United States Department of Agriculture
National Institute of Food and Agriculture

A USDA/NIFA Supported Project

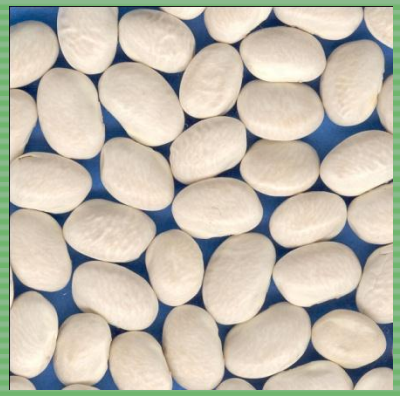
BeanCAP Project 2012 Advisory Board Meeting 2011 Field Experiments

James D. Kelly, Michigan State University
Philip Miklas, USDA-ARS, Prosser, WA
Juan Osorno, North Dakota State University

Middle American Gene Pool

Pinto

Navy



Great Northern

Black

Small Red

Pink

Andean Gene Pool

Light Red Kidney

Soldier

Dark Red Kidney

Cranberry

White Kidney

Yellow Eye

Expts in 2011

- Two Major Field Trials – Association Mapping Studies – Entries from Middle Gene Pool
- Phenotyping 308 Genotypes at 4 Locations
- Separated in MesoAmerican & Durango Races
- Evaluated 96 Genotypes under drought stress & non stress at 6 Locations
- Agronomic & Performance Traits measured
- Seed sent to Mike Grusak – UDSA Houston.
- Locations Listed

2011 Field Trials Association Mapping

Participant	Location	Phenotype - 308 Lines	Drought Trial -96	Comments- Drought
Mark Brick	CSU	**Y**	**Y**	**Completed**
Phil Miklas	Prosser	**N**	**Y**	**Completed**
Juan Osorno	NDSU	**Y**	**Y**	**Lost Drought**
Carlos Urrea	UNL	**Y**	**Y**	**Completed**
Jim Kelly	MSU	**Y**	**Y**	**Completed**
Tim Porch	Mayaguez	**N**	**Y**	**Completed**
Brett Despain ADM	New Plymouth ID	**N**	**Y**	**Completed**
		2 reps	**2 reps – 2 treatments**	

AGRONOMIC TRAITS

- Days to Flower
- Days to Maturity
- Canopy Height
- Growth Habit
- Lodging
- Seed Yield
- Weight of 100 Seeds
- Agronomic Score
- Seed Appearance

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AGRONOMIC DATA-DROUGHT EXPTS

- Based on Replicated Stress and Non stress treatments
- **Drought Intensity Index (DII):** Index for Experiment -
- **Percent Reduction (%R):**
- **Geometric Mean (GM):**
- **Drought Susceptibility Index (DSI):**
- **Chlorophyll Content (CC):** SPAD. – few locations
- **Canopy Temperature (CT):** IR Directional thermometer
- **Other Traits unique to drought – Biomass & Shovelomics**
- **Soil Moisture, Neutron Probe, Gypsum sensors**
- **Soil Analysis at all locations**

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BeanCAP Drought Nurseries 2011

- Conducted in CO, MI, ND, NE, ID, PR, WA
- 96-Entries, All Middle American genotypes
- Shovelomics -collected additional information on root traits in MI and ND
- Tap root diameter – indicator of rooting depth
- Basal root angle – indicator of rooting depth
- Root score – 1=weakest; 10=vigorous

BeanCAP – Tim Porch
USDA-ARS- Juana Diaz PR

Expt. Jan-April	Treat-ment	Entries	High	Low	Mean	CV
DII	0.33			Yield (kg/ha)		%
Drought	Stress	100	1208	318	798	22.5
Drought	Non Stress	100	1696	714	1226	12.7

Planted Jan 2011 -Insect problems. Planted high temperature test July –Sept. 2011 - partially lost to excessive rainfall. Just planted drought trial in Juana Diaz – 2012 collect 2nd year data. Seed from 2012 trial will be shipped to Mike Grusak.

BeanCAP – Brett Dispain
ADM- New Plymouth ID

Expt.	Treat-ment	Entries	High	Low	Mean	CV
DII	0.49			Yield (kg/ha)		%
Drought	Stress	96	1665	35	885	34.7
Drought	Non Stress	96	3454	157	1742	38.1

Planting delayed slightly due to rain and cool weather. Otherwise it was a nice growing season, not too hot. Soil variability caused many plots to grow abnormally, especially in the fully irrigated plots. Few plots did not mature under drought – lost few plots. In spite of variable soil, many of the normal plots yielded quite well. Seed has been shipped to Mike Grusak.

BeanCAP – Phil Miklas
USDA-ARS – Othello WA

Expt.	Treat-ment	Entries	High	Low	Mean	CV
DII	0.30			Yield (kg/ha)		%
Drought	Stress	96	5433	2337	3798	12.1
Drought	Non Stress	96	6865	3002	5365	12.1

Experiment had ideal conditions for high yield. Planted in 22" row widths in one of their best fields at Othello. Fewer extremely hot days during flowering and podding, than in the past. That could explain some of the higher yields obtained this year including weak competitor rows. Seed has been shipped to Mike Grusak.

