Spray Application Methods to Maximize Sclerotinia Control in Canola with Foliar Fungicide

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Abstract

Vinclozolin (Ronilan) and benomyl (Benlate) fungicides were applied to canola with 5 application methods to determine the impact of nozzle type and pressure on sclerotinia stem rot suppression over 3 seasons in north-east Saskatchewan. A spray deposition study was conducted under controlled conditions, which showed that the majority of spray was intercepted by the top third of the canola canopy for all application systems, with a slight increase in the amount deposited on the upper flowers with elevated spray pressure. Flowers and buds retained nearly 20% of the total applied spray dose, and leaves retained most of the remainder. Stems retained a very minor proportion of the applied dose. Coarser sprays delivered more of their dose in the target area, but had lower retention values on flowers and buds than the finer sprays. In field experiments fungicide effectiveness varied with environmental conditions each season but both products were generally equally effective in 1998 and 2000, reducing stem rot incidence and increasing yield over that of untreated plots. In 1999 neither fungicide was effective for sclerotinia control likely due to the prevailing environment that was conducive to heavy disease development. Overall, conventional flat fan nozzles (TeeJet XR) and low-drift venturi nozzles (Greenleaf TurboDrop) were equally effective at reducing stem rot incidence. There was a trend to improved stem rot control and increased yield for each nozzle when operated at elevated pressure. Based on these results, venturi nozzle technology is appropriate for use with foliar fungicides for sclerotinia stem rot control in canola provided pressures are adjusted to optimize nozzle performance.

Introduction

Sclerotinia stem rot of canola is a perennial threat to canola production in the Parkland. Foliar fungicide application is still the most important control method for most producers, who have the choice of a number of products. Spray nozzle design has undergone significant advances over the past few years. Most notably, venturi nozzle technology is rapidly being adopted as a means of improving deposition of sprays under windy conditions. Custom applicators are leading users of the technology, and many are considering wholesale switches to these new nozzles for all their applications, including fungicides. Although spray drift has historically not been considered a major concern for fungicides, the advantages of improving on-target deposition under a wider window of application can improve the timeliness and effectiveness of the spray application.

In order to achieve effective disease control and maximum economic benefit from fungicide application, growers need to know the impact that application equipment has on various control products. A study was undertaken at the Melfort Research Farm from 1998 to 2000 to determine: the effect of low-drift nozzle technology on foliar fungicide application, and interactions among

application methods and fungicide products [benomyl (Benlate) and vinclozolin (Ronilan)] on stem rot control and yield.

Materials and Methods

Canola (cv. Quest) was direct-seeded into wheat stubble in fields at high risk of sclerotinia stem rot infection. At 20-30% bloom fungicide spray treatments were applied using conventional (TeeJet XR) and venturi-type (Greenleaf TurboDrop) flat fan nozzles at normal (40 psi) and elevated pressures (80 psi). A hollow cone nozzle at 90 psi and an unsprayed check were included. At 40 psi, XR8002 tips produce a "medium" spray quality, whereas at 80 psi, XR80015 tips produce a "fine" spray quality. Greenleaf TurboDrop TD11002 and TD110015 are venturi nozzles that emit a "very coarse" spray, even at higher pressures. This spray is noted for its extreme drift resistance, but little is known about impacts on fungicide efficacy. Travel speeds were between 8 and 9.5 km/h, depending on the nozzle treatments.

Results and Discussion

Sclerotinia was prevalent at Melfort in all three years, with a mean disease incidence ranging from 30 to 55% of plants infected on the unsprayed check. Stem rot incidence was reduced and yield increased in 1998 and 2000 with the application of fungicides (Figure 1). Both Ronilan and Benlate effectively managed disease, reducing sclerotinia incidence dramatically in 1998 and 2000 but not in 1999. Differences in effectiveness of fungicide treatments between years were likely due to environmental conditions. In 1998 and 2000 showers and humid conditions during flowering coupled with normal temperatures promoted sclerotinia stem rot infection. In 1999 moisture conditions were suitable for disease development but temperatures were cooler than normal. This increased the flowering period of the crop and perhaps delayed growth and development of the pathogen. To be effective in 1999 fungicides likely should have been applied more than once.

