

Improving white mold management in dry beans – Optimizing fungicide spray volume

Preliminary report from the first three years of a four-year research project.

Final results are anticipated after the completion of field trials planned for the 2023 field season.

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The impact of fungicide spray volume was tested with a PTO-driven tractor-mounted sprayer equipped with a pulse-width modulation system (Capstan AG; Topeka, KS). Pulse width was modified as needed to achieve the target spray volume while maintaining a constant driving speed and the same nozzles and pressure across all treatments, with pulse width calibrated on the basis of measured output immediately before spraying treatments. Topsin (40 fl oz/ac) was applied at early bloom followed by Endura (8 oz/ac) 11-14 days later. To permit overspray of plots, treatment plots were bordered by 5- or 10-foot wide non-harvested plots. On ends of each treatment plot, a non-harvested plot was established so as to permit turning on and off the sprayer at full driving speed. Dry beans were seeded to rows 14 inches apart at a seeding rate of 90,000 viable seeds/ac (pintos and kidneys) or 100,000 viable seeds/ac (blacks and navies).

Increasing spray volume from 10 to 25 gal/ac had no impact on white mold severity or dry bean yield (**Figure 1**, all market classes; **Figure 2**, kidney beans only; **Figure 3**, pinto beans only). A weak trend of increased yield was observed (1) as spray volume increased from 20 to 25 gal/ac in navy beans in 2020 and dark-red kidney beans in 2021 and (2) as spray volume increased from 15 to 20 gal/ac in pinto beans in 2022, but the differences were not statistically significant and this trend was not observed in the other studies.

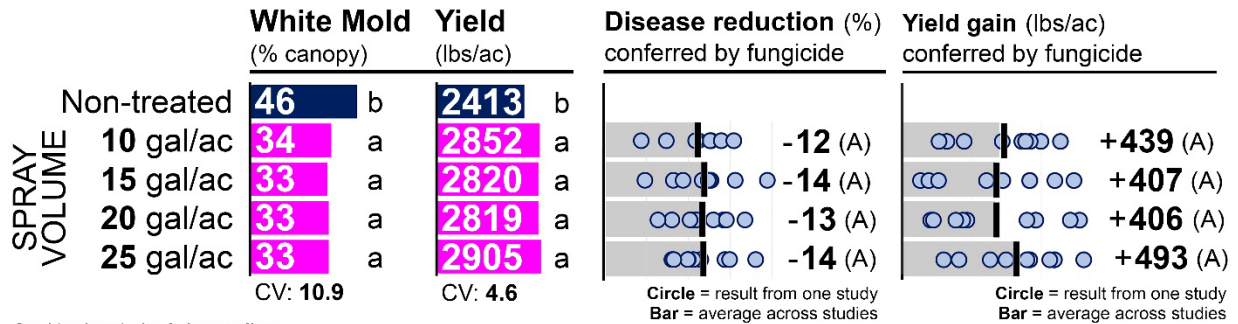
The preliminary results from the third year of this four-year project suggest that there may be little or no response to increasing fungicide spray volume from 10 to 25 gal/ac for white mold management in dry beans. Follow-up testing to evaluate the repeatability of these results is planned for the 2023 field season.

Table 1. Detailed methods – fungicide spray volume studies

Location and year		Carrington 2020	Carrington 2021	Carrington 2022
Applic. #1	Driving speed	6.0 mph	6.0 mph	11.5 mph
	Droplet size	Medium	Medium	Medium
	Nozzles, pressure	XR11006, 35 psi	XR11006, 35 psi	XR11006, 35 psi
Applic. #2	Driving speed	6.0 mph	6.0 mph	8.0 mph
	Droplet size	Medium	Medium	Coarse
	Nozzles, pressure	XR11006, 35 psi	XR11006, 35 psi	XR11010, 30 psi
Application interval		12 days	14 days	11 days
Plot size		5 x ave. 10.9 ft	5 x ave. 16.8 ft	10 x ave. 17.8 ft
Experimental replicates		13 or 14	8	8

IMPACT OF FUNGICIDE SPRAY VOLUME

combined analysis across 9 studies



Combined analysis of nine studies:

Palomino pinto: 14" rows, Carrington 2020, 2021, and 2022

T9905 navy: 14" rows, Carrington 2020, Eclipse black: 14" rows, Carrington 2020

Dynasty DR kidney: 14" rows, Carrington 2020, 2021; Red Hawk DR Kidney: 14" rows, Carrington 2022; Pink Panther LR Kidney: 14" rows, Carrington 2020

