

# **2013 Dry Bean Research Report**

**Black Bean Color Retention and White Mold Control  
in Narrow Row Production Systems**



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

The Michigan Bean Commission was awarded a grant from the MDARD Specialty Crop Block Grant Program-Farm Bill. The title of this project is “Expanded Research to Address Critical Issues Associated with Narrow Row Production of Dry Beans in Michigan”. Two main areas were Black Bean Color Retention and White Mold Disease Control.

Expected outcomes from this project are:

1. Identification of adaptable dry bean cultivars suitable for black color retention and white mold tolerance.
2. Define and recommend a black bean desiccant system that assures maximum color retention.
3. Recommend to growers specific dry bean white mold disease control strategies including varietal tolerance, biological and chemical fungicides.

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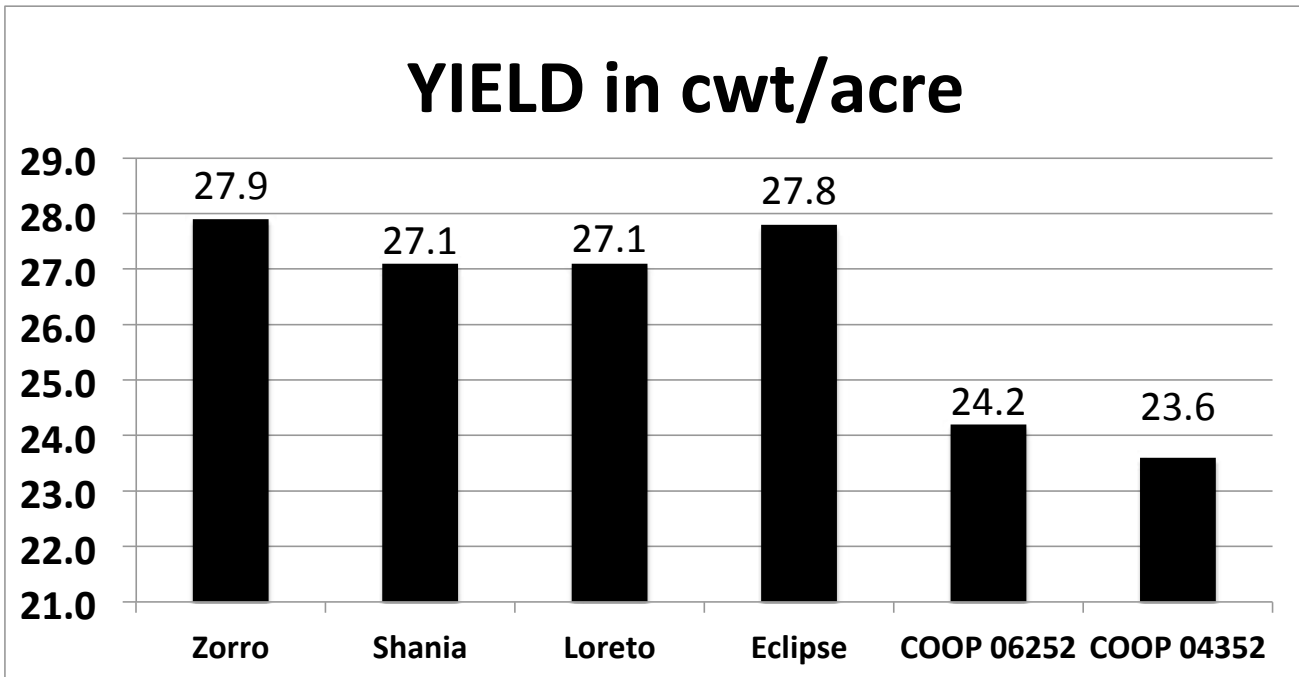
## Photos

Front Cover: 2013 Huron County Dry Bean Variety Tour, Gremel Farms  
Top Back Cover: Upright Dry Beans for High Yield Production  
Bottom Back Cover: New MSU B10244 Black Bean Released as “ZUMBA”  
Compared to the Brown Eclipse Black Bean

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

VARIETY	YIELD	PICK%	MOISTURE	LODGE	HEIGHT	POPULATION	Seeds/lb
Zorro	27.9	2.5	17.4	2	23.5	117,652	2421
Shania	27.1	1.8	18.2	2.5	23.2	118,483	2376
Loreto	27.1	1.9	18.7	2.5	22.7	115,893	2307
Eclipse	27.8	2.0	16.7	1.5	23.6	116,472	2327
COOP 06252	24.2	4.9	18.0	2.5	23.9	121,679	2548
COOP 04352	23.6	8.4	18.3	2.5	23.1	132,785	2754

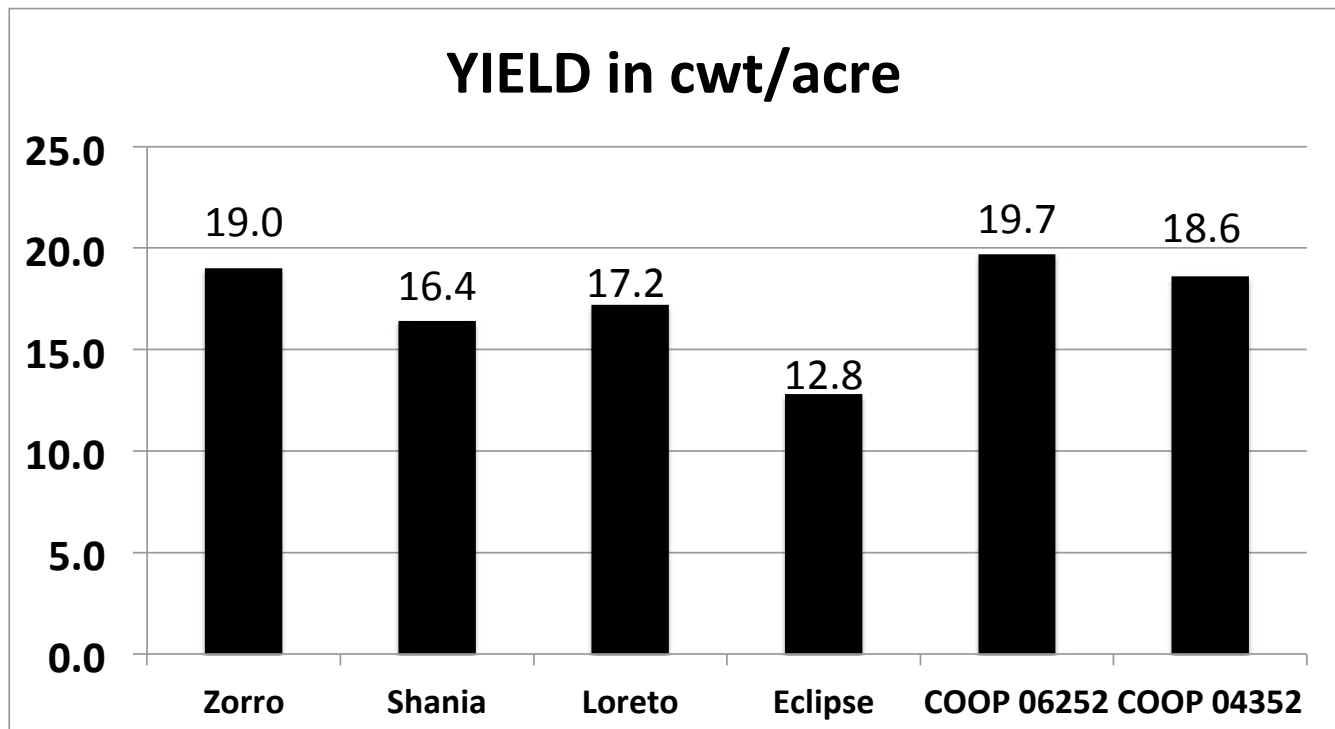
Planted: June 21  
 Harvested: October 2  
 Lodge rating is 1=erect, 5=flat  
 Pick %=FM+Pick  
 Planting Population= 128,000  
 Fertilization=18 gallons of 28%+2 gallons thiosol (AMS)  
 Herbicides=PPI 1 pt Treflan+1pt Dual+1 qt. Eptam  
 Post= 8 oz Basagran+3 oz Raptor+4 oz Reflex  
 Fungicides=8 oz Omega  
 Insecticide=applied with herbicide and fungicide  
 Harvest Aid=None  
 Harvest area=.62 Acres



**BLACK BEAN VARIETY STRIP TRIAL- 30 INCH ROWS  
 JACK KNOCHEL FARM  
 KAWKAWLIN, MICHIGAN**

VARIETY	YIELD	PICK %	MOISTURE	LODGE	HEIGHT	POPULATION	Seeds/lb
Zorro	19.0	2.3	12.7	2	19.2	101,052	2465
Shania	16.4	2.7	12.9	1.5	19.1	99,769	2534
Loreto	17.2	2.2	13.0	2	18.2	103,651	2467
Eclipse	12.8	6.1	12.8	1	19.6	104,038	2673
COOP 06252	19.7	3.7	13.5	2	19	106,367	2734
COOP 04352	18.6	9.7	13.2	2	18.5	108,842	2943

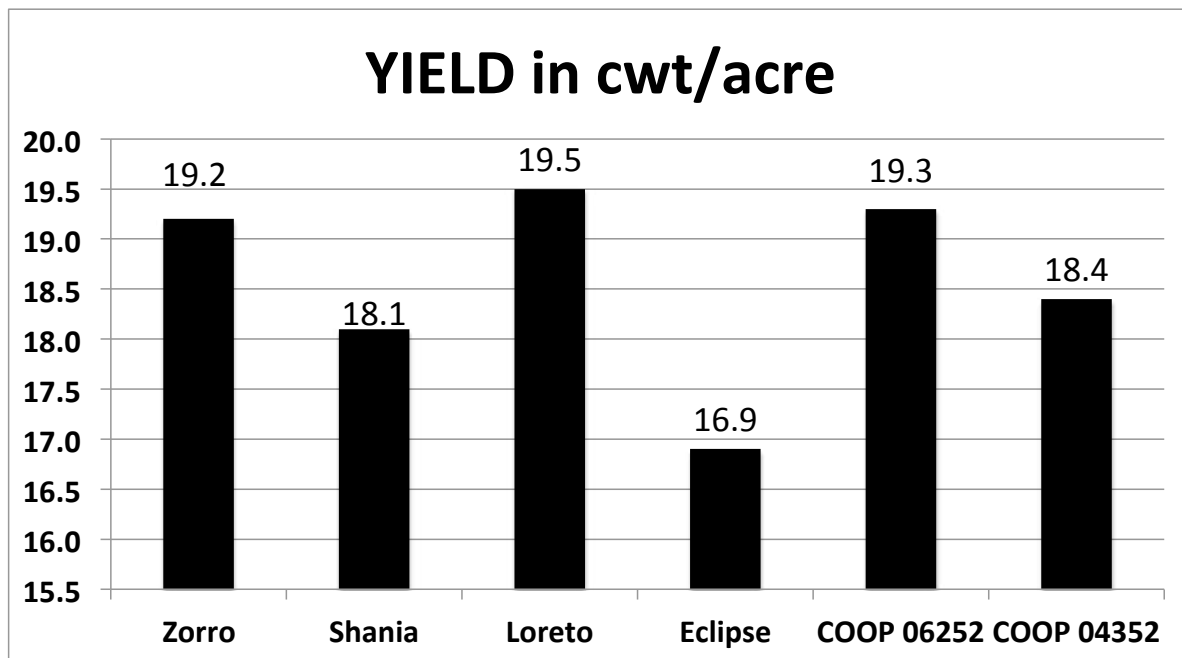
Planted: June 11  
 Harvested: September 19  
 Lodge rating is 1=erect, 5=flat  
 Pick %=FM+Pick  
 Planting Population= 104,544  
 Fertilization=200 Pounds of 22-0-20 2%Mn  
 Herbicides=PPI Outlook  
 Post= 16 oz Basagran  
 Fungicides=None  
 Insecticide=applied with herbicide  
 Harvest Aid=None  
 Harvest area=1.03 Acres



