

## 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.

*Research project funded by the Northarvest Bean Growers Association and the North Dakota Crop Protection Production Harmonization Board and Registration Board.*

**Research leader:** Michael Wunsch, plant pathologist  
 NDSU Carrington Research Extension Center  
 663 Hwy. 281 N. / PO Box 219 / Carrington, ND 58421-0219  
 701-652-2951 office / [michael.wunsch@ndsu.edu](mailto:michael.wunsch@ndsu.edu)

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.

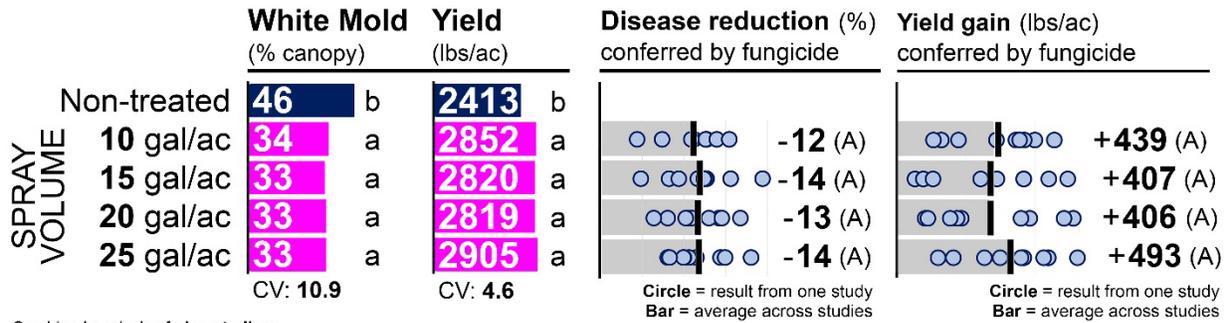
The preliminary results from the third year of this four-year project suggest that there may be little or no response to increasing fungicide spray volume from 10 to 25 gal/ac for white mold management in dry beans. Follow-up testing to evaluate the repeatability of these results is planned for the 2023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

SPRAY VOLUME	YEAR	2020	2020	2020	2021	2022	2020	2020	2021	2022	2020-2022 Combined analysis
	Market Class	BLACK	NAVY	PINTO	PINTO	PINTO	KIDNEY	KIDNEY	KIDNEY	KIDNEY	
	Variety	'Eclipse'	'T9905'	'Palomino'	'Palomino'	'Palomino'	Pink Panther	'Dynasty'	'Dynasty'	'Red Hawk'	
<b>WHITE MOLD (percent of canopy diseased at end of season)</b>											
Non-treated		35	37	56	58	60	11	46	55	60	46
10 gal/ac		19	25	44	46	42	6	31	56	38	34
15 gal/ac		19	22	43	37	45	4	38	56	31	33
20 gal/ac		16	25	45	42	40	4	36	52	36	33
25 gal/ac		16	26	43	48	40	4	36	49	33	33
		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
<b>YIELD (pounds per acre)</b>											
Non-treated		2239	3089	2680	2126	2822	2293	1749	2409	2307	2413
10 gal/ac		2673	3690	3364	2680	3339	2490	2018	2570	2841	2852
15 gal/ac		2605	3641	3116	2786	3373	2374	1866	2568	3050	2820
20 gal/ac		2503	3667	2961	2892	3548	2420	1887	2643	2848	2819
25 gal/ac		2621	3873	3233	2665	3479	2541	1932	2859	2945	2905
		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 ( $P < 0.05$ ).

