EVALUATION OF ALTERNATIVE FUNGICIDES TO AZOXYSTROBIN FOR MANAGING RHIZOCTONIA ROOT AND CROWN ROT IN NEBRASKA

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Abstract

In Nebraska, Rhizoctonia root and crown rot, caused by *Rhizoctonia solani*, is generally considered to be the most commonly occurring and damaging sugar beet disease in Nebraska. Previous studies have demonstrated that applications of azoxystrobin based on soil temperatures exceeding 65°F will effectively reduce disease and improve yield parameters. However, the almost exclusive use of Quadris (azoxystrobin) for more than a decade raises concern for resistance development by the pathogen to this fungicide and other members of the strobilurin class. We then began a study in 2012 to evaluate the performance of alternative fungicides currently registered for Rhizoctonia root rot in sugar beets (Priaxor, Proline, and Headline) and compare their performance to Quadris utilizing both in-furrow treatments at planting and foliar applications based on soil temperatures. The study consisted of 9 treatments and data collected included multiple disease counts during the season, and sucrose and root yield determinations at harvest. The treatments consisted of 1) untreated control, 2-5) applications of each fungicide applied in-furrow at planting, 6-9) applications of each fungicide made using both in-furrow and foliar applications after 4 inch soil temperatures averaged 65° F for three consecutive days. Our results indicated that Quadris, Priaxor, and Proline all performed similarly, significantly reducing disease incidence and increasing sugar yields compared with untreated inoculated controls. Headline was not effective in improving yields or reducing disease compared to the untreated inoculated controls. We further determined that better results were obtained with the combination of in-furrow and foliar applications later in the season than the in-furrow alone.

Introduction

Rhizoctonia root and crown rot, caused by *Rhizoctonia solani* is the most widespread, consistently damaging sugar beet disease in Nebraska, making it arguably the most important disease in the state. It additionally consists of both a seedling disease and two different phases of root rot later in season.

The pathogen can survive for long periods of time and even if known to be present in fields – disease severity and incidence are still dependent upon soil populations and environmental conditions. Disease development conditions are not as rigid as those of rhizomania or Aphanomyces root rot, so *R. solani* can cause disease under a wider range of environmental conditions, therefore Rhizoctonia root rot continues to be difficult to manage.

Quadris (azoxystrobin) has been labeled for sugar beets for more than a decade and has been successfully used for disease management. After 4 years of data on timing for spray applications, we have successfully determined the optimal time for making fungicide applications. However, we wanted to include new fungicides that are now available and compare their performance to the standard (Quadris) utilizing both in-furrow treatments at planting and foliar applications later based on soil temperatures.

Methodology

The study was planted May 8, 2012 with plots consisting of 4 rows, 55 cm in width and 12 m long. The experiment was a randomized complete block design with 9 treatments and 6 replications per treatment. Plots were inoculated with barley kernels infested with a mixture of three *R. solani* isolates at a rate of 30 lbs seeds/ acre and irrigated with sprinkler irrigation (1-1.5in/wk), combined with rainfall exceeding 8 in, resulting in approximately 20 in moisture for both seasons.

Four fungicides, Quadris (azoxystrobin), Proline (prothioconazole), Priaxor (fluxapyroxad + pyraclostrobin), and Headline (pyraclostrobin) were employed. Treatments consisted of: 1) untreated control, 2-5) applications applied in-furrow with each fungicide at planting, and 6-9) applications made using both in-furrow and foliar applications of fungicides after 4 inch soil temperatures average approximately 18° C for three consecutive days.

Four separate disease counts were made in late-June, late-July, mid-August and late-August. Standard yield parameters were determined from plots after harvest at the Western Sugar Cooperative factory in Scottsbluff, NE.

Results

Disease development during 2012 was very severe. Even with the hot, dry conditions experienced in 2012, disease levels resulted in very poor yields. In fact, the best treatments produced root yields of only 7 tons/a (Proline and Priaxor) (Table 1). However, the Quadris treatments produced yields and that were not different significantly from those of Proline and Priaxor (Table 1). Similar relationships were consistently and significantly found between the treatment rankings and several other yield parameters such as disease incidence and overall sugar yields (Table 1). Better results overall were obtained with the combination of in-furrow and foliar applications later in the season compared to in-furrow alone.

Conclusions

Although disease development during 2012 was very severe, disease levels resulted in very poor yields. However, we still received significantly different results among treatments overall compared to the untreated control. The data suggested that even in high disease environments, Quadris, Priaxor, and Proline all performed similarly. This is very good news as it provides producers with information indicating that chemical

products with different modes of action are currently available that perform just as good as Quadris. Headline was not effective in improving yields or reducing disease compared to the other three products. Furthermore, it appears that better results were obtained with the combination of in-furrow and foliar applications later in the season compared to in-furrow alone. We will continue this work in the future with the inclusion of more fungicides, and will also expand the treatments to include in-furrow alone, foliar applications based on soil temperatures alone, and both techniques combined.

Table 1. Management of Rhizoctonia root rot from in-furrow an foliar applications of the fungicides, Quadris, Headline, Proline, and Priaxor during 2012.

Treatment	**Root Yield[a]**	**Sugar Yield[b]**	**No. Infected plants**
Control	2.0	772	64
In-furrow			
Quadris	6.0	2083	46
Headline	2.3	715	49
Proline	4.6	1386	36
Priaxor	4.1	1489	37
In-furrow+ foliar			
Quadris	6.6	2323	13
Headline	4.0	1316	35
Proline	7.3	2395	12
Priaxor	7.2	2451	13
LSD (P=0.05)	2.7	882.6	17.1

[a] yield = tons per acre
[b] yield = lbs sucrose per acre