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

VARIETY	YIELD	PICK %	MOISTURE	LODGE	HEIGHT	POPULATION	Seeds/lb
Zorro	19.2		13.2	2	19.1	114,998	
Shania	18.1		13.1	2	19.4	113,692	
Loreto	19.5		13.5	2	19.3	109,771	
Eclipse	16.9		12.1	1.5	18.7	117,089	
COOP 06252	19.3		12.7	2	19.1	122,316	
COOP 04352	18.4		14.3	2	18.3	132,173	

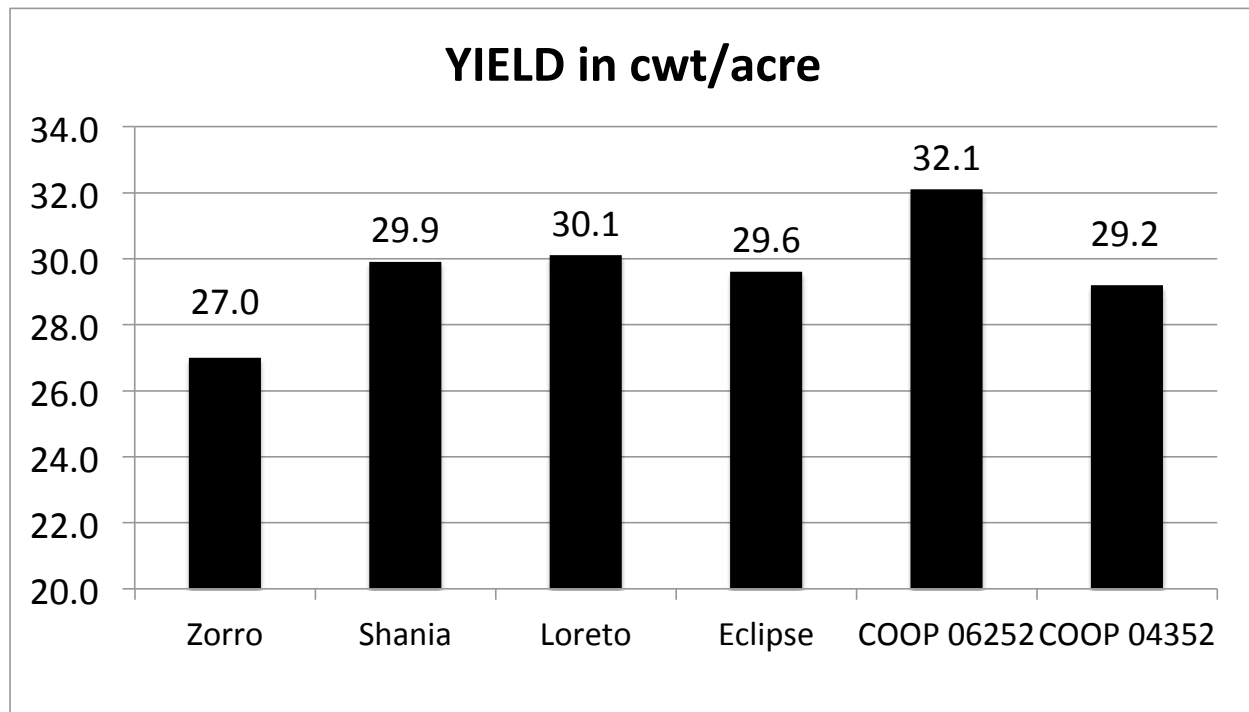
Planted: June 12  
 Harvested: September 26  
 Lodge rating is 1=erect, 5=flat  
 Planting Population= 114,600  
 Fertilization=48 pounds Nitrogen, 2% Mn, 2% Zn (2X2)  
 Herbicides=PPI 32 oz Eptam + 14 oz Outlook  
 Post= 40 oz Basagran (over two applications)  
 Fungicides=11.5 oz Aproach  
 Insecticide= 1 oz Baythoid and 2.5 oz Leverage  
 Harvest Aid= 30 oz Gramoxone  
 Acres per Variety = 2.67



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

VARIETY	YIELD	PICK %	MOISTURE	LOGGE	HEIGHT	POPULATION	Seeds/lb
Zorro	27.0	4.0	15.8	2	23.5	138,634	2241
Shania	29.9	3.7	15.9	3	22.8	140,541	2204
Loreto	30.1	2.5	15.4	3	23.8	136,872	2169
Eclipse	29.6	2.8	15.1	1.5	23.1	143,748	2239
COOP 06252	32.1	2.6	15.3	2	22.7	144,549	2281
COOP 04352	29.2	4.3	15.9	2.5	21.9	145,384	2493

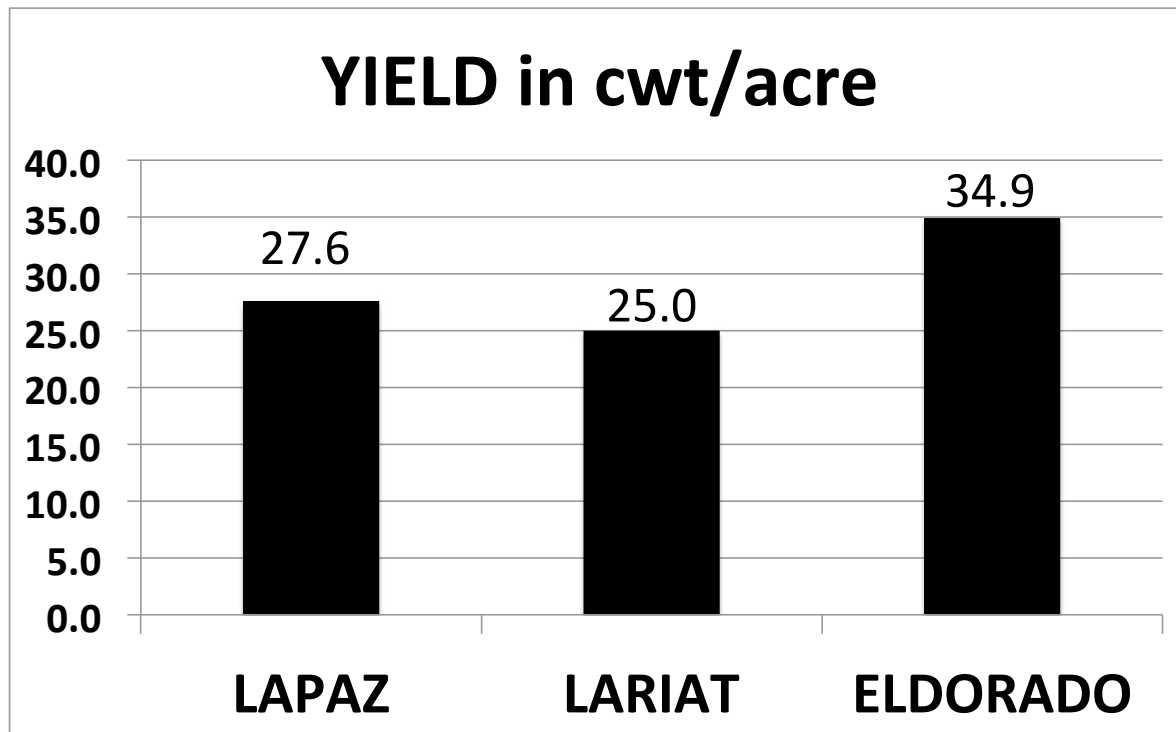
Only one replication of Zorro reduced yield  
 Planted: June 8  
 Harvested: September 27  
 Lodge rating is 1=erect, 5=flat  
 Pick %=FM+Pick+Screen out  
 Planting Population= 140,000  
 Fertilization=55 pounds Nitrogen, 16 gal 10-34-0  
 Harvest area=2.42 Acres  
 Fungicides=8 oz Endura  
 Insecticide=applied with herbicide and fungicide  
 Harvest Aid=glyphosate



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

VARIETY	YIELD	PICK %	MOISTURE	LODGE	HEIGHT	POPULATION	Seeds/lb
LAPAZ	27.6	5.3	15.5	2.5	26.5	118,758	1432
LARIAT	25.0	5.9	14.9	3	25.7	109,652	1146
ELDORADO	34.9	2.5	14.1	2.5	27.4	115,531	1289

Planted: June 14  
 Harvested: September 19 97 days after planting  
 Lodge rating is 1=erect, 5=flat  
 Pick %=FM+Pick+Screen out  
 Planting Population= 118,000  
 Fertilization=55 pounds Nitrogen, 16 gal 10-34-0  
 Harvest area=1.088 Acres  
 Fungicides=8 oz Endura  
 Insecticide=applied with herbicide and fungicide  
 Harvest Aid=glyphosate



**2013 White Mold Fungicide Trial  
Montcalm Research Farm, Entrican, Michigan**

Treatment	Application		Incidence	Severity	YIELD
	Code	Rate	%infection	%severity	
UTC	H2O		65	49	2537
Propulse	AB	8 oz	39	28	2909
Propulse	AB	10.3 oz	34	23	2910
Pulpulse	A	10.3 oz	54	40	2576
Propulse+Serenade Opti	A+B	10.3 oz+16 oz	57	43	2536
Serenade Optimum	AB	16 oz	48	34	2671
Endura	AB	8 oz	28	19	2803
Omega	AB	8 oz	29	19	2892
Aproach	AB	12 oz	46	35	2915
Aproach	A	12 oz	53	39	2537
Cruzin+BF2+Bionic	AB	8 oz + 2 oz	63	47	2627
Cruzin+Bionic	AB	10 oz	62	46	2608
Endura+Omega	A	8 oz + 8 oz	36	23	3140
Endura+Propulse	A	8 oz + 8 oz	28	18	2854
		LSD .05 =	15	12	306
		C. V. =	22%	24%	7.80%

Application Code:A=100% or first bloom, B=10 days after 100% bloom  
 Rating Date: % infection "rating" on September 23, % Incidence, %severity  
 Merlot Small Red Beans planted in 20" rows. Population of 115,680. Irrigation of two .5 inch per week.  
 Planted:June 18 Harvested: October 2 First Spray: July 30 Second Spray: August 9  
 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.

**2013 Eastern Huron County White Mold Fungicide Trial  
Doug Bismack Farm-Cooperative Elevator Co.**

Treatment	Application		Incidence	Severity	YIELD
	Code	Rate	%infection	%severity	
UTC	H2O		36	25	1722
Propulse	AB	8 oz	22	16	2017
Propulse	AB	10.3 oz	29	20	1888
Pulpulse	A	10.3 oz	20	13	2089
Propulse+Serenade Opti	A+B	10.3 oz+16 oz	25	16	1916
Serenade Optimum	AB	16 oz	24	14	1988
Endura	AB	8 oz	21	12	2008
Omega	AB	8 oz	26	17	1921
		LSD .05 =	4	4	251
		C. V. =	12%	16%	8.80%

Melot small reds planted in 22 inch rows.  
 Planted: June 18, First Spray: August 5, Second Spray: August 14, Harvested: September 28



