Foliar Applied Fungicides for the Control of Tan Spot, Regent, ND, 2004

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Summary

Four registered foliar fungicides were evaluated for the control of tan spot (*Pyrenophora tritici-repentis* Died.) on hard red spring wheat (*Triticum aestivum* L. c.v. Reeder) by comparing disease incidence and severity, and yield parameters of treated plots to those in untreated plots near Regent, North Dakota. All early season applications of foliar fungicides reduced both the incidence and severity of tan spot at the early season evaluation but differences in incidence among treatments were not significant during the late season evaluation. In the late season evaluation, the severity of tan spot was significantly lower for all treatments except Tilt. Stratego treatments at Feekes growth stage 10 resulted in significantly lower tan spot severity at late season evaluation compared to other fungicide treatments. No significant differences were noted in grain test weight of any of the treatments but grain yield was significantly higher for both rates of Stratego and Tilt applied early in the season. A slight crop injury was observed only in the two late season applications of Stratego.

Introduction

Spring wheat was grown on approximately 1,410,000 acres in North Dakota counties located south and west of the Missouri River in 2002 (Hartwig and Meyer 2003) . Rotation to non-host crops provides time for wheat pathogens to degrade. However, during some years spores of foliar diseases can move into adjacent fields. Some long-lived residual herbicides that producers have used may prevent rotation to non-host crops, or producers have limited themselves to continuous wheat or wheat-fallow rotations. Foliar diseases such as tan spot are more prevalent in continuous wheat fields than in fields where crop rotation is practiced (Wiese, 1987). In western North Dakota, of the known previous crops reported in a 2004 study, 65% of the wheat grown had been in fields where wheat was grown the previous year (McMullen, 2004).

No-till systems in combination with intensive wheat rotations allow infected wheat residue from the previous year to remain on the surface thus more fruiting bodies are formed compared to clean tilled systems and greater levels of disease spores are placed in close proximity to wheat generally causing greater levels of disease (Adee and Pfender, 1989; Wright and Sutton, 1990).

A "Stacked" rotation, where wheat is grown in two consecutive years and then some crop other than wheat is grown for two years before returning to wheat, is thought to reduce disease pressure compared to continuous wheat (Beck, 2004). Disease pressure is thought to be sufficiently low during the two years in wheat that disease pressure is not an economic problem.

Western North Dakota is often thought to be too dry to support economically damaging levels of foliar disease in most years. The objective of this demonstration/study is to determine if low rates of foliar fungicide applied at the three- to five-leave stage is beneficial when disease pressure is expected to be high during the second year of wheat in a stacked rotation.

Materials and Methods

The experiment was conducted near Regent, North Dakota in a producer's field with a previous cropping history of wheat in 2003 and canola in 2002. Precipitation for this location was recorded at the North Dakota Agricultural Weather Network Mott site, which is located about six miles east of the test location.

A randomized complete block design with four replications was used. Each plot was 6.2 feet wide by 25 feet long with a 3 feet buffer strip of spring wheat seeded between each plot. Urea (46-0-0) was applied at the rate of 100 pounds per acre on 22 October 2003. Herbicide was applied on 9 April 2004 to kill volunteer wheat and emerged weeds. On 16 April, the crop was seeded using a low-disturbance direct seeding method into undisturbed wheat residue.

Post emergent application of herbicide and early season application of fungicide were delayed because of subfreezing temperatures on 13 and 14 May, which severely injured the first and second leaves of the crop. Applications were made after the plant had at least two fully extended uninjured leaves visible. Discover and Harmony Extra herbicides were tank mixed and applied on 25 May. Fungicide applications at Feekes growth stage 3 (FGS3) were

made on 27 May and applications at Feekes growth stage 10 (FGS10) were done on 25 June. All fungicide treatments were applied in 19.1 gallons of water per acre at 30 psi using a CO_2 pressurized hand-held spray boom equipped with 8002VS flat fan nozzles.

The early season crop injury and disease evaluation was conducted on 2 June, the late season evaluation of crop injury on 6 July followed by a late season disease evaluation on 16 July. Evaluations consisted of observation made on ten consecutive plants in the center row of each plot. Incidence was recorded as the percent of plants with at least one tan spot lesion observed on a plant. Severity was recorded as the average leaf area covered by lesions for all leaves for the early season evaluation and only for the top three leaves for the late season evaluation.

Plots were hand harvested on 25 August and bundles hung up to dry. Grain was threshed from each bundle with a stationary combine on 8 September and then cleaned and weighed.

All data was statistically analyzed using SAS Statistical software version 8.02 Proc ANOVA (SAS Institute Inc., 2001).

