Efficacy of Peroxide-based Products for Management of White Mold in Soybeans and Dry Beans

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The use of peroxide-based fungicides has been adopted by some producers in our region as a tool for inhibiting the development of white mold and this study was designed to provide rigorous data to growers, agronomists, and crop advisors who have inquired about the efficacy and profitability of this management tool.

Applications of the peroxide-based fungicides OxiDate 5.0 (hydrogen peroxide, 27%; peroxyacetic acid, 5%) and SaniDate 12.0 (hydrogen peroxide 18.5%, peroxyacetic acid 12.0%) were made to irrigated soybeans in Carrington and Oakes, ND. The efficacy of OxiDate 5.0 was tested at 1.0% v/v in 15 gal/a tank-mixed with traditional fungicides at standard fungicide application timing and as a stand-alone application after white mold disease development to dry beans and soybeans that received the two-application sequence of traditional fungicides. The impact of application rate and spray volume on the efficacy of OxiDate 5.0 was tested with applications at the R3 and/or R4 growth stage with a tractor-mounted sprayer equipped with a pulse-width modulation system. Pulse width was manually calibrated on the basis of the measured spray output to maintain a constant driving speed across treatments differing in spray volume. Applications of OxiDate 5.0 were made with flat-fan nozzles and medium or coarse droplets, with spray droplet size calibrated relative to canopy closure. Applications of SaniDate 12.0 were conducted via chemigation, with SaniDate applied at 0.02% v/v in 0.19 inch of irrigation at the early R3 and full R4 growth stages. To facilitate proper randomization of treatments, chemigation was delivered via rotating micro-sprinklers established in an offset, overlapping pattern. To ensure rigorous results, all studies were conducted with 6 to 12 experimental replicates.

Applications of OxiDate 5.0 and SaniDate 12.0 were often associated with moderate improvements in white mold management and soybean yield, but variability in the response to the peroxide-based fungicides was high and no statistically significant responses were observed. The impact of OxiDate 5.0 on end-of-season white mold severity and soybean yield were similar irrespective of application rate and spray volume. Applications of the traditional fungicides Endura, Topsin and ProPulse conferred stronger, more consistent improvements in white mold that were often statistically significant ($P < 0.05$). The results suggest that OxiDate 5.0 and Sanidate 12.0 may have limited effectiveness against white mold in kidney beans and soybeans.

Harvest of soybeans in the peroxide-based products evaluation.

KIDNEY BEANS: Carrington, ND (2023)
White mold incidence 5-10% in non-treated control at the second fungicide application
White mold incidence in fungicide-treated plots to which OxiDate was applied 9 days after 2nd fungicide application: 20%, Red Hawk; 43%, Pink Panther.

		White mold % of canopy, KIDNEY BEAN VARIETY: PINK PANTHER	White mold % of canopy, KIDNEY BEAN VARIETY: RED HAWK	White mold % of canopy, average across varieties	Yield pounds/acre, KIDNEY BEAN VARIETY: PINK PANTHER	Yield pounds/acre, KIDNEY BEAN VARIETY: RED HAWK	Yield pounds/acre, average across varieties	Yield gain conferred by fungicide program
Non-treated control		**41** b*	**34** b*	**37** b*	**3103** c*	**2595** b*	**2849** c*	
Single application of **T-Methyl**		**38** ab	**20** a	**29** ab	**3147** bc	**2787** ab	**2967** bc	**+118** b**
T-Methyl followed by **ProPulse**	Standard fungicide	**26** a	**18** a	**22** a	**3419** ab	**2879** a	**3149** ab	**+301** ab
	OxiDate tank-mixed with second fungicide	**34** ab	**19** a	**27** a	**3367** abc	**2920** a	**3143** ab	**+295** ab
	OxiDate at 9 days after second fungicide	**29** ab	**18** a	**23** a	**3406** ab	**2983** a	**3195** a	**+346** ab
T-Methyl followed by **Endura**	Standard fungicide	**27** a	**20** a	**23** a	**3397** abc	**2854** a	**3126** ab	**+277** ab
	OxiDate tank-mixed with second fungicide	**27** a	**19** a	**23** a	**3518** a	**2934** a	**3226** a	**+377** a
	OxiDate at 9 days after second fungicide	**30** ab	**15** a	**23** a	**3351** abc	**3004** a	**3178** a	**+329** ab
	CV:	28.8	46.0	35.5	6.1	5.2	5.8	

Bar = average
Circle = result from one kidney bean variety

SOYBEANS: Carrington, ND (2023)
No white mold observed in applications made at the R2 or R3 growth stages.
Percent of plants wilted due to white mold in fungicide-treated plots to which OxiDate was applied at R4 growth stage: 11% (Topsin, ProPulse); 8% (Endura)

