

2015 Dry Bean Research Report

Assessment and optimization of pre-harvest
strategies suitable for direct-cut dry beans
within the State of Michigan



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 “Assessment and optimization of pre-harvest strategies suitable for direct-cut dry beans within the State of Michigan”. Main areas of study were Dry Bean Desiccants and Harvest Aids, Dry Bean Variety, and White Mold Disease Control.

Expected outcomes from this project are:

1. Assessment of late-season weed and bean plant desiccant pre-harvest strategies for production of dry beans in Michigan.
2. Assessment of selected dry bean cultivars and breeding lines suitable for pre-harvest senescence(“dry down”)without loss of yield potential.
3. Engagement and demonstrations appropriate for training growers in the optimum pre-harvest strategies to employ in the management of dry beans as a profitable crop.
4. Recommend to growers specific dry bean white mold disease control strategies including varietal tolerance, biological and chemical fungicides.

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Front Cover: Dry Bean Variety Trial in Gratiot County at Bebow Farms.
 Top Back Cover: Green Stems of Merlin Navy and Eldorado Pinto before Desiccant Spray at SVREC. Bottom Back Cover: Nearly 100% Anthracnose Infection in the Anthracnose Control Trial.

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

VARIETY	YIELD	PICK%	MOISTURE	LODGE	HEIGHT	POPULATION
Zorro	23.6	7.8	17.5	2	22.1	109,674
Zenith	23.6	9.2	17.3	2	22.2	115,769
Loreto	22.9	7.9	17.6	2.5	21.3	119,438
Shania	22.4	6.1	17.1	2.5	22.8	116,640
Black Cat	22.1	8.7	17.4	2.5	21.3	121,637
Eclipse	20.7	9.5	17.1	1.5	21.7	118,754

Previous Crop: Corn

Planted: June 9

Harvested: September 28

Lodge rating is 1=erect, 5=flat

Pick %=FM+Pick+SO

Planting Population= 128,000

Fertilization=18 gallons of 28%+2 gallons thiosol (AMS)

Herbicides=PPI 1 pt Treflan+1pt Dual+1 qt. Eptam

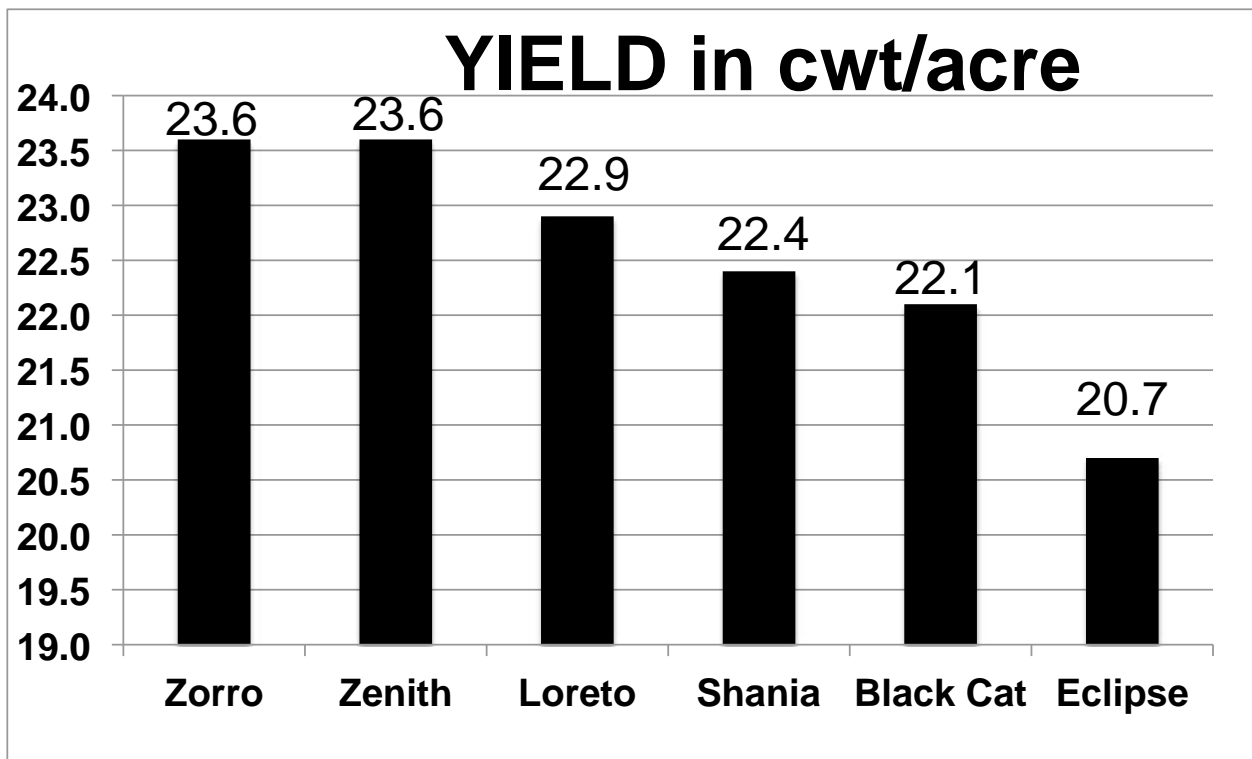
Post= 8 oz Basagran+2 oz Raptor+6 oz Reflex

Fungicides=8 oz Omega

Insecticide=applied with herbicide and fungicide

Harvest Aid=22 oz Roundup

Harvest area=.4 Acres



BLACK BEAN VARIETY STRIP TRIAL- 30 INCH ROWS
Kevin Klink Farm, Delta Co., Garden, Michigan

VARIETY	YIELD	PICK %	MOISTURE
Zorro	22.3	3.0	15.6
Shania	20.8	6.1	16.7
Eclipse	20.6	7.3	16.7
Black Cat	18.9	3.6	16.3
Loreto	17.7	2.8	16.3
Zenith	17.2	4.9	16.5

Planted: June 17

Harvested: October 19

Pick %=FM+Pick+SO

Planting Population= 124,000

Fertilization=75 Pounds of 0-0-62/Acre Spread

12 gallon of 10-34-0

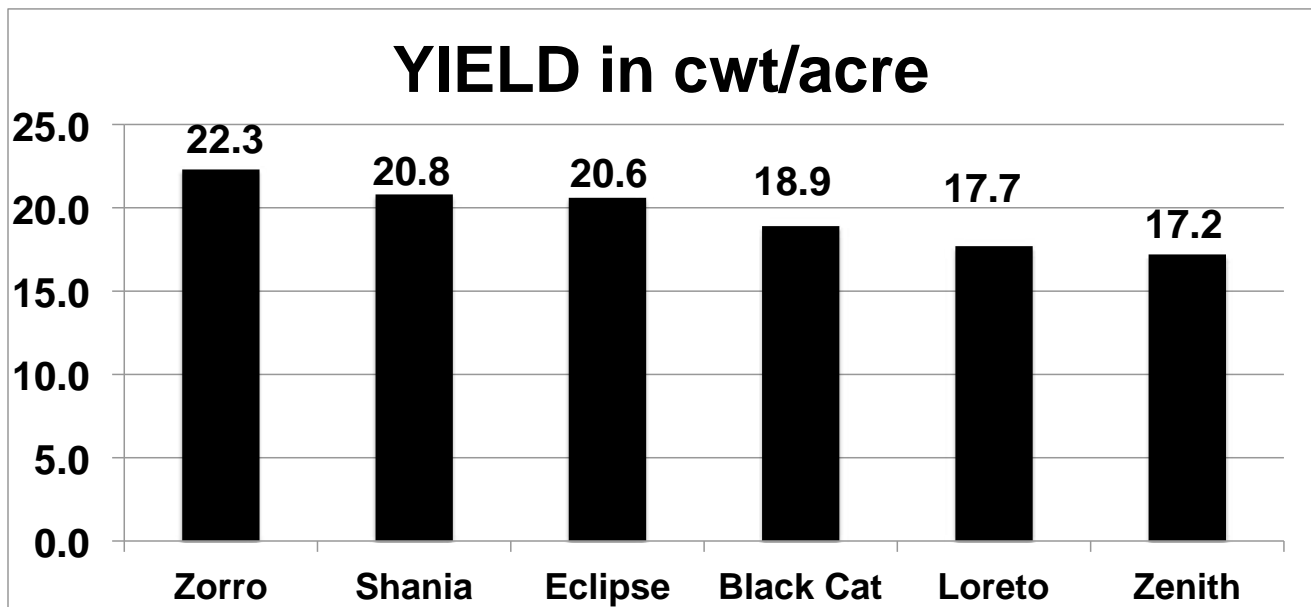
Herbicide=PRE-EMERGE 2 oz. Thunder + 1.75 pts. Prowl

