

2012 Dry Bean Research Report

Assessment of Narrow Row Technology



**Michigan Dry Edible Bean Production
Research Advisory Board**

The Michigan Bean Commission was awarded a grant from the MDA Specialty Crop Block Grant Program-Farm Bill.

The title of this project is “Assessment of Narrow Row Technology for the Michigan Dry Bean Industry”.

Expected outcomes from this project are:

1. Identification of adaptable dry bean cultivars.
2. Identification of two new fungicides for control of white mold disease.
3. Identification of approved herbicides and plant desiccants with no adverse food safety implications.
4. Knowledge of row spacing and plant density impact to enable sound recommendations to growers.
5. Understanding and quantification of the economic benefits and improved management strategies associated with narrow row technology.

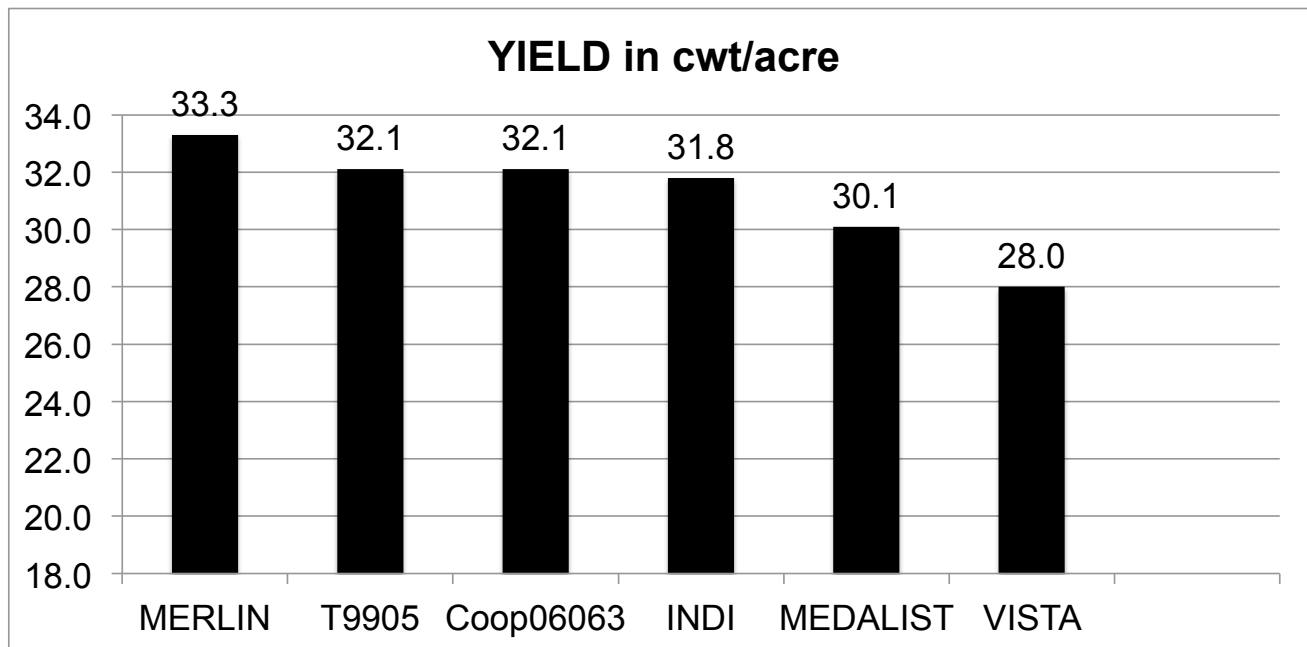
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**NAVY BEAN VARIETY STRIP TRIAL-15 INCH ROWS
GREENFIELD FARMS INC. PIGEON, MICHIGAN**

VARIETY	YIELD	PICK%	MOISTURE	LOGGE	HEIGHT	POPULATION	Seeds/lb
MERLIN	33.3	2.1	17.6	2.5	23.5	113,837	2259
T9905	32.1	1.8	17.4	2.5	22.3	118,483	2108
Coop06063	32.1	2.5	17.5	2.5	22.7	109,190	2004
INDI	31.8	2.6	17.2	1	23.6	106,867	2227
MEDALIST	30.1	1.7	17.8	2	23.9	120,806	2446
VISTA	28.0	1.9	17.5	2.5	23.1	103,382	2413

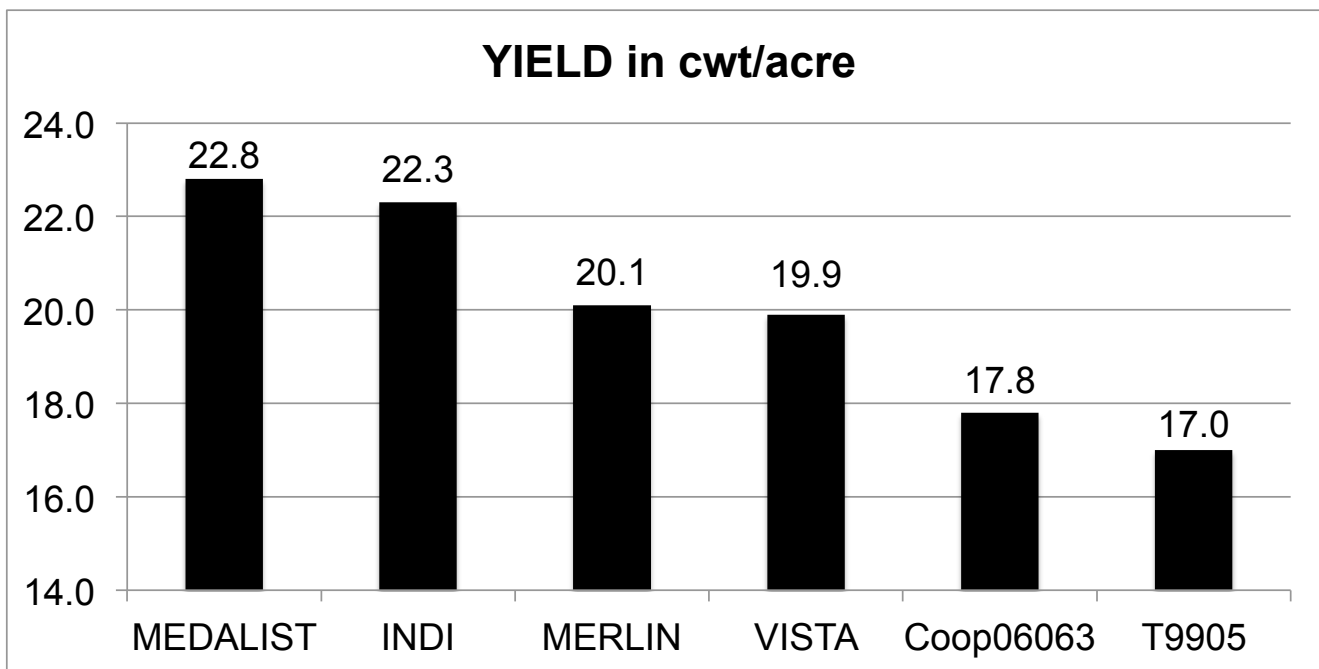
Planted: June 7
 Harvested: September 26 111 days after planting
 Lodge rating is 1=erect, 5=flat
 Pick %=FM+Pick
 Planting Population= 128,000
 Fertilization=18 gallons of 28%+2 gallons thiosol (AMS)
 Herbicides=PPI 1 pt Treflan+1pt Dual+1 qt. Eptam
 Post= 8 oz Basagran+3 oz Raptor+4 oz Reflex
 Fungicides=None
 Insecticide=applied with herbicide
 Harvest Aid=None
 Harvest area=.9917 Acres



**NAVY BEAN VARIETY STRIP TRIAL-22 INCH ROWS
SCHINDLER FARMS KAWKAWLIN, MICHIGAN**

VARIETY	YIELD	PICK %	MOISTURE	LODGE	HEIGHT	POPULATION	Seeds/lb
MEDALIST	22.8	1.9	17.5	2.5	21.2	121,651	2702
INDI	22.3	2.1	17.1	1.5	21.1	116,899	2803
MERLIN	20.1	2.2	17.4	2.5	21.0	121,651	2668
VISTA	19.9	2.4	17.8	2.5	20.5	114,048	2635
Coop06063	17.8	1.9	17.7	2.5	20.8	124,502	2327
T9905	17.0	1.7	17.5	2	20.3	123,552	2504

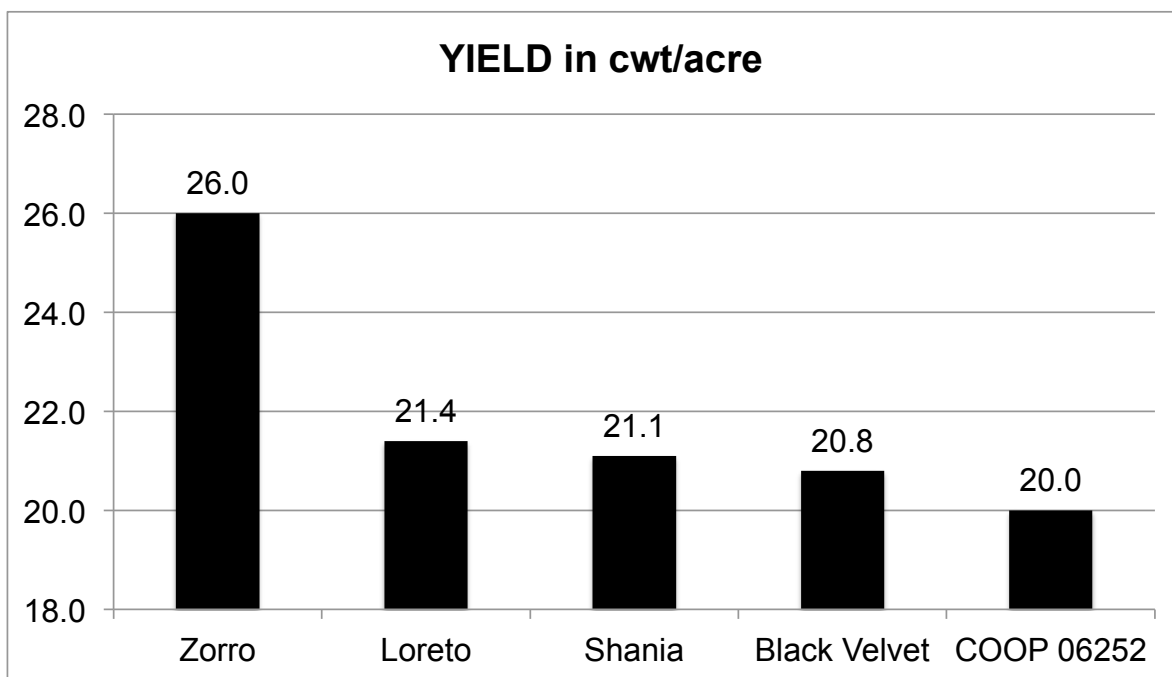
Planted: June 9
 Harvested: September 26 107 days after planting
 Lodge rating is 1=erect, 5=flat
 Pick %=FM+Pick
 Planting Population= 129,000
 Fertilization=20 gallons of 28%
 Herbicides=PPI 1 pt Treflan+1pt Dual
 Post= 8 oz Basagran+3 oz Raptor+4 oz Reflex
 Fungicides=None
 Insecticide=applied with herbicide
 Harvest Aid=1.5 pints Gramoxone + 1 oz AIM + Dynamic 1/4%
 Harvest area=.8 Acres



**BLACK BEAN VARIETY STRIP TRIAL-20 INCH ROWS
LAKKE EWALD FARMS, INC.**

VARIETY	YIELD	PICK %	MOISTURE	LODGE	HEIGHT	POPULATION	Seeds/lb
Zorro	26.0	2.5	15.4	2	22.5	118,483	2443
Loreto	21.4	2.7	15.7	2.5	21.8	124,582	2387
Shania	21.1	2.3	16.5	2	23.3	113,360	2440
Black Velvet	20.8	2.2	15.9	2.5	23.1	116,741	2137
COOP 06252	20.0	2.7	16.2	2	22.7	133,294	2869