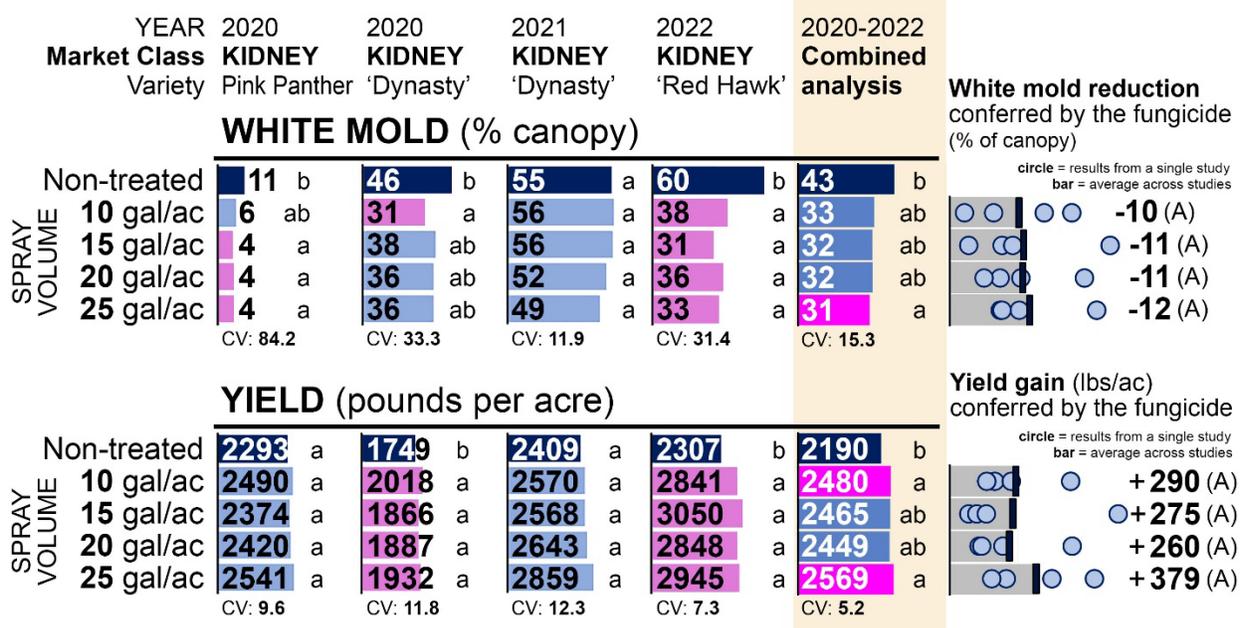


FIGURE 2 – KIDNEY BEANS ONLY. Impact of fungicide spray volume on white mold management in kidney beans, Carrington, ND (2020-2022). Topsin (40 fl oz/ac) was applied at early bloom and initial pod development, and Endura (8 oz/ac) was applied 10-14 days later. Within-column means followed by different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

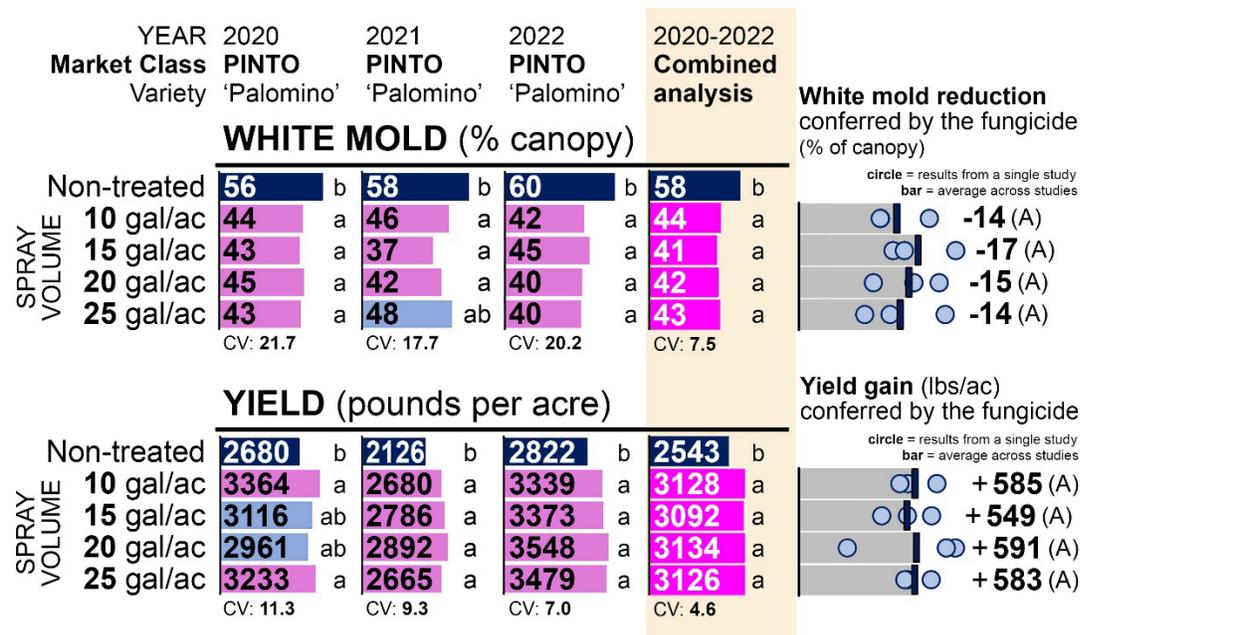


FIGURE 3 – PINTO BEANS ONLY. Impact of fungicide spray volume on white mold management in pinto beans, Carrington, ND (2020-2022). Topsin (40 fl oz/ac) was applied at early bloom and initial pod development, and Endura (8 oz/ac) was applied 10-14 days later. Within-column means followed by different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