**EXPERIMENT 3101 STANDARD NAVY YIELD TRIAL**

**PLANTING DATE 6/5/13**

**Dr. James D. Kelly and Evan Wright, Plant, Soil and Microbial Sciences, Michigan State University**

NAME	PEDIGREE	YIELD CWT 100 SEED		DAYS TO FLOWER	DAYS TO MATURITY	LODGING HEIGHT (1-5)	LODGING HEIGHT (cm)	DES. SCORE
		/ACRE	WT. (g)					
N12440	N09056/N09175	28.0	19.0	46.0	101.0	1.5	53.0	4.5
N12454	B09174/N09056	26.8	18.7	43.0	101.0	2.0	55.0	4.5
I92002	C-20*3//GTS-0801/Seafarer, <b>VISTA</b>	26.3	20.1	46.0	105.0	2.0	52.5	4.0
N11264	N08003/MEDALIST	26.0	20.6	43.0	104.0	1.5	51.5	4.0
N12456	B09174/N09056	26.0	17.6	46.0	99.0	1.5	51.5	4.0
I11264	COOP 03019, <b>MERLIN</b>	25.8	19.3	44.0	105.0	1.0	54.5	4.0
N12447	B09174/N09056	25.7	19.2	45.0	100.0	2.0	51.0	4.3
N12466	N08010/N08007	25.7	16.7	50.0	100.0	1.0	55.0	5.5
N11225	N05311*/B05044	25.4	20.3	47.0	104.0	1.5	52.0	4.0
N12467	N08010/N08007	25.3	16.6	47.0	99.0	1.0	53.0	5.8
N11231	N05311//BMD12/B04587	25.2	17.7	45.0	100.0	1.0	52.5	4.0
N12458	B09174/N09056	25.1	17.6	44.0	98.0	1.5	50.5	4.0
N12457	B09174/N09056	25.0	18.0	44.0	99.0	1.0	51.5	4.8
N12468	N08010//B04349/B05044	24.9	17.2	47.0	99.0	1.5	52.0	5.0
I08902	<b>HYLAND T9905</b>	24.9	22.7	46.0	104.0	2.0	52.5	4.5
N11238	N07009//N05324/B04554	24.8	15.5	47.0	102.0	1.0	55.5	5.0
N11232	N05311//BMD12/B04587	24.7	18.2	45.0	101.0	1.0	52.0	4.3
N12453	N09065/N09050	24.5	19.6	45.0	99.0	1.0	57.0	5.0
N11258	N07009/MEDALIST	24.4	18.8	47.0	101.0	1.0	54.0	5.3
N11283	MEDALIST/N08003	24.2	19.2	46.0	102.0	1.0	54.0	5.5
N12442	N09060/N09175	24.1	22.9	45.0	101.0	1.0	54.0	5.5
N11298	MEDALIST//B05054/B04588	23.9	18.7	46.0	99.0	1.0	53.5	4.5
N11256	N07009/MEDALIST	23.8	17.8	46.0	100.0	1.0	52.0	5.8
N11257	N07009/MEDALIST	23.7	19.8	45.0	101.0	1.0	54.5	5.5
N11228	N05311//N07009/N05324	23.7	17.5	47.0	100.0	1.0	52.5	5.0
N11277	N08010/N08007	23.7	17.8	45.0	99.0	1.0	52.0	5.5
N11282	MEDALIST/N08003	23.6	20.0	44.0	100.0	1.0	52.5	4.8
N12441	N09060/N09175	23.0	22.5	47.0	101.0	1.5	52.0	4.8
N11230	N05311//BMD12/B04587	22.9	19.4	43.0	100.0	1.0	54.0	5.0
I10103	OAC 7-2, <b>OAC REXETER</b>	22.5	20.5	42.0	106.0	2.0	50.5	3.5
N11292	N08006/MEDALIST	22.2	19.0	43.0	100.0	1.0	53.5	4.3
I13438	<b>GTS OB-1723-06</b>	21.9	18.4	46.0	105.0	2.0	51.5	4.0
I08958	Mayflower/Avanti, <b>MEDALIST</b>	21.8	20.3	45.0	104.0	1.5	54.5	4.0
N11226	N05311*/B05044	21.6	19.0	48.0	102.0	1.0	51.0	4.3
N11284	MEDALIST/N08003	21.0	19.2	45.0	101.0	1.0	51.5	5.3
I13416	ND02-220-01N	20.6	20.1	47.0	99.0	1.0	51.0	4.0
I12301	<b>INDI</b>	20.0	18.6	43.0	100.0	1.0	54.0	4.0
N12461	Eclipse/N09056	18.8	17.4	45.0	99.0	1.5	49.0	4.3
N11296	MEDALIST//B05054/B04588	18.4	19.5	44.0	101.0	1.5	51.0	4.0
I10124	ND060514	17.7	23.0	45.0	99.0	2.5	47.5	3.5
N12446	B07554//X08106/X08102	14.9	17.0	42.0	99.0	1.0	48.5	4.3
I13437	<b>GTS H96204</b>	14.7	19.9	40.0	99.0	1.0	48.5	4.0
MEAN		23.3	19.1	44.9	100.7	1.3	52.4	4.6
LSD (.05)		3.0	0.6	2.7	1.2	0.5	2.7	0.6
CV (%)		10.9	2.9	3.6	0.7	24.6	3.0	11.2

**EXPERIMENT 3102 STANDARD BLACK YIELD TRIAL**

**PLANTING DATE 6/5/13**

**Dr. James D. Kelly and Evan Wright, Plant, Soil and Microbial 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)
B10244	B04644/ZORRO	27.4	20.4	45.0	103.0	2.0	52.0	5.8
B11312	B04587//B05070/B05044	27.1	20.7	47.0	104.0	2.0	52.0	4.8
I13418	ND081157	25.3	18.2	49.0	103.0	2.5	51.5	3.8
B12710	B07554//Jaguar/B07554	25.3	20.7	47.0	103.0	1.0	53.5	5.5
B10215	B04587//ZORRO/DPC-1	25.3	19.0	47.0	103.0	1.5	53.5	5.5
B11343	B07554//ZORRO/B05044	25.2	18.0	44.0	102.0	2.5	49.0	4.0
B11371	B05055/B04587	25.1	18.2	47.0	102.0	2.0	51.0	4.3
B09165	B04554/B04587	25.0	19.1	49.0	103.0	2.0	52.5	5.3
B11334	N07009//B04349/B05044	24.8	17.2	43.0	103.0	1.0	51.5	5.8
B10213	B04587//ZORRO/DPC-1	24.8	19.3	47.0	101.0	1.0	52.5	5.5
B12712	B07554//Jaguar/B07554	24.5	19.2	48.0	102.0	1.5	53.0	5.0
B11304	N05324/B05055	24.5	19.1	47.0	101.0	1.5	53.0	4.3
I10102	Mackinac/Jaguar, <b>LORETO</b>	24.0	22.1	46.0	105.0	3.0	50.0	3.0
I07116	T-39/Midnight, <b>SHANIA</b>	23.9	20.3	48.0	105.0	1.0	53.5	4.0
B12711	B07554//Jaguar/B07554	23.9	19.1	44.0	103.0	1.0	53.5	5.8
I13417	ND071256	23.9	21.7	47.0	102.0	1.5	50.5	4.0
B12713	B07554//Jaguar/B07554	23.9	19.9	45.0	101.0	1.0	52.0	4.8
B12728	B09193/B09184	23.7	20.0	40.0	101.0	1.0	50.5	4.3
B12736	Eclipse/N09056	23.6	19.5	49.0	102.0	1.5	53.0	4.8
B95556	B90211/N90616, <b>JAGUAR</b>	23.4	18.1	45.0	100.0	1.0	50.5	4.5
I13436	<b>GTS-1103</b>	23.4	23.7	49.0	105.0	2.0	52.5	4.0
B12709	B07554//Jaguar/B07554	23.3	19.8	46.0	100.0	1.0	52.0	4.5
I08907	Midnight/Blackhawk, <b>BLACK VELVET</b>	23.3	21.8	47.0	105.0	1.0	54.0	4.0
B10238	ZORRO/B05055	23.1	17.3	48.0	100.0	1.0	50.5	5.3
B11364	B04644/B07554	23.0	20.2	46.0	102.0	1.5	50.0	4.5
B10210	N05324/B04431	23.0	21.5	45.0	103.0	2.0	54.5	5.5
B11363	B04644/B07554	22.9	18.1	47.0	101.0	1.0	53.5	5.3
B12720	B09175/Eclipse	22.9	21.3	45.0	103.0	1.0	53.5	5.0
B11311	B04587//ZORRO/DPC-1	22.7	19.3	48.0	103.0	1.5	52.5	5.3
B10214	B04587//ZORRO/DPC-1	22.7	18.5	46.0	102.0	1.0	52.5	5.3
B04554	B00103*/X00822, <b>ZORRO</b>	22.7	19.9	45.0	103.0	2.0	54.5	5.5
B12715	Zorro/N09056	22.5	17.5	49.0	102.0	1.0	51.0	4.5
I81066	SEL-BTS, <b>T-39</b>	22.3	19.5	48.0	104.0	3.5	44.0	3.0
B11370	B05055/B04265	22.2	18.2	46.0	100.0	1.0	50.0	4.8
B12724	B09184/B09135	22.1	18.2	45.0	101.0	1.0	51.5	4.8
B11310	B04587//ZORRO/DPC-1	22.0	19.8	47.0	101.0	1.5	51.5	4.3
B12729	B09201/B09135	21.9	16.1	48.0	100.0	1.0	50.5	4.5
B11259	N07009//B04349/B05044	21.8	17.2	46.0	101.0	1.5	52.5	4.5
B11372	B05055/B04587	21.8	17.1	49.0	101.0	2.0	49.0	4.0
B11302	N05311//B05055/B05053	21.7	19.3	43.0	102.0	1.0	54.5	4.8
B12721	B09175/Eclipse	21.5	20.9	44.0	102.0	1.0	54.5	5.3
I03390	ND9902621-2, <b>ECLIPSE</b>	18.1	18.9	45.0	100.0	1.0	53.5	4.5
MEAN		22.2	19.2	45.8	101.7	1.5	51.8	4.6
LSD (.05)		2.9	0.7	0.9	1.3	0.5	0.9	0.5
CV (%)		11.2	3.0	1.1	0.8	21.4	1.0	9.9

**EXPERIMENT 3104 PRELIMINARY BLACK YIELD TRIAL**

**PLANTING DATE 6/6/13**

**Dr. James D. Kelly and Evan Wright, Plant, Soil and Microbial 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
B10244	B04610/N05346	23.9	20.1	47.0	98.0	1.0	51.4	5.0
B13225	PR0443-151/B09175	22.1	21.5	47.0	98.0	2.0	50.7	5.5
B13217	B09175/I09213	21.7	24.1	46.0	98.0	1.5	51.2	4.5
B13204	B09174/VCW54-1	21.2	23.0	46.0	98.0	1.0	49.8	4.5
B13228	B09175/JAGUAR	21.2	19.9	46.0	98.0	1.0	52.1	5.0
B13218	B09175/I09215	20.5	24.9	45.0	98.0	1.0	52.6	5.5
B13229	B09175/JAGUAR	20.3	19.2	46.0	98.0	1.0	50.9	5.0
B13220	B09175/TARS-MST1	20.3	19.6	44.0	97.0	1.5	49.3	5.0
B13203	B09174/VCW54-1	20.1	23.7	46.0	98.0	1.0	52.1	5.0
B13219	B09175/I09215	20.1	25.2	46.0	98.0	1.0	52.2	5.0
B13202	B09174/VCW54-1	19.8	23.1	46.0	98.0	1.0	51.0	5.0
B13223	PR0443-151/B09175	19.7	21.9	47.0	98.0	1.5	50.5	5.5
B04554	B00103*/X00822, <b>ZORRO</b>	19.2	18.7	47.0	98.0	1.5	50.7	5.0
B13213	B09175/JAGUAR	18.3	20.8	49.0	98.0	1.0	50.5	5.0
B13224	PR0443-151/B09175	18.1	22.1	47.0	98.0	2.0	50.4	4.5
B13214	B09175/JAGUAR	17.8	19.3	47.0	98.0	1.0	49.9	5.0
I07116	T-39/Midnight, <b>SHANIA</b>	17.3	20.5	48.0	99.0	1.5	52.4	4.0
B13211	JAGUAR/B09175	17.1	19.0	48.0	97.0	1.0	49.0	4.0
B13210	JAGUAR/B09175	16.9	19.9	47.0	97.0	1.5	49.7	4.5
B13227	ZORRO/B09204	16.6	19.4	47.0	97.0	1.0	48.8	4.0
B13208	JAGUAR/B09175	16.5	19.0	44.0	97.0	1.0	50.0	4.0
B13205	TACANA/VAX6//B09197	16.2	20.9	48.0	96.0	1.0	48.7	4.5
B13216	B09175/I09213	16.1	22.4	47.0	98.0	1.0	51.4	5.0
B13222	PR0443-151/B09175	15.6	19.7	46.0	98.0	1.0	49.5	5.0
B13230	I09215/JAGUAR	15.5	20.0	46.0	97.0	1.0	47.6	4.0
B13206	TACANA/VAX6//B09197	15.4	22.0	46.0	97.0	1.0	48.2	4.0
B13221	PR0443-151/B09175	15.3	19.0	46.0	97.0	1.0	51.8	4.5
B13215	B09175/I09213	14.7	23.2	49.0	98.0	1.0	48.7	4.0
B13209	JAGUAR/B09175	14.0	18.4	46.0	96.0	1.0	47.2	4.0
B13207	JAGUAR/B09175	13.8	18.9	46.0	96.0	1.0	48.6	4.0
B13231	I09215/B09175	13.7	19.1	46.0	97.0	1.0	49.3	4.0
B13212	JAGUAR/I09213	13.2	21.8	47.0	98.0	1.0	47.3	4.5
B13226	TACANA/VAX6//B09197	10.8	18.4	47.0	96.0	1.0	46.2	4.0
I13403	Zorro/DPC40, PR1165-3	9.9	20.7	45.0	97.0	1.0	47.8	4.0
I13402	Zorro/DPC40, PR1165-2	9.2	20.5	45.0	98.0	1.0	49.6	4.0
B13201	ZORRO//TACANA/VAX6	8.0	18.1	46.0	97.0	1.0	49.0	4.0
MEAN (36)		17.0	20.8	46.2	97.3	1.1	49.9	4.6
LSD (.05)		2.6	0.8	0.9	0.7	0.3	1.3	0.6
CV (%)		11.1	2.7	1.2	0.4	15.2	1.5	7.9