YEAR	2020	2020	2020	2021	2022	2020	2020	2021	2022	2020-2022	
Market Class	BLACK	NAVY	PINTO	PINTO	PINTO	KIDNEY	KIDNEY	KIDNEY	KIDNEY	Combined analysis	
Variety	'Eclipse'	'T9905'	'Palomino'	'Palomino'	'Palomino'	Pink Panther	'Dynasty'	'Dynasty'	'Red Hawk'		
WHITE MOLD (percent of canopy diseased at end of season)											
SPRAY VOLUME	Non-treated	35 b	37 b	56 b	58 b	60 b	11 b	46 b	55 a	60 b	46 b
	10 gal/ac	19 a	25 a	44 a	46 a	42 a	6 ab	31 a	56 a	38 a	34 a
	15 gal/ac	19 a	22 a	43 a	37 a	45 a	4 a	38 ab	56 a	31 a	33 a
	20 gal/ac	16 a	25 a	45 a	42 a	40 a	4 a	36 ab	52 a	36 a	33 a
	25 gal/ac	16 a	26 a	43 a	48 ab	40 a	4 a	36 ab	49 a	33 a	33 a
		CV: 36.3	CV: 26.5	CV: 21.7	CV: 17.7	CV: 20.2	CV: 84.2	CV: 33.3	CV: 11.9	CV: 31.4	CV: 10.9
YIELD (pounds per acre)											
SPRAY VOLUME	Non-treated	2239 b	3089 b	2680 b	2126 b	2822 b	2293 a	1749 b	2409 a	2307 b	2413 b
	10 gal/ac	2673 a	3690 a	3364 a	2680 a	3339 a	2490 a	2018 a	2570 a	2841 a	2852 a
	15 gal/ac	2605 a	3641 a	3116 ab	2786 a	3373 a	2374 a	1866 ab	2568 a	3050 a	2820 a
	20 gal/ac	2503 a	3667 a	2961 ab	2892 a	3548 a	2420 a	1887 a	2643 a	2848 a	2819 a
	25 gal/ac	2621 a	3873 a	3233 a	2665 a	3479 a	2541 a	1932 a	2859 a	2945 a	2905 a
		CV: 12.1	CV: 8.6	CV: 11.3	CV: 9.3	CV: 7.0	CV: 9.6	CV: 11.8	CV: 12.3	CV: 7.3	CV: 4.6

FIGURE 1 – COMBINED ANALYSIS ACROSS KIDNEY, PINTO, BLACK AND NAVY BEANS. Impact of fungicide spray volume on white mold management; pinto, kidney, black and navy beans, Carrington, ND (2020-2022). Topsin (40 fl oz/ac) was applied at early bloom and initial pod development, and Endura (8 oz/ac) was applied 10-14 days later. Within-column means followed by different letters are significantly different ($P < 0.05$).