Fungicides=None

Previous Crop: Hay

Harvest Aid=None

Harvest area=.89 Acres



2015 White Mold Fungicide Trial

Greg Varner, Michigan Dry Bean Production Research Advisory Board
 Doug Bismack Farm-Minden City and Cooperative Elevator Co.-Ruth, MI

Minden City # 1

TREATMENT	RATE	YIELD	%INCIDENCE	%SEVERITY	%PICK
UNTREATED		2379	75	59	3.9
ENDURA	8 oz	2799	56	41	2.2
PROLINE	5.7 oz	3105	52	37	2.1
PROPULSE	8.6 oz	3125	34	21	1.9
OMEGA	8 oz	3195	62	45	2.0
APROACH	12 oz	2990	47	34	2.2

LSD=494 LSD=16.9 LSD=14.6 LSD=0.5
 C.V.=11.2% C.V.=26.2% C.V.=32.8% C.V.=16.8%

Minden City # 2

TREATMENT	RATE	YIELD	%INCIDENCE	%SEVERITY	%PICK
Untreated		2497	81	65	4.0
ENDURA	8 oz	3128	53	41	1.9
PROPULSE	8.6 oz	3180	37	27	2.2
OMEGA	8 oz	3242	59	44	2.0
APROACH	12 oz	3127	52	41	2.5
APROACH+ENDURA	8 oz +8 oz	3337	48	36	1.9
2ND-OMEGA	8 oz				

LSD=402 LSD=15.7 LSD=13.7 LSD=0.8
 C.V.=9.6% C.V.=18.6% C.V.=21.1% C.V.=18.4%

Ruby Small Red Beans planted in 20" rows.

Planted: June 5, Harvested: September 17, First Spray: July 24, Second Spray: August 4

Rating Date for % infection and % severity on September 17

Two applications 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.

2015 Eastern Huron County White Mold Fungicide Trial

Greg Varner, Michigan Dry Bean Production Research Advisory Board

Buckley Creek Farms LLC. and Cooperative Elevator Co.-Ruth, MI. Trial in Rapson Area

TREATMENT	RATE	YIELD	%INCIDENCE	%SEVERITY	%PICK
Untreated		2093	79	60	4.0
PROPULSE	8 oz	2565	57	45	3.1
PROPULSE	10.3 oz	2766	59	45	2.6
ENDURA	8 oz	2666	59	45	3.0
OMEGA	8 oz	2932	62	49	2.5
APROACH	12 oz	2141	65	53	3.8
APROACH+ENDURA	8 oz + 8 oz	2821	57	40	2.3
2ND-OMEGA	8 oz				
		LSD=449	LSD=15.0	LSD=12.4	LSD=0.8
		C.V.=11.8%	C.V.=16.2%	C.V.=17.4%	C.V.=18.7%

Merlot Small Red Beans planted in 20" rows.

Sprayed on July 24 and August 4 and Harvested September 17

Rating Date for % infection and % severity on September 17

Two applications 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.

2015 Anthracnose Fungicide Trial

Greg Varner, Michigan Dry Bean Production Research Advisory Board

Varner Farm-Merrill

TREATMENT	RATE	YIELD	RATING
UNTREATED		295	8.8
PRIAXOR	6 oz	2508	0.8
HEADLINE	6.8 oz	2095	2.0
PROPULSE	8 oz	1632	5.3
VERTISAN	13.7 oz	298	8.0
		LSD=452	LSD=0.9
		C.V.=23.0%	C.V.=12.2%

Zorro Black Beans planted June 25 in 20 inch rows. Trial sprayed on August 5, 14 and 27.

Bean plants were inoculated with anthracnose spores eight hours after first spray.

Beans were re-inoculated on August 12. Trial was harvested on October 15.

Rating (1-9) can be multiplied by 10 to show percentage. Rating was conducted on October 5.

Applications 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.

2015 Desiccant/Harvest Aid Trial on Green Stem and Fast Dry-Down Dry Bean Varieties
Greg Varner, Michigan Dry Bean Production Research Advisory Board
Trial Conducted at the Saginaw Valley Research and Extension Center

Zenith Black Beans

TREATMENT	RATES	%DRY DOWN	YIELD
Glyphosate + AMS	22 oz	95	2734
Sharpen + Aim + MSO + AMS	1 oz + 1 oz	96	2757
Gramoxone + Aim + NIS	24 oz + 1 oz	92	2510
Untreated Check		65	2810
			LSD=247
			C.V.=6%

Zorro Black Beans

TREATMENT	RATES	%DRY DOWN	YIELD
Glyphosate + AMS	22 oz	94	2528
Sharpen + Aim + MSO + AMS	1 oz + 1 oz	95	2192
Gramoxone + Aim + NIS	24 oz + 1 oz	93	2201
Untreated Check		67	2488
			LSD=335
			C.V.=9%

Medalist Navy Beans

TREATMENT	RATES	%DRY DOWN	YIELD
Glyphosate + AMS	22 oz	96	2159
Sharpen + MSO + AMS	2 oz	98	2225
Gramoxone + NIS	24 oz	95	2121
Untreated Check		85	2173
			LSD=288
			C.V.=8%

Merlin Navy Beans

TREATMENT	RATES	%DRY DOWN	YIELD
Glyphosate + AMS	22 oz	97	2192
Sharpen + MSO + AMS	2 oz	98	2314
Gramoxone + NIS	24 oz	96	2120
Untreated Check		84	2202
			LSD=283
			C.V.=8%

Eldorado Pinto Beans

TREATMENT	RATES	%DRY DOWN	YIELD
Glyphosate + AMS	22 oz	97	2107
Sharpen + MSO + AMS	1 oz	97	1947
Sharpen + MSO + AMS	2 oz	99	2172
Gramoxone + NIS	24 oz	95	1826
Untreated Check		82	1991
			LSD=288
			C.V.=9%

Zenith Black Beans planted on June 5 and all other dry beans were planted June 6.
 Zenith and Zorro Black Beans were sprayed on August 31.
 Green Stem Medalist, Merlin Navy and Eldorado Pinto were sprayed on September 12.
 Percent dry down rating taken 7 days after treatment.
 All the dry beans were harvested on September 22.

