

# 9265 Cyazofamid

## Evaluation of Fungicides for Spinach White Rust Stillwater, 2009

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**Introduction and Objective:** White rust, caused by the fungus *Albugo occidentalis*, is the most important foliar disease of spinach in Oklahoma. Multiple fungicide applications are generally required to effectively manage white rust. The strobilurin (Group 11) fungicides azoxystrobin (Quadris), pyraclostrobin (Cabrio), and fenamidone (Reason) are highly effective against white rust. However, these group 11 (strobilurin) fungicides have been prone to resistance problems with several diseases of other crops. Therefore, resistance management guidelines have been developed and labelled which require the alternation of Quadris and Cabrio with fungicides that have a different mode of action. Unfortunately, there are few fungicides registered for use on spinach with non-group 11 modes of action. These include Presidio (fluopicolide), phosphorous acid (K-Phite) copper (Kocide), cyazofamid (Ranman), phosetyl AI (Aliette), and dimethomorph (BAS 651). The objective of this study was to evaluate fungicides and fungicide programs that use alternating modes of action for control of white rust.

**Materials and Methods:** The trial was conducted at the OSU Entomology and Plant Pathology Research Station Stillwater in a field of Norge loam with a history of white rust and previously fallow. Granular fertilizer (50-0-0 lb/A N-P-K) was incorporated into the soil prior to seeding on 5 March. The herbicide Dual Magnum II 7.6E at 0.67 pt/A was broadcast immediately after seeding. Plots were top-dressed with additional granular fertilizer (46-0-0 lb/A N-P-K) on 7 Apr. Plots consisted of 4-row beds, 20-ft long, with rows spaced 14 in. apart. The experimental design was a randomized complete block with four blocks separated by a 5-ft-wide fallow buffer. Treatments were broadcast through flat-fan nozzles (8002vk) spaced 18 inches apart with a CO<sub>2</sub>-pressurized wheelbarrow sprayer. The sprayer was calibrated to deliver 25 gal/A at 40 psi. Treatments were applied on 7-day intervals beginning at the first true-leaf stage. Plots were irrigated lightly (about 0.1 inches water) each day after planting until stand establishment on 22 March. Plots received 0.45 inches of sprinkler irrigation on 24 Apr. Rainfall (inches) during the cropping period (5 Mar to 12 May) totaled 3.63 in Mar, 5.07 in Apr, and 2.01 in May. Disease incidence (percentage of leaves with rust) and severity (percentage of leaf area with rust) were assessed on 12 May. Six, 1-ft row segments were harvested arbitrarily from the middle two rows of each plot. The harvested leaves were bulked, mixed, and disease severity was visually estimated on 30 blindly sampled leaves.

**Results:** Rainfall was 0.5 and 1.7 inches above normal (30-yr average) and in April and May. Average daily temperature was near normal for March and May. White rust appeared in late March when the spinach was small but did not increase to high levels in the untreated check until May. Disease levels in the untreated check were severe compared to previous trial at this site. All treatments reduced levels of white rust compared to the untreated check (Table 1). Cabrio and Presidio provided the best

disease control. BAS 651 and Quadris alone did not provide adequate disease control. The relatively poor disease control with Quadris alone resulted from an unexplainably high level of disease in one of the blocks.

**Table 1.** Evaluation of fungicides for control of white rust on spinach ('Melody'), Stillwater - 2009.

Treatment and rate/A (Timing <sup>1</sup> )	White Rust (%)	
	Leaves <sup>2</sup>	Leaf area <sup>2</sup>
Quadris 2.08F 12.3 fl oz (1-4).....	21.8 cd <sup>4</sup>	7.4 b
Cabrio 20WG 0.75 lb (1-4).....	0.0 e	0.0 b
9265- Ranman 3.3F 2.75 fl oz + Silwet-L77 2 fl oz (1-4).....	10.0 de	0.6 b
Quadris 2.08F 12.3 fl oz (1,3) Aliette 80WG 3 lb (2,4)...	17.5 cde	1.3 b
Presidio 4F 4 fl oz (1-4).....	0.8 e	0.1 b
K-Phite 7L 4 pt (1-4).....	31.8 cb	3.9 b
X K-Phite 7L 2 pt + Quadris 2.08F 6 fl oz (1-4).....	12.5 de	0.7 b
X - BAS 651 00F 13.7 fl oz + Silwet-L77 2 fl. oz. (1-4).....	43.3 b	6.0 b
Check.....	80.8 a	30.7 a
LSD(P≤0.05) <sup>5</sup> .....	17.8	10.0

<sup>1</sup> The numbers (1-4) correspond to the spray dates of 1=16 April, 2=23 April, 3=30 April, 4=7 May.

<sup>2</sup> The percentage of leaves with white rust from 30 leaves on 12 May.

<sup>3</sup> The percentage of leaf area with white rust from 30 leaves on 12 May.

<sup>4</sup> Means in a column followed by the same letter are not statistically different according to Fisher's least significant difference test.

<sup>5</sup> Least significant difference.

**Conclusions:** Ranman, Presidio, and phosphonate fungicides (Aliette, K-Phite) appear to be effective non-group 11 fungicides, suitable for use in alternation with Quadris, Cabrio, and Reason in fungicide programs targeting white rust.

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