When fungicide reduced disease (i.e., 1998 and 2000), nozzles did not differ in their ability to control disease or protect yield (Figure 2). It appeared that reduced stem rot incidence and increased yield was associated with increased spray pressure for either nozzle or fungicide product, although these effects were not statistically significant. Testing under controlled conditions revealed that spray deposition patterns were similar for all nozzles but increased pressure tended to deposit more spray on the flowers (Figure 3). Since the petals are the primary sites of stem rot infection and colonization it appears that the increased deposition of spray on petals when spray pressure was increased was responsible for the reduced infection and yield loss.

Under the conditions present at Melfort in 1998 and 2000 both Benlate and Ronilan effectively reduced sclerotinia stem rot incidence in canola and increased yield. Venturi type nozzles appear suited for use with foliar fungicides in canola. For best venturi nozzle performance, higher spray pressures are recommended.

Acknowledgments

Financial support from the Canola Council of Canada (Saskatchewan Canola Development Commission and Manitoba Canola Growers Association) and the Matching Investment Initiative

of Agriculture & Agri-Food Canada is acknowledged. Products supplied by DuPont Canada and BASF. Thank you to Colleen Kirkham and Brian Caldwell for technical support.

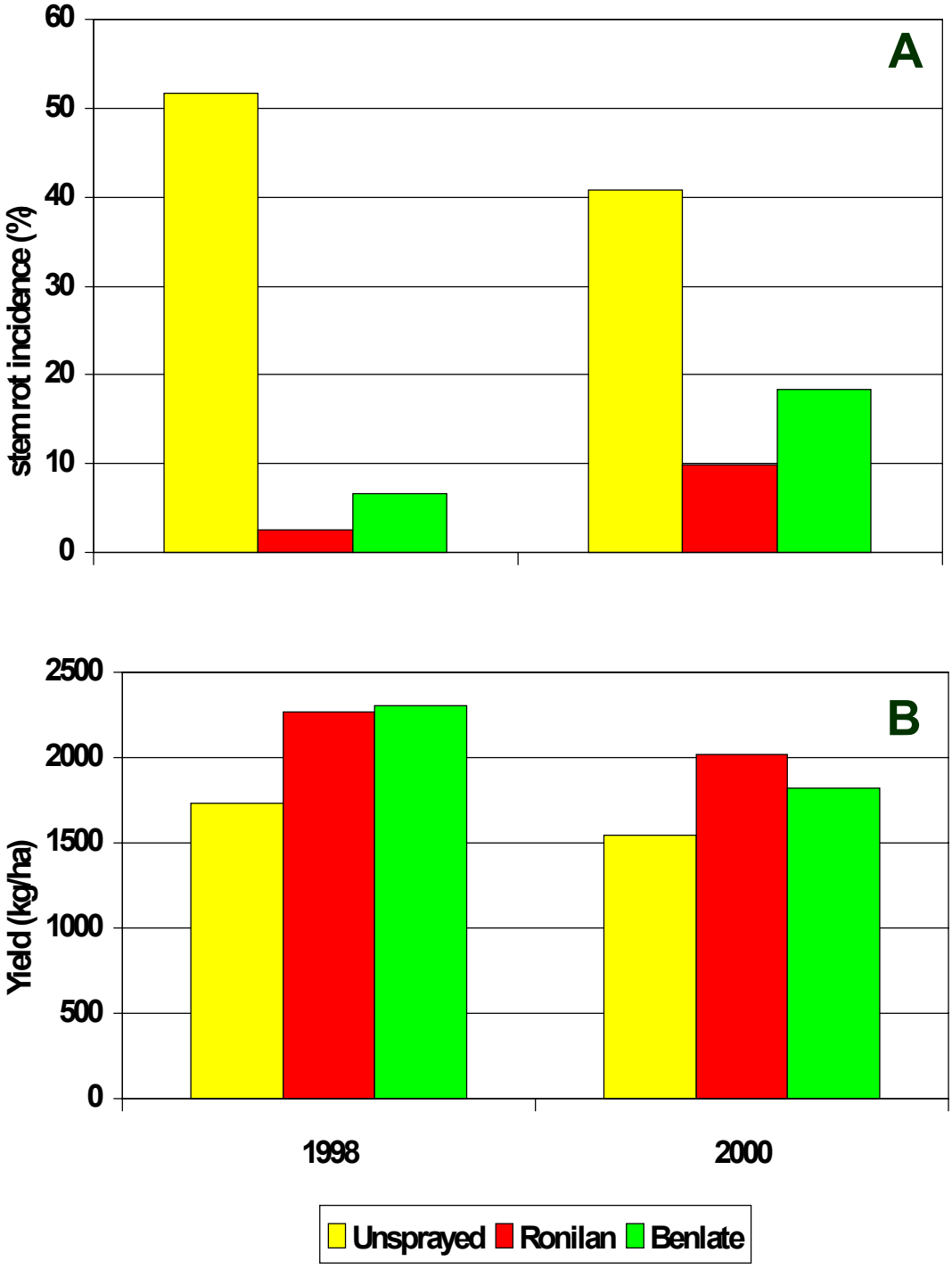

Figure 1. Effect of Ronilan and Benlate fungicides on: A - sclerotinia stem rot incidence (% of plants infected) and B - yield (kg/ha) of Quest canola at Melfort, SK in 1998 and 2000.

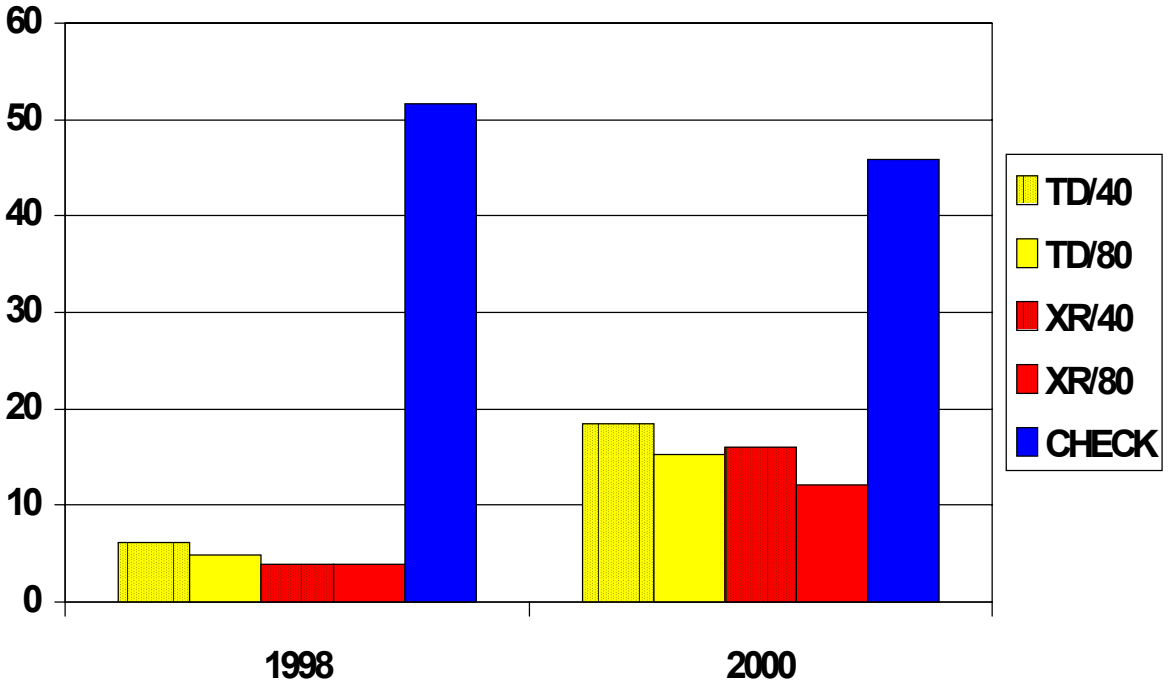

Figure 2. Sclerotinia stem rot incidence (% of plants infected) for Greenleaf TurboDrop venturi (TD) and conventional (XR) sprayer nozzles at 40 and 80 psi at Melfort, SK.