EXPERIMENT 5101 STANDARD NAVY YIELD TRIAL

PLANTING DATE: 6/4/15

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

NAME	PEDIGREE	YIELD CWT100 SEED DAYS TO DAYS TO LODGING HEIGHT DES.						
		/ACRE	WT. (g)	FLOWER MATURITY	(1-5)	(cm)	SCORE	
N14229	N11275/N11256	28.7	17.2	46.0	96	1.0	50.0	5.3
N14218	N11256/N11298	27.5	18.4	46.0	98	1.0	50.5	5.3
N13142	N08007/N09046	26.1	18.3	46.0	96	1.0	49.8	4.0
N14243	N11284/N11277	26.1	17.3	46.0	93	1.0	48.5	4.3
N14230	N11275/N11256	25.7	17.4	46.0	95	1.3	49.8	5.0
N12457	B09174/N09056	25.5	18.7	45.0	94	1.0	48.0	3.8
N14201	N11249/N11256	25.1	18.2	46.0	97	1.0	52.0	5.5
N11283	MEDALIST/N08003, ALPENA	24.7	19.1	45.0	98	1.3	50.5	4.3
I11264	COOP 03019, MERLIN	24.3	19.1	45.0	99	1.8	50.0	3.3
N12447	B09174/N09056	24.3	19.8	46.0	98	1.3	49.5	4.0
N13131	N09175/N08007	23.6	19.2	45.0	94	1.0	48.3	4.3
N14247	B11343/B11271	23.2	17.6	46.0	94	1.0	49.3	4.3
N13120	N08003/N05324	23.2	20.4	45.0	94	1.0	49.0	5.0
N14210	N11256/N11262	23.1	21.3	46.0	94	1.0	48.0	3.8
N14215	N11256/N11292	23.0	16.3	45.0	96	1.0	47.8	3.5
N14225	N11257/N11280	23.0	20.1	45.0	93	1.0	48.3	3.8
N12454	B09174/N09056	22.9	19.2	45.0	95	1.0	48.8	3.3
I15627	ISB2884-4	22.7	24.1	44.0	98	1.0	49.0	3.0
N14216	N11256/N11292	21.9	17.4	45.0	95	1.0	48.5	4.0
N14206	N11256/N11258	21.7	18.7	45.0	98	1.0	48.3	3.5
I15621	MIST	21.7	21.1	45.0	110	1.5	49.5	3.0
N14238	Alpena/N11249	21.6	18.4	45.0	93	1.0	48.3	3.5
N14205	N11256/N11258	21.4	19.4	45.0	96	1.0	48.0	3.5
N14240	Alpena/N11264	21.3	19.3	46.0	93	1.0	47.3	3.5
N14202	N11249/N11256	21.3	21.1	45.0	98	1.0	51.3	3.5
N14208	N11256/N11262	21.1	20.0	45.0	93	1.0	47.0	3.8
N13139	N05324/MEDALIST	20.9	18.6	46.0	96	1.5	49.0	3.3
N14223	N11257/N11256	20.5	17.9	45.0	100	1.3	53.0	4.5
N13135	N10102/N09046	20.0	19.0	45.0	94	1.0	48.0	3.8
N11264	N08003/MEDALIST	19.4	19.7	45.0	95	1.3	47.3	3.3
N14221	N11257/N11249	19.0	20.8	46.0	105	1.0	50.0	3.3
I15628	LIGHTHOUSE	18.8	21.2	45.0	109	1.5	50.0	3.0
N14231	N11275/N11264	18.2	20.7	45.0	94	1.3	48.8	3.3
N14224	N11257/N11280	17.7	19.0	45.0	95	1.0	48.5	3.3
I08902	HYLAND T9905	16.8	21.7	45.0	110	1.8	50.8	3.0
I15614	IG-10M	16.6	22.2	39.0	92	1.0	46.3	3.0
I14502	FATHOM	16.2	21.2	39.0	108	2.0	50.3	3.0
N14219	N11257/N11249	16.0	18.2	46.0	95	1.0	48.3	3.3
N13140	N05324/MEDALIST	15.7	18.4	46.0	98	1.3	48.5	3.0
I15625	ND070612	15.0	20.1	45.0	105	2.0	51.3	3.0
I08958	Mayflower/Avanti, MEDALIST	14.6	22.4	46.0	106	2.0	51.8	3.0
I15629	ISB96-3156	14.6	22.2	38.0	91	1.0	43.8	3.0
MEAN (42)		21.3	19.5	44.6	97.3	1.2	49.0	3.7
LSD (.05)		3.7	1.0	0.6	2.7	0.3	1.5	0.8
CV (%)		14.9	4.5	0.9	2.3	22.9	2.5	17.4

EXPERIMENT 5103 PRELIMINARY NAVY YIELD TRIAL

PLANTING DATE: 6/4/15

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

NAME	PEDIGREE	YIELD CWT 100 SEED DAYS TO LODGING HEIGHT DES.						
		/ACRE	WT. (g)	FLOWER MATURITY	(1-5)	(cm)	SCORE	
N15331	N12438/N12468	31.1	19.6	45.0	96	1.0	49.0	4.3
N15343	N11227/X12519	29.8	19.7	45.0	96	1.0	49.3	4.7
N15318	N11277/N09034	29.1	20.0	45.0	96	2.0	50.7	5.0
N15341	N12468/N12466	28.4	17.6	45.0	94	1.0	50.0	5.7
N15345	N11258/X12508	28.3	21.7	45.0	99	1.0	52.7	4.7
N15334	N12442/N11277	27.8	24.8	45.0	102	1.0	54.7	4.0
N15330	N12438/N11258	27.2	20.3	45.0	100	1.3	49.0	3.3
N15335	N12453/N11277	26.4	17.1	45.0	93	1.0	46.3	4.7
N15339	N12468/N11292	26.3	17.4	45.0	97	1.0	47.0	4.0
N15321	N11277/N11258	25.8	18.6	45.0	93	1.0	48.3	4.0
N15306	N11230/N11298	25.2	19.9	46.0	98	1.0	48.3	3.7
N15338	N12466/N11258	25.1	16.1	45.0	93	1.3	50.0	4.3
N15301	N09034/N11292	24.5	16.7	45.0	92	1.0	47.7	4.0
N15329	N12438/N11258	24.5	19.9	45.0	98	2.0	51.0	3.3
N15346	X12501/X12518	24.3	18.1	45.0	93	1.0	47.0	4.0
N15336	N12466/N11238	24.2	17.0	45.0	94	1.0	50.0	5.3
N15344	N11227/X11537	24.1	19.3	45.0	93	1.3	47.0	3.3
N15313	N11258/N11277	23.7	16.4	45.0	93	1.0	50.0	5.3
N15319	N11277/N09034	23.7	19.9	46.0	98	1.3	50.0	4.3
N11283	MEDALIST/N08003, ALPENA	23.5	19.2	45.0	96	1.3	50.3	4.7
N15323	N12405/N12468	23.4	18.0	44.0	94	1.0	48.0	4.7
N15332	N12438/N12468	23.3	20.8	45.0	101	1.0	49.0	3.3
N15326	N12405/N12468	23.1	16.7	45.0	94	1.0	45.7	4.3
N15307	N11238/N11258	23.0	15.4	45.0	97	1.0	51.0	4.7
N15322	N12405/N11238	22.9	19.0	45.0	94	1.0	46.0	4.0
N15337	N12466/N11258	22.3	17.3	46.0	94	1.0	47.7	4.3
I15616	PR0806-80A	22.0	21.2	45.0	99	1.0	49.7	4.0
N15320	N11277/N11258	21.6	18.3	45.0	93	1.0	48.3	4.0
N15328	N12405/N12468	21.6	19.3	45.0	96	1.0	49.3	5.0
N15340	N12468/N11298	21.6	22.7	46.0	99	1.0	50.7	4.7
N15342	X12507/X12519	21.5	19.8	46.0	96	1.0	49.7	3.0
N15309	N11258/N11277	21.2	17.4	45.0	94	1.0	47.0	4.3
N15314	N11258/N12405	21.1	20.0	45.0	93	1.0	46.3	4.3
N15315	N11258/N12405	20.8	17.9	45.0	93	1.0	44.0	3.7
N15303	N11230/N11277	20.5	15.8	45.0	94	1.0	46.3	3.3
N15324	N12405/N12468	20.3	16.9	45.0	93	1.0	44.0	3.0
N15308	N11258/N11238	20.2	17.1	45.0	99	1.0	50.0	3.0
N15312	N11258/N11277	20.0	16.3	45.0	93	1.0	46.3	3.7
N15302	N11230/N11277	19.4	17.7	45.0	99	1.0	52.7	4.7
N15333	N12442/N11277	18.9	22.5	46.0	97	1.3	51.3	4.7
I11264	COOP 03019, MERLIN	17.3	20.4	45.0	99	1.0	48.3	3.0
I08958	Mayflower/Avanti, MEDALIST	16.5	19.7	45.0	102	1.3	50.0	3.0
MEAN (56)		21.9	18.9	44.9	95.8	1.1	48.5	4.0
LSD (.05)		3.7	1.2	0.9	2.8	0.3	2.4	1.0
CV (%)		12.3	4.5	1.2	2.1	20.7	3.7	18.3