2013 MICHIGAN DRY BEAN TRIALS

Compiled by Gregory V. Varner, Dry Bean Research Director

COUNTY & COOPERATOR: ALCONA-Duane Dellar Farm; BAY-Schindler Farms  
 GRATIOT-Hrabal Farms; HURON-Gremel Farms; MONTCALM-Sowerby Farms  
 SANILAC-Tom VanSickle Farm; TUSCOLA-Bernia Family Farms

PLANTING DATES		JUNE 4	June 11	June 19	June 6	June 18	June 5	June 15	2013 AVE	white mold	
VARIETY-NAVY	DAYS	ORIGIN	ALCONA	BAY	GRATIOT	HURON	MONTCALM	SANILAC	TUSCOLA	6-3 LOC	Huron
HMS MEDALIST	100-105	COOP	2302	2760	1766	2982	2749	2956	2321	2589-2753	2.3-2.5
MERLIN	102-105	COOP	2174	3250	1875	3262	2574	2735	2721	2736-2906	1.9-2.1
HYLAND T9905	99-100	HYLAND	3295	3215	1965	2980	2674	3020	2610	2744-2870	2.1-2.5
INDI	95-97	ADM	2081	2578	1544	2781	2489	2965	2240	2433-2662	2.1-1.6
VIGILANT	96-100	COOP		3104	2149	3070		3038	2509	2872	2.8-1.8
REXETER	102-107	OAC-HDC				3445		2985	2710	3047	2.4-3.0
NAUTICA	100-102	OAC-HDC				3037		3202	2467	2902	1.8-2.1
MIST	101-103	OAC-HDC				2818		2932	2060	2603	1.6-2.6
ADM N8118340	98-102	ADM		2913		2924		3253	2254	2810	2.1-2.0
ADM N8010375	97-102	ADM		2946		2815		3870	2743	3143	3.3-3.1
GTS OB-1723-06	102-105	GTS	2525	3562		2654		3144	2715	2838	3.8-3.5
COOP 99039-3	99-103	COOP				3046		3342	2610	2999	2.9-3.1
COOP 03036	98-105	COOP				3035		2926	2674	2878	3.0-3.1
COOP 06063	98-103	COOP				2812		3319	2863	2998	3.5-2.8
COOP 07073	97-102	COOP				2607		2950	2766	2774	2.8-2.5
COOP 08070	97-104	COOP				3253		2781	2750	2928	2.5-3.3
COOP 08072	96-102	COOP				3053		3060	2663	2925	2.9-2.4
COOP 08077	98-104	COOP				2789		2381	2193	2454	3.4-2.4
COOP 10042	99-104	COOP				2540		2954	2750	2748	3.5-2.4
ADM N8120345	99-102	ADM				2675			2705		2.6-2.0
ADM N8002370	95-101	ADM				2465			2142		2.5-2.0
ADM N8118334	98-102	ADM				2771			2483		2.9-2.6
ADM N8118339	99-103	ADM				2607			2601		2.6-2.1
SEM NAVC6V1200	99-104	SEMINIS				2712			2846		3.8-2.6
SEM NAVC6V1246	97-102	SEMINIS				1964			2648		4.4-2.5
SEM NAVC6V1202	101-104	SEMINIS				2087			2373		2.6-2.1
GTS OB-5551-99	105-108	GTS				2674			2392		2.4-3.5
MSU N11216	100-104	MSU			2424	3301			2886		2.4-2.5
MSU N11258	98-103	MSU			2122	2945			2325		2.4-2.0
MSU N11283	98-103	MSU	2786	3010	2068	2510	2585	2783	2702	2610-2665	3.5-2.0
MSU N11298	98-103	MSU			2011	2819			2813		1.9-2.0
MSU N12442	100-105	MSU			2035	2904			2734		1.8-2.4
VISTA	102-105	GTS				2551			2557		3.1-2.8
			Isd=371	Isd=294	Isd=452	Isd=326	Isd=458	Isd=368	Isd=301		white mold
			cv-9.8%	cv-6.6%	cv-16.8%	cv-8.3%	cv-11.4%	cv-8.6%	cv-8.4%	2013 AVE	lodge rating
BLACK	DAYS	ORIGIN	ALCONA	BAY	GRATIOT	HURON	MONTCALM	SANILAC	TUSCOLA	6-3 LOC	Huron
ZORRO	98-103	MSU	3280	2916	2224	2879	2147	3443	2899	2751-3074	2.3-2.3
SHANIA	99-105	ADM	3368	3047	1785	2635	2554	3657	2777	2743-3023	3.0-2.6
LORETO	97-104	COOP-PRC	3103	2732	1926	2817		3135	3027	2993	2.3-2.5
MSU B10244	96-103	MSU	4006	3286	2560	2299	2386	3548	3045	2854-2964	2.6-2.5
ECLIPSE	94-99	NDSU	3286		2029	2650		3391	2586	2876	2.4-2.0
T-39	96-103	CAL	3350	2730	1797	2505		3401	2483	2796	2.9-3.5
BL 04352	97-100	COOP-PRO				2192		3411	2694	2766	3.8-2.6
BL 06252	97-102	COOP-PRO				2634		3095	2677	2802	2.9-2.8
BL 11352	98-102	COOP-PRO				1979		3181	2440	2533	2.9-2.5
BL 11353	95-100	COOP-PRO				2572		3074	2726	2791	2.9-2.0
BL 11355	96-101	COOP-PRO				2595		3164	2736	2832	2.3-2.9
BL 11356	100-103	COOP-PRO				2036		2964	2611	2537	3.0-2.1
MSU B11343	96-101	MSU				3194		3395	3014	3201	2.3-2.4
MSU B11363	95-101	MSU				3153		3337	2797	3096	2.1-2.1
MSU B12709	95-99	MSU				2287		2726	2685	2566	2.1-1.9
MSU B12720	96-98	MSU				2819			2976		2.8-2.3
MSU B12721	95-98	MSU	3346			2586		3632	2802	3007	2.0-1.9

BLACK continued	DAYS	ORIGIN	ALCONA	BAY	GRATIOT	HURON	MONTCALM	SANILACTUSCOLA	2013 AVE	W.M.+lodge	
MSU B12724	96-99	MSU				2607		3192	2717	2839	2.3-1.9
ADM B8038279	95-99	ADM				2555			2418		1.9-1.8
ADM B8039279	98-102	ADM				2264			2621		2.3-1.9
ADM B8064307	99-104	ADM				2424			2657		2.6-2.5
ADM B8052293	98-103	ADM				2555			2200		2.3-2.0
ADM B8035303	95-97	ADM		2684					2515		
ADM B8037283	98-100	ADM		2577					2453		
ADM B8039282	96-99	ADM		2563					2560		
SEM BKBC6C1206	96-100	SEMINIS				1952			2406		3.0-2.0
SEM BKBC6V1312	97-101	SEMINIS				2411			2565		3.1-2.5
SEM BKBC6V1313	96-100	SEMINIS				2977			2868		2.3-1.9
GTS-1103	100-104	GTS				3249		3402	2811		2.6-3.0

lsd=386 lsd=440 lsd=778 lsd=421 lsd=489 lsd=480 lsd=313  
cv-7.5% cv-10.6% cv-25.2% cv-11.6% cv-12.0% cv-10.3% cv-8.3%

Huron

<u>SMALL RED</u>	DAYS	ORIGIN	ALCONA	BAY	GRATIOT	HURON	MONTCALM	SANILACTUSCOLA	3 LOC	W.M.+lodge	
MERLOT	98-105	USDAMSU	3230	2923	2206	2444	2089	3152	2530	2709	3.8-3.5
SR 09303	99-104	PROVITA	3440			2813		3390	3297	3167	4.0-2.9
SR 09304	96-104	PROVITA				2570		3144	3091	2935	3.9-3.9
SR 11511	102-107	PROVITA				2717		3248	2973	2979	3.3-3.1
RIO ROJO	90-102	NDSU				3214		2418	1833	2488	2.6-3.5
MSU R12832	94-100	MSU				3082		1920	2658	2553	1.9-2.0
MSU R12859	94-103	MSU				3067		2018	2827	2637	2.1-2.3

lsd=470 lsd=459 lsd=330  
cv-11.1% cv-11.2% cv-8.1%

Montcalm  
%white mold

<u>PINTO</u>	DAYS	ORIGIN	ALCONA	BAY	GRATIOT	HURON	MONTCALM	SANILACTUSCOLA	4 LOC	lodge rating
ELDORADO		MSU	2998	3617	2711		3774	3750	3463	21-2.4
LA PAZ	94-99	PROVITA		3231	2291		3102	3488	3028	65-2.8
LARIAT	96-100	NDSU		3397	2321		2555	2890	2791	68-3.7
MEDICINE HAT	90-92	SEMINIS	3481	2616	1867		3294	2229	2502	46-2.3
MSU P12603	94-97	MSU		3172	1954		2430	2721	2569	58-2.1
Sem-PIN-DJ091012	93-94	SEMINIS			2279		3321			47-2.9
Sem-PINC6V1314	92-93	SEMINIS			1781		3370			46-2.8

lsd=254 lsd=410 lsd=520 lsd=359  
cv-5.1% cv-12.7% cv-11.2% cv-7.7%

Huron

<u>GREAT NORTHERN</u>	DAYS	ORIGIN	ALCONA	BAY	GRATIOT	HURON	MONTCALM	SANILACTUSCOLA		
POWDERHORN	94-99	MSU	3180	2583		2704		2057		2.5-2.5
MSU G12502	97	MSU				2657				1.8-1.8
MSU G12508	98	MSU				2163				2.6-2.0

lsd=438  
cv-10.1%

Huron

<u>PINK</u>	DAYS	ORIGIN	ALCONA	BAY	GRATIOT	HURON	MONTCALM	SANILACTUSCOLA		
ROSETTA	93-102	MSU	4011			3047		3361	2600	2.6-2.4
MSU S12911	93-101	MSU				2486		2349	2626	2.9-3.3