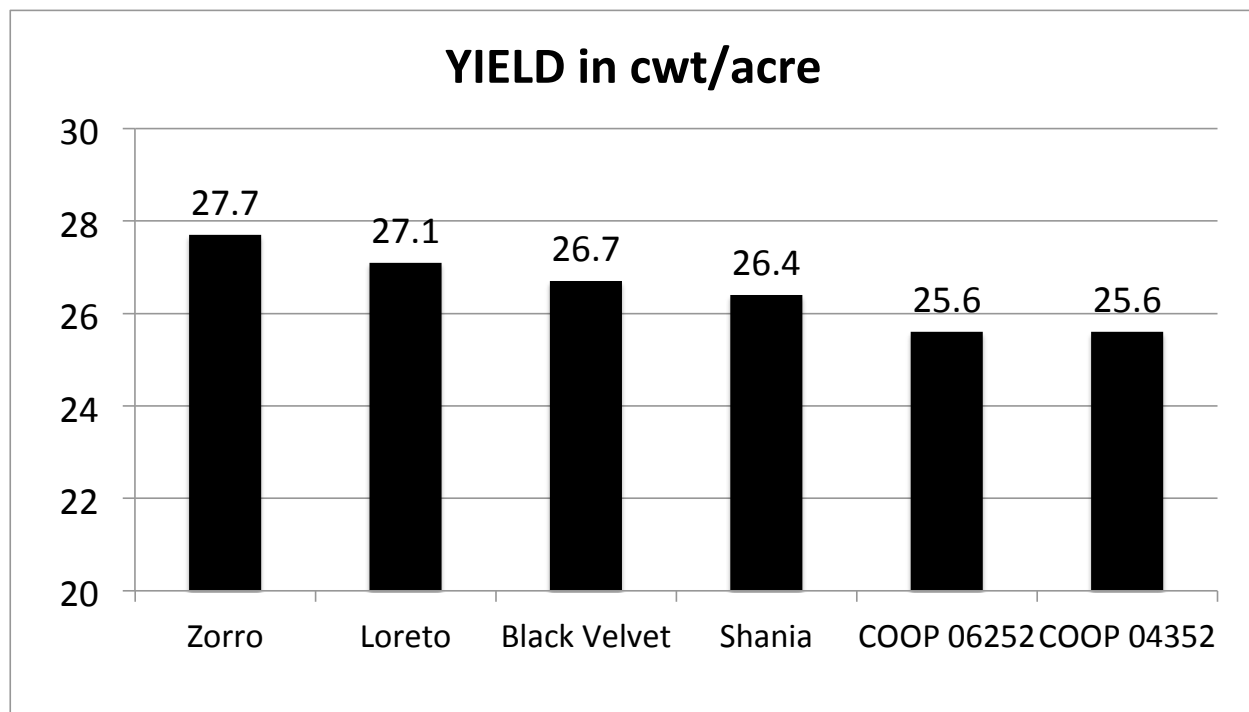
Planted: June 9
 Harvested: September 19
 Lodge rating is 1=erect, 5=flat
 Planting Population= 120,000
 Fertilization=48 pounds Nitrogen, 2% Mn, 2% Zn (2X2)
 Herbicides=PPI 39 oz Eptam + 14 oz Outlook
 Post= 8 oz Basagran+ Raptor + Reflex
 Fungicides=8 oz Endura
 Insecticide=applied with herbicide and fungicide
 Harvest Aid=1.5 pints Gramoxone + 1.5 oz AIM
 Acres per Variety = 2.62



**BLACK BEAN VARIETY STRIP TRIAL-20 INCH ROWS
STOUTENBURG FARMS SANDUSKY, MICHIGAN**

VARIETY	YIELD	PICK %	MOISTURE	LOGGE	HEIGHT	POPULATION	Seeds/lb
Zorro	27.7	2.8	16.4	2	21.3	144,184	2227
Loreto	27.1	3.1	16.6	3	20.8	145,111	2119
Black Velvet	26.7	2.7	17.2	3	23.8	142,005	1618
Shania	26.4	2.9	17.3	3	22.9	143,748	2098
COOP 06252	25.6	2.8	17.1	2	21.6	146,362	2225
COOP 04352	25.6	2.6	16.9	2	21.4	155,111	2395

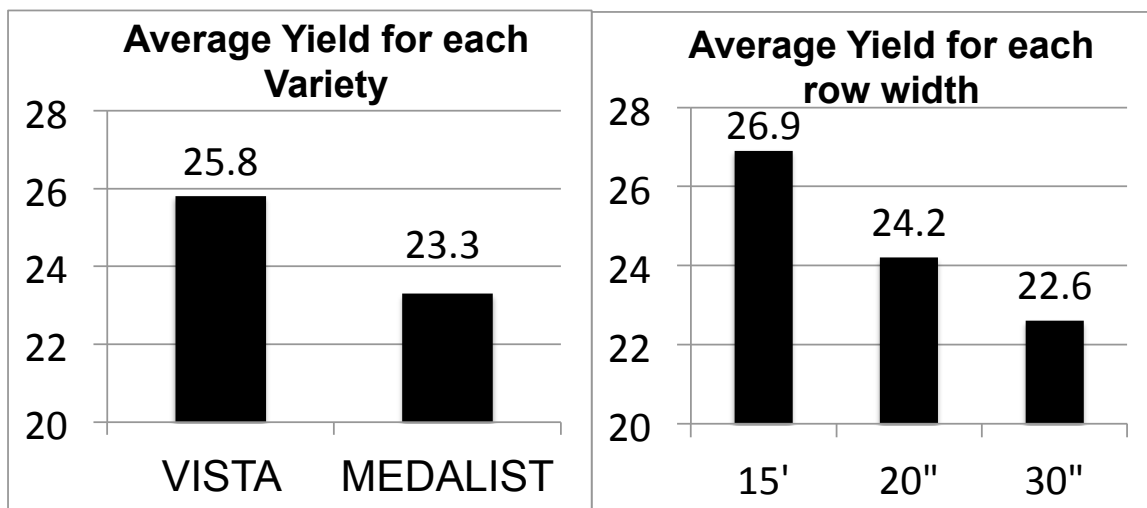
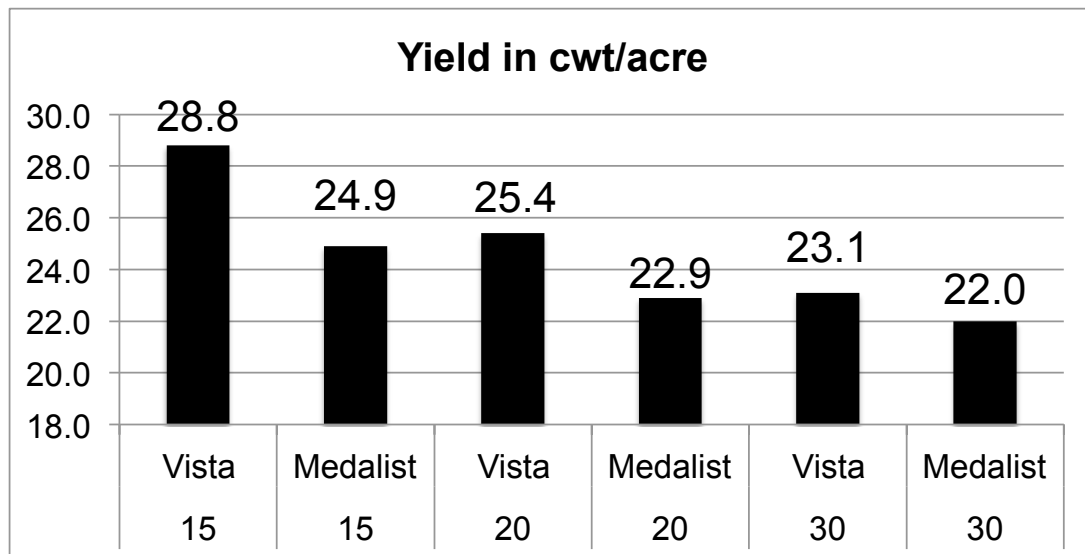
Planted: May 30
 Harvested: October 3 126 days after planting
 Lodge rating is 1=erect, 5=flat
 Pick %=FM+Pick
 Planting Population= 145,000
 Fertilization=55 pounds Nitrogen, 16 gal 10-34-0
 Harvest area=2.87 Acres
 Fungicides=8 oz Endura
 Insecticide=applied with herbicide and fungicide
 Harvest Aid=1.5 pints Gramoxone



**Navy Row Width
MSU Saginaw Valley Research and Extension Center
Frankenmuth, MI**

Row width	Variety	Yield	Height	Population
15	Vista	28.8	21.5	132,456
15	Medalist	24.9	22.3	128,324
20	Vista	25.4	22.1	118,456
20	Medalist	22.9	22.5	116,978
30	Vista	23.1	23.5	105,279
30	Medalist	22.0	23.5	104,238

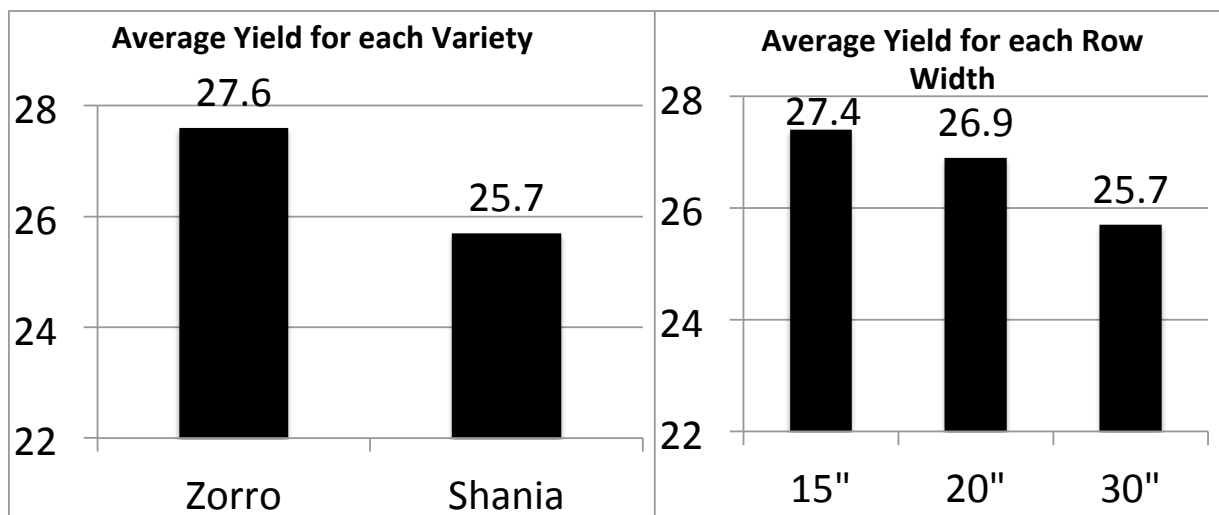
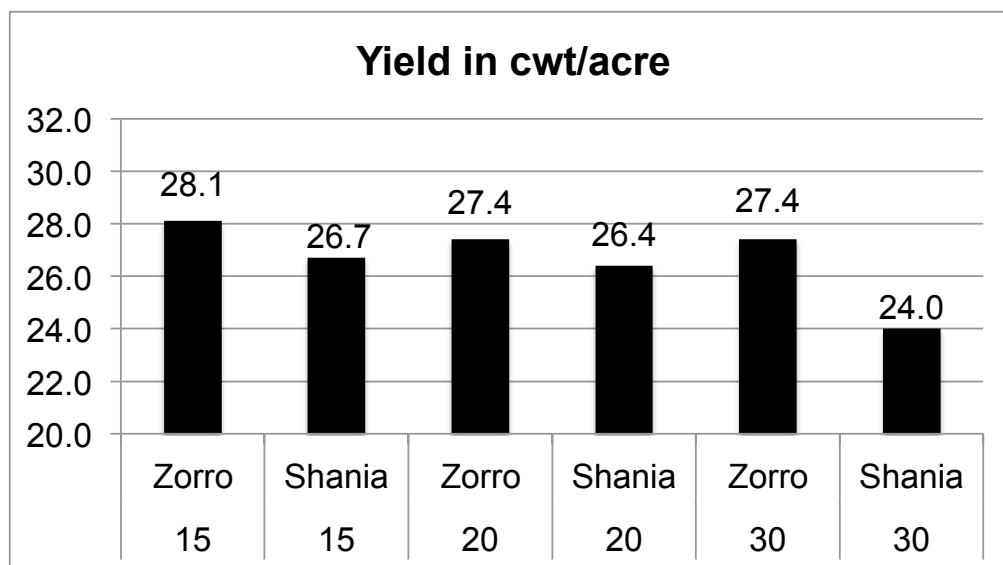
LSD=2.17
C.V.= 5.9%



**Black Row Width
MSU Saginaw Valley Research and Extension Center
Frankenmuth, MI**

Row width	Variety	Yield	Height	Population
15	Zorro	28.1	21.1	126,876
15	Shania	26.7	21.2	128,432
20	Zorro	27.4	21.8	118,632
20	Shania	26.4	21.9	116,479
30	Zorro	27.4	22.1	105,387
30	Shania	24.0	22.3	106,368

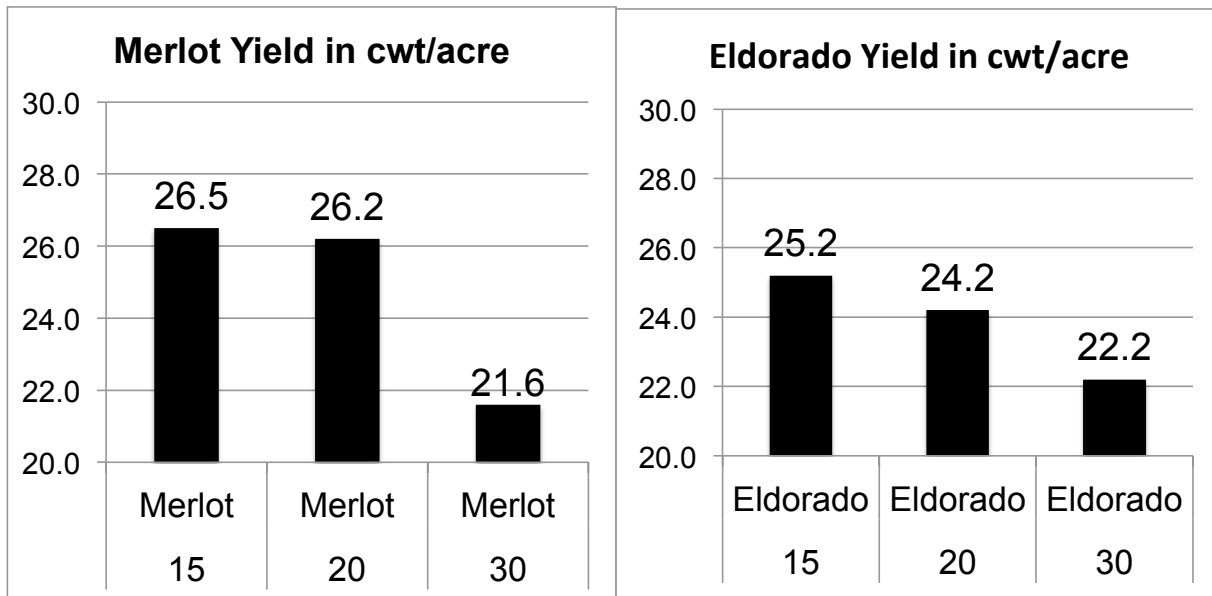
LSD=3.01
C.V.=7.5%



**Small Red Row Width
MSU Saginaw Valley Research and Extension Center
Frankenmuth, MI**

Row width	Variety	Yield	Height	Population
15	Merlot	26.5	24.7	108,782
20	Merlot	26.2	25.6	102,654
30	Merlot	21.6	26.2	92,345