EXPERIMENT 5102 STANDARD BLACK YIELD TRIAL

PLANTED: 6/4/15

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

NAME	PEDIGREE	YIELD CWT100 SEEDDAYS TO DAYS TO LODGING HEIGHT DES.						
		/ACRE	WT. (g)	FLOWER MATURITY	(1-5)	(cm)	SCORE	
B13220	B09175/TARS-MST1	31.3	19.8	44.0	94	1.0	49.0	4.8
B13204	B09174/VCW54-1	30.1	24.7	45.0	96	1.0	49.3	5.3
B13225	PR0443-151/B09175	29.9	22.3	45.0	98	1.0	49.3	4.8
B14303	B09197/B11334	29.7	18.9	45.0	96	1.0	51.0	5.8
B14302	B09197/B11334	28.2	18.2	45.0	97	1.0	51.3	5.8
B13218	B09175/I09215	27.2	25.5	45.0	97	1.0	49.3	5.0
B13223	PR0443-151/B09175	27.0	22.6	45.0	97	1.3	47.8	3.8
B11363	B04644/B07554	26.6	21.5	45.0	95	1.0	47.8	4.3
B14309	B11338/B10222	26.4	18.2	45.0	96	1.3	49.3	3.5
B12720	B09175/Eclipse	26.1	23.1	45.0	94	1.0	47.3	4.5
B14307	B11271/B11343	25.4	23.5	46.0	98	1.5	54.8	4.3
B14311	B11338/B10241	24.2	18.7	45.0	96	1.0	48.3	5.0
B14308	B11301/B10222	23.4	19.5	45.0	96	1.0	49.5	4.3
B10244	B04644/ZORRO, ZENITH	23.3	22.4	44.0	96	1.0	50.5	4.8
I13419	NDF09304	22.7	16.4	45.0	94	1.0	48.5	3.8
B11311	B04587//ZORRO/DPC-1	22.6	19.5	46.0	96	1.3	47.5	4.0
B11555	I82054/B07554	22.5	23.3	45.0	100	1.5	49.5	3.5
B14313	B11343/B09196	22.3	16.9	45.0	93	1.0	45.5	3.8
I03390	ND9902621-2, ECLIPSE	22.1	19.6	45.0	95	1.0	48.0	4.3
B12724	B09184/B09135	22.0	21.2	45.0	101	1.0	49.3	3.5
B12711	B07554//Jaguar/B07554	21.8	20.3	45.0	94	1.0	47.0	4.0
I07116	T-39/Midnight, SHANIA	21.3	20.0	46.0	102	1.5	51.0	3.5
B14312	B11343/B09196	21.0	15.4	45.0	93	1.0	45.0	3.5
B11364	B04644/B07554	20.9	20.7	45.0	93	1.0	46.5	3.3
B14310	B11338/B10241	20.4	17.9	45.0	95	1.0	45.5	4.0
B11312	B04587//B05070/B05044	20.0	18.8	45.0	97	1.0	48.3	3.3
B12712	B07554//Jaguar/B07554	19.2	21.1	45.0	93	1.0	45.0	3.0
B12715	Zorro/N09056	19.2	19.4	45.0	94	1.0	45.3	3.0
B04554	B00103*/X00822, ZORRO	18.4	19.4	45.0	97	1.0	50.3	4.3
I81066	SEL-BTS, T-39	18.3	19.6	46.0	97	2.0	48.3	2.3
MEAN (30)		23.8	20.3	44.9	95.8	1.1	48.5	4.1
LSD (.05)		3.5	1.1	0.7	1.7	0.3	1.5	0.6
CV (%)		12.6	4.5	0.9	1.5	22.0	2.7	13.4

EXPERIMENT 5104 PRELIMINARY BLACK YIELD TRIAL

PLANTING DATE: 6/4/15

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

NAME	PEDIGREE	YIELD CWT100 SEED DAYS TO LODGING HEIGHT DES.						
		/ACRE	WT. (g)	FLOWER MATURITY	(1-5)	(cm)	SCORE	
B15428	Zenith/B12721	36.6	26.7	44.0	95	1.0	50.0	5.3
B15408	B09175/B10215	36.1	23.8	46.0	96	1.0	48.0	5.0
B15442	B11363/B09175	36.1	26.7	45.0	98	1.0	48.3	4.3
B15418	B10208/B09175	35.8	26.1	45.0	96	1.0	49.7	4.3
B15407	B09175/B10215	34.5	24.4	45.0	97	1.3	48.7	4.0
B15441	B11343/B10213	34.4	22.8	45.0	93	1.0	45.3	4.7
B15416	B10208/B09175	34.1	28.5	45.0	97	1.3	48.0	4.0
B15451	B11371/B11363	34.1	22.8	46.0	97	1.0	50.3	5.0
B15430	Zenith/B12721	33.9	26.4	44.0	93	1.0	49.0	5.7
B15449	B11371/B09175	33.9	22.8	45.0	94	1.0	46.3	4.3
B15452	B11371/B11363	33.8	22.0	46.0	98	1.3	50.7	4.7
B15406	B09175/B10215	33.8	24.4	45.0	95	1.0	47.3	4.7
B15433	Zenith/B12721	33.7	26.2	45.0	96	1.0	50.0	4.0
B15453	B11371/B11363	33.5	23.4	46.0	95	1.0	49.0	5.0
B15425	Zenith/B10215	33.5	24.0	46.0	96	1.3	47.3	4.0
B15431	Zenith/B12721	33.5	26.0	44.0	93	1.0	47.3	4.7
B15412	B09175/B11363	33.3	22.0	45.0	93	1.0	46.3	5.0
B15434	Zenith/B12721	33.2	24.3	45.0	95	1.0	48.3	5.0
B15435	Zenith/B12721	33.1	24.8	45.0	94	1.0	46.0	4.7
B15414	B09175/B11611	33.1	27.8	45.0	95	1.0	48.0	4.0
B15421	B10208/B11611	32.8	23.8	45.0	95	1.0	46.7	4.7
B15410	B09175/B11343	32.8	22.5	46.0	95	1.0	47.3	4.0
B15427	Zenith/B11343	32.8	26.1	45.0	93	1.0	47.0	4.7
B15438	B11334/Zenith	32.7	22.7	46.0	94	1.0	48.3	4.7
B15417	B10208/B09175	32.6	22.6	45.0	95	1.0	47.3	4.0
B15415	B09175/B11611	32.5	26.0	45.0	95	1.0	46.3	3.7
B15432	Zenith/B12721	32.2	26.6	45.0	94	1.0	48.3	5.3
B15439	B11334/Zenith	32.1	22.3	46.0	94	1.0	47.0	4.3
B15464	B12709/B12721	31.9	26.7	46.0	96	1.0	48.7	5.3
B15454	B11561/B11343	31.8	23.7	45.0	94	1.0	47.3	3.7
B15419	B10208/B09175	31.8	25.2	45.0	100	1.0	49.7	4.0
B15443	B11363/B09175	31.7	26.5	45.0	95	1.0	46.0	4.3
B15404	B09175/Zorro	31.2	23.4	45.0	94	1.0	45.0	4.7
B10244	B04644/ZORRO, ZENITH	31.1	24.3	45.0	96	1.0	48.0	4.3
B15469	Zenith/X11530	30.8	21.9	46.0	96	1.0	48.3	3.7
B15465	B12709/B12721	30.8	24.9	45.0	95	1.0	46.0	4.3
B15447	B11363/Zenith	30.7	23.3	45.0	93	1.3	45.3	4.3
B15411	B09175/B11363	30.5	21.9	45.0	94	1.0	45.3	4.7
B15426	Zenith/B11343	30.5	22.1	45.0	97	1.0	49.7	4.3
B15470	Alpena*/B09197	30.5	23.7	45.0	93	1.0	45.7	3.7
B15409	B09175/B11343	30.3	20.4	46.0	94	1.0	47.3	4.3
B04554	B00103*/X00822, ZORRO	25.4	19.1	45.0	98	1.0	49.7	4.3
MEAN (72)		30.3	23.5	44.9	94.9	1.0	47.2	4.3
LSD (.05)		3.8	1.5	1.1	2.0	0.3	2.3	0.8
CV (%)		9.2	4.8	1.4	1.6	18.7	3.6	14.3



2015 MICHIGAN DRY BEAN TRIALS

Compiled by Gregory V. Varner, Dry Bean Research Director

COUNTY & COOPERATOR: **Alpena:** *Smolinski Green Acres Farm* **Montcalm:** *Stratton Farms*
Bay: *Schindler Farms* **Sanilac:** *Brian Aldrich Farms*
Gratiot: *Bebow Farms* **Tuscola:** *Ackerman & Son Farms*
Huron: *Pulvalowski Farms*

