mid-flowering spray at four doses [0.25, 0.50, 0.75 and 1.0 (full label rate)]. High levels of sclerotinia developed at the sites in Hereford (82% untreated plants affected) and in Kent (41% untreated plants affected). All treatments gave control of stem rot though late infection at the Hereford site was poorly controlled. Treatments increased yield by an average 2.00 t ha^{-1} in Hereford and 0.59 t ha^{-1} in Kent. Boscalid, iprodione + thiophanate-methyl and prothioconazole were more effective than azoxystrobin, azoxystrobin + cyproconazole and tebuconazole for stem rot control and yield response in these experiments. For both disease control and yield response, higher dose rates were more effective than low rates. Growers are encouraged to use robust dose rates of fungicides to achieve good control of sclerotinia in oilseed rape.

Keywords: *Sclerotinia sclerotiorum*, yield response, fungicide dose, disease control

Introduction

Fungicides are used on more 90% of winter oilseed rape crops in the UK and expenditure is estimated to be about £12 million/annum (http://www.cropmonitor.co.uk/), but this could now double with changed economics when rapeseed is £400/tonne. There has been an increase in the use of fungicides to control sclerotinia stem rot (*Sclerotinia sclerotiorum*) following epidemics in England in 2007 and 2008 (Gladders *et al.*, 2008). Fungicide treatments are very cost-effective when optimised for product, dose and timing. There was a lack of independent data on the effectiveness of products for control of diseases in oilseed rape and this has been addressed in a project funded by HGCA. The results from two experiments with high levels of sclerotinia stem rot are presented in this paper.

Materials and Methods

Experiments for sclerotinia control were done on winter oilseed rape in 2007 near Hereford on cv. Catalina and on Romney Marsh, Kent on cv. Castille. Both farms had a history of sclerotinia problems. Fungicides were applied at 0.25, 0.50, 0.75 and 1.00 the full recommended rate in all trials at the early to mid-flowering stage (GS 4,2-4,3) in 200 litres of water ha^{-1} by OPS knapsack sprayer. The full rates of fungicides tested were azoxstrobin 250g a.i. ha^{-1} (as Amistar), azoxstrobin + cyproconazole 200g a.i. + 80 g a.i. ha^{-1} (as Priori Xtra), boscalid 250g a.i. ha^{-1} (as Filan), iprodione + thiophanate-methyl 500g a.i. + 500g a.i. ha^{-1} (as Compass), prothioconazole 175g a.i. ha^{-1} (as Proline) and tebuconazole 250g a.i. ha^{-1} (as Folicur). There was three-fold replication of treatments and plots (40-60m^2) were combine harvested and yields were adjusted to 90% dry matter. Disease assessments were done pre-harvest on 100 plants plot^{-1} and disease incidence data are presented here. Genstat with curve fitting using a negative exponential function (Paveley *et al.,* 2000) was used for statistical analyses.