LSD=3.36
C.V.=7.8%



**Pinto Row Width
MSU Saginaw Valley Research and Extension Center
Frankenmuth, MI**

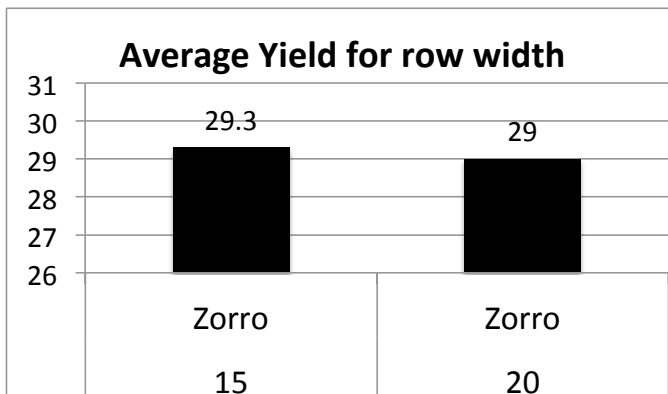
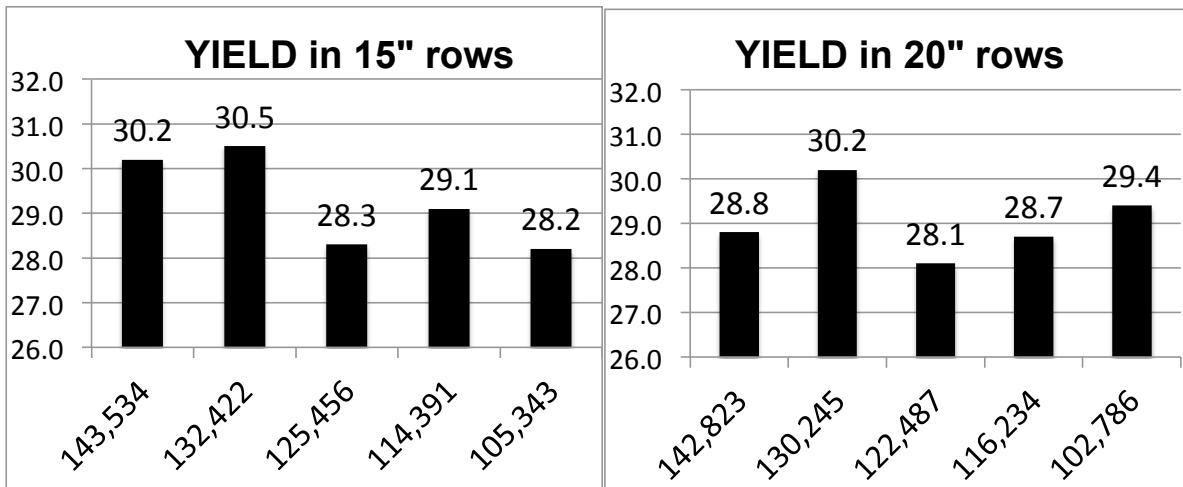
Row width	Variety	Yield	Height	Population
15	Eldorado	25.2	24.8	117,322
20	Eldorado	24.2	25.4	101,930
30	Eldorado	22.2	26.6	84,215

LSD=3.79
C.V.=9.2%

Black Row Width/Population
MSU Saginaw Valley Research and Extension Center
Frankenmuth, MI

Row width	Variety	Yield	Height	Population
15	Zorro	30.2	21.9	143,534
15	Zorro	30.5	22.1	132,422
15	Zorro	28.3	20.2	125,456
15	Zorro	29.1	21.4	114,391
15	Zorro	28.2	21.5	105,343
20	Zorro	28.8	22.3	142,823
20	Zorro	30.2	20.8	130,245
20	Zorro	28.1	21.7	122,487
20	Zorro	28.7	22.1	116,234
20	Zorro	29.4	22.4	102,786

LSD=1.44
C.V.=3.4%

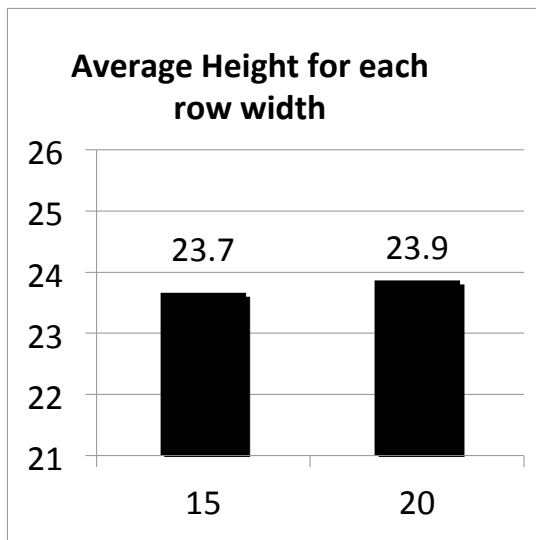
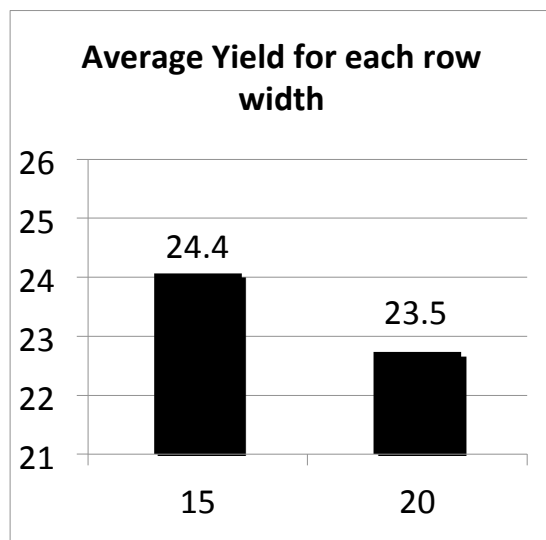
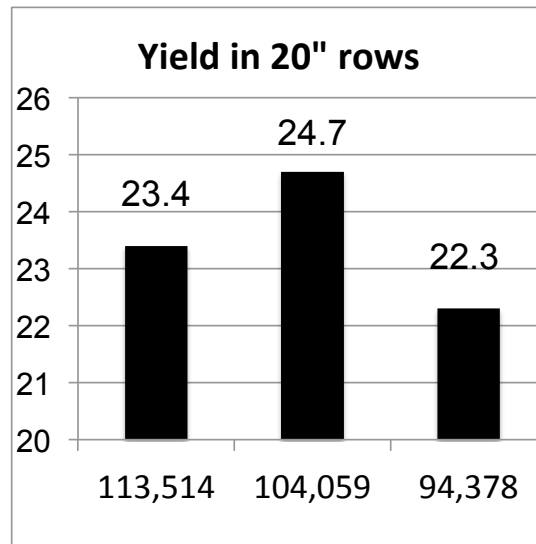
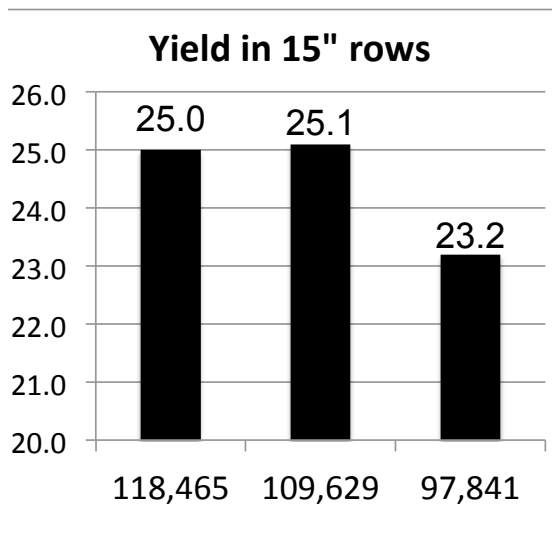


Small Red Row Width/Population
MSU Saginaw Valley Research and Extension Center
Frankenmuth, MI

Row width	Variety	Yield	Height	Population
15	Merlot	25.0	23.6	118,465
15	Merlot	25.1	23.9	109,629
15	Merlot	23.2	23.5	97,841
20	Merlot	23.4	23.6	113,514
20	Merlot	24.7	24.2	104,059
20	Merlot	22.3	23.8	94,378

LSD=3.60

C.V.=10%



2012 White Mold Fungicide Trial
 Montcalm Research Farm, Entrican, Michigan
 Merlot Small Red

Treatment	Rate	Application		Incidence	Severity	YIELD
		Code	%infection	%severity		
UTC			63	48	1924	
Endura	8 oz	AB	43	29	2291	
Omega	8 oz	AB	40	27	2350	
PROPULSE+INDUCE	8 oz	A	44	31	2362	
PROPULSE+INDUCE	10 oz	A	43	29	2410	
PROPULSE+INDUCE	8 oz	AB	45	32	2413	
PROPULSE+INDUCE	10 oz	AB	36	24	2544	
PROLINE+INDUCE	5.7 oz	AB	40	28	2280	
APPROACH+INDUCE	9 oz	A	50	37	2402	
APPROACH+INDUCE	9 oz	AB	36	24	2213	
				LSD@.05	394	
				C.V. Value	11.70%	

Application Code:A=100% or first bloom, B=7 days after 100% bloom
 Rating - % infection "rating" on September 26, % Incidence, %severity
 Merlot Small Red Beans planted in 20" rows. Irrigation of two .5 inch per week
 Planted: June 14 Harvested: September 28
 First Spray: July 28 Second Spray: August 6
 Sprayed with 4 row bicycle-wheel CO2 sprayer using 30 gpa at 65 psi.
 Twin-Jet nozzle placed directly over the row.
 Plot size sprayed was 4 Rows by 30 feet.
 Harvest area was middle 2 Rows by 15 feet.

Volmering Family Farms-Cooperative Elevator-Ruth Merlot Small Red

Treatment	Rate	Application		Incidence	Severity	YIELD
		Code	%infection	%severity		
UTC			26	13	3162	
Endura	8 oz	AB	21	8	3587	
Omega	8 oz	AB	23	7	3488	
PROPULSE+INDUCE	8 oz	A	23	7	3465	
PROPULSE+INDUCE	10 oz	A	29	12	3394	
PROPULSE+INDUCE	8 oz	AB	21	8	3763	
PROPULSE+INDUCE	10 oz	AB	26	11.5	3536	
PROLINE+INDUCE	5.7 oz	AB	21	10	3124	
				LSD@.05	331	
				C.V. Value	6.60%	

Planted: May 30 Harvested: September 13
 First Spray: July 23 Second Spray: July 30
 22" inch Rows

EXPERIMENT 2101 STANDARD NAVY YIELD TRIAL

PLANTING DATE: 6/6/11

Dr. James D. Kelly and Evan Wright, Crops and Soil Sciences, Michigan State University

