

Comparative fungicide efficacy: Management of white mold in soybeans

North Dakota State Univ. Carrington Research Extension Center; Michael Wunsch, Jesse Hafner, Suanne Kallis, Aaron Fauss, Thomas Miorino

Delaro Complete: fluopyram (FRAC 7), prothioconazole (FRAC 3), trifloxystrobin (FRAC 11)

ProPulse: fluopyram (FRAC 7) + prothioconazole (FRAC 3)

year	2022	2023	2024	COMBINED ANALYSIS 3 studies ProPulse 6 fl oz versus Delaro Complete 8 fl oz/ac Two sequential applications of the same fungicide
location	Carrington	Carrington	Carrington	
funding	BASF	BASF	Corteva	
variety	AG09Xf0	21Xf07	P08A44E	
brand, maturity	Asgrow, 0.9	Peterson Farms, 0.7	Pioneer, 0.8	
row spacing	14 inches	14 inches	15 inches	
seeding rate	165,000 pls/ac	165,000 pls/ac	140,000 pls/ac	
previous crop	dry bean	chickpeas	sunflowers	
planting date	May 27	May 24	May 16	
disease assessment date	Oct. 19	Oct. 12	Oct. 9	
rows assessed for disease	1	1	2	
harvest date	Oct. 21	Oct. 17	Oct. 14	
dates, applications 1 and 2	July 23, Aug. 1	July 22, Aug. 2	July 24, July 31	
interval between applications	9 days	11 days	7 days	
growth stage, 1st applic.	100% R2	100% R2	100% R2	
canopy closure, 1st applic	99-100%	98-100%	75-90%	
nozzles, pressure, 1st applic.	AIXR110015, 50 psi	AIXR110015, 50 psi	AIXR110015, 60 psi	
droplet size, 1st applic.	medium-coarse	medium-coarse	medium	
canopy closure, 2nd applic.	100%	100%	90-98%	
nozzles, pressure, 2nd applic.	AIXR110015, 50 psi	AIXR110015, 40 psi	AIXR110015, 40 psi	
droplet size, 2nd applic.	medium-coarse	coarse	coarse	
adjuvant	Masterlock, 6.4 fl oz/ac	Masterlock, 6.4 fl oz/ac	Induce, 0.25% v/v	
fungicide spray volume	15 gal/ac	15 gal/ac	15 gal/ac	
application method	hand-held boom	hand-held boom	hand-held boom	

White mold incidence (% of plants) White mold (% plants)

Non-treated control	82 b	54 a	46 a	61 b
ProPulse 6 fl oz/ac	49 a	35 a	27 a	37 a
Delaro Complete 8 fl oz/ac	41 a	38 a	24 a	34 a
CV:	14.4	35.6	14.9	15.3

White mold severity index (% of canopy) White mold (% canopy)

Non-treated control	70 b	31 a	20 a	40 b
ProPulse 6 fl oz/ac	35 a	18 a	12 a	22 a
Delaro Complete 8 fl oz/ac	31 a	20 a	8 a	20 a
CV:	17.5	47.4	22.6	4.4

Soybean yield (bu/ac; 13% moisture) Yield (bu/ac)

Non-treated control	25 b	50 a	53 a	43 a
ProPulse 6 fl oz/ac	43 a	56 a	55 a	51 a
Delaro Complete 8 fl oz/ac	47 a	53 a	61 a	53 a
CV:	10.7	15	7.9	10.9