Results

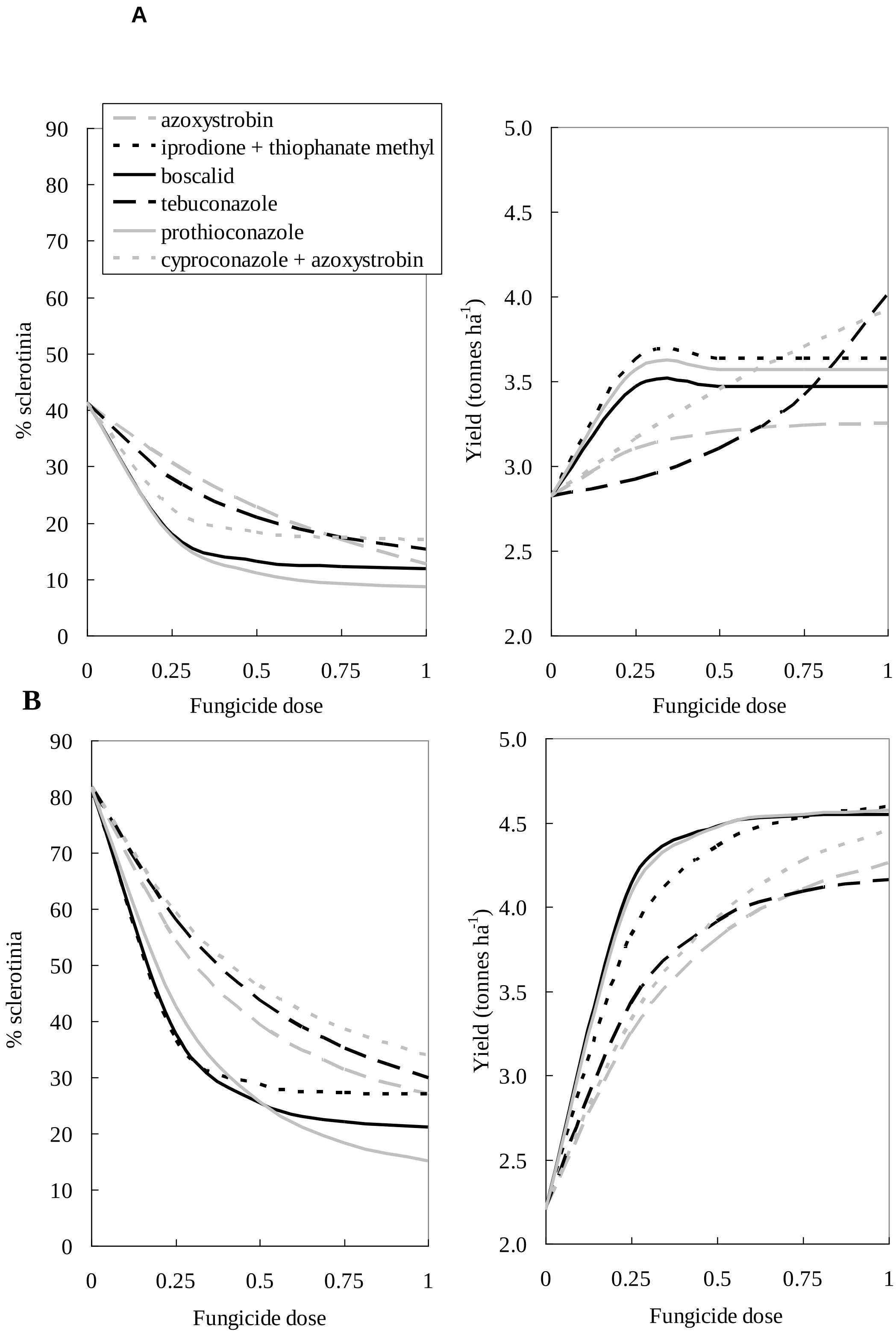

Figure 1. Sclerotinia stem incidence pre-harvest and yield in relation to fungicide treatments and dose at sites in Kent (A) and Hereford (B) and in 2007.

The Hereford site had severe disease (82% plants affected in the untreated controls) that developed in two stages. The first infection occurred during showery weather in late April and resulted in about 30% plant infection in untreated plots by mid May. The second phase occurred in mid to late May and this gave a further 50% plant infection. As a result of the severe infection, the plants in the untreated plots partially collapsed pre-harvest. All treatments gave significant control of sclerotinia, the range for individual products was 41-66%. Most treatments showed more than 35% of plants affected (Figure 1) as they gave poor control of late infection. Boscalid, iprodione + thiophanate methyl and prothioconazole gave better control than azoxystrobin, azoxystrobin + cyproconazole and tebuconazole (averaged over all doses) (Figure 1). The mean percentage stem rot control averaged over all doses increased with dose from 41.5% at 0.25 dose to 68.1% at full dose. Control was significantly improved by increasing dose up to 0.75 dose.

At the Kent site, there was very low disease up to the end of May but by the end of June, 41% plants were affected (30% plants with main stem lesions, 11% with lateral branches affected) in untreated controls. This suggested infection had occurred during mid-to late May when there was frequent rainfall. Nevertheless, the fungicides gave good control of stem rot and the most effective treatments had less than 2% of plants with sclerotinia on the main stem. There was significant control of main stem lesions from all fungicides ranging from 71 to 93% (averaged over all doses). Treatments were less effective against lesions on lateral stems and overall control on main and lateral stems was weaker (49 to 83%) than on main stems alone. Boscalid, iprodione + thiophanate-methyl and prothioconazole were the most effective products (Fig. 1). Low dose treatments gave significantly poorer control of sclerotinia. For example, 22% of plants had sclerotinia lesions at 0.25 dose compared with 12% at full dose (1.0).

There were significant differences in yield in relation to fungicide product and dose at the Hereford site but only to fungicide product in Kent where the mean response to fungicides 0.59 t ha^{-1} was significant (untreated yield 2.82 t ha^{-1}). The average yield at Hereford was 3.77 t ha^{-1} at 0.25 dose compared with 4.46 t ha^{-1} at full dose and 2.20 t ha^{-1} untreated. There were significant increases in yield between each dose up to 0.75 dose at the Hereford site but no significant dose effects at the Kent site where disease incidence was lower. There was no significant yield difference between 0.75 and full dose (1.0) at the Hereford site. Use of full dose treatments compared with 0.25 dose, improved margins over fungicide costs by about £300 ha^{-1} (rapeseed at £400 t^{-1}) at the Hereford site.

Discussion

Control of severe epidemics of sclerotinia stem rot was achieved with a single fungicide treatment applied at the early to mid-flowering stage. There were large yield responses (>2.0 t ha^{-1}) where the crop had 82% plants with stem rot. The response to treatment is usually related to the level of stem rot that develops in the crop though additional benefits may be achieved from plant growth regulation and decreased lodging. In 2007, plant infection occurred on several occasions during the flowering period and late infection at the Hereford site was poorly controlled. It now appears that fungicides provide good protection for about three weeks after application and that two-spray programmes are required to protect crops during the whole flowering period (ADAS, unpublished data).

There were significant differences in fungicide performance in relation to product and dose for stem rot control. Boscalid, iprodione + thiophanate-methyl and prothioconazole were more effective than azoxystrobin, azoxystrobin + cyproconazole and tebuconazole for stem rot control and yield response in these experiments. Product choice is more important where disease pressure is high. The availability of a range of fungicides with different modes of action will enable treatments to be diversified to reduce the risks of fungicide resistance developing in *S. sclerotiorum*. For both disease control and yield response, higher dose rates were more effective than low rates. Growers are encouraged to use robust dose rates of fungicides to achieve good control of sclerotinia in oilseed rape.

Acknowledgements

We gratefully acknowledge funding from the Home-Grown Cereals Authority (HGCA).

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