NAME	PEDIGREE	YIELD CWT	100 SEED	DAYS TO	DAYS TO	LODGING HEIGHT	DES.
		/ACRE	WT. (g)	FLOWER MATURITY	(1-5)	(cm)	SCORE
N11284	MEDALIST/N08003	28.4	18.3	45.0	99.0	1.0	4.5
N11276	N08010/N08007	27.3	18.7	50.0	97.0	1.0	4.5
N11230	N05311//BMD12/B04587	27.1	18.7	42.0	100.0	1.0	4.5
N11283	MEDALIST/N08003	26.9	18.4	44.0	100.0	1.5	6.0
I11264	COOP 03019, MERLIN	26.9	19.6	45.0	102.0	2.0	4.0
N11277	N08010/N08007	26.9	20.5	48.0	97.0	1.0	6.0
N11292	N08006/MEDALIST	26.4	17.3	46.0	100.0	1.0	4.5
N11232	N05311//BMD12/B04587	25.8	18.3	44.0	100.0	1.5	5.0
N12471	B09174/N09056	25.8	23.7	46.0	98.0	1.5	4.0
N11238	N07009//N05324/B04554	25.6	15.7	49.0	101.0	1.0	6.0
N11298	MEDALIST//B05054/B04588	25.5	19.7	46.0	99.0	1.0	4.0
N11296	MEDALIST//B05054/B04588	25.4	20.2	43.0	99.0	1.5	4.5
I10103	OAC 7-2, OAC REXETER	25.3	20.1	44.0	103.0	2.0	4.0
N11264	N08003/MEDALIST	25.1	20.0	42.0	99.0	2.0	4.5
I08958	Mayflower/Avanti, MEDALIST	25.0	18.9	46.0	102.0	2.0	4.5
N11282	MEDALIST/N08003	24.8	18.4	44.0	101.0	2.0	4.0
N11256	N07009/MEDALIST	24.6	18.3	48.0	98.0	1.0	4.5
N11231	N05311//BMD12/B04587	24.3	17.0	44.0	99.0	1.5	5.0
N10109	B05055/N05324	24.1	19.8	48.0	101.0	1.5	4.5
N09104	N05311/B05055	23.9	19.2	47.0	98.0	1.0	4.5
N11225	N05311*/B05044	23.9	18.1	49.0	101.0	1.5	4.0
N09044	N05311/X06121	23.8	17.5	44.0	100.0	1.0	5.0
N11257	N07009/MEDALIST	23.8	19.9	49.0	100.0	1.0	5.0
N11245	N04158/B07554	23.8	19.2	47.0	99.0	1.0	4.0
I92002	C-20*3//GTS-0801/Seaf, VISTA	23.8	19.9	46.0	100.0	2.5	4.0
I12301	INDI	23.7	20.3	44.0	98.0	1.0	4.5
N11258	N07009/MEDALIST	23.6	19.5	49.0	100.0	1.0	4.0
N10103	N05319//N05311/N04109	23.5	20.5	43.0	100.0	1.0	5.0
N11275	N08010/N08007	23.4	19.2	44.0	101.0	1.5	4.0
N11262	N08003/B07554	23.4	22.8	45.0	102.0	2.0	4.5
N11216	N04158/B04265	23.4	21.8	44.0	101.0	2.0	4.0
N11300	MEDALIST//B05054/B04588	23.3	20.4	46.0	100.0	1.0	4.5
N11289	N08012/N08007	22.9	20.8	45.0	101.0	1.0	4.0
N11228	N05311//N07009/N05324	22.8	17.0	46.0	100.0	2.0	5.0
N11226	N05311*/B05044	22.7	17.4	50.0	102.0	1.0	4.0
N11227	N05311//N07009/N05324	22.7	19.2	45.0	99.0	2.0	4.5
N11234	N05311//N06705/B04588	22.3	20.5	45.0	100.0	1.5	4.0
N11002	N04164//N05311/B05044	22.3	19.7	43.0	99.0	1.0	4.5
N11008	B07554/N08007	21.9	19.0	46.0	102.0	1.0	4.0
N11293	N08006/MEDALIST	21.8	20.8	45.0	102.0	1.5	5.0
N11217	N05324/N04158	21.6	19.4	50.0	102.0	1.5	4.5
N11280	AVALANCHE/N08007	21.6	21.3	45.0	102.0	2.0	4.0
I08902	HYLAND T9905	21.1	19.8	44.0	100.0	2.0	4.0
MEAN (23.2	19.4	45.4	100.3	1.5	4.4
LSD (.05		3.2	1.1	1.0	2.3	0.7	0.5
CV (%)		11.7	4.7	1.3	1.4	28.0	6.6

EXPERIMENT 2102 STANDARD BLACK YIELD TRIAL
PLANTING DATE: 6/6/12
Dr. James D. Kelly and Evan Wright, Crops and Soil Sciences, Michigan State University

NAME	PEDIGREE	YIELD CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE
B10244	B04610/N05346	35.6	22.2	46.0	101.0	1.0	54.5	6.0
I10102	Mackinac/Jaguar, LORETO	35.4	21.1	46.0	101.0	3.0	48.0	4.0
B11363	B04644/B07554	34.9	21.0	45.0	100.0	1.0	50.0	5.0
B10213	B04587//ZORRO/DPC-1	34.5	20.1	46.0	101.0	1.5	52.5	5.0
B10208	N05324/B05055	34.1	23.4	44.0	101.0	1.0	51.0	4.5
B11334	N07009//B04349/B05044	34.0	19.3	43.0	99.0	1.0	51.5	5.5
B10215	B04587//ZORRO/DPC-1	33.9	19.9	47.0	100.0	1.0	50.0	5.0
B04554	B00103*/X00822, ZORRO	33.6	20.2	48.0	102.0	2.0	54.0	5.0
B10202	N05311/X06121	32.9	22.8	44.0	100.0	1.0	53.5	5.0
B11259	N07009//B04349/B05044	32.3	19.5	45.0	103.0	1.5	50.5	4.0
B09165	B04554/B04587	32.1	18.9	46.0	102.0	1.5	54.0	6.0
B11360	B04644/B05066	31.9	21.5	42.0	101.0	2.0	48.0	4.0
B09175	N05311/B05055	31.8	24.2	46.0	103.0	2.0	54.0	4.5
B10214	B04587//ZORRO/DPC-1	31.7	19.9	46.0	101.0	2.0	53.0	5.0
B11364	B04644/B07554	31.4	23.0	45.0	100.0	1.0	52.5	5.5
B11588	I82054/B07554	31.4	21.2	47.0	104.0	2.0	48.0	4.0
B10210	N05324/B04431	31.4	24.0	44.0	104.0	2.0	54.0	4.5
B11343	B07554//ZORRO/B05044	31.4	19.8	44.0	100.0	2.5	48.5	4.0
B09119	B04554/X06127	31.1	19.5	47.0	100.0	1.0	51.5	4.5
B95556	B90211/N90616, JAGUAR	30.9	19.9	47.0	101.0	1.0	50.0	4.5
B11344	B07554//ZORRO/B05044	30.8	19.0	47.0	100.0	2.0	48.0	4.0
B10238	ZORRO/B05055	30.8	19.0	47.0	101.0	1.0	50.5	4.5
B10227	B05055/N05324	30.7	22.4	45.0	103.0	2.0	49.5	4.0
B10231	B06311/N05311	30.4	17.0	47.0	100.0	1.0	49.0	4.0
B10243	B04610/N05346	30.4	18.5	48.0	103.0	2.0	53.0	4.0
B11361	B04644/B05066	30.0	20.2	45.0	102.0	2.0	50.5	3.5
B11362	B04644/B07554	29.9	24.2	44.0	99.0	2.0	48.5	4.0
I03390	ND9902621-2, ECLIPSE	29.8	20.2	45.0	99.0	2.0	51.5	4.0
B10225	B04644//B05055/B05044	29.6	20.7	45.0	98.0	1.0	48.5	4.0
B11375	B07104/B04391	29.3	20.6	44.0	102.0	2.0	52.5	4.5
I07116	T-39/Midnight, SHANIA	29.2	20.0	48.0	103.0	2.5	49.5	3.0
B10201	N05311/B05055	28.5	21.0	43.0	99.0	1.5	52.0	5.0
I08907	Midnight/Blackhawk, BLACK VELVET	26.8	23.7	48.0	104.0	3.0	49.5	3.5
I81066	SEL-BTS, T-39	24.8	21.9	44.0	103.0	4.0	40.5	3.0
B10228	B06311/B05039	24.2	22.0	45.0	103.0	2.0	47.5	4.0
B10234	B04644/B190	24.1	19.4	45.0	101.0	1.5	47.0	3.5
MEAN (36)		31.0	20.9	45.3	101.0	1.7	50.5	4.4
LSD (0.05)		2.7	1.4	1.4	1.8	0.5	2.5	0.6
CV (%)		7.5	5.7	1.8	1.0	17.9	2.9	7.4

EXPERIMENT 2103 STANDARD BLACK YIELD TRIAL
PLANTING DATE: 6/6/12
Dr. James D. Kelly and Evan Wright, Crops and Soil Sciences, Michigan State University

NAME	PEDIGREE	YIELD CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE
B09175	N05311/B05055	34.5	24.6	46.0	102.0	2.0	53.0	4.5
B11371	B05055/B04587	33.0	21.5	45.0	101.0	2.0	51.5	4.5
B11311	B04587//ZORRO/DPC-1	32.8	19.1	47.0	102.0	1.5	51.0	5.0
B04554	B00103*/X00822, ZORRO	31.9	18.4	47.0	101.0	2.0	51.5	5.0
B11310	B04587//ZORRO/DPC-1	31.8	22.1	46.0	100.0	2.0	49.0	4.0
B11312	B04587//B05070/B05044	31.8	20.1	46.0	103.0	2.0	50.5	4.0
B11370	B05055/B04265	31.4	18.6	44.0	99.0	1.5	47.5	4.0
B10244	B04610/N05346	31.4	21.7	46.0	100.0	1.0	54.0	6.0
B11304	N05324/B05055	31.3	21.4	44.0	100.0	2.0	48.5	4.5
B11348	B04644//ZORRO/B05044	30.9	20.4	46.0	98.0	1.5	49.5	4.5
B11302	N05311//B05055/B05053	30.6	21.1	44.0	99.0	2.0	51.5	4.5
B11356	JAGUAR/B04644	30.1	19.2	45.0	101.0	2.0	51.5	4.5
B11338	N08007//B04349/B05044	30.1	17.8	46.0	100.0	1.0	51.5	5.0
B11285	N04152/N05346//N04141/N05317	30.0	19.2	46.0	101.0	2.0	49.0	4.5
B11372	B05055/B04587	29.8	20.6	48.0	99.0	2.5	49.5	5.0
I03390	ND9902621-2, ECLIPSE	29.2	19.2	44.0	98.0	1.0	49.0	4.0
B11305	N05324/N04158	29.1	19.1	46.0	101.0	1.0	51.0	4.5
B11309	B04587//ZORRO/B05055	28.5	19.5	44.0	100.0	1.0	49.5	5.0
B01261	Black Magic/Shiny Crow	28.5	19.7	52.0	100.0	3.5	44.5	3.0
B11306	B04591/ZORRO	28.5	18.3	46.0	103.0	2.0	53.0	4.5
B11313	B04644//B04349/B05044	28.4	18.8	43.0	97.0	1.5	47.0	4.0
B11341	N05311//N07009/N05324	28.3	18.7	43.0	99.0	2.0	47.5	4.5
B11004	N05324//N05311/B05044	28.3	21.4	42.0	102.0	2.0	49.0	3.0
B11316	B05052//B05044/B04588	27.9	20.0	45.0	99.0	1.5	48.5	4.0
B11329	B04644/B04391	27.3	20.2	43.0	101.0	1.0	51.5	4.5
B11369	B05054/B04588//B07554	27.2	19.9	47.0	101.0	1.5	48.5	4.0
B11322	B05055/B04644	27.0	17.8	43.0	98.0	1.0	48.5	5.0
I07116	T-39/Midnight, SHANIA	26.9	17.7	46.0	100.0	2.0	47.5	3.0
B11352	B04644//B06311/B05044	26.8	20.4	44.0	98.0	1.5	47.5	4.5
B11314	B04644//B04349/B05044	26.8	22.0	42.0	98.0	1.5	48.0	4.0
B11350	B04644//B05055/B05044	26.3	20.5	46.0	98.0	1.0	47.5	4.0
B11315	B04644//B05055/B04587	25.9	19.6	42.0	98.0	1.0	47.0	4.0
B11351	B04644//B05055/B05044	25.9	18.5	44.0	98.0	1.5	46.5	4.0
B11307	N05311/B04587	25.6	22.2	43.0	99.0	1.5	47.5	4.0
B11355	JAGUAR/B04644	23.8	17.0	44.0	98.0	1.0	48.0	2.5
B11345	B07554//B05044 /N04158	23.2	18.9	43.0	101.0	2.0	49.0	4.0
MEAN (36)		28.9	19.9	44.9	99.6	1.6	49.3	4.3
LSD (0.05)		2.6	1.4	1.9	2.9	0.7	2.7	0.8
CV (%)		7.6	6.0	2.5	1.7	23.3	3.3	11.0