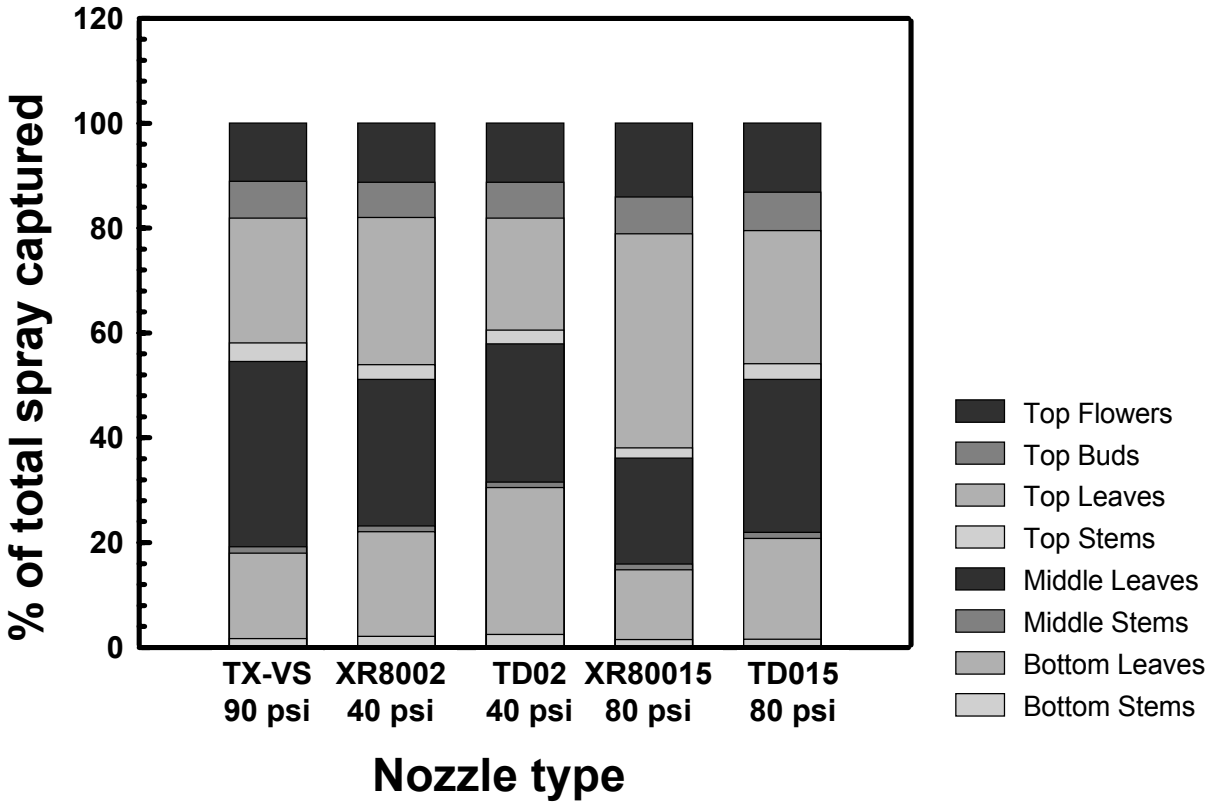

Figure 3. Deposition of spray (%) captured by canola plant parts under controlled conditions by hollow cone (TX-VS), conventional (XR) and Greenleaf TurboDrop venturi (TD) nozzles at various pressures.