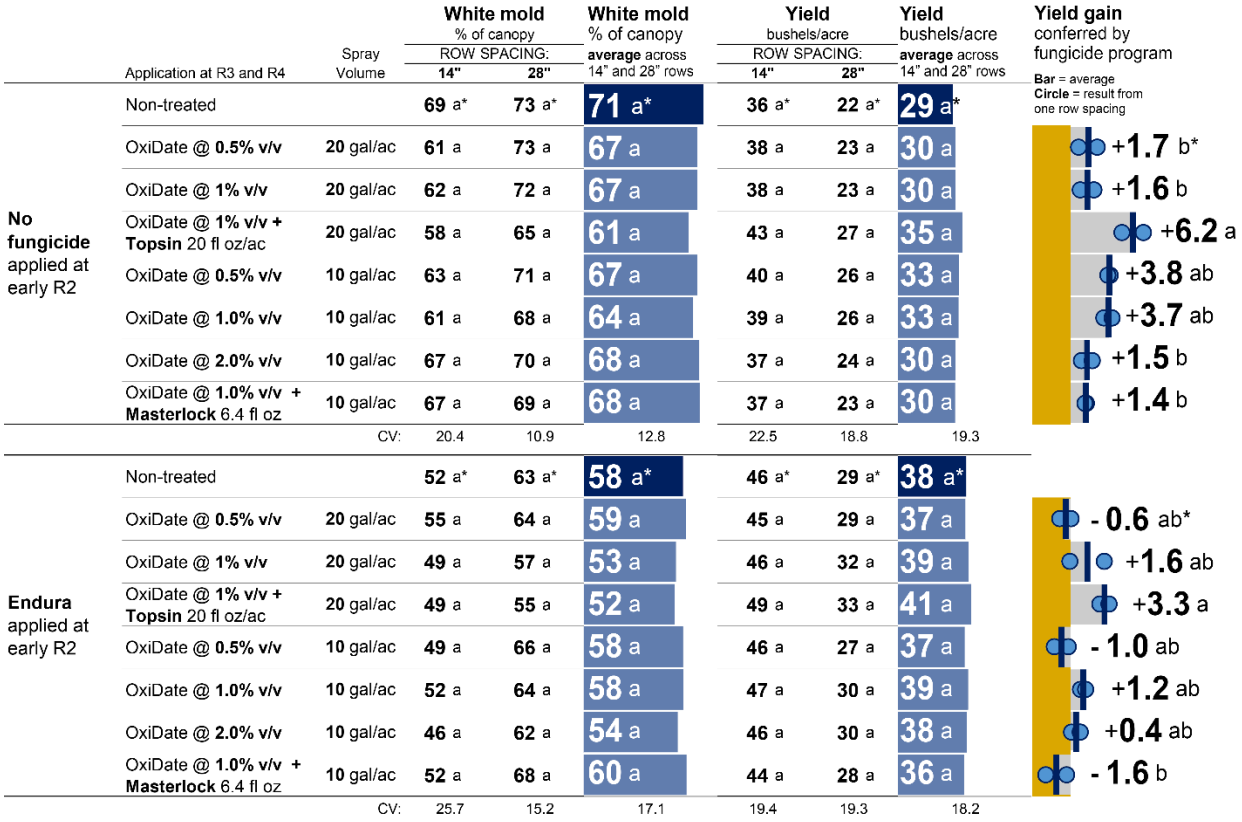
		White mold % of canopy, STANDARD FUNGICIDE: TOPSIN 20 fl oz	PROPULSE 6.0 fl oz	ENDURA 5.5 oz	White mold % of canopy, average across fungicide **programs**	Yield bushels/acre, STANDARD FUNGICIDE: TOPSIN 20 fl oz	PROPULSE 6.0 fl oz	ENDURA 5.5 oz	Yield bu/ac, average across fungicide **programs**	Yield gain conferred by fungicide program
Non-treated control		**60** b*	**42** a*	**50** c*	**51** b*	**32** a*	**44** b*	**41** b*	**39** c*	
Single application of standard fungicide at R2	Standard fungicide	**48** a	**41** a	**34** bc	**41** ab	**38** a	**48** ab	**49** ab	**45** ab	**+5.4** b*
	OxiDate tank-mixed at R2	**55** ab	**35** a	**34** bc	**42** ab	**33** a	**49** ab	**50** a	**44** b	**+4.5** b
	OxiDate applied at R3	**50** ab	**40** a	**36** bc	**42** ab	**35** a	**49** ab	**49** ab	**44** ab	**+5.2** b
Two applications of standard fungicide (R2, R3)	Standard fungicide	**47** a	**32** a	**29** ab	**36** a	**40** a	**53** a	**53** a	**49** a	**+9.5** a
	OxiDate tank-mixed at R3	**50** ab	**30** a	**24** ab	**35** a	**36** a	**51** ab	**52** a	**46** ab	**+7.0** ab
	OxiDate applied at R4	**48** a	**33** a	**21** a	**34** a	**38** a	**51** ab	**52** a	**47** ab	**+7.7** ab
	CV:	15.4	35.9	11.9	10.4	17.0	12.5	12.9	3.4	

Bar = average
Circle = result from one fungicide program

Figure 1. Efficacy of Oxidate 5.0 applied at 1.0% v/v in 15 gal/a applied as a tank-mix with traditional fungicides at standard fungicide application timing or applied as a stand-alone application to kidney beans or soybeans that received two applications of a standard fungicide. In dry beans, testing was conducted with T-methyl @ 40 fl oz/ac or T-methyl followed by Endura @ 8 oz/ac. In soybeans, testing was conducted by a single or two sequential applications of T-methyl @ 20 fl oz/ac, ProPulse @ 6 fl oz/ac, and Endura @ 5.5 oz/ac. Within-column means followed by different letters are significantly different ($P < 0.05$; Tukey multiple comparison procedure).