2012 MICHIGAN DRY BEAN TRIALS

Compiled by Gregory V. Varner, Dry Bean Research Director

COUNTY & COOPERATOR: BAY-Schindler Farms

GRATIOT-Matt Brown Farms; HURON-Charles Briolat Farm; MONTCALM-Nitengale Farms

SANILAC-Steve Keinath Farm; TUSCOLA-Mark Bauer Farm

PLANTING DATES			June 9	June 13	June 6	June 14	May 31	June 13	2012 AVE	lodge rating
VARIETY-NAVY	DAYS	ORIGIN	BAY	GRATIOT	HURON	MONTCALM	SANILAC	TUSCOLA	6 LOC	direct-cut
										Tuscola & Bay
HMS MEDALIST	99-102	COOP	2804	3029	1549	3400	3048	2461	2715	2-1.5
MERLIN	98-101	COOP	2704	3114	1604	3263	3044	2473	2700	2.5-2
HYLAND T9905	95-99	HYLAND	2142	2882	1203	2948	2865	2563	2434	2.5-2
INDI	94-96	ADM	2126	2661	1227	2961	2861	2491	2388	1-1.5
VISTA	96-99	GTS	2576	2610	1365		3454	2258		2-2
RELIANT	96-100	GTS	2358		1443		2626	2358		3-2
GTS 544	98-102	GTS			1708		3031	2281		3-2.5
GTS OB-5551-99	104-106	GTS	1552		2314		2797	2302		3-2.5
GTS OB-1723-06	98-100	GTS	2920		1447		3699	3001		2.5-2.5
OAC REXETER	99-102	OAC-HDC			1172		2883	2100		2.5
OAC LIGHTNING	94-97	OAC-HDC			1199		3049	2195		2-1.5
ADM N8118340	94-95	ADM	2532		1097			2341		1-1
ADM N8118333	94-96	ADM	1938		1161			2299		2-2.5
ADM N8051307	95-97	ADM	2398		1211			2286		1.5-1.5
ADM N8120345	97-101	ADM	2710		1295			2558		1.5-1.5
SEM NAVC6V1200	97-99	SEMINIS			1073			2279		2-1.5
SEM NAVC6V1246	97-100	SEMINIS			1111			2684		1.5-1.5
COOP 02084	94-97	COOP			1268		2832	2425		1.5
COOP 99039-3	91-95	COOP			1339		3389	2609		2-2
COOP 03036	94-100	COOP			1419		2937	2392		2-2.5
COOP 06063	95-97	COOP			1686		3644	2951		1.5-1.5
COOP 07073	94-98	COOP			1258		2665	2630		2.5-2
COOP 08070	99-101	COOP			1348		2366	2878		2.5-2.5
COOP 08072	94-99	COOP			1351		2954	2749		1.5-2
MSU N11216	96-100	MSU		3096	1546			2763		2-
MSU N11226	95-98	MSU		3000	1375			2249		1.5
MSU N11228	96-99	MSU		2340	907			2166		2.5
MSU N11258	97-99	MSU		2892	976			2535		2-
MSU N11283	96-98	MSU		2779	1121			2708		2.5
MSU N11298	98-100	MSU		2897	992			2747		2-
			lsd=561	lsd=493	lsd=467	lsd=510	lsd=821	lsd=452		Tuscola
			cv-16.3%	cv-12.0%	cv-25.1%	cv-10.2%	cv-19.2%	cv-12.9%		& Bay
BLACK	DAYS	ORIGIN	BAY	GRATIOT	HURON	MONTCALM	SANILAC	TUSCOLA	2012 AVE	direct-cut
ZORRO	96-100	MSU	2778	2857	1075	2480	3234	2288	2452	1.5-2
SHANIA	96-102	ADM	2751	2900	1407	2178	2960	2063	2377	2-2.5
LORETO	96-101	COOP-PRO	2573	2440	1127		2693	2181		2-2
BLACK VELVET	99-103	SEMINIS	2638	2466	1185			2075		2.5-3
JAGUAR	95-98	MSU			1174			2084		1.5-2
ECLIPSE	92-94	NDSU			1011			2207		2-2
T-39	95-96	CAL			1131			2095		3.5-3
BL 05222	95-96	COOP-PRO			1025		2452	2027		2.5-2.5
BL 04352	99-100	COOP-PRO			1468		3056	2060		2.5
BL 06252	97-99	COOP-PRO			1647		2672	2327		2.5
ADM B8038279	95-98	ADM	2585		1780			2362		2.5
ADM B8039279	97-99	ADM	2487		1921			2369		2.5
GTS-1103	97-99	GTS			1902		3133	2190		3.5-2
SEM BKBC6V1312	97	SEMINIS			1893			2161		2-
SEM BKBC6V1313	97	SEMINIS			1387			2453		1.5
MSU B09175	95-97	MSU			1794		3022	2903		2-2
MSU B10244	95-97	MSU			1919		2893	2809		1-1.5
MSU B11334	95-96	MSU			1342		2347	2397		2.5-1.5
MSU B11343	94-97	MSU			1650		2923	2818		2-
MSU B11355	94-96	MSU			1049		1978	1964		2-2
MSU B11363	96-97	MSU			1770		2924	2743		1-1
			lsd=418	lsd=500	lsd=699		lsd=872	lsd=352		Tuscola
			cv-10.5%	cv-11.7%	cv-33.8%		cv-21.8%	cv-10.8%		& Bay

<u>SMALL RED</u>	DAYS	ORIGIN	BAY	GRATIOT	HURON	MONTCALM	SANILAC	TUSCOLA	3 LOC	<u>direct-cut</u>
MERLOT	97-98	USDA*MSU	2462	2190	1412	2877	3146	2038	2199	3.5-2.5
SR 07264	94-97	PROVITA			2293		4177	2801	3090	3.5-2
SR 09303	94-98	PROVITA			2467		4135	2374	2992	3-2.5
SR 09304	94-98	PROVITA			2089		3850	2694	2878	3.5-2.5
SR 09306	97-98	PROVITA			1649		3664	2143	2485	2.5
MSU R11610	95-97	MSU			1446		3624	2701	2590	3-
					lsd=385		lsd=501	lsd=428		
					cv-13.5%		cv-8.8%	cv-11.5%		
<u>PINTO</u>	DAYS	ORIGIN	BAY	GRATIOT	HURON	MONTCALM	SANILAC	TUSCOLA	3-6 LOC	
OTHELLO	84-86	USDA	2244	2113			2799		2385	
SANTA FE	94-95	MSU	2243	2309		2422	3238		2597	
LA PAZ	96-98	PROVITA	2462	2595		3443	4368		3142	
LARIAT	95-96	NDSU	2366	2699		3153	4336		3134	
ELDORADO	99-102	MSU	2226	2601	1895	3809	3927	2261	2918-2787	
MSU P08161	94-98	MSU	2361	2900			3891		3051	
MSU P11522	95-97	MSU	2257	2560			3174		2664	
MEDICINE HAT	91-94	SEMINIS	2643	2730			3189		2854	
			lsd=612	lsd=583		lsd=526	lsd=494			
			cv-17.7%	cv-15.5%		cv-13.7%	cv-9.3%			
<u>GREAT NORTHERN</u>										
COYNE	94-97	UN	2409		1389		3317			
MSU G09303	95-96	MSU	2971		1837		3773			
MSU G08254	92-93	MSU	3064		1784		3443			
MSU G11464	94-96	MSU	2929		1932		2836			<u>Tuscola</u>
			lsd=504		lsd=178		lsd=497			<u>& Bay</u>
			cv-10.9%		cv-6.4%		cv-9.3%			<u>direct-cut</u>
<u>PINK</u>										
76 ROSETTA	95-98	MSU			1836		4076	2446		2-2
77 MSU S11610	94-97	MSU			1370		3920	1826		3-
78 MSU S11701	94-95	MSU			1155		3328	2344		2.5-2
					lsd=137		lsd=379	lsd=442		
					cv-5.8%		cv-5.8%	cv-13.1%		
<u>TEBO</u>										
FUJI	96-97	MSU	1697	1902						
<u>CRANBERRY</u>	DAYS	ORIGIN	BAY	GRATIOT	HURON	MONTCALM	SANILAC	TUSCOLA		
SVM TAYLOR	92-94	ADM		2432		3041				
ETNA	91-93	SEMINIS		2672		2859				
KRIMSON	95-97	BASIN		2402		3482				
CHIANTI vine	102-104	SEMINIS		1739		2398				
BELLAGIO vine	103-106	MSU		1828		2755				
BRB DJ09-1016	97-99	SEMINIS		2762		2854				
BRB DJ09-1031	90-92	SEMINIS		2771		3020				
BRB-085-0926	91-92	SEMINIS		2729		3072				
BRB-085-0928	97-99	SEMINIS		2308		2976				
MSU C11221	96-97	MSU		2219		3101				
MSU C11314	94-95	MSU		2197		2868				
MECCANO	95-96	HDC		2517		2551				
				lsd=308		lsd=440				
				cv-9.0%		cv-10.5%				
<u>LIGHT RED KIDNEY</u>	DAYS	ORIGIN	BAY	GRATIOT	HURON	MONTCALM				
CHINOOK 2000	102-108	MSU		1972		2961				
CALIF ELRK	92-93	CAL		2233		3056				
PINK PANTHER	94-95	SEMINIS		2034		3028				
CLOUSEAU	94-96	SEMINIS		1892		3001				
MSU K11712	96	MSU		1803		2860				
MSU K11714	104-110	MSU		1852		2738				
KDLC6V1239	91-92	SEMINIS		1978		2821				
KDLC6V1242	92-94	SEMINIS		1728		2755				
KDLC6V1244	98-101	SEMINIS		1365		3482				
LRK 09350	93	PROVITA				2786				
LRK 09351	94	PROVITA				2835				
LRK 09352	95	PROVITA				2705				
LRK 09353	108	PROVITA				2662				
LRK 09354	110	PROVITA				3020				
LRK 09356	115	PROVITA				2175				
				lsd=347		lsd=585				
				cv-12.7%		cv-14.4%				

<u>DARK RED KIDNEY</u>	DAYS	ORIGIN	BAY	GRATIOT	HURON	MONTCALM
RED HAWK	98-101	MSU		2102		2658
MONTCALM	101-106	MSU		1756		2757
RED ROVER	95-96	SEMINIS		2147		2791
MAJESTY	100-103	OAC-HDC		1862		3068
KDD-DJ091013	96-97	SEMINIS		2183		3008
KDD-DJ091030	96-99	SEMINIS		2128		3135
MSU K11303	96-99	MSU		2269		3107
GTS 104	106	GTS				2498
GTS 106	101	GTS				2868
DRK 09423	113	PROVITA				3039
DRK 09424	110	PROVITA				2909
DRK 09426	110	PROVITA				2286
DRK 09427	111	PROVITA				2259
DRK 09429	105	PROVITA				3075
DRK 09430	101	PROVITA				3138
DRK 09433	104	PROVITA				2251
				lsd=394		lsd=421
				cv-12.9%		cv-10.6%

ALUBIA-W. KID.

BELUGA	102-108	MSU	1803	2261		2347
MSU SNOWDON	94-96	MSU	2078	2439		2741
MSU K11914	94-95	MSU	2110	2524		3089
			lsd=381	lsd=211		lsd=472
			cv-11.0%	cv-5.1%		cv-10.0%

ADZUKI

ERIMO 100-102 JAPAN

1434

ORIGIN KEY

Greg Varner

MSU=MICHIGAN STATE UNIVERSITY

Michigan Dry Bean Production Research Advisory Board

GTS=GEN-TEC SEEDS LIMITED

8439 North Blair Road

SEMINIS-SEMINIS SEEDS

Breckenridge, Michigan 48615

ADM==ARCHER DANIELS MIDLAND

989-751-8415 phone

HYLAND=HYLAND SEEDS, LIMITED

varnerbean@hotmail.com

COOP=COOPERATIVE ELEVATOR-PROVITA

CAL=UNIVERSITY OF CALIFORNIA-DAVIS

Maturity days = planting until harvest in 2011

USDA=UNITED STATES DEPT. OF AGRIC.ARS

Direct -Cut Lodging Ratings = 1-erect, 5-laying flat on ground.

NDSU=NORTH DAKOTA STATE UNIVERSITY

White Mold Rating = 1-10% mold, 5-100% mold.

OAC===UNIVERSITYofGUELPH

No White Mold to Rate in 2012.

PROVITA=PROVITA SEEDS

BASIN==BASIN SEED COMPANY

Bay, Huron, Sanilac and Tuscola were direct harvested.

UN=UNIVERSITY OF NEBRASKA

Gratiot and Montcalm navies, blacks, pintos and sm. reds were direct

JAPAN==PURITY FOODS INC.

harvested and large colored beans were hand pulled and harvested.

DRY BEAN CHARACTERISTICS

Greg Varner, Michigan Dry Edible Bean Production Research Advisory Board

Variety	Class	Plant Type	Maturity	Origin	BCMV	73	Anthracnose		Canning Quality	White Mold	Halo Blight	Common Blight	Rust	Air Pollution	Direct Cut-Rating
							7	7							
Vista	N	USV	F	GEN	R-I	S	R	R	2	2	R	S	T	T	2
Medalist	N	USV	F	COOP	R-I	S	R	R	3	2	R	S	T	T	2
GTS 544	N	USV	F	GEN	R-I	S	R	R	2	4	T	S	T	T	2
Reliant	N	USV	F	GEN	R-I	S	R	R	3	2	R	S	T	T	2
Hyland T9905	N	USV	M	HYLAND	R-I	S	R	R	2	2	R	S	T	T	2
Merlin	N	USV	M-F	COOP	R-I	S	R	R	3	2	R	S	T	T	2
Indi	N	USV	M-F	ADM	R-I	S	R	R	3	2	R	S	T	T	1
Othello	P	V	E	USDA	R	S	S	S	4	3	T	S	S	S	5
Buster	P	USV	M	SEMINIS	R-I	S	S	S	2	3	T	S	R	T	4
Santa Fe	P	USV	M	MSU	R-I	S	R	R	3	2	T	S	R	T	3
La Paz	P	USV	M	ADM	?	S	?	?	3	2	T	S	R	T	2
Lariat	P	USV	M	NDSU	?	S	?	?	3	2	T	S	R	T	3
T-39	B	SV	F	UCD	R-I	S	S	S	3	3	R	S	T	T	4
Midnight	B	USV	F	CUNY	R-I	S	S	S	4	3	R	S	T	T	2
Domino	B	USV	F	MSU	R-I	S	S	S	4	2	R	S	T	T	2
Jaguar	B	USV	F	MSU	R-I	R	R	R	5	2	R	S	T	T	3
Black Velvet	B	USV	F	SEMINIS	R-I	S	R	R	4	3	R	S	T	T	2
Zorro	B	USV	F	MSU	R-I	S	R	R	5	2	R	S	T	T	2
Eclipse	B	USV	M	NDSU	R-I	S	R	R	4	2	R	S	T	T	2
Shania	B	USV	F	ADM	R-I	S	?	?	3	3	R	S	T	T	2
Loreto	B	USV	F	COOP/ADM	R-I	R	R	R	3	2	R	S	T	T	2
Chinook 2000	LRK	B	F	MSU	R-I	R	R	R	3	2	R	S	T	T	6
Calif. ELRK	LRK	B	E	UCD	R-I	R	S	S	3	2	S	S	T	T	6
Clouseau	LRK	B	M	SEMINIS	R-I	R	S	S	3	2	S	S	T	T	6
Pink Panther	LRK	B	M	SEMINIS	R-I	R	S	S	3	2	S	S	T	T	6
Montcalm	DRK	B	F	MSU	R-I	R	S	S	4	2	R	T	T	T	6
Red Hawk	DRK	B	F	MSU	R-I	R	R	R	4	2	T	S	T	T	6
Red Rover	DRK	B	F	SEMINIS	R-I	R	R	R	4	2	S	S	T	T	6
SVM Taylor	C	B	E	ADM	R-I	R	S	S	2	3	S	S	T	T	6
Etna	C	B	E	SEMINIS	R-I	R	S	S	2	2	S	S	T	T	6
Chianti	C	SV	M	SEMINIS	R-I	S	S	S	5	3	S	S	T	T	6
Capri	C	B	M	MSU	R-I	R	S	S	3	3	S	S	T	T	6
Hooter	C	B	F	SEMINIS	R-I	S	S	S	2	3	S	S	T	T	6
Merlot	SR	USV	M	MSU/USDA	R	S	S	S	4	2	R	S	T	T	2
Matterhorn	GN	USV	E	MSU	R-I	S	S	S	3	4	T	S	R	T	3
Tebo	W	B	M	JAPAN	S	R	S	S	2	3	T	S	S	S	4
Fuji Tebo	W	B	M	MSU	R-I	R	S	S	3	3	T	S	S	S	4
Beluga	WK-AL	B	F	MSU	R-I	R	S	S	3	3	S	S	T	T	6
Aurora	SW	SV	M	CUNY	R-I	S	S	S	3	3	R	S	R	S	4