TEBO

FUJI	DAYS	ORIGIN	ALCONA	BAY	GRATIOT	HURON	MONTCALM	SANILACTUSCOLA		
FUJI	100-102	MSU		2140	1051		1481			
MSU G12901	98-100	MSU		3230	2684		2133			
<u>CRANBERRY</u>	DAYS	ORIGIN	ALCONA	BAY	GRATIOT	HURON	MONTCALM	SANILACTUSCOLA		
ETNA	90-92	SEMINIS			1772		2625			
KRIMSON	95-96	BASIN			1606		2422			
MECCANO	92-94	HDC			1435		2404			
CHIANTI vine	96-97	SEMINIS			1899		2400			
BELLAGIO vine	102-103	MSU			1997		2483			
BRB-DJ091031	91-93	SEMINIS			1365		2309			
BRBCV61261	91-92	SEMINIS			1955		2531			
SEM 08570929	88-90	SEMINIS			2020		2678			
MSU C11260	91-93	MSU			1994		2739			
MSU C11266	96-97	MSU			1688		2673			
MSU C11273	96-97	MSU			1526		2751			

lsd=621 lsd=374  
cv-24.5% cv-10.2%

<u>LIGHT RED KIDNEY</u>	DAYS	ORIGIN	BAY	GRATIOT	MONTCALM
CHINOOK 2000	102-104	MSU		1484	2822
CALIF ELRK	90-93	CAL		1215	2815
PINK PANTHER	92-95	SEMINIS		1293	2568
CLOUSEAU	93-96	SEMINIS		1553	2443
INFERNO	103-106	OAC-HDC		1526	2908
MSU K11714	102-104	MSU		1672	2841
GTS-IG-INF	103-106	GTS		1371	3185
LRK 09351	93	PROVITA			2545
LRK 09354	104	PROVITA			2484
LRK 09357	93	PROVITA			2530
LRK 09360	104	PROVITA			2683
LRK 09378	94	PROVITA			2909

lsd=322                      lsd=491  
cv-15.37%                      cv-12.5%

<u>DARK RED KIDNEY</u>	DAYS	ORIGIN	GRATIOT	MONTCALM
RED HAWK	99-102	MSU	1034	2606
MONTCALM	102-104	MSU	705	2278
RED ROVER	98-99	SEMINIS	1174	2329
MAJESTY	102-104	OAC-HDC	1306	2435
DYNASTY	104-106	OAC-HDC	679	3096
KDD-DJ091013	100-102	SEMINIS	946	2365
KDD-DJ1030	99-102	SEMINIS	929	2371
KDDC6V1249	97-100	SEMINIS	857	1981
KDDC6V1257	98-100	SEMINIS	1129	2419
MSU K11306	97-99	MSU	1226	2049
MSU K11320	96-98	MSU	992	2072
MSU K12225	96-98	MSU	1049	2133
GTS 104	103-105	GTS	840	2616
DRK 09423	106	PROVITA		2703
DRK 09424	103	PROVITA		2173
DRK 09429	101	PROVITA		2753
DRK 09430	100	PROVITA		2760
DRK 09431	103	PROVITA		2601

lsd=437                      lsd=299  
cv-30.8%                      cv-8.7%

<u>ALUBIA-W. KID.</u>	DAYS	ORIGIN	BAY	GRATIOT	MONTCALM
BELUGA	102-105	MSU	1547	1436	2660
SNOWDON	94-95	MSU	933	1437	2254
YETI	102-105	OAC-HDC		1649	2726
GTS 401	102-104	GTS		1928	2675
MSU K11914	96-98	MSU	1128	1890	2577
MSU K11916	96-99	MSU	888	1837	2284

lsd=348    lsd=434                      lsd=334  
cv-19.4%    cv-17.0%                      cv-8.8%

<u>ADZUKI</u>	DAYS	ORIGIN
ERIMO	104	JAPAN

ORIGIN KEY  
MSU=MICHIGAN STATE UNIVERSITY  
GTS=GEN-TEC SEEDS LIMITED  
SEMINIS=SEMINIS SEEDS=MONSANTO  
ADM==ARCHER DANIELS MIDLAND=SEEDWEST  
HYLAND=HYLAND SEEDS, LIMITED  
COOP=COOPERATIVE ELEVATOR-PROVITA  
CAL=UNIVERSITY OF CALIFORNIA-DAVIS  
USDA=UNITED STATES DEPT. OF AGRIC.ARS  
NDSU=NORTH DAKOTA STATE UNIVERSITY  
OAC-HDC UNIVERSITYofGUELPH-HENSALL DISTRICT COOP  
PROVITA=PROVITA SEEDS  
BASIN==BASIN SEED COMPANY  
JAPAN==PURITY FOODS INC.

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Maturity days = planting until harvest in 2013  
Direct -Cut Lodging Ratings = 1-erect, 5-laying flat on ground.  
White Mold Rating = 1-10% mold, 5-100% mold.  
  
Alcona, Bay, Huron, Sanilac and Tuscola were direct harvested.  
Gratiot and Montcalm navies, blacks, pintos and sm. reds were direct 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
Vista	N	USV	F	GEN	R-1	S	R	2	2	R	S	T	T	2
Medalist	N	USV	F	COOP/ADM	R-1	S	R	3	2	R	S	T	T	2
Reliant	N	USV	F	GEN	R-1	S	R	3	2	R	S	T	T	2
Hyland T9905	N	USV	M	HYLAND	R-1	S	R	2	2	R	S	T	T	2
Merlin	N	USV	M-F	COOP/ADM	R-1	S	R	3	2	R	S	T	T	2
Indi	N	USV	M-F	ADM	R-1	S	R	3	2	R	S	T	T	1
Othello	P	V	E	USDA	R	S	S	4	3	T	S	S	S	5
Buster	P	USV	M	SEMINIS	R-1	S	S	2	3	T	S	R	T	3
La Paz	P	USV	M	ADM	R	S	S	3	2	T	S	R	T	2
Lariat	P	USV	M	NDSU	R	S	S	3	3	T	S	R	T	3
Eldorado	P	USV	F	MSU	R	S	S	3	1	T	S	R	T	2
T-39	B	SV	F	UCD	R-1	S	S	3	3	R	S	T	T	4
Jaguar	B	USV	F	MSU	R-1	R	R	5	2	R	S	T	T	3
Black Velvet	B	USV	F	SEMINIS	R-1	S	R	4	3	R	S	T	T	2
Zorro	B	USV	F	MSU	R-1	S	R	5	2	R	S	T	T	2
Eclipse	B	USV	M	NDSU	R-1	S	R	4	2	R	S	T	T	2
Shania	B	USV	F	ADM	R-1	S	?	3	3	R	S	T	T	2
Loreto	B	USV	F	COOP/ADM	R-1	R	R	3	2	R	S	T	T	2
Chinook 2000	LRK	B	F	MSU	R-1	R	R	3	2	R	S	T	T	6
Calif. ELRK	LRK	B	E	UCD	R-1	R	S	3	2	S	S	T	T	6
Clouseau	LRK	B	M	SEMINIS	R-1	R	S	3	2	S	S	T	T	6
Pink Panther	LRK	B	M	SEMINIS	R-1	R	S	3	2	S	S	T	T	6
Montcalm	DRK	B	F	MSU	R-1	R	S	4	2	R	T	T	T	6
Red Hawk	DRK	B	F	MSU	R-1	R	R	4	2	T	S	T	T	6
Red Rover	DRK	B	F	SEMINIS	R-1	R	R	4	2	S	S	T	T	6
Etna	C	B	E	SEMINIS	R-1	R	S	2	2	S	S	T	T	6
Chianti	C	SV	M	SEMINIS	R-1	S	S	5	3	S	S	T	T	6
Bellagio	C	SV	F	MSU	R-1	R	S	5	3	S	S	T	T	6
Capri	C	B	M	MSU	R-1	R	S	3	3	S	S	T	T	6
Hooter	C	B	F	SEMINIS	R-1	S	S	2	3	S	S	T	T	6
Merlot	SR	USV	M	MSUUSDA	R	S	S	4	2	R	S	T	T	2
Rosetta	PK	USV	M	MSU	R-1	S	S	3	3	R	S	T	T	3
Tebo	W	B	M	JAPAN	S	R	S	2	3	T	S	S	S	4
Fuji Tebo	W	B	M	MSU	R-1	R	S	3	3	T	S	S	S	4
Beluga	WK-AL	B	F	MSU	R-1	R	S	3	3	S	S	T	T	6
Snowdon	WK-AL	B	E	MSU	R-1	R	S	3	3	S	S	T	T	6
Aurora	SW	SV	M	CUNY	R-1	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=Fair, 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 off ground, 3=lodging, pods close to ground, 4=high yield loss, 5=severe yield loss, 6=not recommended

JAN-2014

## 2012 Black Bean Canning Color Ratings and L Color Values

2012 Color Ratings 1-7, 1=poor brown color, 7=excellent black color

Lowest L color Value=most black color

dry=sample before canning can=sample after canning

Variety	L Color	L Color	L Color	L Color	Rating	Rating
	Huron dry	Huron can	Tuscola dry	Tuscola can	Huron Color	Tuscola Color
ZORRO	13.58	13.96	14.10	13.57	4.7	4.6
SHANIA	12.86	16.31	12.79	13.39	3.6	4.3
LORETO	13.89	14.26	13.47	14.85	3.9	4
BLACK VELVET	14.03	15.35	12.68	11.65	3.1	3.9
JAGUAR	15.16	15.09	13.22	15.82	3.3	3.4
ECLIPSE	13.72	18.38	13.35	15.28	2.8	3.6
T-39	13.94	14.87	13.35	13.22	4	4.6
BL 05222	14.50	14.74	13.55	16.57	3.4	2.6
BL 04352	14.34	13.77	13.07	14.30	4.5	5
BL 06252	13.34	12.72	12.99	13.32	3.5	3.9
ADM B8038279	14.72	15.40	12.79	16.71	3.3	3.9
ADM B8039279	13.78	14.79	13.62	16.20	3.5	3.5
GTS-1103	13.11	9.72	13.42	10.79	5.2	5.6
SEM BKBC6V1312	13.50	14.80	13.31	14.98	3.9	4.1
SEM BKBC6V1313	13.89	21.01	12.93	18.29	3	3
MSU B09175	14.14	13.11	12.91	12.62	2.7	3.5
MSU B10244	14.31	11.72	13.19	10.83	6.1	6.2
MSU B11334	14.11	17.77	12.51	16.78	3	3.6
MSU B11343	13.49	16.14	12.70	16.73	3.1	3.5
MSU B11355	14.27	13.43	12.16	13.58	4.9	5.1
MSU B11363	14.25	12.58	12.59	12.59	5.1	5.3

VARIETY	L Color	L Color	L Color	L Color	L Color	L Color	Rating	Rating	Rating
	Sanilac dry	Sanilac can	Ewald dry	Ewald can	Stout dry	Stout can	Sanilac Color	Ewald Color	Stout Color
ZORRO	13.28	14.89	14.37	13.45	21.74	14.28	4.7	4.1	4.6
SHANIA	13.11	14.93	14.46	16.49	18.50	14.76	4	4.3	4.1
LORETO	13.49	NA	14.64	14.74	20.90	13.09	4.3	3.9	4
BLACK VELVET			15.43	12.03	21.20	13.96		4.2	3.8
BL 04352	12.78	13.60			16.86	16.39	4.7		3.8
BL 06252	13.18	14.51	14.32	16.80	18.06	15.50	2.7	3.20	3.6
GTS-1103	13.58	11.96					4.8		
MSU B10244	13.74	13.13					5.3		
MSU B11343	13.25	15.81					2.8		
MSU B11363	13.95	13.04					4.7		



## 2013 Michigan Black Bean Canning, L-Scale Colorimeter and Subjective Rating Scores

2013 Color Ratings 1-5, 1=poor brown color, 5=excellent black color

Lowest L color Value=most black color

Locations	L color	Rating	L color	Rating	L color	Rating	L color	Rating
	Tuscola		Huron		Bay		Alcona	
ZORRO	14.95	3.58	15.24	3.42	15.92	3.42	17.04	3.42
SHANIA	16.62	3.00	16.56	3.08	17.98	2.83	15.60	3.08
LORETO	15.26	2.83	15.30	3.25				
MSU B10244	12.98	4.75	12.89	4.83	13.91	4.33	15.20	4.67
ECLIPSE	18.09	2.25	15.89	2.25	19.10	2.25	16.71	2.67
T-39	17.24	3.25	15.22	3.17				
BL 04352	14.21	3.58	14.79	3.58				
BL 06252	16.16	2.50	18.37	2.50				
BK 11352	17.59	2.58	15.56	2.75				
BL 11353	19.11	2.25	18.94	1.58				
BL 11355	15.46	2.83	17.57	3.50				
BL 11356	15.27	2.33	16.45	2.42				
MSU B11343	17.12	2.67	16.50	2.58				
MSU B11363	14.38	4.00	12.79	4.17				
MSU B12709	15.61	4.08	16.13	3.58				
MSU B12720	14.45	3.17	16.57	3.00				
MSU B12721	14.28	3.17	16.41	3.00				
MSU B12724	13.31	4.33	12.81	4.25				
ADM B8038279	15.84	2.58	15.87	2.42				
ADM B8039279	16.66	2.58	19.92	2.50				
ADM B8064307	16.63	2.75	15.63	3.58				
ADM B805229	14.63	2.75	14.13	3.17				
ADM B8035303	16.96	2.83			16.43	2.92		
ADM B8037283	16.64	2.75			17.98	2.83		
ADM B8039282	17.54	2.92			17.80	2.92		
SEM BKBC6C1206	18.34	2.00	19.28	2.25				
SEM BKBC6V1312	15.46	3.17	16.77	3.17				
SEM BKBC6V1313	18.45	1.58	17.74	2.25				
GTS 1103	13.34	4.25	13.82	4.33				
Planting	L color							
Dates	SVREC	Rating						
ZORRO 6-7-13	14.63	3.42						
ZORRO 6-25-13	NA	3.42						