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Endura: boscalid (FRAC 7) ProPulse: fluopyram (FRAC 7) + prothioconazole (FRAC 3)							COMBINED ANALYSIS
year	2022	2023	2024	2024	2024	2024	
location	Carrington	Carrington	Carrington	Carrington	Carrington	Carrington	
funding	BASF	BASF	BASF	BASF	BASF	Corteva	
variety	AG09Xf0	21Xf07	XO0602E	P064T04E	AG07XF2	P08A44E	
brand, maturity	Asgrow, 0.9	Peterson Farms, 0.7	Xitavo, 0.6	Pioneer, 0.6	Asgrow, 0.7	Pioneer, 0.8	
row spacing	14 inches	14 inches	14 inches	14 inches	14 inches	15 inches	
seeding rate	165,000 pls/ac	165,000 pls/ac	165,000 pls/ac	165,000 pls/ac	165,000 pls/ac	140,000 pls/ac	
previous crop	dry bean	chickpeas	dry edible beans	dry edible beans	dry edible beans	sunflowers	
planting date	May 27	May 24	May 15	May 15	May 15	May 16	
disease assessment date	Oct. 19	Oct. 12	Oct. 1	Oct. 1-2	Oct. 2	Oct. 9	
rows assessed for disease	1	1	1	1	1	2	
harvest date	Oct. 21	Oct. 17	Oct. 4	Oct. 4	Oct. 4	Oct. 14	
dates, applications 1 and 2	July 23, Aug. 1	July 22, Aug. 2	July 23, July 30	July 23, July 30	July 23, July 30	July 24, July 31	
interval between applications	9 days	11 days	7 days	7 days	7 days	7 days	6 studies
growth stage, 1st applic.	100% R2	100% R2	100% R2	100% R2	100% R2	100% R2	
canopy closure, 1st applic	99-100%	98-100%	90-95%	90-95%	90-95%	75-90%	
nozzles, pressure, 1st applic.	AIXR110015, 50 psi	AIXR110015, 50 psi	AIXR110015, 60 psi	AIXR110015, 60 psi	AIXR110015, 60 psi	AIXR110015, 60 psi	
droplet size, 1st applic.	medium-coarse	medium-coarse	medium	medium	medium	medium	
canopy closure, 2nd applic.	100%	100%	99-100%	99-100%	99-100%	90-98%	
nozzles, pressure, 2nd applic.	AIXR110015, 50 psi	AIXR110015, 40 psi	AIXR110015, 40 psi	AIXR110015, 40 psi	AIXR110015, 40 psi	AIXR110015, 40 psi	
droplet size, 2nd applic.	medium-coarse	coarse	coarse	coarse	coarse	coarse	
adjuvant	Masterlock, 6.4 fl oz/ac	Masterlock, 6.4 fl oz/ac	Masterlock, 6.4 fl oz/ac	Masterlock, 6.4 fl oz/ac	Masterlock, 6.4 fl oz/ac	Induce, 0.25% v/v	
fungicide spray volume	15 gal/ac	15 gal/ac	15 gal/ac	15 gal/ac	15 gal/ac	15 gal/ac	
application method	hand-held boom	hand-held boom	hand-held boom	hand-held boom	hand-held boom	hand-held boom	
White mold incidence (% of plants)							White mold (% plants)
Non-treated control	82 b	54 a	86 b	83 c	92 b	46 b	74 b
Endura 6 oz/ac	53 a	33 a	67 a	44 a	69 a	16 a	47 a
ProPulse 6 fl oz/ac	49 a	35 a	70 a	59 b	75 a	27 ab	52 a
CV:	14.4	35.6	9.3	16.1	8.5	14.9	8.4
White mold severity index (% of canopy)							White mold (% canopy)
Non-treated control	70 b	31 a	70 b	68 c	83 b	20 b	57 b
Endura 6 oz/ac	40 a	18 a	48 a	32 a	54 a	5 a	33 a
ProPulse 6 fl oz/ac	35 a	18 a	52 a	46 b	63 a	12 ab	38 a
CV:	17.5	47.4	13.9	18.2	10.7	22.6	13.9
Soybean yield (bu/ac; 13% moisture)							Yield (bu/ac)
Non-treated control	25 b	50 a	28 b	28 b	16 b	53 a	33 b
Endura 6 oz/ac	42 a	50 a	46 a	42 a	34 a	58 a	45 a
ProPulse 6 fl oz/ac	43 a	56 a	43 a	40 a	29 a	55 a	44 a
CV:	10.7	15	10.2	7.2	13.7	7.9	10.3

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ProPulse: fluopyram (FRAC 7) + prothioconazole (FRAC 3)

Viatude: picoxystrobin (FRAC 11) + prothioconazole (FRAC 3)