Plant Type: B=Bush, SV=Short Vine, USV=Upright Short Vine, V=Vine

Maturity: E=Early (less than 88 days), M=Mid-Season (89-95 days), F=Full Season (96-102 days), L=Late Full Season (greater than 102 days)

Canning Quality: 1=Poor, 2=Fair, 3=Good, 4=Above Average, 5=Excellent

White Mold: 1=Less than 10% infection, 2=Less than 20% infection, 3=20-40% infection, 4=40-60% infection, 5=Greater than 60% infection

Direct Cut Rating: 1=Very erect, 2=lodging, pods close to ground, 3=lodging, pods close to ground, 4=high yield loss, 5=severe yield loss, 6=not recommended

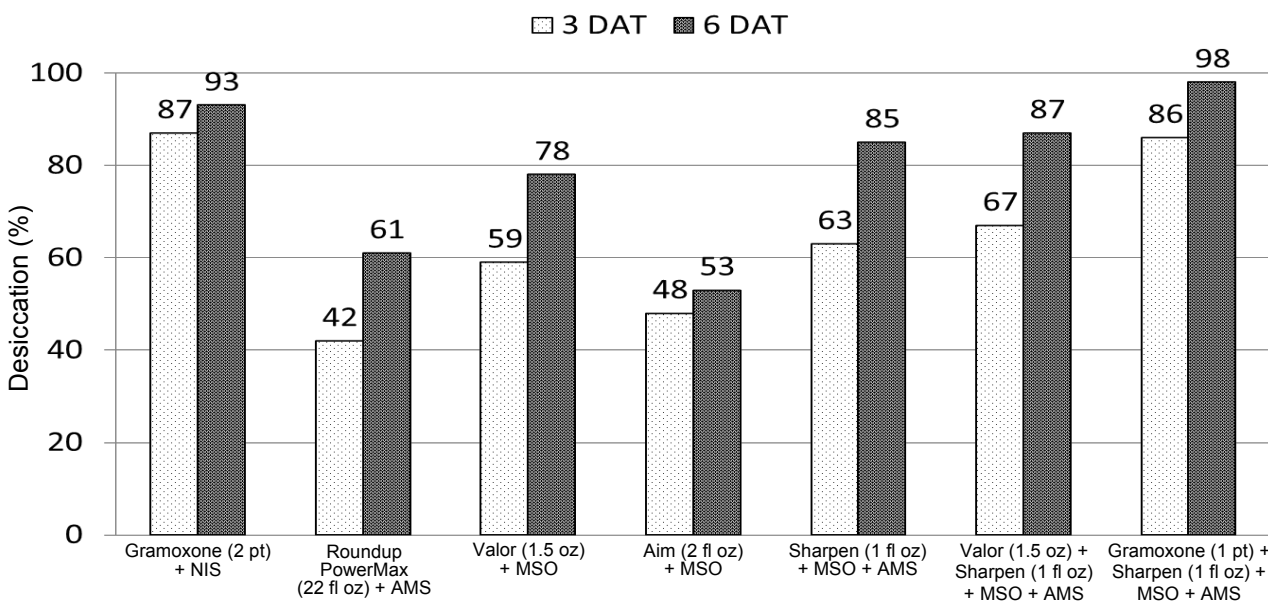
JAN-2013

Evaluation of preharvest desiccants in dry edible beans (Saginaw Valley Research and Extension Center – 2012)

Christy Sprague and Gary Powell, Michigan State University

Location: Richville (SVREC)	Tillage: Conventional
Planting Date: June 13, 2012	Variety: ‘Zorro’ black beans
Preharvest Application Date: Sept. 5, 2012	Row width: 20-inch
Soil Type: Clay loam	Replicated: 4 times

Figure 1. Preharvest treatment effects on dry bean desiccation 3 and 6 days after treatment (DAT).



Summary: This study was conducted to examine various preharvest treatments for dry edible bean desiccation. At the 3 DAT evaluation, Gramoxone alone and tank-mixed with Sharpen provided significantly higher ($p \leq 0.05$) dry bean desiccation than any of the other treatments. This was in contrast to results from 2011 where Valor (1.5 oz/A) + MSO and Sharpen (1 fl oz/A) + MSO + AMS provided the greatest desiccation at this timing. By 6 DAT, the Gramoxone treatments still provided the greatest dry bean desiccation (>90%), however Valor, Sharpen and the combination of the two provided greater than 75% dry bean desiccation. All of these treatments provided greater than 90% desiccation in 2011. Differences in moisture and temperature between the two years at the time of desiccation may help explain the differences in the speed of desiccation between the two years. This year conditions were cooler and wetter at the time of desiccation. By 14 DAT all treatments with the exception of Aim (2 fl oz) + MSO provided 99% dry bean desiccation. From these results and from those of previous years there are several effective desiccation products. However, each of these products has specific precautions and limitations that need to be considered. Information on these restrictions and how to best use these products can be found in Chapter 5 of the 2013 MSU Weed Control Guide for Field Crops (E-434). This research was supported by various companies and Michigan Dry Bean Commission funding from the Michigan Department of Agriculture Specialty Crops grant.

2013 Weed Control Guide for Field Crops

Dr. Christy Sprague, Department of Crop and Soil Science, Michigan State University

TABLE 5B – Dry Edible Bean Herbicides – Remarks and Limitations

Dry Edible Beans – Preplant Incorporated Only

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual grasses	EPTC (<i>Eptam</i>)	2.25	1.25 qt 7EC	<ul style="list-style-type: none"> • Apply preplant incorporated only. • Refer to Table 5A for weed control and crop tolerance ratings. • Incorporate immediately after application. • <i>Eptam</i> suppresses common ragweed and wild mustard. • Prowl (pendimethalin), trifluralin, or Sonalan should be tank mixed with <i>Eptam</i> for additional broadleaf control, including lambsquarters. • <i>Pursuit</i> (2 oz) can be added to tank mixes with <i>Prowl</i>, <i>trifluralin</i>, or <i>Sonalan</i> for nightshade control. • <i>Pursuit</i> (2 oz) may also be applied preemergence after preplant incorporated applications of <i>Eptam</i> tank mixed with <i>Prowl</i>, <i>trifluralin</i>, or <i>Sonalan</i>. See remarks for <i>Pursuit</i>. • A postemergence application of <i>Basagran</i>, <i>Pursuit</i> or <i>Raptor</i> may be necessary for additional broadleaf control. • DO NOT use on adzuki beans. • Refer to label and Table 12 for crop rotation restrictions.
Annual grasses Annual broadleaves	alachlor (<i>IntRRo</i>) OR (<i>Micro-Tech</i>)	2	2 qt 4EC OR 2 qt 4ME	<ul style="list-style-type: none"> • Apply preplant incorporated only. • Refer to Table 5A for weed control and crop tolerance ratings. • Alachlor should be incorporated in the top 2 inches of soil to minimize the danger of bean injury. • DO NOT use on sands or sandy loam soils – injury can occur. • Alachlor provides better nightshade and pigweed control than metolachlor products. • <i>Prowl</i>, <i>trifluralin</i> or <i>Sonalan</i> can be tank-mixed for lambsquarters control. • <i>Pursuit</i> (2 oz) can be tank mixed for nightshade and additional broadleaf control. • A postemergence application of <i>Basagran</i>, <i>Pursuit</i> or <i>Raptor</i> may be necessary for additional broadleaf control. • DO NOT use on adzuki beans. • Refer to label and Table 12 for crop rotation restrictions.
	pendimethalin (<i>Prowl</i>) OR (<i>Prowl H₂O</i>)	0.75	1.8 pt 3.3EC OR 1.6 pt 3.8CS	<ul style="list-style-type: none"> • Apply preplant incorporated only. • Refer to Table 5A for weed control and crop tolerance ratings. • Incorporate immediately after application. • <i>Prowl</i> provides better velvetleaf control than <i>trifluralin</i> or <i>Sonalan</i>. • Prowl should be tank mixed with <i>Eptam</i>. Other measures may need to be taken for additional broadleaf control. • Refer to label and Table 12 for crop rotation restrictions.

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Dry Edible Beans – Preplant Incorporated Only (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual grasses Annual broadleaves	mazethapyr + pendimethalin <i>(Pursuit Plus)</i>	0.47	20 oz 2.9EC	<ul style="list-style-type: none"> • Apply preplant incorporated only. • Refer to Table 5A for weed control and crop tolerance ratings. • DO NOT use on sands or loamy sand soils. • DO NOT apply <i>Pursuit Plus</i> if cold and/or wet conditions are present or predicted to occur within one week of application. • Delayed maturity may result from applications of <i>Pursuit Plus</i>. DO NOT apply if planting is delayed and frost is likely to occur prior to maturity. • 20 oz of <i>Pursuit Plus</i> contains 1.1 pt of <i>Prowl</i> 3.3EC, which may not be adequate grass control under heavy infestations. • On heavy soils with greater than 2% organic matter and heavy weed pressure, 30 oz of <i>Pursuit Plus</i> may be applied. • Dry bean varieties vary in their sensitivity to <i>Pursuit Plus</i>. Use ONLY on navy, black turtle, pinto, kidney and cranberry beans. DO NOT use on DOMINO black or OLATHE pinto beans. • DO NOT apply within 60 days of harvest. • DO NOT use if SUGAR BEETS, CUCUMBERS, CANOLA or TOMATOES are in the rotation; requires 40 months and a soil bioassay. • Refer to label and Table 12 for crop rotation restrictions.
	ethalfluralin <i>(Sonalan)</i>	0.75	2 pt 3EC	<ul style="list-style-type: none"> • Apply preplant incorporated only. • Refer to Table 5A for weed control and crop tolerance ratings. • Incorporate immediately after application. • Sonalan should be tank mixed with Eptam. Other measures may need to be taken for additional broadleaf control. • Refer to label and Table 12 for crop rotation restrictions.
	trifluralin <i>(many)</i>	0.5	1 pt 4EC	<ul style="list-style-type: none"> • Apply preplant incorporated only. • Refer to Table 5A for weed control and crop tolerance ratings. • Incorporate immediately after application. • <i>Trifluralin</i> provides better pigweed control than <i>Prowl</i> or <i>Sonalan</i>. • Trifluralin should be tank mixed with Eptam. Other measures may need to be taken for additional broadleaf control. • Refer to label and Table 12 for crop rotation restrictions.

Dry Edible Beans – Soil Applied

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual grasses	s-metolachlor (<i>Dual Magnum</i>) OR (<i>Dual II Magnum</i> , <i>Cinch</i>)	1.27	1.33 pt 7.62EC OR 1.33 pt 7.64EC	<ul style="list-style-type: none"> • May be applied preplant incorporated or preemergence. • Refer to Table 5A for weed control and crop tolerance ratings. • PREPLANT INCORPORATED <i>Dual Magnum</i> minimizes the danger of bean injury. • DO NOT apply if soil is cracking and beans are in the crook stage. • Reduce <i>Dual Magnum</i> rate to 1 pt/A on coarse-textured soils with low organic matter. • Preemergence applications require rainfall for incorporation. Rotary hoe if no rainfall occurs within 7 days. • <i>Dual Magnum</i> provides better yellow nutsedge control than <i>alachlor</i> or <i>Outlook</i>. • <i>Prowl</i>, <i>trifluralin</i> or <i>Sonalan</i> can be tank mixed preplant incorporated for lambsquarters control. • <i>Pursuit</i> (2 oz) can be tank mixed for nightshade and additional broadleaf control. • A postemergence application of <i>Basagran</i>, <i>Pursuit</i> or <i>Raptor</i> may be necessary for additional broadleaf control. • DO NOT apply <i>Dual Magnum</i> within 60 days of harvest. • DO NOT use on adzuki beans. • Refer to label and Table 12 for crop rotation restrictions.
	dimethenamid-P (<i>Outlook</i>)	0.66	14 oz 6L	<ul style="list-style-type: none"> • May be applied preplant incorporated or preemergence. • Refer to Table 5A for weed control and crop tolerance ratings. • PREPLANT INCORPORATED <i>Outlook</i> minimizes the danger of bean injury. • DO NOT apply if soil is cracking and beans are in the crook stage. • Reduce <i>Outlook</i> rate to 12 oz/A on coarse-textured soils with low organic matter. • Navy and black beans are more sensitive to <i>Outlook</i> applications than to <i>Dual Magnum</i>. • Preemergence applications require rainfall for incorporation. Rotary hoe if no rainfall occurs within 7 days. • <i>Outlook</i> provides better pigweed and nightshade control than <i>Dual Magnum</i>. • <i>Prowl</i>, <i>trifluralin</i>, or <i>Sonalan</i> can be tank mixed preplant incorporated for lambsquarters control. • <i>Pursuit</i> (2 oz) can be tank mixed for nightshade and additional broadleaf control. • A postemergence application of <i>Basagran</i>, <i>Pursuit</i>, or <i>Raptor</i> may be necessary for additional broadleaf control. • DO NOT apply <i>Outlook</i> within 70 days of harvest. • DO NOT use on adzuki beans. • Refer to label and Table 12 for crop rotation restrictions.
	metolachlor (<i>Parallel PCS</i>)	1.3	1.33 pt 8EC	<ul style="list-style-type: none"> • May be applied preplant incorporated or preemergence. • <i>Parallel PCS</i> is a mix of the R and S-isomers of metolachlor. Limited research has shown that 1.33 pt/A of these products provide similar activity to s-metolachlor products at 1.33 pt/A. However, <i>Parallel PCS</i> may not provide the consistency, length of control or performance on more difficult to control weeds. Rates would need to be increased to 2.0 pt/A to provide the same amount of s-metolachlor (the more active isomer) in the 1.33 pt/A rate of <i>Dual Magnum</i>/<i>Dual II Magnum</i>/<i>Cinch</i> (s-metolachlor). • Refer to Table 5A for weed control and crop tolerance ratings. • See remarks and limitations for <i>Dual Magnum</i>. • DO NOT use on adzuki beans. • Refer to label and Table 12 for crop rotation restrictions.