2013 Michigan Black Bean Canning, L-Scale Colorimeter and Subjective Rating Scores

Continued

2013 Color Ratings 1-5, 1=poor brown color, 5=excellent black color

Lowest L color Value=most black color

	L Color		L Color		L Color		L Color	
	Gratiot	Rating	Montalm	Rating	Sanilac	Rating	Pigeon	Rating
ZORRO	16.68	3.17	15.35	3.58	15.98	3.75	15.61	3.42
SHANIA	15.68	3.17	20.42	3.25	16.72	3.33	16.89	3.50
LORETO							18.25	3.50
MSU B10244	13.51	4.50	11.14	4.67	13.63	4.58		
ECLIPSE	18.21	1.92			18.60	3.00	20.03	2.33
BL 04352							21.35	3.00
BL 06252							19.70	3.42

	L Color		L Color		L Color	
	Sandusky	Rating	Linwood	Rating	Oganic	Rating
ZORRO	15.53	3.50	15.92	3.00	14.41	3.67
SHANIA	17.35	3.08	18.04	3.17	15.78	3.17
LORETO	17.39	2.83	14.93	2.75		
MSU B10244					11.61	4.50
ECLIPSE	18.97	2.33	17.28	2.00		
T-39						
BL 04352	18.53	2.83	16.29	2.75		
BL 06252	18.35	3.33	15.53	3.00		

	Average	Average	Rating	L-Color
	Rating	L Color	Rank	Rank
ZORRO	3.44 (13)	15.61(12)	2	2
SHANIA	3.15 (11)	17.06	4-tie	6
LORETO	3.03 (5)	16.23	6	3-tie
MSU B10244	4.60 (8)	13.11	1	1
ECLIPSE	2.33 (9)	18.10	8	8
T-39	3.21 (2)	16.23	3	3-tie
BL 04352	3.15 (5)	17.03	4-tie	5
BL 06252	2.95 (5)	17.62	7	7

## Sprague Final Report

### Preharvest herbicide effects on black desiccation, yield, and color retention after canning

The first year of a 2-year field project was conducted at the Saginaw Valley Research and Extension Center near Richville, MI in 2013 to evaluate the effects preharvest herbicide applications on the desiccation, yield, and canning characteristics (including color retention) of three black bean varieties. Type II black bean varieties: 'Zorro', 'Eclipse', and 'B10244' were planted at two different dates, June 13 and June 26, for diverse growing conditions. Three desiccation treatments: 1) Gramoxone (2 pt/A) + non-ionic surfactant (0.25% v/v), 2) Roundup PowerMax (22 fl oz/A) + ammonium sulfate (2% w/w), 3) Sharpen (2 fl oz/A) + methylated seed oil (1% v/v) + ammonium sulfate (2% w/w) were compared to an untreated control for each variety. Desiccation treatments were applied at two different timings for each planting date: a) 50% of pods were yellow (early) and b) 80% of pods were yellow (normal). The early timing was to evaluate differences in desiccation treatments and many times there are areas in a field that may be at this stage when a desiccation treatment is made. Black bean desiccation was assessed at 3, 7, and 14 days after treatment (DAT) and yield direct harvested. After harvest samples were canned using industry standard small scale canning methods and evaluated for color retention, appearance, texture, and other industry important characteristics. A herbicide by variety interaction was observed in the first planting for the early application timing for dry bean desiccation. Gramoxone provided the greatest desiccation (>96%) for 'Eclipse' and 'B10244', 3 DAT. At 3 DAT, black bean desiccation with Roundup PowerMax was similar to the untreated for all varieties. By 7 DAT, all herbicide treatments were greater than the natural dry down of their untreated counterpart. Sharpen provided the greatest dry bean desiccation for both application timings 3 DAT for the second planting date. By 7 DAT, differences between herbicide and varieties were observed. Overall yield was lower for 'Eclipse' for the first planting date and yields were lower for 'Zorro' and 'B10244' when Gramoxone and Sharpen were applied early in the first planting. This may be due to the rapid desiccation observed that stopped the continued development of these beans. Yields were also lower for early applications of Gramoxone and Sharpen in the second planting. 'Zorro' also yielded slightly behind 'Eclipse' and 'B10244' for the early application at the later planting, which may partially be explained by the slight difference in maturity between 'Eclipse' and 'Zorro'. Overall differences in desiccation and yield were observed between the varieties. Black bean color measurements after canning indicated that the time of preharvest desiccation, preharvest product type, and variety had a major impact on the color retention of canned black beans. Color values (L-values) revealed that overall the three varieties varied in their canned color, with 'B10244' retaining its color better than 'Zorro', which was better than 'Eclipse'. Early preharvest applications to black beans also lost more color after canning than several of the later applications. The later application of Sharpen retained its color better than any of the other desiccation treatments. This research will be conducted again in 2014 to further evaluate these treatments and varieties.

# 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"> <li>• <b>Apply preplant incorporated only.</b></li> <li>• Refer to Table 5A for weed control and crop tolerance ratings.</li> <li>• Incorporate immediately after application.</li> <li>• <i>Eptam</i> suppresses common ragweed and wild mustard.</li> <li>• <b>Prowl (pendimethalin), trifluralin, or Sonalan</b> should be <b>tank mixed</b> with <i>Eptam</i> for additional broadleaf control, including lambsquarters.</li> <li>• <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.</li> <li>• <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>.</li> <li>• A postemergence application of <i>Basagran</i>, <i>Pursuit</i> or <i>Raptor</i> may be necessary for additional broadleaf control.</li> <li>• DO NOT use on adzuki beans.</li> <li>• Refer to label and Table 12 for crop rotation restrictions.</li> </ul>
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"> <li>• <b>Apply preplant incorporated only.</b></li> <li>• Refer to Table 5A for weed control and crop tolerance ratings.</li> <li>• Alachlor should be incorporated in the top 2 inches of soil to minimize the danger of bean injury.</li> <li>• DO NOT use on sands or sandy loam soils – injury can occur.</li> <li>• Alachlor provides better nightshade and pigweed control than metolachlor products.</li> <li>• <i>Prowl</i>, <i>trifluralin</i> or <i>Sonalan</i> can be tank-mixed for lambsquarters control.</li> <li>• <i>Pursuit</i> (2 oz) can be tank mixed for nightshade and additional broadleaf control.</li> <li>• A postemergence application of <i>Basagran</i>, <i>Pursuit</i> or <i>Raptor</i> may be necessary for additional broadleaf control.</li> <li>• DO NOT use on adzuki beans.</li> <li>• Refer to label and Table 12 for crop rotation restrictions.</li> </ul>
	pendimethalin ( <i>Prowl</i> ) OR ( <i>Prowl H<sub>2</sub>O</i> )	0.75	1.8 pt 3.3EC OR 1.6 pt 3.8CS	<ul style="list-style-type: none"> <li>• <b>Apply preplant incorporated only.</b></li> <li>• Refer to Table 5A for weed control and crop tolerance ratings.</li> <li>• Incorporate immediately after application.</li> <li>• <i>Prowl</i> provides better velvetleaf control than <i>trifluralin</i> or <i>Sonalan</i>.</li> <li>• <b>Prowl</b> should be <b>tank mixed</b> with <i>Eptam</i>. Other measures may need to be taken for additional broadleaf control.</li> <li>• Refer to label and Table 12 for crop rotation restrictions.</li> </ul>

(Continued on next page)

## Dry Edible Beans – Preplant Incorporated Only (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
(continued)				
<b>Annual grasses</b> <b>Annual broadleaves</b>	mazethapyr + pendimethalin <i>(Pursuit Plus)</i>	0.47	20 oz 2.9EC	<ul style="list-style-type: none"> <li>• <b>Apply preplant incorporated only.</b></li> <li>• Refer to Table 5A for weed control and crop tolerance ratings.</li> <li>• DO NOT use on sands or loamy sand soils.</li> <li>• DO NOT apply <i>Pursuit Plus</i> if cold and/or wet conditions are present or predicted to occur within one week of application.</li> <li>• 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.</li> <li>• 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.</li> <li>• On heavy soils with greater than 2% organic matter and heavy weed pressure, 30 oz of <i>Pursuit Plus</i> may be applied.</li> <li>• 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.</li> <li>• DO NOT apply within 60 days of harvest.</li> <li>• DO NOT use if SUGAR BEETS, CUCUMBERS, CANOLA or TOMATOES are in the rotation; requires 40 months and a soil bioassay.</li> <li>• Refer to label and Table 12 for crop rotation restrictions.</li> </ul>
	ethalfluralin <i>(Sonalan)</i>	0.75	2 pt 3EC	<ul style="list-style-type: none"> <li>• <b>Apply preplant incorporated only.</b></li> <li>• Refer to Table 5A for weed control and crop tolerance ratings.</li> <li>• Incorporate immediately after application.</li> <li>• <b>Sonalan</b> should be <b>tank mixed</b> with <b>Eptam</b>. Other measures may need to be taken for additional broadleaf control.</li> <li>• Refer to label and Table 12 for crop rotation restrictions.</li> </ul>
	trifluralin <i>(many)</i>	0.5	1 pt 4EC	<ul style="list-style-type: none"> <li>• <b>Apply preplant incorporated only.</b></li> <li>• Refer to Table 5A for weed control and crop tolerance ratings.</li> <li>• Incorporate immediately after application.</li> <li>• <i>Trifluralin</i> provides better pigweed control than <i>Prowl</i> or <i>Sonalan</i>.</li> <li>• <b>Trifluralin</b> should be <b>tank mixed</b> with <b>Eptam</b>. Other measures may need to be taken for additional broadleaf control.</li> <li>• Refer to label and Table 12 for crop rotation restrictions.</li> </ul>

## 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"> <li>• <b>May be applied preplant incorporated or preemergence.</b></li> <li>• Refer to Table 5A for weed control and crop tolerance ratings.</li> <li>• PREPLANT INCORPORATED <i>Dual Magnum</i> minimizes the danger of bean injury.</li> <li>• DO NOT apply if soil is cracking and beans are in the crook stage.</li> <li>• Reduce <i>Dual Magnum</i> rate to 1 pt/A on coarse-textured soils with low organic matter.</li> <li>• Preemergence applications require rainfall for incorporation. Rotary hoe if no rainfall occurs within 7 days.</li> <li>• <i>Dual Magnum</i> provides better yellow nutsedge control than <i>alachlor</i> or <i>Outlook</i>.</li> <li>• <i>Prowl</i>, <i>trifluralin</i> or <i>Sonalan</i> can be tank mixed preplant incorporated for lambsquarters control.</li> <li>• <i>Pursuit</i> (2 oz) can be tank mixed for nightshade and additional broadleaf control.</li> <li>• A postemergence application of <i>Basagran</i>, <i>Pursuit</i> or <i>Raptor</i> may be necessary for additional broadleaf control.</li> <li>• DO NOT apply <i>Dual Magnum</i> within 60 days of harvest.</li> <li>• DO NOT use on adzuki beans.</li> <li>• Refer to label and Table 12 for crop rotation restrictions.</li> </ul>
	dimethenamid-P ( <i>Outlook</i> )	0.66	14 oz 6L	<ul style="list-style-type: none"> <li>• <b>May be applied preplant incorporated or preemergence.</b></li> <li>• Refer to Table 5A for weed control and crop tolerance ratings.</li> <li>• PREPLANT INCORPORATED <i>Outlook</i> minimizes the danger of bean injury.</li> <li>• DO NOT apply if soil is cracking and beans are in the crook stage.</li> <li>• Reduce <i>Outlook</i> rate to 12 oz/A on coarse-textured soils with low organic matter.</li> <li>• Navy and black beans are more sensitive to <i>Outlook</i> applications than to <i>Dual Magnum</i>.</li> <li>• Preemergence applications require rainfall for incorporation. Rotary hoe if no rainfall occurs within 7 days.</li> <li>• <i>Outlook</i> provides better pigweed and nightshade control than <i>Dual Magnum</i>.</li> <li>• <i>Prowl</i>, <i>trifluralin</i>, or <i>Sonalan</i> can be tank mixed preplant incorporated for lambsquarters control.</li> <li>• <i>Pursuit</i> (2 oz) can be tank mixed for nightshade and additional broadleaf control.</li> <li>• A postemergence application of <i>Basagran</i>, <i>Pursuit</i>, or <i>Raptor</i> may be necessary for additional broadleaf control.</li> <li>• DO NOT apply <i>Outlook</i> within 70 days of harvest.</li> <li>• DO NOT use on adzuki beans.</li> <li>• Refer to label and Table 12 for crop rotation restrictions.</li> </ul>
	metolachlor ( <i>Parallel PCS</i> )	1.3	1.33 pt 8EC	<ul style="list-style-type: none"> <li>• <b>May be applied preplant incorporated or preemergence.</b></li> <li>• <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/ Dual II Magnum/Cinch</i> (s-metolachlor).</li> <li>• Refer to Table 5A for weed control and crop tolerance ratings.</li> <li>• See remarks and limitations for <i>Dual Magnum</i>.</li> <li>• DO NOT use on adzuki beans.</li> <li>• Refer to label and Table 12 for crop rotation restrictions.</li> </ul>