Results and Discussion

Early season precipitation was well below normal with 52, 51, and 26% of normal for April, May, and June respectively. July rainfall was 105% of normal followed by August with 76% of normal. The lack of rainfall in June and early July delayed the late season disease evaluation .

All early season applications of foliar fungicides reduced both the incidence and severity of tan spot at the early season evaluation on 2 June but differences in incidence among treatments were not significant on 16 July (Table 1). In the late season evaluation on 16 July, the severity of tan spot symptoms on leaves was significantly lower for all treatments except the Tilt treatment. Stratego treatments at FGS10 resulted in significantly lower tan spot severity than other fungicide treatments. The lower leaves of plants from both the untreated Control and Stratego application made at FGS10 appeared to exhibit the same degree of necrosis while the leaves of plants from the early Stratego application appeared to have fewer necrotic lower leaves (Figure 1).

The early season applications of Stratego, Tilt and Headline treated plots yielded 4.6, 3.9, and 2.3 bushels more grain than the untreated plots. Grain yield for the Stratego and Tilt plots was significantly higher than the untreated Control plots. There were no differences in grain test weight detected for any of the treatments. Folicur 3.6F, a product that is not registered for the control of tan spot reduced the severity of symptoms on the leaves of the plant but yield was not significantly improved over the check.

A foliar fungicide applied to the second year of wheat in a "stacked" rotation was beneficial in terms of grain yield. Tan spot inoculum levels may not have been high enough to cause economic injury to wheat grown in the first year in a "stacked" rotation but inoculum levels and the close proximity of infected residue developed into a problem for wheat grown in the second year of the "stacked" rotation.

Implications of Demonstration

Early season applications of foliar fungicides registered for the control of tan spot at low rates tank mixed with herbicides may be beneficial in controlling foliar fungus problems in fields that have a cropping history of continuous or the second year of wheat in "stacked" rotations. Early season, low rate Stratego or Tilt fungicide applications may be applied at the same time that producers apply herbicides to the growing crop. This may present growers with an economical means to apply fungicides when intensive wheat rotations warrant their application.

Cooperating Producer

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Table 1. Foliar fungicide application for the control of tan spot in Reeder hard red spring wheat on the Vernon Mayer Farm, Regent, 2004.

	-- Early season evaluation[y] --			-- Late season evaluation[x] --			---- Grain ----	
Treatment[z]	Crop injury	Incidence	Severity	Crop injury	Incidence	Severity	Yield	Test weight
rate/A	%	%	%	%	%	%	bu/A	lb/bu
Control	0.0	85.0	13.0	0.0	100.0	27.8	41.8	60.4
Stratego 5 fl oz/FGS3	0.0	48.0	2.0	0.0	100.0	16.0	46.5	60.4
Stratego 4 fl oz/FGS3	0.0	60.0	4.0	0.0	100.0	16.3	46.2	60.1
Stratego 5 fl oz/FGS10	-	-	-	0.8	100.0	7.3	43.0	60.5
Stratego 10 fl oz/FGS10	-	-	-	1.3	100.0	7.5	44.0	60.5
Folicur 3.6F 2 fl oz/FGS3	0.0	48.0	4.0	0.0	100.0	12.3	41.0	60.8
Headline 3 fl oz/FGS3	0.0	48.0	1.8	0.0	100.0	18.5	44.1	60.8
Tilt 2 fl oz/FGS3	0.0	50.0	4.0	0.0	100.0	22.3	45.7	60.9
Mean	0.0	56.5	4.8	0.25	100.0	16.0	44.0	60.6
CV%	-	17.2	38.3	97.6	-	31.6	5.0	1.0
$LSD_{.05}$	NS	16.0	4.1	0.35	NS	7.4	3.2	NS

[z] Fungicide, rate, and treatment stage. Growth stage: FGS3 = Feekes Growth Stage 3, FGS10 = Feekes Growth Stage 10. Activator 90, a non-ionic surfactant, was added to all fungicide treatments at a rate of 1% of spray volume.

[y] Early season evaluation was on 2 Jun.

[x] Late season evaluation of crop injury was on 6 Jul and evaluation of leaf spot disease incidence and severity was on 16 Jul.

Figure 1. Representative plants from three selected treatments from the foliar fungicide trial at Regent, ND, as they appeared on 16 Jul 2004. Note necrotic leaves in the untreated Control plants compared to the necrotic leaves for Stratego applied at Feekes growth stage 10 (FGS 10) and Stratego applied at Feekes growth stage 3 (FGS 3).