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Dry Edible Beans – Soil Applied (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual grasses	glyphosate + s-metolachlor (<i>Sequence</i>) + ammonium sulfate	1.64	3 pt 2.25L + 17 lb/100 gal	<ul style="list-style-type: none"> • May be applied preplant or preemergence. • <i>Sequence</i> contains 0.9 lb a.e./A of glyphosate and 1.2 pt/A of <i>Dual Magnum</i>. • <i>Sequence</i> is best used to control existing vegetation prior to planting no-till dry beans with the residual control of <i>Dual Magnum</i>. • Refer to Table 5A for residual weed control and crop tolerance ratings. • DO NOT apply to emerged dry bean – severe injury will occur. • DO NOT apply more than 3.5 pt/A on coarse textured soils or 4 pt/A on medium and fine textured soils. • Apply only one application per crop year. • Refer to label and Table 12 for crop rotation restrictions.
Annual broadleaves	halosulfuron (<i>Permit/Sandea</i>)	0.023	0.67 oz 75DG	<ul style="list-style-type: none"> • May be applied preplant incorporated or preemergence. • Refer to Table 5A for weed control and crop tolerance ratings. • Reduce the rate of <i>Permit/Sandea</i> to 0.5 oz/A on lighter textured soils with low organic matter. • <i>Permit/Sandea</i> can cause injury under cool and wet growing conditions. • Delayed maturity may result from applications of <i>Permit/Sandea</i>. • Dry bean varieties and classes vary in their tolerance to <i>Permit/Sandea</i>. From MSU research, CAUTION should be taken when applying <i>Permit/Sandea</i> to kidney and black beans. • <i>Permit/Sandea</i> can be tank mixed with <i>Eptam</i> for grass and additional lambsquarters control. • <i>Permit/Sandea</i> can be tank mixed with metolachlor products or <i>Outlook</i> for annual grass control. • <i>Permit/Sandea</i> will not control ALS-resistant weed species. • DO NOT plant SUGAR BEETS within 21 months of a <i>Permit/Sandea</i> application. • Refer to label and Table 12 for crop rotation restrictions.

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Dry Edible Beans – Soil Applied (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves	imazethapyr <i>(Pursuit)</i>	0.031	2 oz 2L	<ul style="list-style-type: none"> • May be applied preplant incorporated or preemergence. • Refer to Table 5A for weed control and crop tolerance ratings. • DO NOT use on sands or loamy sand soils. • DO NOT apply <i>Pursuit</i> if cold and/or wet conditions are present or predicted to occur within 1 week of application. • Delayed maturity may result from applications of <i>Pursuit</i>. DO NOT apply if planting is delayed and frost is likely to occur prior to maturity. • On heavy soils with greater than 2% organic matter and heavy weed pressure, 3 oz of <i>Pursuit</i> may be applied. • Pursuit can be tank mixed and applied preplant incorporated with <i>Eptam</i> plus <i>trifluralin</i>, <i>Prowl</i>, or <i>Sonalan</i>; or <i>alachlor</i>, <i>Dual Magnum</i> or <i>Outlook</i>; or preemergence with <i>Dual Magnum</i> or <i>Outlook</i>. <i>Pursuit</i> in these mixes will control eastern black nightshade. • Preemergence applications require rainfall for incorporation. Rotary hoe if no rainfall occurs within 7 days. • <i>Pursuit</i> will NOT control common ragweed. • Dry bean varieties vary in their sensitivity to <i>Pursuit</i>. Use ONLY on navy, black turtle, pinto, kidney, and cranberry beans. DO NOT use on DOMINO black or OLATHE pinto beans. • DO NOT apply within 60 days of harvest. • DO NOT use if SUGAR BEETS, CUCUMBERS, CANOLA or TOMATOES are in the rotation; requires 40 months and a soil bioassay. • Refer to label and Table 12 for crop rotation restrictions.
	fomesafen <i>(Reflex)</i>	0.25	1 pt 2L	<ul style="list-style-type: none"> • May be applied preplant surface or preemergence. • Refer to Table 5C for weed control and crop tolerance ratings. • <i>Reflex</i> will provide 4-5 weeks of control and/or suppression of broadleaf weeds. • Rainfall that splashes treated soil onto newly emerged seedlings can cause temporary crop injury. • Tank mixtures or sequential herbicide applications are needed to broaden the spectrum of weed control. • <i>Reflex</i> can be applied only in the Lower Peninsula of Michigan. • DO NOT apply <i>Reflex</i> to the same field in CONSECUTIVE years. • The maximum use rate of <i>Reflex</i> per field is 1 pint per acre. • Refer to Table 12 for crop rotation restrictions.

Dry Edible Beans – Postemergence

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Grasses	quizalofop-P-ethyl (<i>Assure II/Targa</i>)	0.044	7 oz 0.88L	<ul style="list-style-type: none"> • Refer to Table 5A for weed control and crop tolerance ratings. • Treat actively growing grasses (annual grasses up to 4 inches). • DO NOT apply to grasses under stress — poor weed control will result. • DO NOT cultivate within 5 days prior to and 7 days following application. • Allow 30 days between <i>Assure II/Targa</i> application and dry bean harvest. • <i>Assure II/Targa</i> can be tank mixed with <i>Basagran</i> for foxtails and barnyardgrass. Increase the <i>Assure II/Targa</i> rate by 2 oz. • Tank mixes with <i>Pursuit</i> and <i>Raptor</i> are not recommended — grass antagonism will occur. • <i>Assure II/Targa</i> (10 oz/A) plus crop oil concentrate (1% v/v) or nonionic surfactant (0.25% v/v) will control quackgrass 6-10 inches tall. A sequential application of 7 oz/A may be needed 14-21 days later. • Refer to label and Table 12 for crop rotation restrictions.
	+		+	
	crop oil concentrate OR surfactant		1% OR 0.25%	
	fluazifop-P-butyl (<i>Fusilade DX</i>)	0.188	12 oz 2L	<ul style="list-style-type: none"> • Refer to Table 5A for weed control and crop tolerance ratings. • Apply 6 oz/A of <i>Fusilade DX</i> to control volunteer corn. • Allow 60 days between <i>Fusilade DX</i> application and dry bean harvest. • Two applications 7-14 days apart are usually needed for control of perennial grasses. • Tank mixes with <i>Pursuit</i> and <i>Raptor</i> are not recommended — grass antagonism will occur. • DO NOT apply more than 48 oz/A of <i>Fusilade DX</i> per season. • Refer to label and Table 12 for crop rotation restrictions.
	+		+	
	crop oil concentrate		1%	
	sethoxydim (<i>Poast</i>)	0.19	1 pt 1.5SC	<ul style="list-style-type: none"> • Refer to Table 5A for weed control and crop tolerance ratings. • Reduced rates of <i>Poast</i> (12 oz/A) may be used when barnyardgrass, green and giant foxtail, and fall panicum are less than 4 inches tall and the target species. • DO NOT apply to grasses under stress — poor weed control will result. • DO NOT cultivate within 5 days prior to and 7 days following application. • Allow 30 days between <i>Poast</i> application and dry bean harvest. • <i>Poast</i> is generally less effective than other postemergence grass herbicides for perennial grass control. • Tank mixes with <i>Pursuit</i> and <i>Raptor</i> are not recommended — grass antagonism will occur. • Refer to label and Table 12 for crop rotation restrictions.
	+		+	
	crop oil concentrate		1 qt	
	+		+	
	ammonium sulfate		2.5 lb	

(Continued on next page)

Dry Edible Beans — Postemergence (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Grasses	clethodim (<i>Select/Arrow</i>)	0.094	6 oz 2EC	<ul style="list-style-type: none"> • Refer to Table 5A for weed control and crop tolerance ratings. • Reduced rates of <i>Select/Arrow</i> (4-5 oz/A) or <i>Select Max</i> (6-8 oz/A) may be used when some grass species are small. • The addition of ammonium sulfate at 2.5 to 4 lb/A has been shown to improve control of difficult to control weeds, e.g., quackgrass, rhizome Johnsongrass, volunteer cereals, and volunteer corn. • DO NOT apply to grasses under stress — poor weed control will result. • DO NOT cultivate within 7 days prior to and 7 days following application. • Allow 30 days between application and dry bean harvest. • <i>Select/Arrow</i> or <i>Select Max</i> can be tank mixed with <i>Basagran</i>. Increase the <i>Select/Arrow</i> rate to 8-10 oz/A and the <i>Select Max</i> rate to 12 oz/A and apply with crop oil concentrate (1% v/v). • Tank mixes with <i>Pursuit</i> and <i>Raptor</i> are not recommended — grass antagonism will occur. • <i>Select/Arrow</i> (8-16 oz/A) plus crop oil concentrate (1% v/v) plus ammonium sulfate (2.5 lb/A) will control quackgrass 4-12 inches tall. A sequential application of 8 oz/A may be needed 14-21 days later. Sequential applications of <i>Select Max</i> (12 + 12 oz/A) are needed to control 4 to 12 inch quackgrass. • Refer to label and Table 12 for crop rotation restrictions.
	+ crop oil concentrate OR (<i>Select Max</i>)	0.068	9 oz 0.97EC	
	+ surfactant + ammonium sulfate		+ 1% OR + 0.25% + 2.5 lb	
Annual Broadleaves	bentazon (<i>Basagran</i>) + crop oil concentrate	0.75	1.25 pt 4L + 1 qt	<ul style="list-style-type: none"> • Refer to Table 5A for weed control and crop tolerance ratings. • Most effective on small weeds. Check <i>Basagran</i> dry bean label for specific rate and proper weed growth stage. • Beans MUST HAVE one fully expanded trifoliolate before application. • Use a minimum of 20 gal. water/A for adequate coverage. • DO NOT apply if dry beans are under stress from herbicide injury, cold or dry weather, or hail damage. • For improved velvetleaf control 28% liquid nitrogen (2-4 qt/A) or ammonium sulfate (2.5 lb/A) can be used INSTEAD OF crop oil concentrate. However, if common ragweed and common lambsquarters are present, a crop oil concentrate must also be included. • Split applications of <i>Basagran</i> (1 pt + 1 pt) plus crop oil concentrate (1 pt + 1 pt) can be used for more consistent common ragweed and lambsquarters control. Make the first application when weeds are less than 1 inch tall, and make second application 10-14 days later. • For CANADA THISTLE and YELLOW NUTSEDGE control, apply sequential applications of <i>Basagran</i> (1.5 pt + 1.5 pt) plus crop oil concentrate (1 qt + 1 qt) when Canada thistle is 6-8 inches tall and yellow nutsedge is 4-6 inches. Make second application 7-10 days later. • Allow 30 days between <i>Basagran</i> application and dry bean harvest. • DO NOT use on adzuki beans. • Refer to label and Table 12 for crop rotation restrictions.