(Continued on next page)

## Dry Edible Beans – Soil Applied (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
<b>Annual grasses</b>	glyphosate + s-metolachlor (Sequence) + ammonium sulfate	1.64	3 pt 2.25L  + 17 lb/100 gal	<ul style="list-style-type: none"> <li>• May be applied preplant or preemergence.</li> <li>• <i>Sequence</i> contains 0.9 lb a.e./A of glyphosate and 1.2 pt/A of <i>Dual Magnum</i>.</li> <li>• <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>.</li> <li>• Refer to Table 5A for residual weed control and crop tolerance ratings.</li> <li>• DO NOT apply to emerged dry bean – severe injury will occur.</li> <li>• DO NOT apply more than 3.5 pt/A on coarse textured soils or 4 pt/A on medium and fine textured soils.</li> <li>• Apply only one application per crop year.</li> <li>• Refer to label and Table 12 for crop rotation restrictions.</li> </ul>
<b>Annual broadleaves</b>	halosulfuron (Permit/Sandea)	0.023	0.67 oz 75DG	<ul style="list-style-type: none"> <li>• <b>May be applied preplant incorporated or preemergence.</b></li> <li>• Refer to Table 5A for weed control and crop tolerance ratings.</li> <li>• Reduce the rate of <i>Permit/Sandea</i> to 0.5 oz/A on lighter textured soils with low organic matter.</li> <li>• <i>Permit/Sandea</i> can cause injury under cool and wet growing conditions.</li> <li>• Delayed maturity may result from applications of <i>Permit/Sandea</i>.</li> <li>• 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.</li> <li>• <i>Permit/Sandea</i> can be tank mixed with <i>Eptam</i> for grass and additional lambsquarters control.</li> <li>• <i>Permit/Sandea</i> can be tank mixed with metolachlor products or <i>Outlook</i> for annual grass control.</li> <li>• <i>Permit/Sandea</i> will not control ALS-resistant weed species.</li> <li>• DO NOT plant SUGAR BEETS within 21 months of a <i>Permit/Sandea</i> application.</li> <li>• Refer to label and Table 12 for crop rotation restrictions.</li> </ul>

*(Continued on next page)*

## Dry Edible Beans – Soil Applied (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
<b>Annual broadleaves</b>	imazethapyr <i>(Pursuit)</i>	0.031	2 oz 2L	<ul style="list-style-type: none"> <li>• <b>May be applied preplant incorporated or preemergence.</b></li> <li>• Refer to Table 5A for weed control and crop tolerance ratings.</li> <li>• DO NOT use on sands or loamy sand soils.</li> <li>• DO NOT apply <i>Pursuit</i> if cold and/or wet conditions are present or predicted to occur within 1 week of application.</li> <li>• 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.</li> <li>• On heavy soils with greater than 2% organic matter and heavy weed pressure, 3 oz of <i>Pursuit</i> may be applied.</li> <li>• <i>Pursuit</i> 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.</li> <li>• Preemergence applications require rainfall for incorporation. Rotary hoe if no rainfall occurs within 7 days.</li> <li>• <i>Pursuit</i> will NOT control common ragweed.</li> <li>• 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.</li> <li>• DO NOT apply within 60 days of harvest.</li> <li>• DO NOT use if SUGAR BEETS, CUCUMBERS, CANOLA or TOMATOES are in the rotation; requires 40 months and a soil bioassay.</li> <li>• Refer to label and Table 12 for crop rotation restrictions.</li> </ul>
	fomesafen <i>(Reflex)</i>	0.25	1 pt 2L	<ul style="list-style-type: none"> <li>• <b>May be applied preplant surface or preemergence.</b></li> <li>• Refer to Table 5C for weed control and crop tolerance ratings.</li> <li>• <i>Reflex</i> will provide 4-5 weeks of control and/or suppression of broadleaf weeds.</li> <li>• Rainfall that splashes treated soil onto newly emerged seedlings can cause temporary crop injury.</li> <li>• Tank mixtures or sequential herbicide applications are needed to broaden the spectrum of weed control.</li> <li>• <i>Reflex</i> can be applied only in the Lower Peninsula of Michigan.</li> <li>• DO NOT apply <i>Reflex</i> to the same field in CONSECUTIVE years.</li> <li>• The maximum use rate of <i>Reflex</i> per field is 1 pint per acre.</li> <li>• Refer to Table 12 for crop rotation restrictions.</li> </ul>



## Dry Edible Beans – Postemergence

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Grasses</b>	quizalofop-P-ethyl ( <i>Assure II/Targa</i> )	0.044	7 oz 0.88L	<ul style="list-style-type: none"> <li>• Refer to Table 5A for weed control and crop tolerance ratings.</li> <li>• Treat actively growing grasses (annual grasses up to 4 inches).</li> <li>• DO NOT apply to grasses under stress — poor weed control will result.</li> <li>• DO NOT cultivate within 5 days prior to and 7 days following application.</li> <li>• Allow 30 days between <i>Assure II/Targa</i> application and dry bean harvest.</li> <li>• <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.</li> <li>• Tank mixes with <i>Pursuit</i> and <i>Raptor</i> are not recommended — grass antagonism will occur.</li> <li>• <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.</li> <li>• Refer to label and Table 12 for crop rotation restrictions.</li> </ul>
	+		+	
	crop oil concentrate OR surfactant			
	fluazifop-P-butyl ( <i>Fusilade DX</i> )	0.188	12 oz 2L	<ul style="list-style-type: none"> <li>• Refer to Table 5A for weed control and crop tolerance ratings.</li> <li>• Apply 6 oz/A of <i>Fusilade DX</i> to control volunteer corn.</li> <li>• Allow 60 days between <i>Fusilade DX</i> application and dry bean harvest.</li> <li>• Two applications 7-14 days apart are usually needed for control of perennial grasses.</li> <li>• Tank mixes with <i>Pursuit</i> and <i>Raptor</i> are not recommended — grass antagonism will occur.</li> <li>• DO NOT apply more than 48 oz/A of <i>Fusilade DX</i> per season.</li> <li>• Refer to label and Table 12 for crop rotation restrictions.</li> </ul>
+			+	
crop oil concentrate			1%	
	sethoxydim ( <i>Poast</i> )	0.19	1 pt 1.5SC	<ul style="list-style-type: none"> <li>• Refer to Table 5A for weed control and crop tolerance ratings.</li> <li>• 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.</li> <li>• DO NOT apply to grasses under stress — poor weed control will result.</li> <li>• DO NOT cultivate within 5 days prior to and 7 days following application.</li> <li>• Allow 30 days between <i>Poast</i> application and dry bean harvest.</li> <li>• <i>Poast</i> is generally less effective than other postemergence grass herbicides for perennial grass control.</li> <li>• Tank mixes with <i>Pursuit</i> and <i>Raptor</i> are not recommended — grass antagonism will occur.</li> <li>• Refer to label and Table 12 for crop rotation restrictions.</li> </ul>
+			+	
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>				
<b>Grasses</b>	clethodim ( <i>Select/Arrow</i> )	0.094	6 oz 2EC	<ul style="list-style-type: none"> <li>• Refer to Table 5A for weed control and crop tolerance ratings.</li> <li>• 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.</li> <li>• 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.</li> <li>• DO NOT apply to grasses under stress — poor weed control will result.</li> <li>• DO NOT cultivate within 7 days prior to and 7 days following application.</li> <li>• Allow 30 days between application and dry bean harvest.</li> <li>• <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).</li> <li>• Tank mixes with <i>Pursuit</i> and <i>Raptor</i> are not recommended — grass antagonism will occur.</li> <li>• <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.</li> <li>• Refer to label and Table 12 for crop rotation restrictions.</li> </ul>
	+	+	+	
crop oil concentrate			1%	
OR			OR	
( <i>Select Max</i> )	0.068	9 oz 0.97EC		
+			+	
surfactant			0.25%	
+			+	
ammonium sulfate			2.5 lb	
<b>Annual Broadleaves</b>	bentazon ( <i>Basagran</i> )	0.75	1.25 pt 4L	
+	+	+	+	
crop oil concentrate			1 qt	

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## Dry Edible Beans – Postemergence (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
(continued)				
<b>Annual Broadleaves</b>	halosulfuron ( <i>Permit</i> ) + surfactant	0.023	0.67 oz 75WG  + 0.25%	<ul style="list-style-type: none"> <li>• Refer to Table 5A for weed control and crop tolerance ratings.</li> <li>• Most effective on small weeds (less than 2 inches).</li> <li>• Apply when beans have 1-3 trifoliolate leaves.</li> <li>• DO NOT apply if dry beans have begun to flower.</li> <li>• <i>Permit</i> can be tank-mixed with other herbicides for additional broadleaf and grass control.</li> <li>• Dry bean varieties and classes vary in their tolerance to <i>Permit</i>. From MSU research, CAUTION should be taken when applying to kidney and black beans. Under adverse conditions maturity of the treated crop can be delayed which can affect harvest date, yield, and quality.</li> <li>• DO NOT use on adzuki beans.</li> <li>• DO NOT plant SUGARBEETS within 21 months of <i>Permit</i> application.</li> <li>• Refer to Table 12 for crop rotation restrictions.</li> </ul>
	imazethapyr ( <i>Pursuit</i> ) + surfactant	0.031	2 oz 2L  + 0.25%	<ul style="list-style-type: none"> <li>• Refer to Table 5A for weed control and crop tolerance ratings.</li> <li>• Most effective on small weeds (less than 2 inches).</li> <li>• Beans MUST HAVE one fully expanded trifoliolate before application.</li> <li>• DO NOT apply if dry beans have begun to flower.</li> <li>• Apply <i>Pursuit</i> with non-ionic surfactant (0.25% v/v).</li> <li>• 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.</li> <li>• Increase the rate of <i>Basagran</i> (16 oz) when tank mixed with <i>Pursuit</i> to control common cocklebur and jimsonweed.</li> <li>• 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.</li> <li>• DO NOT tank mix with postemergence grass herbicides — grass antagonism will occur.</li> <li>• 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.</li> <li>• DO NOT apply within 60 days of harvest.</li> <li>• DO NOT use if sugar beets, cucumbers, canola or tomatoes are in the rotation; requires 40 months and a soil bioassay.</li> <li>• DO NOT use on adzuki beans.</li> <li>• Refer to label and Table 12 for crop rotation restrictions.</li> </ul>