PLANTING DATES:			6/5	6/25	6/10	6/4	6/10	6/4	6/25	2015 AVE 6-4 LOC	White Mold - Lodging Rating
NAVY	DAYS	ORIGIN	ALPENAS	BAY	GRATIOT	HURON	MONTCALM	SANILAC	TUSCOLA		
HMS MEDALIST	97-107	COOP	1112	2966	3361	3017	3090	3373	2180	2998-2884	1.8 - 2
MERLIN	100-106	COOP	1407	2714	3335	3317	1704	3209	2562	2807-2951	2.2 - 2.5
HYLAND T9905	98-102	HYLAND	1997	2351	3435	3437	1720	3146	2454	2757-2847	2.8 - 2.7
INDI	94-100	ADM	1280	3131	3381	2898	2845	2521	2717	2916-2817	2.2 - 1.5
ALPENAS	98-102	MSU	1116	2187	3304	2826	1863	2719	1939	2473-2418	2.7 - 2.3
GTS OB-1723-03	98-106	GTS	1298	2636	3502	3244	2598	3256	2530	2961-2917	2.5 - 2.8
GTS OB-3970-03	95-102	GTS	1010	1658	2595	1832	1023	2083	1921	1852-1874	2.9 - 2.7
VISTA	97-104	GTS	1665	3003	3416	3060	3542	2830	2153	3001-2762	2.5 - 2.8
REXETER	102-107	OAC-HDC	1522	2873	3332	3155	2818	2764	2661	2934-2863	2.2 - 2.7
NAUTICA	98-105	OAC-HDC	1576	2493	3441	3571	2234	3165	2579	2914-2952	1.8 - 2
MIST	99-105	OAC-HDC	1319	2802	3055	3053	3053	2789	2454	2868-2775	1.7 - 2
FATHOM	99-101	OAC-HDC	1431	2161	2678	2482	3178	2759	1692	2492-2274	4 - 2.8
VIGILANT	96-99	PROVITA	1666	2621		3393		2812	2190	2754	2.8 - 1.7
PROVITA 06063	98-101	PROVITA		2827		3392		3360	2280	2965	2.8 - 2.3
PROVITA 08070	98-102	PROVITA		2610		3150		3297	2115	2793	2.3 - 2.8
PROVITA 08072	98-102	PROVITA		2435		3127		3563	2313	2860	2.2 - 2
PROVITA 12039	98-102	PROVITA		2768		3320		3555	2400	3011	3 - 2.7
PROVITA 12047	99-104	PROVITA		3017		2871		3802	2473	3041	2.3 - 2.3
PROVITA 12051	95-100	PROVITA		2262		3039		3102	1875	2570	4 - 2.7
PROVITA 12063	98-102	PROVITA		2901		3208		2998	2299	2852	2.8 - 2
PROVITA 12064	101-104	PROVITA		2630		3588		3641	2731	3148	2 - 2
PROVITA 13066	95-104	PROVITA		3152		3413		3653	2458	3169	2 - 2
MSU N13131	96-98	MSU		2171		3257		3376	2113	2729	3.5 - 2.2
MSU N13140	96-102	MSU		2876		3432		3132	2353	2948	2.3 - 2.2
MSU N14202	100-102	MSU		2185		2781		3150	2057	2543	2.5 - 2
MSU N14230	98-102	MSU		1919		3343		3321	2326	2727	2.7 - 2
SEM NAVC6V1200	103-104	SEMINIS				3624		3202	2225		2.8 - 2.5
GTS OB-1587-09	95-98	GTS				1016		2039	1041		4.3 - 2.3
GTS OB-1593-09	99-100	GTS				2115		2433	1508		2.3 - 2.3
			lsd=318	lsd=450	lsd=513	lsd=508	lsd=805	lsd=433	lsd=384		
			cv-15.7%	cv-12.3%	cv-11.0%	cv-11.9%	cv-22.6%	cv-10.0%	cv-12.3%		

PLANTING DATES:			6/5	6/25	6/10	6/4	6/10	6/4	6/25	2015 AVE 6-4 LOC	White Mold - Lodging Rating
SMALL RED	DAYS	ORIGIN	ALPENAS	BAY	GRATIOT	HURON	MONTCALM	SANILAC	TUSCOLA		
MERLOT	95-101	USDAMSU	1486	2446		2547		2688	2251	2483	3.2 - 2.8
VIPER SR 09303	94-100	PROVITA	2218	2854		3719		4082	2294	3237	3.3 - 2.8
RUBY SR 09304	94-100	PROVITA	1612	1665		3138		2844	2108	2439	3.8 - 4.2
SR 11511	94-101	PROVITA		2854		2906		3213	2259	2808	2.5 - 2.3
MSU R12844	93-97	MSU		3311		3152		3194	2546	3051	1.7 - 2
MSU R12845	93-98	MSU		2960		3108		3431	2368	2967	2 - 2.2
MSU R13752	94-98	MSU		2904		3468		2936	2443	2938	1.8 - 2
PINK-ROSETTA	94-100	MSU		3025		3296		2825	2098	2811	1.8 - 2.2
			lsd=413	lsd=454		lsd=546		lsd=627	lsd=604		
			cv-13.5%	cv-11.8%		cv-11.7%		cv-14.5%	cv-17.5%		

<u>BLACK</u>	<u>DAYS</u>	<u>ORIGIN</u>	<u>ALPENA</u>	<u>BAY</u>	<u>GRATIOT</u>	<u>HURON</u>	<u>MONTCALM</u>	<u>SANILAC</u>	<u>TUSCOLA</u>	<u>2015 AVE</u> <u>6-4 LOC</u>	<u>White Mold</u> <u>- Lodging</u> <u>Rating</u>
ZORRO	99-103	MSU	1697	2871	4083	3501	2174	2789	2479	2983-2910	1.8 - 1.7
SHANIA	102-107	ADM	1919	2795	3837	3044	2207	3082	2292	2876-2803	2.2 - 2.5
LORETO	99-105	COOP-PRO	1636	2785	3657	3342	2415	3541	2036	2963-2926	2.7 - 2.7
ZENITH	98-102	MSU	1858	3192	3678	3961	2511	3230	2275	3141-3165	2.7 - 2
ECLIPSE	98-100	NDSU		2894		3145		2671	2636	2837	2.2 - 1.7
BLACK VELVET	103-107	SEMINIS	1498	2677		3545			2397		2.5 - 3
BLACK CAT	101-102	PROVITA		2748		3624		2833	1886	2773	3 - 2.8
BL 11355	100-103	PROVITA		2562		3569		3238	2125	2874	3.3 - 2.8
BL 12576	102-106	PROVITA		3126		3811		3412	1987	3084	2.5 - 2.7
BL 13490	100-104	PROVITA		3032		3322		2758	2590	2926	2.5 - 2.2
BL 13500	99-103	PROVITA		2767		3658		2634	2172	2808	2.5 - 2
BL 14498	103-105	PROVITA		3443		3803		3399	3094	3435	1.7 - 2
BL 14504	99-105	PROVITA		3361		3042		3284	2379	3017	2.2 - 2
BL 14506	98-104	PROVITA		3351		3020		2826	2358	2889	2.8 - 2
BL 14510	99-105	PROVITA		3102		3569		3140	2300	3028	2.8 - 2.2
BL 14518	98-102	PROVITA		2774		3324		2612	2200	2728	2.3 - 2.2
BL 14520	100-104	PROVITA		2412		3227		3157	1908	2676	3.5 - 2.8
GTS-1103	100-105	GTS		3208	3717	3738	2655	2705	2341	3061-2998	2 - 2.8
ADM B8006282	95-100	ADM		3145		3336		2976	2597	3014	2.5 - 1.7
ADM B0042613	99-103	ADM		2820		3497		3123	2709	3037	2.5 - 2.2
ADM B0043647	97-102	ADM				3134			2119		2.3 - 1.8
SEM BKBC6V1312	98-100	SEMINIS				2900		2433	2314		2.5 - 1.5
MSU B12712	97-101	MSU	1358	2698		2067		1720	1926	2103	2 - 1.5
MSU B12724	96-101	MSU	1579	2661	3617	3232	2235	2932	2514	2865-2835	2.5 - 1.8
MSU B14302	99-102	MSU		2954		3020		3202	2793	2992	2.3 - 1.7
MSU B14311	100-104	MSU		2928		3365		3028	2797	3030	1.3 - 1.7
T-39	96-97	CAL	1724								2.5 - 3.5
			lsd=306 cv-12.1%	lsd=603 cv-13.4%	lsd=553 cv-9.7%	lsd=559 cv-11.9%	lsd=612 cv-17.2%	lsd=653 cv-17.8%	lsd=292 cv-8.8%		