Dry Edible Beans – Postemergence (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual Broadleaves	imazethapyr <i>(Pursuit)</i>	0.031	2 oz 2L	<ul style="list-style-type: none"> • Refer to Table 5A for weed control and crop tolerance ratings. • Most effective on small weeds (less than 2 inches). • Beans MUST HAVE one fully expanded trifoliolate before application. • DO NOT apply if dry beans have begun to flower. • Apply <i>Pursuit</i> with non-ionic surfactant (0.25% v/v). • DO NOT add 28% liquid nitrogen (2.5% v/v) or ammonium sulfate (2.5 lb/A) unless at least 8 oz of <i>Basagran</i> is added to “safen” this application. • Increase the rate of <i>Basagran</i> (16 oz) when tank mixed with <i>Pursuit</i> to control common cocklebur and jimsonweed. • Delayed maturity may result from applications of <i>Pursuit</i>. DO NOT apply if planting is delayed and frost is likely to occur prior to maturity. • DO NOT tank mix with postemergence grass herbicides — grass antagonism will occur. • Dry bean varieties vary in their sensitivity to <i>Pursuit</i>. Use ONLY on navy, black turtle, pinto, kidney, and cranberry beans. DO NOT use on DOMINO black or OLATHE pinto beans. • DO NOT apply within 60 days of harvest. • DO NOT use if sugar beets, cucumbers, canola or tomatoes are in the rotation; requires 40 months and a soil bioassay. • DO NOT use on adzuki beans. • Refer to label and Table 12 for crop rotation restrictions.
	+		+	
	surfactant		0.25%	
	imazamox <i>(Raptor)</i>	0.032	4 oz 1L	<ul style="list-style-type: none"> • Refer to Table 5A for weed control and crop tolerance ratings. • Most effective on small weeds (less than 2 inches). • Beans MUST HAVE one fully expanded trifoliolate before application. • DO NOT apply if dry beans have begun to flower. • DO NOT apply if planting is delayed and frost is likely to occur prior to maturity.
	+		+	
	bentazon <i>(Basagran)</i>	0.25	8 oz 4L	<ul style="list-style-type: none"> • Apply <i>Raptor</i> with crop oil concentrate (1% v/v) or a non-ionic surfactant (0.25% v/v). • At least 8 fl oz of <i>Basagran</i> must be tank mixed with <i>Raptor</i>, if ammonium sulfate (12-15 lb/100 gal) or 28% liquid nitrogen (2.5% v/v) are added. <i>Basagran</i> “safens” this application. • Increase the rate of <i>Basagran</i> (16 oz) when tank mixed with <i>Raptor</i> to control common cocklebur and jimsonweed, and to provide good control of common lambsquarters (less than 2 inch tall). • DO NOT tank mix with postemergence grass herbicides — grass antagonism will occur. • DO NOT apply within 60 days of harvest. • DO NOT use the combination of <i>Raptor</i> + <i>Basagran</i> on adzuki beans. <i>Basagran</i> causes significant injury to adzuki beans. • Refer to label and Table 12 for crop rotation restrictions.
	+		+	
	crop oil concentrate		1%	
	+		+	
	ammonium sulfate		2.5 lb	

(Continued on next page)

Dry Edible Beans – Postemergence (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual Broadleaves	fomesafen <i>(Reflex)</i> + surfactant	0.25	1 pt 2L + 0.25%	<ul style="list-style-type: none"> • Refer to Table 5A for weed control and crop tolerance ratings. • Most effective on small weeds; common ragweed 4-inches or less and eastern black nightshade 2-inches or less. • Common ragweed less than 4-inches will be controlled with 0.5 pt/A of <i>Reflex</i>. • Beans MUST HAVE one fully expanded trifoliolate before application. • A non-ionic surfactant at 0.25-0.5% v/v or a crop oil concentrate at 0.5-1.0% v/v must be included for effective control. • <i>Reflex</i> can be tank-mixed with <i>Basagran</i>, <i>Raptor</i>, or <i>Pursuit</i>. Include a COC when tank-mixing <i>Reflex</i> + <i>Basagran</i>. ONLY include a non-ionic surfactant when tank-mixing with <i>Raptor</i> or <i>Pursuit</i>. DO NOT add AMS or 28%N. • <i>Reflex</i> can be applied only in the Lower Peninsula of Michigan. • DO NOT apply <i>Reflex</i> to the same field in CONSECUTIVE years. • DO NOT apply within 45 days of harvest. • Refer to Table 12 for crop rotation restrictions.

Preharvest Treatments in Dry Edible Beans

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Preharvest	flumioxazin <i>(Valor)</i> + methylated seed oil	0.05	1.5 oz 51WG + 1 qt	<ul style="list-style-type: none"> • Apply when crop is mature – at least 80% of the pods are yellowing and mostly ripe and no more than 40% (bush-type beans) or 30% (vine-type beans) of the leaves are still green. • <i>Valor</i> can be applied at rates up to 2 oz/A. • Dry beans can be harvested 5 days after <i>Valor</i> application. However, it generally takes 7 to 14 days to reach maximum desiccation activity. • Dry bean desiccation is similar to that from <i>Gramoxone</i> and glyphosate; however, the spectrum of weed control is not as broad. • <i>Valor</i> provides residual activity that may reduce winter annual growth. • Follow sprayer clean-up instructions — residues of <i>Valor</i> can be trapped in poly-tanks and hoses if not adequately cleaned. • Crop rotation restrictions are dependent on rainfall, <i>Valor</i> use rate and tillage. • Rotation restrictions for 2 oz or less of <i>Valor</i> are 1 month with 1 inch of rain for corn and winter wheat. Dry bean and barley may be planted after 3 months, and alfalfa, oats and sugar beets may be planted after 4 months if the ground is tilled prior to planting or 8 months if no tillage is performed. Note: In Michigan research trials, planting sugar beet no-till the spring following a <i>Valor</i> preharvest treatment resulted in major sugar beet stand reduction. Tillage reduced the effect of <i>Valor</i> on sugar beet; however, slight injury may occur on sandier soils. • Refer to label and Table 12 for crop rotation restrictions.

Table 5C – Preharvest Treatments in Dry Edible Beans

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Preharvest	glyphosate (<i>many</i>) + ammonium sulfate	0.75 lb a.e.	See Table 10 + 17 lb/100gal	<ul style="list-style-type: none"> • Glyphosate should ONLY be used to control weeds that hinder harvest. • Not all glyphosate products are labeled for Preharvest application in dry edible beans. Consult product labels for legal applications. <i>Roundup</i> branded products, <i>Duramax</i>, <i>Durango DMA</i>, <i>Touchdown Total</i> and <i>Traxion</i> are some glyphosate products that are currently labeled. • DO NOT use glyphosate for vine desiccation — residues of glyphosate have been found in harvested beans if applications are made too early. • Glyphosate should be applied when beans are in the hard dough stage (30% moisture or less). • Glyphosate applications should be made at least 7 days before harvest. • ONLY one application should be made per year. • DO NOT apply glyphosate to beans grown for seed. • DO NOT feed treated vines and hay from these crops to live-stock.
	paraquat (<i>Gramoxone SL 2.0</i>) + surfactant	0.3-0.5	1.2–2 pt 2SL + 0.25%	<ul style="list-style-type: none"> • <i>Gramoxone SL 2.0</i> is a restricted-use pesticide. • Apply when crop is mature, at least 80% of the pods are yellowing and mostly ripe and no more than 40% (bush-type beans) or 30% (vine-type beans) of the leaves are still green. • Always add a non-ionic surfactant at 0.25% v/v or a crop oil concentrate at 1% v/v. • Apply by air in 5 gal water/A or by ground in 20-40 gal of water/A. • If growth is lush and vigorous, make either a single application of the higher rate of <i>Gramoxone SL 2.0</i>; or split applications at the lower rates. Split applications may improve vine coverage. DO NOT exceed 2.0 pt/A of <i>Gramoxone SL 2.0</i>. • Do not harvest within 7 days of application.
	paraquat (<i>Parazone</i>) + surfactant	0.5	1.33 pt 3SL + 0.25%	<ul style="list-style-type: none"> • <i>Parazone</i> is a restricted-use pesticide. • <i>Parazone</i> contains the same active ingredient as <i>Gramoxone SL 2.0</i> (paraquat), but is at a different concentration. • See the Remarks and Limitation section for <i>Gramoxone SL 2.0</i>.
	saflufenacil (<i>Sharpen</i>) + methylated seed oil + ammonium sulfate	0.023	1 oz 2.85L + 1% + 17 lb/100 gal	<ul style="list-style-type: none"> • Apply when crop is mature – at least 80% of the pods are yellowing and mostly ripe and no more than 40% (bush-type beans) or 30% (vine-type) beans of the leaves are still green. • <i>Sharpen</i> can be applied at rates up to 2 oz/A. • Dry beans can be harvested 2 days after application. However, it generally takes 7 days to reach maximum desiccation activity. • <i>Sharpen</i> is an effective desiccant. • DO NOT apply to beans grown for seed. • DO NOT graze or feed desiccation-treated hay or straw to livestock. • Maximum residue levels (MRLs) for <i>Sharpen</i> have only been approved in North America, as of the printing of this guide. <i>Sharpen</i> should not be used to desiccate dry beans exported out of North America, unless MRLs outside North America have been approved. • Refer to label and Table 12 for crop rotation restrictions.

TABLE 5A – Weed Response to Herbicides in Dry Edible Beans*

	SITE OF ACTION	CROP TOLERANCE**	ANNUAL BROADLEAVES										ANNUAL GRASSES										PERENNIALS				
			COCKLEBUR	JIMSONWEED	LAMBSQUARTERS	NIGHTSHADE (E. BLACK)	PIGWEEED	RAGWEED (COMMON)	SMARTWEED	VELVETLEAF	WILD MUSTARD	BARNYARDGRASS	CRABGRASS	GIANT FOXTAIL	GREEN FOXTAIL	YELLOW FOXTAIL	FALL PANICUM	WITCHGRASS	SANDBUR	BINDWEED (FIELD)	BINDWEED (HEDGE)	CANADA THISTLE	QUACKGRASS	YELLOW NUTSEDGE			
Preplant Incorporated																											
DUAL MAGNUM/PARALLEL	15	2	N	N	P	F	G	P	P	N	P	F	F	F	F	F	G	G	F	N	N	N	N	G			
EPTAM	8	2	P	P	G	F	F	F	F	F	F	F	F	F	F	F	F	F	G	N	N	N	F	F			
INTRRO	15	3	N	N	P	G	G	P	P	N	P	F	F	F	F	F	G	G	F	N	N	N	N	F			
OUTLOOK	15	3 ^a	N	N	P	G	G	P	P	N	P	F	F	F	F	F	G	G	P	N	N	N	N	F			
PROWL H ₂ O/PROWL	3	1	N	N	G	P	F	P	P	F	P	F	F	F	F	F	F	F	G	N	N	N	N	N			
PURSUIT	2	3	F	F	P	F	F	P	F	F	G	P	P	F	F	F	P	P	P	N	N	N	N	F			
PURSUIT PLUS	2/3	3	F	F	G	F	F	P	F	G	G	F	F	F	F	F	F	F	G	N	N	N	N	F			
SONALAN	3	1	N	N	G	F	G	P	P	N	P	F	F	F	F	F	F	F	G	N	N	N	N	N			
TRIFLURALIN	3	1	N	N	G	N	G	N	P	N	P	F	F	F	F	F	F	F	G	N	N	N	N	N			
Preemergence																											
DUAL MAGNUM/PARALLEL	15	2	N	N	P	F	G	P	P	N	P	F	F	F	F	F	G	G	F	N	N	N	N	F			
OUTLOOK	15	3 ^a	N	N	P	G	G	P	P	N	P	F	F	F	F	F	G	G	P	N	N	N	N	F			
PERMIT/SANDEA	2	3	F	F	F	P	F	G	P	G	E	N	N	N	N	N	N	N	N	N	N	N	N	F			
PURSUIT	2	3	P	P	P	F	F	P	F	P	G	P	P	F	F	F	P	P	P	N	N	P	N	F			
REFLEX	14	2	P	P	G	F	F	G	G	P	F	N	N	N	N	N	N	N	N	N	N	N	N	N			
SEQUENCE ^b	9/15	2	N	N	P	F	G	P	P	N	P	F	F	F	F	F	G	G	F	N	N	N	N	F			
Postemergence																											
ASSURE II/TARGA	1	1	N	N	N	N	N	N	N	N	N	G	G	F	F	G	F	F	F	N	N	N	F	N			
BASAGRAN ^c	6	2	F	G	F	P	P	F	F	G	F	N	N	N	N	N	N	N	N	N	N	G	N	G			
FUSILADE DX	1	1	N	N	N	N	N	N	N	N	N	F	G	F	F	F	F	F	F	N	N	N	G	N			
POAST	1	1	N	N	N	N	N	N	N	N	N	F	G	F	F	F	F	F	F	N	N	N	F	N			
PURSUIT ^d	2	3	F	P	P	F	F	P	F	F	F	P	P	F	P	P	P	P	P	N	N	P	N	F			
PURSUIT ^d + BASAGRAN	2/16	2	F	G	F	F	F	F	G	G	F	P	P	F	P	P	P	P	P	N	N	G	N	G			
RAPTOR ^d	2	3	F	F	F	F	F	P	F	G	F	F	P	F	P	P	P	P	P	N	N	P	N	P			
RAPTOR ^d + BASAGRAN (8 oz)	2/6	2	G	F	F	G	F	F	G	G	F	F	P	F	P	P	P	P	P	N	N	F	N	F			
RAPTOR ^{de} + BASAGRAN (16 oz)	2/6	2	F	G	G	F	F	F	F	G	F	P	P	F	P	P	P	P	P	N	N	G	N	F			
REFLEX	14	2	P	F	P	G	G	F	P	P	F	N	N	N	N	N	N	N	N	N	N	N	N	N			
REFLEX + BASAGRAN	6/14	2	F	G	F	G	G	F	F	G	F	N	N	N	N	N	N	N	N	N	N	F	N	G			
REFLEX + RAPTOR ^e	2/14	3	F	F	F	F	F	F	G	F	F	F	P	F	P	P	N	N	N	N	N	P	N	P			
SELECT/SELECT MAX/ARROW	1	1	N	N	N	N	N	N	N	N	N	F	G	F	F	F	F	F	F	N	N	N	G	N			

Herbicide Site of Action: The site of action key is located on pages 16-17.

Herbicide Effectiveness: P = Poor; F = Fair; **G** = Good; **F** = Excellent; N = None

*The above ratings are a relative comparison of herbicide effectiveness. Weather conditions greatly influence the herbicide's effectiveness, and weed control may be better under favorable conditions or poorer under unfavorable conditions.

** Crop Tolerance: 1 = Minimal risk of crop injury; 2 = Crop injury can occur under certain conditions (soil applied — cold, wet; foliar applied — hot, humid); 3 = Severe crop injury can occur. Follow precautions under Remarks and Limitations and on the label; 4 = Risk of severe crop injury is high.

^a Crop tolerance for navy and black beans = 3. For other bean classes, crop tolerance = 2. Preplant incorporation will increase tolerance of navy and black beans to *Outlook*.

^b Sequence is a premixture of *Dual Magnum* and glyphosate and should be used to control existing vegetation prior to planting dry beans. See Remarks and Limitations section.

^c Control of **hairy nightshade** with *Basagran* is good.

^d Control of **hairy nightshade** with *Pursuit* and *Raptor* is excellent.

^e **Common lambsquarters** will be controlled with this tank mixture **if** the weeds are less than 2 inches tall and **not** under drought stress.

