A Comparison of Foliar-Banded Fungicide Treatments for the Management of Rhizoctonia Root and Crown Rot of Sugarbeet

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Introduction
Sugarbeet (Beta vulgaris) represents an important crop for Wyoming farmers with approximately 31,400 acres harvested in Wyoming in 2015. The estimated value of the crop was $46.3 million, according to the U.S. Department of Agriculture’s National Agricultural Statistics Service. Rhizoctonia crown and root rot (RRCR)—caused by the pathogenic fungus Rhizoctonia solani—is the number one disease affecting sugarbeet across the growing region with losses up to 50% having been reported. The disease is estimated as threatening or affecting economic returns on 24% of the acres sown to sugarbeet in the U.S.

Treating seed with a fungicide prior to planting is recommended. Penthiopyrad (Kabina® ST) is a new succinate dehydrogenase inhibitor (SDHI) fungicide that has been shown to provide good levels of protection. Seed treatment is effective for up to six weeks after planting, at which point foliar applications of fungicides may be necessary. Growers in the region tend use the fungicide Quadris® (azoxystrobin) exclusively for RRCR management. But over reliance on one fungicide is not recommended due to potential for the development of resistance.

Objectives
The objectives of this study are to determine the efficacy of various foliar fungicides compared to Quadris on Rhizoctonia root and crown rot disease and sugarbeet yield.

Materials and Methods
Field plots were established in 2015 at the Powell Research and Extension Center (PREC). The experimental design was a randomized complete block with four replications; plots were 6 rows (22-in row centers) by 20-ft long, with a 10-ft in-row buffer. Plots were inoculated with Rhizoctonia solani-infested barley at a rate of 45 lb per plot. Inoculum was broadcast with a cyclone spreader and then incorporated into the soil. All seed used in this study was treated with Kabina ST at standard rates. Stand counts were determined per 10 ft of row on May 22. Foliar fungicides were applied at the 12-leaf stage on June 18. Fungicides were applied with the aid of a CO2 backpack sprayer in a total volume 0.42 gal per 400 ft of row at 40 psi. Incidence was the average number of plants showing RCRR symptoms (4 rows x 20 ft). Disease severity is presented as percent canopy decline. Both incidence and disease severity were determined August 26. Two rows by 20 ft were harvested September 11 using a mechanical beet harvester. Percent RCRR severity on beet roots was measured on a 0–100 scale at harvest. Mean separation was tested using Fisher’s protected least significant difference (LSD) ($p\leq 0.05$).

Results and Discussion
All fungicide treatments significantly reduced incidence, percent canopy decline, and RCRR levels compared to the inoculated check ($p\leq 0.05$). Data is summarized in Table 1. Proline® applied at 0.33 fl oz/1,000 ft of row also had incidence levels and percent canopy decline similar to that of the non-inoculated check. The Quadris treatment also was similar to the non-inoculated check in terms of % canopy decline. All fungicide treatments significantly increased yield and pounds of extractable sucrose per acre compared to the inoculated check ($p\leq 0.05$). Results demonstrate that seed treatment along

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with foliar-banded fungicides can provide season-long RRCR management and that there are viable fungicide alternatives to Quadris.

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PARP: I:1, X:3

### Table 1. Fungicide effects on *Rhizoctonia* root and crown rot and yield of sugarbeet.

<table>
<thead>
<tr>
<th>Treatment and Rate (fl oz)/1,000 ft¹</th>
<th>Incidence²</th>
<th>% Canopy Decline³</th>
<th>RCRR⁴</th>
<th>Yield⁵</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-inoculated check</td>
<td>0</td>
<td>c</td>
<td>0</td>
<td>b</td>
</tr>
<tr>
<td>Inoculated check</td>
<td>86</td>
<td>a</td>
<td>74</td>
<td>a</td>
</tr>
<tr>
<td>Quadris 0.6</td>
<td>29</td>
<td>b</td>
<td>16</td>
<td>cb</td>
</tr>
<tr>
<td>Proline 0.33</td>
<td>10</td>
<td>bc</td>
<td>7</td>
<td>cb</td>
</tr>
<tr>
<td>Priaxor 0.46</td>
<td>34</td>
<td>b</td>
<td>26</td>
<td>b</td>
</tr>
<tr>
<td>Vertisan 1.2</td>
<td>28</td>
<td>b</td>
<td>25</td>
<td>b</td>
</tr>
<tr>
<td>LSD (p≤0.05)</td>
<td>24</td>
<td>24</td>
<td>26</td>
<td>3</td>
</tr>
</tbody>
</table>

¹All seed was treated with Kabina ST. Treatments were applied at the 12-leaf stage using a single-nozzle sprayer at 40 psi.

²Incidence was determined August 26 and is represented as average number of RCRR-infected plants per plot.

³Percent canopy decline (disease severity) was determined August 26.

⁴Ten beets per plot were rated for percent surface area showing discoloration at harvest.

⁵Beet root weight in ton/ac.

⁶Treatment means followed by different letters differ significantly (p≤0.05).