<u>PINTO</u>	<u>DAYS</u>	<u>ORIGIN</u>	<u>ALPENA</u>	<u>BAY</u>	<u>GRATIOT</u>	<u>HURON</u>	<u>MONTCALM</u>	<u>SANILAC</u>	<u>TUSCOLA</u>	<u>4 LOC</u>	<u>White Mold</u> <u>- Lodging</u> <u>Rating</u>
ELDORADO	100-110	MSU		2921	3239		2335	3106		2900	2.5 - 3
LA PAZ	94-97	PROVITA		2563	3170		2244	3009		2747	3.7 - 2.7
LARIAT	95-99	NDSU		2224	3113		2420	2969		2682	4 - 3.5
MSU P14811	96-97	MSU		2202	3414		2201	2926		2686	4.5 - 2.5
MSU P14815	97-98	MSU		2158	3092		3012	2547		2702	4 - 2.5
Sem-PIN-DJ091012	90-94	SEMINIS		2320	2533						3.5 - 2.5
Sem-PINC6V1314	87-94	SEMINIS		2778	2356						4 - 2.5
				lsd=368 cv-9.3%	lsd=517 cv-11.6%		lsd=814 cv-21.6%	lsd=797 cv-17.8%			

<u>GREAT NORTHERN</u>	<u>DAYS</u>	<u>ORIGIN</u>	<u>ALPENA</u>	<u>BAY</u>	<u>GRATIOT</u>	<u>HURON</u>	<u>MONTCALM</u>	<u>SANILAC</u>	<u>TUSCOLA</u>	<u>4 LOC</u>	<u>White Mold</u> <u>- Lodging</u> <u>Rating</u>
POWDERHORN	91-93	MSU		2458		2954	1715				2.8 - 2.3
MSU G13444	91-94	MSU		2594		2835	2591				2 - 1.8
MSU G13479	92-97	MSU		2263		2945	1570				3.5 - 1.8
MSU G14506	92-99	MSU		2331		3154	2100				3.3 - 2.8
				lsd=419 cv-11.1%		lsd=410 cv-8.6%	lsd=730 cv-22.9%				

<u>CRANBERRY</u>	<u>DAYS</u>	<u>ORIGIN</u>	<u>GRATIOT</u>	<u>MONTCALM</u>
ETNA	89-91	SEMINIS	3394	2916
CHIANTI vine	99-101	SEMINIS	2826	2118
BELLAGIO vine	102-103	MSU	3105	2046
BRB-DJ091031	88-91	SEMINIS	2872	1740
MSU C13413	95-96	MSU	3636	2797
			lsd=689	lsd=417
			cv-14.1%	cv-11.7%
<u>LIGHT RED KIDNEY</u>	<u>DAYS</u>	<u>ORIGIN</u>	<u>GRATIOT</u>	<u>MONTCALM</u>
CALIF ELRK	93-94	CAL	2422	2045
PINK PANTHER	95-96	SEMINIS	2223	2592
CLOUSEAU	95-97	SEMINIS	2581	2105
INFERNO	102-104	OAC-HDC	3134	3145
MSU K11709	90-93	MSU	2435	2348
ROSIE ND 061106	98-101	NDSU	2562	2531
BIG RED 09351	91-93	PROVITA	2361	2458
LRK 09360	98-101	PROVITA	2581	1840
LRK 09363	88-90	PROVITA	1950	1959
LRK 09378	91-93	PROVITA	2476	2117
LRK 06269	94-95	PROVITA	3055	3088
LRK 09394	99-102	PROVITA	2532	2392
			lsd=551	lsd=654
			cv-15.2%	cv-17.5%
<u>DARK RED KIDNEY</u>	<u>DAYS</u>	<u>ORIGIN</u>	<u>GRATIOT</u>	<u>MONTCALM</u>
RED HAWK	96-99	MSU	2351	1754
MONTCALM	98-102	MSU	2469	1643
RED ROVER	90-92	SEMINIS	1996	3043
DYNASTY	101-102	OAC-HDC	3639	2348
MSU K11306	94-95	MSU	2964	1923
MSU K14104	96-97	MSU	2549	1897
GTS 104	102-104	GTS	3267	1968
TALON ND061210	96-97	NDSU	2694	1743
CHAPARRAL 09423	98-100	PROVITA	3029	1674
DRK 09424	104-106	PROVITA	3445	2139
DRK 09429	98-100	PROVITA	2535	2032
DRK 09430	97-99	PROVITA	2687	2015
DRK 09431	104-105	PROVITA	3402	2174
			lsd=544	lsd=864
			cv-13.3%	cv-31.8%
<u>ALUBIA-W. KIDNEY</u>	<u>DAYS</u>	<u>ORIGIN</u>	<u>GRATIOT</u>	<u>MONTCALM</u>
BELUGA	95-100	MSU	1851	2340
SNOWDON	90-92	MSU	1736	1362
YETI	97-100	OAC-HDC	2198	2585
MSU K12803	88-91	MSU	2211	2315
MSU K13908	90-91	MSU	2083	1352
MSU K14807	89-91	MSU	1469	1680
MSU K14814	95-96	MSU	2281	2260
			lsd=895	lsd=627
			cv-27.5%	cv-21.6%

<u>TEBO</u>	<u>DAYS</u>	<u>ORIGIN</u>	<u>BAY</u>	<u>GRATIOT</u>	<u>MONTCALM</u>	<u>SANILAC</u>	White Mold - Lodging
FUJI	97-100	MSU	1519	3115	1771	2203	3.7 - 4
SAMURAI G12901	94-103	MSU	2643	3905	975	3437	3.3 - 2.2
MSU G14505	91-98	MSU	2383	2966	1941	2092	3.3 - 2.3
			lsd=427 cv-12.4%	lsd=623 cv-10.8%	lsd=865 cv-32.0%	lsd=587 cv-16.8%	
<u>ADZUKI</u>							
ERIMO	101-103	JAPAN		1256			

ORIGIN KEY

MSU - Michigan State University
GTS - Gen-Tec Seeds LTD
SEMINIS - Seminis Seeds - Monsanto
ADM - Archer Daniels Midland-Seedwest
HYLAND - Hyland Seeds, LTD
COOP - Cooperative Elevator Company
CAL - University of California
USDA - US Department of Ag - ARS
NDSU - North Dakota State University
OAC-HDC - University of Guelph-Hensall District Coop
PROVITA - Provita Seeds
JAPAN - Japan Foods - Purity Foods
Maturity days = planting until harvest in 2015
Direct Cut Lodging Ratings = 1-erect, 5-laying flat on ground
White Mold Rating = 1-10% mold, 5-100% mold
White Mold Rating from Bay, Tuscola and Huron counties
Alpena, 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
6 location average did not include Alpena
4 location average Thumb and Bay county

Contact Information:



Production Research Advisory Board
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DRY BEAN CHARACTERISTICS

Greg Varner, Michigan Dry-Edible Bean Production Research Advisory Board														
Variety	Class	Plant Type	Maturity	Origin	BCMV	Anthracnose 73	Anthracnose 7	Canning Quality	White Mold	Halo Blight	Common Blight	Rust	Air Pollution	Direct Cut-Rating
Medalist	N	USV	F	COOP/ADM	R-1	S	R	3	2	R	S	T	T	2
Vigilant	N	USV	F	COOP/ADM	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
Alpena	N	USV	F	MSU	R-1	S	R	3	3	T	S	T	T	2
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
Zenith	B	USV	F	MSU	R-1	R	R	5	3	R	S	T	T	2
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
Etra	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
Ballagio	C	SV	F	MSU	R-1	R	S	5	3	S	S	T	T	6
Merlot	SR	USV	M	MSUSDA	R	S	S	4	3	R	S	T	T	3
Viper 09303	SR	USV	M	COOP/ADM	R	S	S	3	4	R	S	T	T	3
Ruby 09304	SR	USV	M	COOP/ADM	R	S	S	2	4	R	S	T	T	3
Rosetta	PK	USV	M	MSU	R-1	S	S	3	3	R	S	T	T	3
Tebos	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	SV	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-F=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 off ground, 3=lodging, pods close to ground, 4=high yield loss, 5=severe yield loss, 6=not recommended

JAN-2016

Michigan Dry Bean Root Rot Survey Results

2014 and 2015

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Field Sampling Summary:

Year	# Counties Sampled	# Fields Sampled	# Samples Collected	# of Isolates Recovered*
2014	4	9	196	139
2015	6	14	373	472

*This only accounts for the number of oomycetes, *Fusarium spp.*, and *Rhizoctonia solani* recovered.