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## Dry Edible Beans – Postemergence (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
<b>Annual Broadleaves</b>	imazamox <i>(Raptor)</i>	0.032	4 oz 1L	<ul style="list-style-type: none"> <li>• Refer to Table 5A for weed control and crop tolerance ratings.</li> <li>• Most effective on small weeds (less than 2 inches).</li> <li>• Beans MUST HAVE one fully expanded trifoliolate before application.</li> <li>• DO NOT apply if dry beans have begun to flower.</li> <li>• DO NOT apply if planting is delayed and frost is likely to occur prior to maturity.</li> </ul>
	+		+	
	bentazon <i>(Basagran)</i>	0.25	8 oz 4L	<ul style="list-style-type: none"> <li>• DO NOT apply if dry beans have begun to flower.</li> <li>• DO NOT apply if planting is delayed and frost is likely to occur prior to maturity.</li> <li>• Apply <i>Raptor</i> with crop oil concentrate (1% v/v) or a non-ionic surfactant (0.25% v/v).</li> <li>• At least 8 fl oz of <i>Basagran</i> <b>must</b> 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.</li> <li>• 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).</li> <li>• DO NOT tank mix with postemergence grass herbicides — grass antagonism will occur.</li> <li>• DO NOT apply within 60 days of harvest.</li> <li>• DO NOT use the combination of <i>Raptor</i> + <i>Basagran</i> on adzuki beans. <i>Basagran</i> causes significant injury to adzuki beans.</li> <li>• Refer to label and Table 12 for crop rotation restrictions.</li> </ul>
	+		+	
	crop oil concentrate		1%	
	+		+	
	ammonium sulfate		2.5 lb	
	fomesafen <i>(Reflex)</i>	0.25	1 pt 2L	<ul style="list-style-type: none"> <li>• Refer to Table 5A for weed control and crop tolerance ratings.</li> <li>• Most effective on small weeds; common ragweed 4-inches or less and eastern black nightshade 2-inches or less.</li> <li>• Common ragweed less than 4-inches will be controlled with 0.5 pt/A of <i>Reflex</i>.</li> <li>• Beans MUST HAVE one fully expanded trifoliolate before application.</li> <li>• 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.</li> <li>• <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.</li> <li>• <i>Reflex</i> can be applied only in the Lower Peninsula of Michigan.</li> <li>• DO NOT apply <i>Reflex</i> to the same field in CONSECUTIVE years.</li> <li>• DO NOT apply within 45 days of harvest.</li> <li>• Refer to Table 12 for crop rotation restrictions.</li> </ul>
	+		+	
	surfactant		0.25%	

# 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"> <li>• Glyphosate should ONLY be used to control weeds that hinder harvest.</li> <li>• Not all glyphosate products are labeled for <b>Preharvest</b> 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.</li> <li>• <b>DO NOT</b> use glyphosate for <b>vine desiccation</b> — residues of glyphosate have been found in harvested beans if applications are made too early.</li> <li>• Glyphosate should be applied when beans are in the <b>hard dough stage (30% moisture or less)</b>.</li> <li>• Glyphosate applications should be made at least 7 days before harvest.</li> <li>• ONLY one application should be made per year.</li> <li>• DO NOT apply glyphosate to beans grown for seed.</li> <li>• DO NOT feed treated vines and hay from these crops to live-stock.</li> </ul>
	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"> <li>• <i>Gramoxone SL 2.0</i> is a restricted-use pesticide.</li> <li>• 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.</li> <li>• Always add a non-ionic surfactant at 0.25% v/v or a crop oil concentrate at 1% v/v.</li> <li>• Apply by air in 5 gal water/A or by ground in 20-40 gal of water/A.</li> <li>• 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>.</li> <li>• Do not harvest within 7 days of application.</li> </ul>
	paraquat ( <i>Parazone</i> ) + surfactant	0.5	1.33 pt 3SL  + 0.25%	<ul style="list-style-type: none"> <li>• <i>Parazone</i> is a restricted-use pesticide.</li> <li>• <i>Parazone</i> contains the same active ingredient as <i>Gramoxone SL 2.0</i> (paraquat), but is at a different concentration.</li> <li>• See the Remarks and Limitation section for <i>Gramoxone SL 2.0</i>.</li> </ul>
	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"> <li>• 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.</li> <li>• <i>Sharpen</i> can be applied at rates up to 2 oz/A.</li> <li>• Dry beans can be harvested 2 days after application. However, it generally takes 7 days to reach maximum desiccation activity.</li> <li>• <i>Sharpen</i> is an effective desiccant.</li> <li>• DO NOT apply to beans grown for seed.</li> <li>• DO NOT graze or feed desiccation-treated hay or straw to livestock.</li> <li>• 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.</li> <li>• Refer to label and Table 12 for crop rotation restrictions.</li> </ul>

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## Preharvest Treatments in Dry Edible Beans (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
<b>Preharvest</b>	flumioxazin ( <i>Valor</i> ) + methylated seed oil	0.05	1.5 oz 51WG  + 1 qt	<ul style="list-style-type: none"> <li>• 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.</li> <li>• <i>Valor</i> can be applied at rates up to 2 oz/A.</li> <li>• 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.</li> <li>• Dry bean desiccation is similar to that from <i>Gramoxone</i> and glyphosate; however, the spectrum of weed control is not as broad.</li> <li>• <i>Valor</i> provides residual activity that may reduce winter annual growth.</li> <li>• Follow sprayer clean-up instructions — residues of <i>Valor</i> can be trapped in poly-tanks and hoses if not adequately cleaned.</li> <li>• Crop rotation restrictions are dependent on rainfall, <i>Valor</i> use rate and tillage.</li> <li>• 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.</li> <li>• Refer to label and Table 12 for crop rotation restrictions.</li> </ul>

# 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)	PIGWEED	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	
<b>Preplant Incorporated</b>																									
DUAL MAGNUM/PARALLEL	15	2	N	N	P	F	<b>G</b>	P	P	N	P	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>G</b>	<b>G</b>	F	N	N	N	N	<b>G</b>	
EPTAM	8	2	P	P	<b>G</b>	F	F	F	F	F	F	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>G</b>	N	N	N	F	F	
INTRRO	15	3	N	N	P	<b>G</b>	<b>G</b>	P	P	N	P	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>G</b>	<b>G</b>	F	N	N	N	N	F	
OUTLOOK	15	3 <sup>a</sup>	N	N	P	<b>G</b>	<b>G</b>	P	P	N	P	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>G</b>	<b>G</b>	P	N	N	N	N	F	
PROWL H <sub>2</sub> O/PROWL	3	1	N	N	<b>G</b>	P	F	P	P	F	P	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>G</b>	N	N	N	N	N	
PURSUIT	2	3	F	F	P	<b>E</b>	<b>E</b>	P	F	F	<b>G</b>	P	P	F	F	F	P	P	P	N	N	N	N	F	
PURSUIT PLUS	2/3	3	F	F	<b>G</b>	<b>E</b>	<b>E</b>	P	F	<b>G</b>	<b>G</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>G</b>	N	N	N	N	F	
SONALAN	3	1	N	N	<b>G</b>	F	<b>G</b>	P	P	N	P	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>G</b>	N	N	N	N	N	
TRIFLURALIN	3	1	N	N	<b>G</b>	N	<b>G</b>	N	P	N	P	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>G</b>	N	N	N	N	N	
<b>Preemergence</b>																									
DUAL MAGNUM/PARALLEL	15	2	N	N	P	F	<b>G</b>	P	P	N	P	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>G</b>	<b>G</b>	F	N	N	N	N	F	
OUTLOOK	15	3 <sup>a</sup>	N	N	P	<b>G</b>	<b>G</b>	P	P	N	P	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>G</b>	<b>G</b>	P	N	N	N	N	F	
PERMIT/SANDEA	2	3	F	F	F	P	<b>E</b>	<b>G</b>	P	<b>G</b>	<b>E</b>	N	N	N	N	N	N	N	N	N	N	N	N	F	
PURSUIT	2	3	P	P	P	<b>E</b>	<b>E</b>	P	F	P	<b>G</b>	P	P	F	F	F	P	P	P	N	N	P	N	F	
REFLEX	14	2	P	P	<b>G</b>	<b>E</b>	<b>E</b>	<b>G</b>	<b>G</b>	P	<b>E</b>	N	N	N	N	N	N	N	N	N	N	N	N	N	
SEQUENCE <sup>b</sup>	9/15	2	N	N	P	F	<b>G</b>	P	P	N	P	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>G</b>	<b>G</b>	F	N	N	N	N	F	
<b>Postemergence</b>																									
ASSURE II/TARGA	1	1	N	N	N	N	N	N	N	N	N	<b>G</b>	<b>G</b>	<b>E</b>	<b>E</b>	<b>G</b>	<b>E</b>	<b>E</b>	<b>E</b>	N	N	N	<b>E</b>	N	
BASAGRAN <sup>c</sup>	6	2	<b>E</b>	<b>G</b>	F	P	P	F	<b>E</b>	<b>G</b>	<b>E</b>	N	N	N	N	N	N	N	N	N	N	<b>G</b>	N	<b>G</b>	
FUSILADE DX	1	1	N	N	N	N	N	N	N	N	N	<b>E</b>	<b>G</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	N	N	N	<b>G</b>	N	
PERMIT	2	3	<b>E</b>	<b>G</b>	N	P	<b>E</b>	<b>G</b>	F	<b>G</b>	<b>E</b>	N	N	N	N	N	N	N	N	P	P	P	N	<b>E</b>	
POAST	1	1	N	N	N	N	N	N	N	N	N	<b>E</b>	<b>G</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	N	N	N	F	N	
PURSUIT <sup>d</sup>	2	3	F	P	P	<b>E</b>	<b>E</b>	P	F	F	<b>E</b>	P	P	F	P	P	P	P	P	N	N	P	N	F	
PURSUIT <sup>d</sup> + BASAGRAN	2/16	2	<b>E</b>	<b>G</b>	F	<b>E</b>	<b>E</b>	F	<b>G</b>	<b>G</b>	<b>E</b>	P	P	F	P	P	P	P	P	N	N	<b>G</b>	N	<b>G</b>	
RAPTOR <sup>d</sup>	2	3	F	F	F	<b>E</b>	<b>E</b>	P	F	<b>G</b>	<b>E</b>	F	P	F	P	P	P	P	P	N	N	P	N	P	
RAPTOR <sup>d</sup> + BASAGRAN (8 oz)	2/6	2	<b>G</b>	F	F/ <b>G</b>	<b>E</b>	<b>E</b>	F	<b>G</b>	<b>G</b>	<b>E</b>	F	P	F	P	P	P	P	P	N	N	F	N	F	
RAPTOR <sup>de</sup> + BASAGRAN (16 oz)	2/6	2	<b>E</b>	<b>G</b>	<b>G</b>	<b>E</b>	<b>E</b>	F	<b>E</b>	<b>G</b>	<b>E</b>	P	P	F	P	P	P	P	P	N	N	<b>G</b>	N	F	
REFLEX	14	2	P	F	P	<b>G</b>	<b>G</b>	<b>E</b>	P	P	<b>E</b>	N	N	N	N	N	N	N	N	N	N	N	N	N	
REFLEX + BASAGRAN	6/14	2	<b>E</b>	<b>G</b>	F/ <b>G</b>	<b>G</b>	<b>G</b>	<b>E</b>	<b>E</b>	<b>G</b>	<b>E</b>	N	N	N	N	N	N	N	N	N	N	F	N	<b>G</b>	
REFLEX + RAPTOR <sup>e</sup>	2/14	3	F	F	F	<b>E</b>	<b>E</b>	<b>E</b>	F	<b>G</b>	<b>E</b>	F	P	F	P	P	P	N	N	N	N	P	N	P	
SELECT/SELECT MAX/ARROW	1	1	N	N	N	N	N	N	N	N	N	<b>E</b>	<b>G</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	N	N	N	<b>G</b>	N	

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

Herbicide Effectiveness: P = Poor; F = Fair; **G** = Good; **E** = 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.

<sup>a</sup> 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*.

<sup>b</sup> 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.

<sup>c</sup> Control of **hairy nightshade** with *Basagran* is good.

<sup>d</sup> Control of **hairy nightshade** with *Pursuit* and *Raptor* is excellent.

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





D802-13 B10294  
Tri:25 Plot: 216 Rep:2  
Gramoxone Timing: B  
**463**

D802-13 Eclipse  
Tri:4 Plot: 217 Rep:2  
Untreated Timing: A  
**464**