

Economic Evaluation of Tebuconazole on Commercial Wheat Varieties in Northeast Texas, 2013

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INTRODUCTION

Foliar fungicides have proven to be an effective tool to manage foliar diseases in this region. They are very effective against leaf rust, stripe rust, and glume blotch. Following is a discussion of our local applied research over the five year period from 2009-2013.

Foliar fungicides do not enhance yields- they can only protect potential yields from loss to the rusts or glume blotch. Consequently, they are not profitable in the absence of disease.

Our early work was focused on evaluating the performance of foliar fungicides on varieties that were highly susceptible to leaf and stripe rust. As would be expected, a fungicide application on susceptible varieties was almost always profitable when disease was present. Our most recent work concentrated on evaluating the performance of foliar fungicides on commercially planted varieties – wheat varieties with at least some level of resistance to the rusts. We selected tebuconazole because it was as effective as any wheat fungicide on the market, at a fraction of the cost of the others.

Over the past five years, we conducted a study on the profitability of tebuconazole on commercially planted varieties with good resistance to both leaf and stripe rust. From 2009-2012, the varieties included Syngenta Magnolia, Syngenta Coker 9553, Pioneer 25R47, and Terral LA 841. In 2013, we amended the study to include the newest, high performing varieties available in this region. We dropped most of the older varieties, and added varieties we considered to be even more resistant to the rusts than the ones we had been evaluating. In 2013, we compared the following varieties in both a sprayed and unsprayed scenario: USG 3555, USG 3251, SY Coker 9553, Terral TV 8525, Terral TV 8861, Pioneer 25R30, Pioneer 25R40, and Billings. All of the varieties tested were soft red winter wheats (SRWW) except Billings, which is an early maturing hard red winter wheat (HRWW).

A single application of TebuStar® (tebuconazole) was applied at the rate of 4 ounces per acre. We targeted a late application, at growth stages ranging from Feekes 9 (full flag leaf emergence) to Feekes 10.5.1 (flowering). A non-ionic surfactant (Preference®) was mixed with the spray solution at the rate of

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.25% by volume. The plots were sprayed with a CO₂ powered backpack sprayer in 14 gallons of spray solution per acre. Fungicide effectiveness was evaluated by measuring both yield and bushel weights of the treated and untreated wheat.

DISCUSSION

Over the period from 2009-2011, tebuconazole did not provide a positive return on investment in 13 out of 28 observations, even though the breakeven cost of this application was just a little over a bushel per acre. With a few exceptions, this was a measure of the value of controlling leaf rust in Terral LA 841, Magnolia, Pioneer 25R47, and Coker 9553. Control of glume blotch was the reason we saw a positive return on investment with tebuconazole with these varieties in 2009 in Royse City and 2012 in Howe.

The 2012-2013 growing season was a different story. The crop was planted on time, but much of the area wheat crop did not emerge until early January, following a rain and snow event on Christmas day.

Unusually cool winter and early spring temperatures, allowed all of the commercial wheat to accumulate enough hours of chilling to vernalize and begin the reproductive process. However, jointing occurred two weeks later than normal, delaying the maturation process. Thus, the grain filling process was also delayed by around two weeks, pushing it into a time when average conditions are usually much warmer and drier. Fortunately, the cooler than normal conditions persisted into early summer, allowing the plants enough time to complete the grain filling process.

We rated the plots for foliar diseases on May 17, and estimated the percent of the flag leaf that was infected by leaf rust (there was no stripe rust or glume blotch observed at this time). Results are as follows:

USG 3555	11.7ab
SY Coker 9553	15.0abc
Pioneer 25R30	15.8abc
Pioneer 25R40	15.8abc
USG 3251	15.8abc
Terral 8525	31.7cd
Terral TV 8861	38.3d

In most years, these levels of leaf rust at this stage of development would not cause serious damage, but that was not the case in 2013. We measured unusually large yield and bushel weight increases in all varieties under study. We can only surmise that leaf rust infections increased dramatically after our ratings, and that they had a devastating effect on the wheat because the crop matured so much later than usual. Following is a summary of our 2013 results:

**Table 1 Yield in Bushels Per Acre
Bailey, TX**

Variety	Bu/A Sprayed	Bu/A Unsprayed	Additional Bushels With Fungicide	Percent Increase with Fungicide
USG 3555	102.3a	87.9b	14.4	16.4
SY Coker 9553	100.9a	85.8b	15.1	17.6
Terral TV 8525	90.0b	56.7d	33.3	58.7
Pioneer 25R40	87.4b	65.2c	22.2	34.0
Terral TV 8861	86.3b	54.5d	31.8	58.3
Pioneer 25R30	85.7b	55.1d	30.6	55.5
Billings	81.3b	68.9c	12.4	18.0
USG 3251	73.7c	50.9d	22.8	44.8
Average	88.5	65.6	22.8	37.9

Howe, TX

Variety	Bu/A Sprayed	Bu/A Unsprayed	Additional Bushels With Fungicide	Percent Increase with Fungicide
Pioneer 25R30	105.2a	75.4b	29.8	39.5
Pioneer 25R40	103.6a	65.0bc	38.6	59.4
Terral TV 8525	99.9a	68.9bc	31.0	45.0
USG 3251	96.2a	58.1c	38.1	65.6
USG 3555	95.7a	76.8b	18.9	24.6
Terral TV 8861	95.7a	64.5bc	31.2	48.4
SY Coker 9553	94.5a	70.0bc	24.5	35.0
Billings	76.8b	61.3c	15.5	25.3
Average	96.0	67.5	28.5	42.9