Sampling Results Summary:

Year	% Oomycetes	% <i>Fusarium spp.</i>	% <i>Rhizoctonia solani</i>	% <i>Macrophominia</i>
2014	20	38	44	0
2015	28	44	24	3

Oomycete Summary

2014 and 2015

- 20 Pythium, 1 Phytophthora and 1 Phytopythium species were identified

- *Pythium sylvaticum* was the most abundant species isolated both years
- 11 *Pythium spp.* were found to be associated with diseased dry bean roots that had not been previously reported.
- In a seedling pathogenicity assay, isolates of *Pythium ultimum*, *Pythium myriotylum*, and *Phytophthium aff. vexans* significantly reduced emergence in both red kidney and black bean
- New dry bean associated species, *Pythium attrantheridium*, *Pythium coloratum*, and *Pythium heterothallicum* caused a significant reduction in root dry weight in red kidney bean, but not in black bean

Fusarium Summary 2014 and 2015

- 9 *Fusarium* species or species complexes were identified
- *Fusarium oxysporum* species complex was the most abundant in both years
- In 2015, a higher percentage of common bean root pathogens (*Fusarium solani* species complex) were isolated due to improved technique
- *Fusarium* appeared to have the biggest impact in 2015, based on the number of isolates recovered, but also on the symptoms observed in the field

Rhizoctonia Summary

2014 and 2015

- In 2014, *Rhizoctonia* accounted for 42% of the organisms recovered from symptomatic roots and was the dominant pathogen in sampled fields
- In 2015, *Rhizoctonia* only accounted for 24% of the organisms recovered and had a significant presence in just 5/14 fields sampled
- *Rhizoctonia* isolates were characterized into anastomosis groups (AG): AG2-2, AG2-3, AG4, AG5, and AG11
- Approximately 70% of the *Rhizoctonia solani* isolated were identified as AG2-2
- In pathogenicity screening on dry bean, AG2-2 and AG 4 isolates were the most aggressive, while AG 11 was found to be the least pathogenic
- In a seed rot assay, AG2-2 isolates caused complete seed rot or reduced germination

Harvest aid effects on three classes of dry beans

Christy Sprague and Gary Powell, Michigan State University

Location:	Richville (SVREC)	Tillage:	Conventional
Planting Date:	June 4, 2015	Row width:	30-inch
Replicated:	4 times	Soil Type:	Clay loam, 2.6% OM, pH 8.1
Varieties:	‘Zorro’ black beans	Populations:	106,000 seeds/A
	‘Merlin’ navy beans		106,000 seeds/A
	‘El Dorado’ pinto beans		100,000 seeds/A

Table 1. Effect of preharvest treatments on bean desiccation (%) 3 & 7 days after treatment (DAT) and yield.

Treatments	Zorro			Merlin			El Dorado		
	3 DAT	7 DAT	Yield ^a	3 DAT	7 DAT	Yield	3 DAT	7 DAT	Yield
Sharpen (1 fl oz) + MSO + AMS	90 bc ^b	97 ab	18.7 ab	76 b	93 a	23.8 a	78 b	98 a	17.6 a
Gramoxone (2 pt) + NIS	83 e	90 c	19.2 ab	82 a	86 b	24.9 a	80 b	80 b	19.8 a
Valor (1.5 oz) + MSO	85 de	93 bc	18.0 ab	70 c	91 ab	24.3 a	79 b	95 a	20.8 a
Roundup (22 fl oz) + AMS	66 g	84 d	20.6 a	62 d	76 c	24.8 a	60 d	74 c	20.7 a
Aim (2 fl oz) + MSO	72 f	79 e	18.9 ab	60 d	76 c	25.4 a	65 c	84 b	21.0 a
Sharpen (2 fl oz) + MSO + AMS	93 b	97 ab	17.2 b	71 bc	94 a	22.8 a	80 b	97 a	18.1 a
Sharpen (1 fl oz) + Roundup + MSO + AMS	87 cd	98 a	18.2 ab	69 c	94 a	24.3 a	82 b	98 a	20.2 a
Sharpen (1 fl oz) + Gramox.+ MSO + AMS	97 a	99 a	18.5 ab	86 a	91 ab	23.0 a	88 a	98 a	18.1 a
Untreated	52 h	65 f	19.6 ab	52 e	58 d	24.0 a	52 e	58 d	20.5 a

^a Yield is in cwt/A obtained by direct harvest and adjusted to 18% moisture

^b Means within a column with different letters are significantly different from each other

Summary: This study was conducted to evaluate the effects of different preharvest treatments on desiccation and yield of three different classes of dry beans that have different speeds of dry down, ‘Zorro’ black bean (uniform dry down), ‘Merlin’ navy bean (green stem), and ‘El Dorado’ pinto bean (green stem). All preharvest applications were made when 80% of the pods were yellow for each variety. There were some differences in the speed and effectiveness of the different treatments between varieties. However, there were some general trends that were similar among the three varieties. For example, Sharpen + Gramoxone always provided the quickest speed of activity 3 DAT. By 7 DAT, most treatments provided greater than 90% desiccation, with the exception of Roundup and Aim; and Gramoxone alone in 2 of 3 varieties. By 14 DAT, Aim was the only treatment for all three varieties that did not reach 90% desiccation. Yield was only lower in one instance, when Sharpen was applied at 2 fl oz/A to Zorro (12% reduction). Overall, many of the treatments provided good bean desiccation and when applied at 80% pods yellow did not reduce yield. This research was supported by the Michigan Dry Bean Commission through the Michigan Department of Agriculture Specialty Crops grant.

Harvest aid effects on common lambsquarters and dry bean desiccation

Christy Sprague and Gary Powell, Michigan State University

Location:	Richville (SVREC)	Tillage:	Conventional
Planting Date:	June 4, 2015	Row width:	30-inch
Replicated:	4 times	Soil Type:	Clay loam, 2.6% OM, pH 8.1
Varieties:	'Merlin' navy beans	Populations:	106,000 seeds/A

Table 1. Effect of preharvest treatment on common lambsquarters and bean desiccation 7 and 14 days after treatment (DAT) and yield.

Treatments	C. lambsquarters		'Merlin' navy bean		
	7 DAT	14 DAT	7 DAT	14 DAT	Yield ^a
Sharpen (1 fl oz) + MSO + AMS	50 bc ^b	50 c	91 a	97 a	21.7 abc
Sharpen (2 fl oz) + MSO + AMS	60 b	76 b	91 a	98 a	15.9 e
Gramoxone (2 pt) + NIS	77 ab	90 a	84 a	84 bc	20.3 bcd
Valor (1.5 oz) + MSO	33 cd	70 b	85 a	94 ab	19.4 cde
Roundup (22 fl oz) + AMS	11 de	91 a	75 c	98 a	22.5 abc
Aim (2 fl oz) + MSO	20 d	24 d	76 bc	82 c	21.5 a-d
Sharpen (1 oz) +Roundup+ MSO +AMS	18 d	81 ab	84 a	99 a	17.9 de
Sharpen (1 oz) +Gramox.+ MSO + AMS	89 a	94 a	91 a	97 a	23.2 ab
Valor (1.5 oz) +Roundup+ MSO +AMS	43 c	92 a	91 a	98 a	20.1 bcd
Valor (1.5 oz) +Gramox.+ MSO + AMS	90 a	94 a	88 a	92 ab	19.6 cd
Aim (2 fl oz) +Roundup+ MSO +AMS	21 c	88 a	83 b	99 a	21.5 abc
Aim (2 fl oz) +Gramox.+ MSO + AMS	90 a	91 a	90 a	91 ab	21.2 a-d
Untreated	0 e	0 e	0 d	0 d	23.5 a