year	2024	2024	2024	COMBINED ANALYSIS 3 studies Viatude 16 fl oz/ac vs. ProPulse 6 fl oz/ac Two sequential applications of the same fungicide
location	Carrington	Carrington	Carrington	
funding	BASF	BASF	BASF	
variety	XO0602E	P064T04E	AG07XF2	
brand, maturity	Xitavo, 0.6	Pioneer, 0.6	Asgrow, 0.7	
row spacing	14 inches	14 inches	14 inches	
seeding rate	165,000 pls/ac	165,000 pls/ac	165,000 pls/ac	
previous crop	dry edible beans	dry edible beans	dry edible beans	
planting date	May 15	May 15	May 15	
disease assessment date	Oct. 1	Oct. 1-2	Oct. 2	
rows assessed for disease	1	1	1	
harvest date	Oct. 4	Oct. 4	Oct. 4	
dates, applications 1 and 2	July 23, July 30	July 23, July 30	July 23, July 30	
interval between applications	7 days	7 days	7 days	
growth stage, 1st applic.	100% R2	100% R2	100% R2	
canopy closure, 1st applic	90-95%	90-95%	90-95%	
nozzles, pressure, 1st applic.	AIXR110015, 60 psi	AIXR110015, 60 psi	AIXR110015, 60 psi	
droplet size, 1st applic.	medium	medium	medium	
canopy closure, 2nd applic.	99-100%	99-100%	99-100%	
nozzles, pressure, 2nd applic.	AIXR110015, 40 psi	AIXR110015, 40 psi	AIXR110015, 40 psi	
droplet size, 2nd applic.	coarse	coarse	coarse	
adjuvant	Masterlock, 6.4 fl oz/ac	Masterlock, 6.4 fl oz/ac	Masterlock, 6.4 fl oz/ac	
fungicide spray volume	15 gal/ac	15 gal/ac	15 gal/ac	
application method	hand-held boom	hand-held boom	hand-held boom	

White mold incidence (% of plants)

	White mold (% plants)			
Non-treated control	86 b	83 c	92 b	87 b
ProPulse 6 fl oz/ac	70 a	59 b	75 a	68 a
Viatude 16 fl oz/ac	69 a	46 a	72 a	62 a
CV:	9.3	16.1	8.5	7.5

White mold severity index (% of canopy)

	White mold (% canopy)			
Non-treated control	70 b	68 c	83 b	74 b
ProPulse 6 fl oz/ac	52 a	46 b	63 a	53 a
Viatude 16 fl oz/ac	52 a	31 a	56 a	47 a
CV:	13.9	18.2	10.7	8.5

Soybean yield (bu/ac; 13% moisture)

	Yield (bu/ac)			
Non-treated control	28 b	28 b	16 b	24 b
ProPulse 6 fl oz/ac	43 a	40 a	29 a	37 a
Viatude 16 fl oz/ac	42 a	42 a	33 a	39 a
CV:	10.2	7.2	13.7	4.2

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Delaro Complete: fluopyram (FRAC 7), trifloxystrobin (FRAC 11), prothioconazole (FRAC 3)					ProPulse: fluopyram (FRAC 7), prothioconazole (FRAC 3)
year	2020	2022	2023	2024	COMBINED ANALYSIS 4 studies Delaro Complete 8 fl oz/ac versus ProPulse 6 or 8 fl oz/ac Single fungicide application
location	Carrington	Carrington	Carrington	Carrington	
funding	Bayer	Bayer	Bayer	Bayer	
variety	DSR-0418	AG09Xf0	P06T04E	AG07XF2	
brand, maturity	Dairyland, 0.4	Asgrow, 0.9	Pioneer, 0.6	Asgrow, 0.7	
row spacing	21 inches	14 inches	14 inches	14 inches	
seeding rate	165,000 pls/ac	165,000 pls/ac	165,000 pls/ac	165,000 pls/ac	
previous crop	spring wheat	dry bean	chickpeas	dry edible beans	
planting date	May 18	May 27	May 24	May 15	
disease assessment date	Oct. 16	Oct. 19	Oct. 12	Oct. 2	
rows assessed for disease	1	1	1	1	
harvest date	Oct. 19	Oct. 21	Oct. 17	Oct. 4	
date fungicide was applied	July 17	July 23	July 22	July 23	
growth stage when fungicide was applied	100% R2	100% R2	100% R2	100% R2	
canopy closure when fungicide was applied	75-90%	99-100%	95-100%	90-95%	
nozzles, application pressure	AIXR110015, 60 psi	AIXR110015, 50 psi	AIXR110015, 50 psi	AIXR110015, 60 psi	
spray droplet size	medium	medium-coarse	medium-coarse	medium	
adjuvant	Induce 0.125% v/v	Induce 0.125% v/v	Induce, 0.125% v/v	Induce, 0.125% v/v	
fungicide spray volume	15 gal/ac	15 gal/ac	15 gal/ac	15 gal/ac	
application method	hand-held boom	hand-held boom	hand-held boom	hand-held boom	
White mold incidence (% of plants)					White mold (% plants)
Non-treated control	38 a	74 b	63 a	88 b	66 b
Delaro Complete 8 fl oz/ac	42 a	49 a	50 a	70 ab	53 ab
ProPulse 6 fl oz/ac	45 a	53 a	57 a	79 ab	59 ab
ProPulse 8 fl oz/ac	31 a	48 a	51 a	67 a	49 a
CV:	19.7	18.2	22.2	15.1	10.5
White mold severity index (% of canopy)					White mold (% canopy)
Non-treated control	15 a	63 b	43 a	78 b	50 b
Delaro Complete 8 fl oz/ac	17 a	34 a	30 a	54 ab	34 a
ProPulse 6 fl oz/ac	23 a	36 a	37 a	65 ab	40 ab
ProPulse 8 fl oz/ac	8 a	33 a	32 a	53 a	31 a
CV:	23.2	24.6	31.2	22.5	18.2
Soybean yield (bu/ac; 13% moisture)					Yield (bu/ac)
Non-treated control	49 ab	30 b	47 b	21 b	37 b
Delaro Complete 8 fl oz/ac	48 b	43 a	54 a	36 a	45 a
ProPulse 6 fl oz/ac	49 ab	39 a	51 ab	30 ab	43 ab
ProPulse 8 fl oz/ac	53 a	42 a	52 ab	36 a	46 a
CV:	5.1	8.2	6.5	23.7	7.6