SOYBEANS: Carrington, ND (2023)

OxiDate treatments applied at late R3 before the development of white mold and at late R4 when incidence of wilted plants due to white mold was 8% in 14" rows and 5% in 28" rows



SOYBEANS: Oakes, ND (2023)

OxiDate treatments applied at R4 before the development of white mold

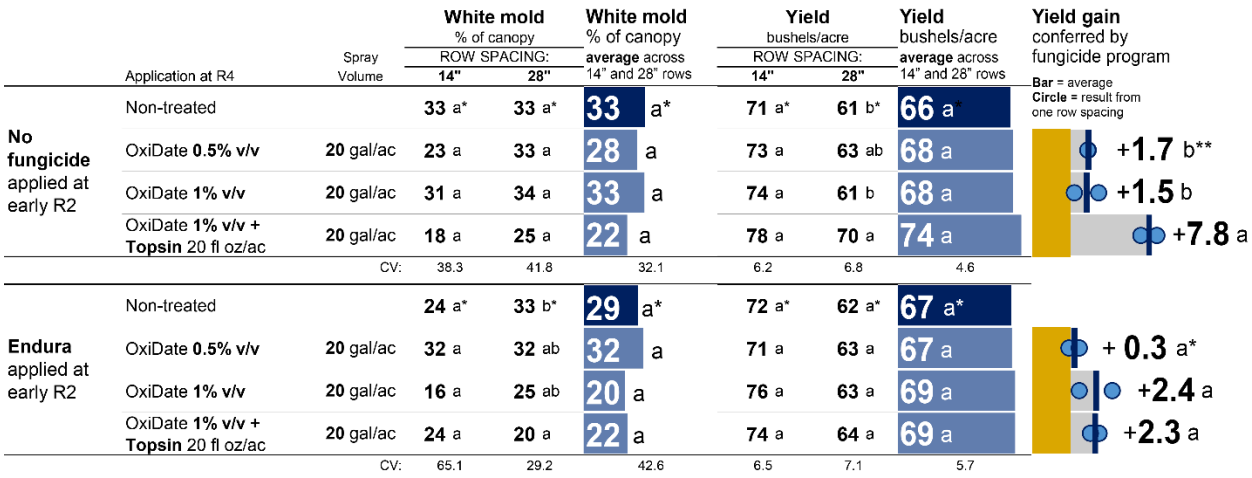


Figure 2. Impact of application rate, spray volume, and tank-mix partners on efficacy of Oxidate 5.0. Applications were made with a tractor-mounted sprayer at the R3 and/or R4 growth stages. Within-column means followed by different letters are significantly different ($P < 0.05$; Tukey multiple comparison procedure).

SOYBEANS: Carrington, ND (2023)

SaniDate treatments applied at early R3 before the development of white mold and at R4 when incidence of wilted plants due to white mold was 3-11%, depending on row spacing and treatment

		Irrigation quantity	White mold % of canopy, ROW SPACING: 14"	White mold % of canopy, ROW SPACING: 28"	White mold % of canopy **average** across 14" and 28" rows	Yield bushels/acre, ROW SPACING: 14"	Yield bushels/acre, ROW SPACING: 28"	White mold % of canopy **average** across 14" and 28" rows
No foliar fungicide	Water	**0.19** inch	**66** a*	**56** a*	**61** a*	**30** a*	**32** a*	**31** a*
	SaniDate **0.02% v/v**	**0.19** inch	**57** a	**55** a	**56** a	**38** a	**34** a	**36** a
		CV:	16.4	19.6	16.4	18.5	21.7	18.1
Endura applied at R2	Water	**0.19** inch	**30** a*	**36** a*	**33** a*	**54** a*	**46** a*	**50** a*
	SaniDate **0.02% v/v**	**0.19** inch	**34** a	**30** a	**32** a	**52** a	**48** a	**50** a
		CV:	25.3	42.5	32.0	13.3	17.1	14.9

Yield gain conferred by chemigation

Bar = average
Circle = result from one row spacing

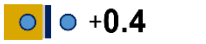


Figure 4. Efficacy of SaniDate 12.0 (0.2% v/v) applied via chemigation in 0.19 inch of water at the early R3 and full R4 growth stages, Carrington, ND (2023). Within-column means followed by different letters are significantly different ($P < 0.05$; Tukey multiple comparison procedure).

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