^a Yield is in cwt/A obtained by direct harvest and adjusted to 18% moisture

^b Means within a column with different letters are significantly different from each other

Summary: This study was conducted to evaluate the effects of preharvest herbicide treatments on common lambsquarters and bean desiccation and yield. All preharvest applications were made when 80% of the pods were yellow. Gramoxone or combinations with Gramoxone provided the greatest desiccation of common lambsquarters (77% or greater) 7 DAT. These treatment also provided good desiccation of navy beans 7 DAT. By 14 DAT, Gramoxone, Roundup (glyphosate) or combinations with these herbicides were needed for common lambsquarters desiccation. Navy bean yield was lowest when Sharpen was applied at 2 fl oz/A. Bean desiccation was similar for 1 and 2 fl oz/A of Sharpen, but in two trials this year the higher rate of Sharpen is where we have observed lower yields. While we have several years data comparing preharvest treatments, our recommendation if a grower decides to use Sharpen is to use 1 fl oz/A rate, this also reduces the rotation restriction for following crops, such as sugarbeet. In many cases there were no detriments for applying tank-mixtures of the preharvest herbicides. However, Gramoxone or Roundup were in many cases needed to help with weed desiccation. Please refer to the 2016 MSU Weed Control Guide (E-434) for recommendations for the different preharvest herbicide treatments available in dry bean. This research was supported by the Michigan Dry Bean Commission through the Michigan Department of Agriculture Specialty Crops grant.

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	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.
	ethalfuralin (<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 <i>Eptam</i>. 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 <i>Eptam</i>. 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>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.

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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	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/ Dual II Magnum/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.
	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. • Sequence 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.

(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>				
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. • <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>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> or other fomesafen products 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	quiazlofop-P-ethyl (<i>Assure II/Targa</i>) + crop oil concentrate OR surfactant	0.044	7 oz 0.88L + 1% OR 0.25%	<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.
	fluzafop-P-butyl (<i>Fusilade DX</i>) + crop oil concentrate	0.188	12 oz 2L + 1%	<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.
	sethoxydim (<i>Poast</i>) + crop oil concentrate + ammonium sulfate	0.19	1 pt 1.5SC + 1 qt + 2.5 lb	<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.

(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		+ 1%
+ surfactant			+ 0.25%		
+ ammonium sulfate			+ 2.5 lb		
Annual Broadleaves	bentazon (<i>Basagran/Broadloom</i>)	0.75	1.25 pt 4L		<ul style="list-style-type: none"> • Refer to Table 5A for weed control and crop tolerance ratings. • Most effective on small weeds. Check 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 (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 (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 application and dry bean harvest. • DO NOT use on adzuki beans. • Refer to label and Table 12 for crop rotation restrictions.
	+ crop oil concentrate		+ 1 qt		

(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	halosulfuron (<i>Permit</i>) + surfactant	0.023	0.67 oz 75WG + 0.25%	<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). • Apply when beans have 1-3 trifoliolate leaves. • DO NOT apply if dry beans have begun to flower. • <i>Permit</i> can be tank-mixed with other herbicides for additional broadleaf and grass control. • 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. • DO NOT use on adzuki beans. • DO NOT plant SUGARBEETS within 21 months of <i>Permit</i> application. • Refer to Table 12 for crop rotation restrictions.
	imazethapyr (<i>Pursuit</i>) + surfactant	0.031	2 oz 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 (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.

(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	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. • 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.
	+	+	+	
	bentazon <i>(Basagran)</i>	0.25	8 oz 4L	
+	+	+		
	crop oil concentrate		1%	
+	+	+		
	ammonium sulfate		2.5 lb	
	fomesafen <i>(Reflex)</i>	0.25	1 pt 2L	
+	+	+		
	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"> • 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. Roundup 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 livestock.
	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. • Refer to label and Table 12 for crop rotation restrictions. DO NOT include time in the rotation interval when the ground is frozen.

(Continued on next page)

Preharvest Treatments in Dry Edible Beans *(continued)*

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.
	carfentrazone <i>(Aim)</i> + methylated seed oil	0.03	2 oz 2EC + 1% v/v	<ul style="list-style-type: none"> • Apply when crop is mature – at least 80% of the pods are yellowing and most ripe and no more than 40% (bush-type beans) or 30% (vine-type beans) of the leaves are still green. • <i>Aim</i> alone is not as effective as <i>Sharpen</i>, glyphosate, <i>Gramoxone</i>, or <i>Valor</i> for dry bean desiccation. • Tank mixtures with <i>Gramoxone</i> or glyphosate will improve dry bean desiccation and is needed to improve the spectrum of weed desiccation. • Thorough spray coverage is required – sequential applications may be needed. • The preharvest interval is 0 days for <i>Aim</i> alone.

**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	E	E	E	E	E	G	G	F	N	N	N	N	G
EPTAM	8	2	P	P	G	F	F	F	F	F	F	E	E	E	E	E	E	E	G	N	N	N	F	F
OUTLOOK	15	3 ^a	N	N	P	G	G	P	P	N	P	E	E	E	E	E	G	G	P	N	N	N	N	F
PROWL H ₂ O/PROWL	3	1	N	N	G	P	F	P	P	F	P	E	E	E	E	E	E	E	G	N	N	N	N	N
PURSUIT	2	3	F	F	P	E	E	P	F	F	G	P	P	F	F	F	P	P	P	N	N	N	N	F
SONALAN	3	1	N	N	G	F	G	P	P	N	P	E	E	E	E	E	E	E	G	N	N	N	N	N
TRIFLURALIN	3	1	N	N	G	N	G	N	P	N	P	E	E	E	E	E	E	E	G	N	N	N	N	N
Preemergence																								
DUAL MAGNUM/PARALLEL	15	2	N	N	P	F	G	P	P	N	P	E	E	E	E	E	G	G	F	N	N	N	N	F
OUTLOOK	15	3 ^a	N	N	P	G	G	P	P	N	P	E	E	E	E	E	G	G	P	N	N	N	N	F
PERMIT/SANDEA	2	3	F	F	F	P	E	G	P	G	E	N	N	N	N	N	N	N	N	N	N	N	N	F
PURSUIT	2	3	P	P	P	E	E	P	F	P	G	P	P	F	F	F	P	P	P	N	N	P	N	F
REFLEX	14	2	P	P	G	E	E	G	G	P	E	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	E	E	E	E	E	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	E	E	G	E	E	E	N	N	N	E	N
BASAGRAN/BROADLOOM ^c	6	2	E	G	F	P	P	F	E	G	E	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	E	G	E	E	E	E	E	E	N	N	N	G	N
PERMIT	2	3	E	G	N	P	E	G	F	G	E	N	N	N	N	N	N	N	N	P	P	P	N	E
POAST	1	1	N	N	N	N	N	N	N	N	N	E	G	E	E	E	E	E	E	N	N	N	F	N
PURSUIT ^d	2	3	F	P	P	E	E	P	F	F	E	P	P	F	P	P	P	P	P	N	N	P	N	F
PURSUIT ^d + BASAGRAN	2/6	2	E	G	F	E	E	F	G	G	E	P	P	F	P	P	P	P	P	N	N	G	N	G
RAPTOR ^d	2	3	F	F	F	E	E	P	F	G	E	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	E	E	F	G	G	E	F	P	F	P	P	P	P	P	N	N	F	N	F
RAPTOR ^{de} + BASAGRAN (16 oz)	2/6	2	E	G	G	E	E	F	E	G	E	P	P	F	P	P	P	P	P	N	N	G	N	F
REFLEX	14	2	P	F	P	G	G	E	P	P	E	N	N	N	N	N	N	N	N	N	N	N	N	N
REFLEX + BASAGRAN	6/14	2	E	G	F/ G	G	G	E	E	G	E	N	N	N	N	N	N	N	N	N	N	F	N	G
REFLEX + RAPTOR ^e	2/14	3	F	F	F	E	E	F	G	E	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	E	G	E	E	E	E	E	E	N	N	N	G	N

Herbicide Site of Action: The site of action key is located on pages 15-16.

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.

^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** 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.



**Top: Green Stems of Merlin Navy and Eldorado Pinto before
Desiccant Spray at SVREC, (Page 5)**

**Below: Nearly 100% Anthracnose Infection in the Anthracnose Control Trial,
(Page 4)**