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ProPulse: fluopyram (FRAC 7), prothioconazole (FRAC 3) **Endura:** boscalid (FRAC 7)

year	2022	2023	2024	COMBINED ANALYSIS 3 studies Propulse 6 or 8 fl oz/ac versus Endura 5.5 oz/ac Single fungicide application
location	Carrington	Carrington	Carrington	
funding	Bayer	Bayer	Bayer	
variety	AG09Xf0	P06T04E	AG07XF2	
brand, maturity	Asgrow, 0.9	Pioneer, 0.6	Asgrow, 0.7	
row spacing	14 inches	14 inches	14 inches	
seeding rate	165,000 pls/ac	165,000 pls/ac	165,000 pls/ac	
previous crop	dry bean	chickpeas	dry edible beans	
planting date	May 27	May 24	May 15	
disease assessment date	Oct. 19	Oct. 12	Oct. 2	
rows assessed for disease	1	1	1	
harvest date	Oct. 21	Oct. 17	Oct. 4	
date fungicide was applied	July 23	July 22	July 23	
growth stage when fungicide applied	100% R2	100% R2	100% R2	
canopy closure when fungicide applied	99-100%	95-100%	90-95%	
nozzles, application pressure	AIXR110015, 50 psi	AIXR110015, 50 psi	AIXR110015, 60 psi	
spray droplet size	medium-coarse	medium-coarse	medium	
adjuvant	Induce 0.125% v/v	Induce, 0.125% v/v	Induce, 0.125% v/v	
fungicide spray volume	15 gal/ac	15 gal/ac	15 gal/ac	
application method	hand-held boom	hand-held boom	hand-held boom	

White mold incidence (% of plants) White mold (% plants)

Non-treated control	74 b	63 b	88 b	75 b
ProPulse 6 fl oz/ac	53 a	57 ab	79 ab	63 ab
ProPulse 8 fl oz/ac	48 a	51 ab	67 a	55 a
Endura 5.5 oz/ac	60 ab	42 a	80 ab	61 ab
CV:	18.2	22.2	15.1	9.5

White mold severity index (% of canopy) White mold (% canopy)

Non-treated control	63 b	43 b	78 b	61 b
ProPulse 6 fl oz/ac	36 a	37 ab	65 ab	46 ab
ProPulse 8 fl oz/ac	33 a	32 ab	53 a	39 a
Endura 5.5 oz/ac	41 a	24 a	63 ab	43 a
CV:	24.6	31.2	22.5	12.5

Soybean yield (bu/ac; 13% moisture) Yield (bu/ac)

Non-treated control	30 b	47 b	21 b	32 b
ProPulse 6 fl oz/ac	39 a	51 ab	30 ab	40 a
ProPulse 8 fl oz/ac	42 a	52 ab	36 a	43 a
Endura 5.5 oz/ac	38 a	56 a	32 ab	42 a
CV:	8.2	6.5	23.7	6.3