Table 2 Bushel Weight (Lb/Bu)**Bailey, TX**

Variety	Lb/Bu Sprayed	Lb/Bu Unsprayed	Increase Lb/Bu With Fungicide	Percent Increase with Fungicide
Billings	61.5a	59.9bc	1.6	2.6
SY Coker 9553	60.6b	59.4c	1.2	2.0
Terral TV 8525	58.1d	54.2g	3.9	7.2
Pioneer 25R30	57.6de	53.8gh	3.8	7.1
Terral TV 8861	57.3de	54.5fg	2.8	5.1
USG 3555	57.3de	54.9fg	2.4	4.4
Pioneer 25R40	56.9e	54.3fg	2.6	4.8
USG 3251	55.4f	53.0h	2.4	4.5
Average	58.1	55.5	2.6	4.7

Howe, TX

Variety	Bu/A Sprayed	Bu/A Unsprayed	Additional Bushels With Fungicide	Percent Increase with Fungicide
Billings	61.5a	59.3cd	2.2	3.7
SY Coker 9553	60.8ab	58.1de	2.7	4.6
Pioneer 25R30	59.9bc	55.7f	4.2	7.5
Terral TV 8525	59.2cd	55.3fg	3.9	7.1
Pioneer 25R40	58.6cde	53.5h	5.1	9.5
Terral TV 8861	58.5cde	54.9fg	3.6	6.6
USG 3251	57.5e	51.7i	5.8	11.2
USG 3555	57.3e	54.0gh	3.3	6.1
Average	59.2	55.3	3.9	7.0

Table 3 Lodging Comparisons²**Bailey, TX**

Variety	Lodging Rating Sprayed	Lodging Rating Unsprayed	Difference
Terral TV 8525	80.0a	78.3ab	1.7
Terral TV 8861	80.0a	80.0a	0.0
USG 3555	80.0a	78.3ab	1.7
USG 3251	80.0a	78.3ab	1.7
Pioneer 25R40	78.3ab	78.3ab	0.0
Pioneer 25R30	76.7ab	71.7ab	5.0
SY Coker 9553	71.7ab	68.3b	3.4
Billings	45.0c	43.3c	1.7

Howe, TX

Variety	Lodging Rating Sprayed	Lodging Rating Unsprayed	Difference
Terral 8525	80.0a	63.3abc	16.7
Terral 8861	80.0a	75.0a	5.0
USG 3555	75.0a	73.3a	1.7
Pioneer 25R30	75.0a	65.0abc	10.0
Pioneer 25R40	75.0a	65.0abc	10.0
USG 3251	71.7ab	70.0ab	1.7
SY Coker 9553	70.0ab	55.0bcd	15.0
Billings	51.7cde	36.7e	15.0

² Lodging was determined by estimating the angle of the stem to the ground in degrees. Wheat standing straight up would be 90°. Wheat that was fully lodged and on the ground would be represented by an angle of 0°.

SUMMARY

Yield increases with a foliar fungicide at the Bailey location ranged from 14.4 to 31.8 bushels per acre, with an average increase of 22.8 bushels per acre. The early maturing varieties showed a smaller increase (14.0 bushels) than the later maturing varieties (27.5 bushels). Yield increases at the Howe location ranged from 15.5 to 38.6 bushels per acre, with an average increase of 28.5 bushels per acre (Table 1). Again, the early maturing varieties produced a smaller yield increase (19.6 bushels) than the later maturing varieties (34.4 bushels per acre).

We also observed large increases in bushel weight where tebuconazole was sprayed. At the Bailey location, we observed bushel weight increases with the fungicide ranging from 1.2 to 3.8 pounds per bushel, with an average of 2.6 pounds per bushel. At the Howe location, we measured bushel weight increases with tebuconazole from 2.2 to 5.8 pounds per bushel (Table 2). We observed a smaller average bushel weight increase with the early maturing varieties (2.7 pounds) than the later maturing varieties (4.7 pounds).

Weather conditions just prior to and during harvest were mild at our research sites, so lodging was not a serious problem this year. However, there was a slight but not significant improvement in standability in the fungicide treated wheat (Table 3). Fungicide treated wheat has better straw quality than untreated wheat, and some years a fungicide treatment can significantly reduce lodging and facilitate harvest operations.

CONCLUSIONS

In 2013, we changed the lineup of wheat varieties to test in our fungicide profitability study, with the expectation that the responses to the fungicide would be less than we had observed over the previous four years. All of the varieties we tested this year had previously shown excellent resistance to leaf and stripe rust. What we actually observed was the largest responses to a fungicide treatment that we have seen since we initiated this study. At today's wheat prices, the breakeven cost of tebuconazole (fungicide + application cost) is approximately the value of one bushel of wheat. That means for every dollar spent on a tebuconazole application, we got a return of over \$20.

We suspect the large yield and quality improvement with tebuconazole was attributed to two factors:

1. There was likely a leaf rust race change in 2013. Terral TV 8861, Pioneer 25R30, and Pioneer 25R40 had shown excellent resistance to leaf rust in past years, but all three varieties exhibited a significant increase in infection levels this year.

2. Much of the wheat crop did not emerge until early January, which had the effect of delaying maturity and extending the grain filling period later into the year. This likely exposed the crop to heavier rust infections levels than usual. This theory was supported by the fact that the later maturing varieties were damaged more by leaf rust than the earlier maturing varieties.

In 2013, tebuconazole was profitable on all varieties tested in both locations. In fact, any of the more expensive fungicides would also have been profitable on these varieties this year. However, in the previous four years, even tebuconazole was profitable a little more than half of the time.