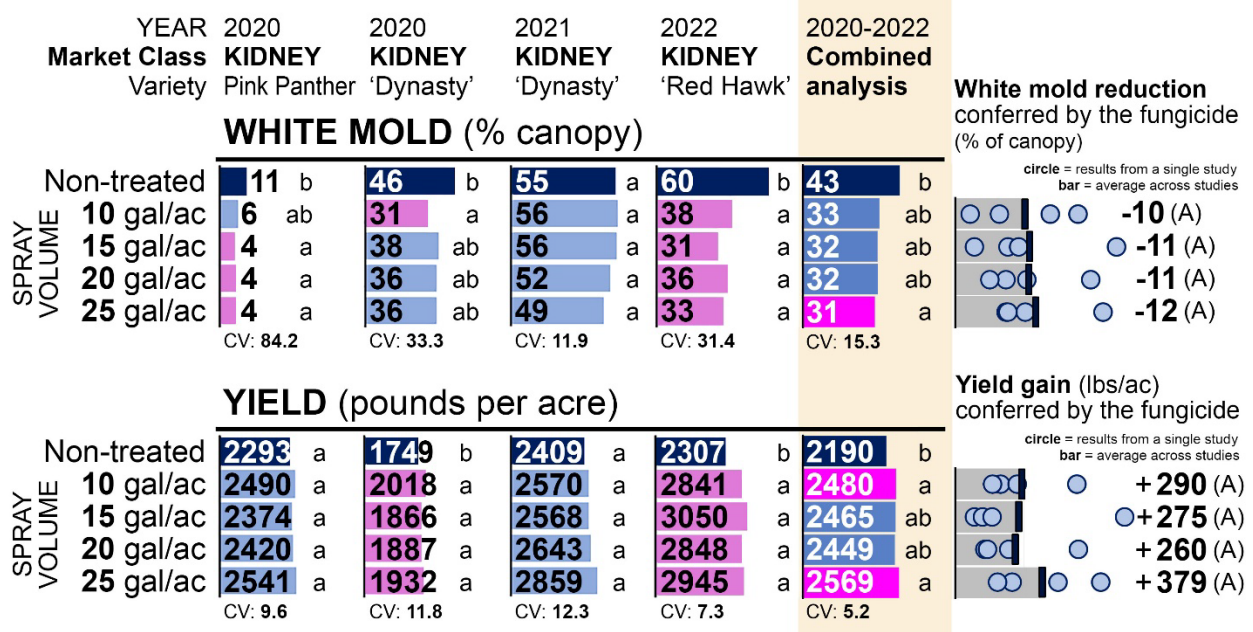


FIGURE 2 – KIDNEY BEANS ONLY. Impact of fungicide spray volume on white mold management in kidney beans, Carrington, ND (2020-2022). Topsin (40 fl oz/ac) was applied at early bloom and initial pod development, and Endura (8 oz/ac) was applied 10-14 days later. Within-column means followed by different letters are significantly different ($P < 0.05$).

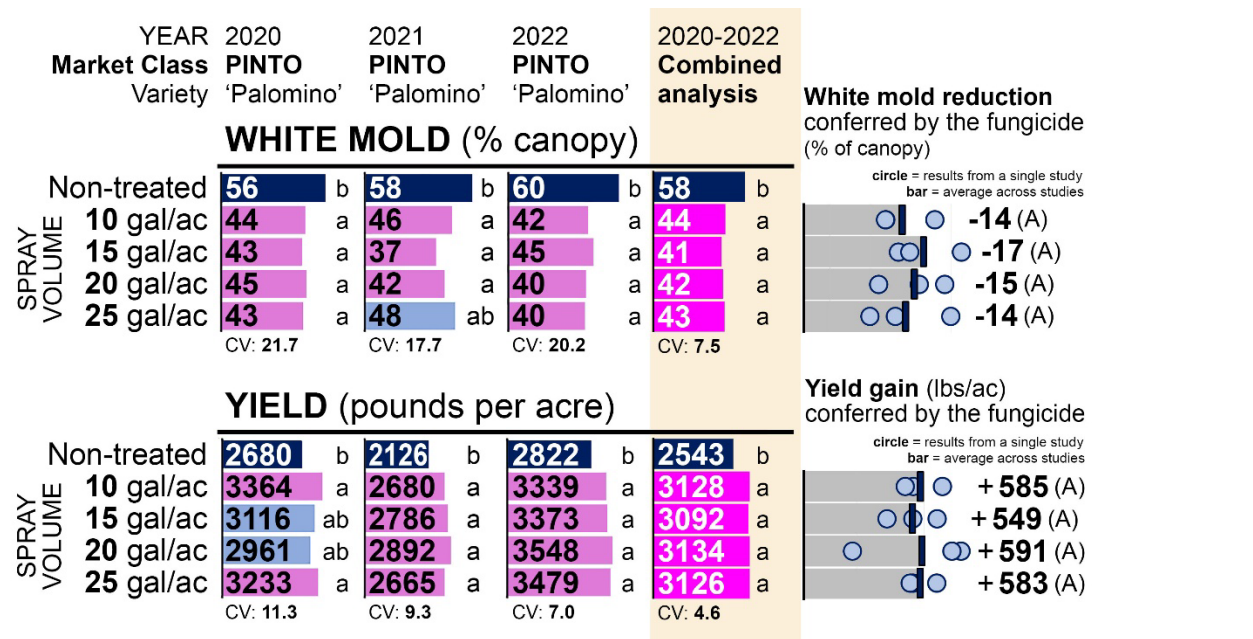


FIGURE 3 – PINTO BEANS ONLY. Impact of fungicide spray volume on white mold management in pinto beans, Carrington, ND (2020-2022). Topsin (40 fl oz/ac) was applied at early bloom and initial pod development, and Endura (8 oz/ac) was applied 10-14 days later. Within-column means followed by different letters are significantly different ($P < 0.05$).