BeanCAP – Carlos Urrea
UNL – Mitchell NE

Expt.	Treat-ment	Entries	High	Low	Mean	CV
DII	0.35			Yield (kg/ha)		%
Drought	Stress	96	3371	1286	2262	18.1
Drought	Non Stress	96	4999	1907	3496	18.1

Irrigated plots received 9 irrigations of 38 mm each total 228 mm (13.5”). Non-irrigated received 2 irrigations of 38 each total 75mm. Irrigation was stopped on July 16. Precipitation from planting (June 15) until harvest was 103 mm. Seed has been shipped to Mike Grusak.

BeanCAP – Jim Kelly
MSU- Montcalm MI

Expt.	Treat-ment	Entries	High	Low	Mean	CV
DII	-0.45			Yield (kg/ha)		%
Drought	Stress	96	4827	594	3394	15.5
Franken-muth	Non Stress	96	3606	1019	2330	16.9

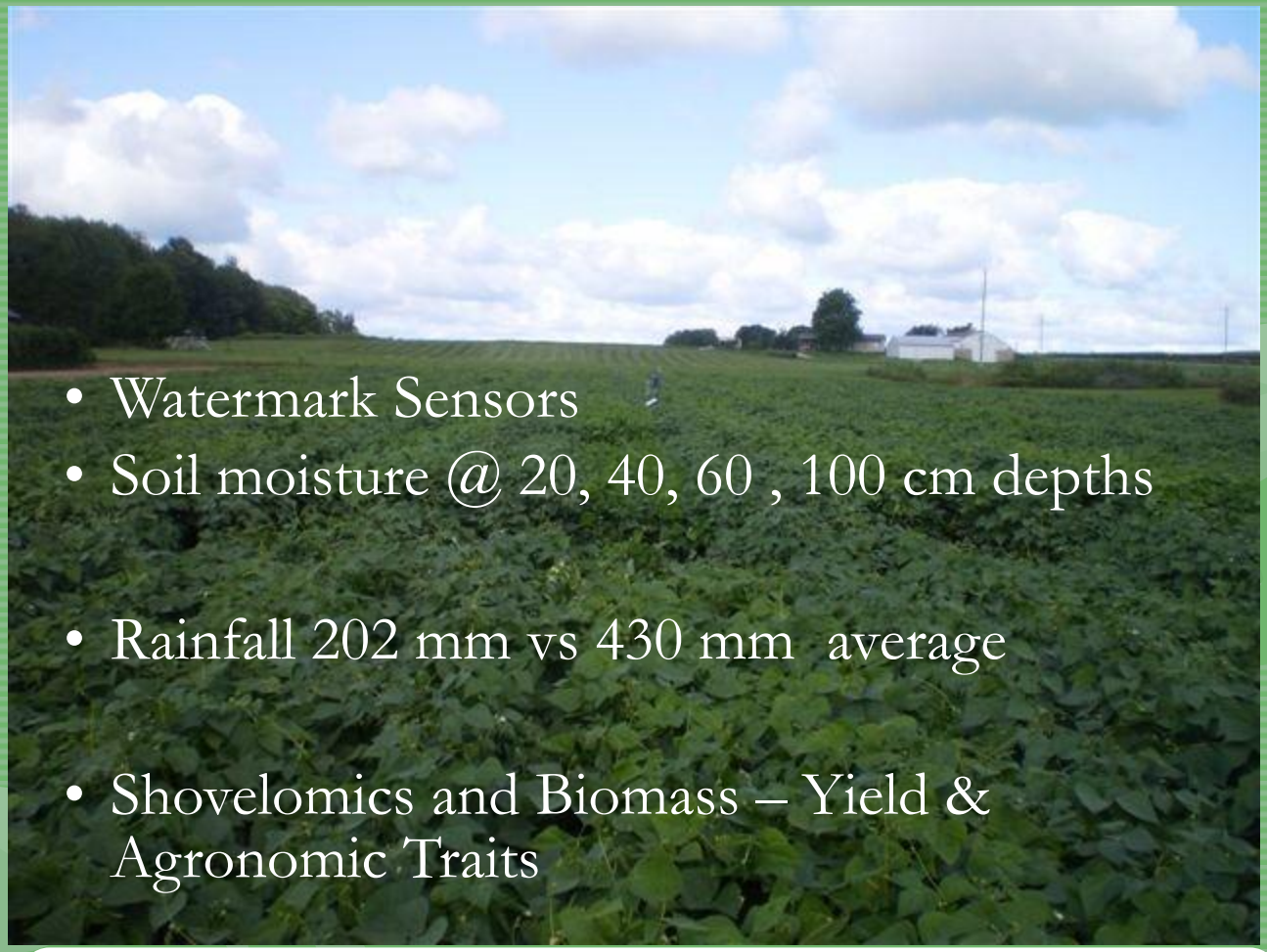
Drought nursery planted on course textured sandy loam – No irrigation. Trial experienced extended 5- week dry period following planting – followed normal rainfall pattern. Seasonal rainfall 202 mm vs 430 mm average. Vigorous growth following rains, delayed maturities and exceptional yields under low rainfall. Plots were pulled (Pickett) at maturity, biomass measured and threshed. Seed is being shipped to Mike Grusak.

BeanCAP Drought Trial- 2011

- Planted June 15
- Harvest Oct. 6

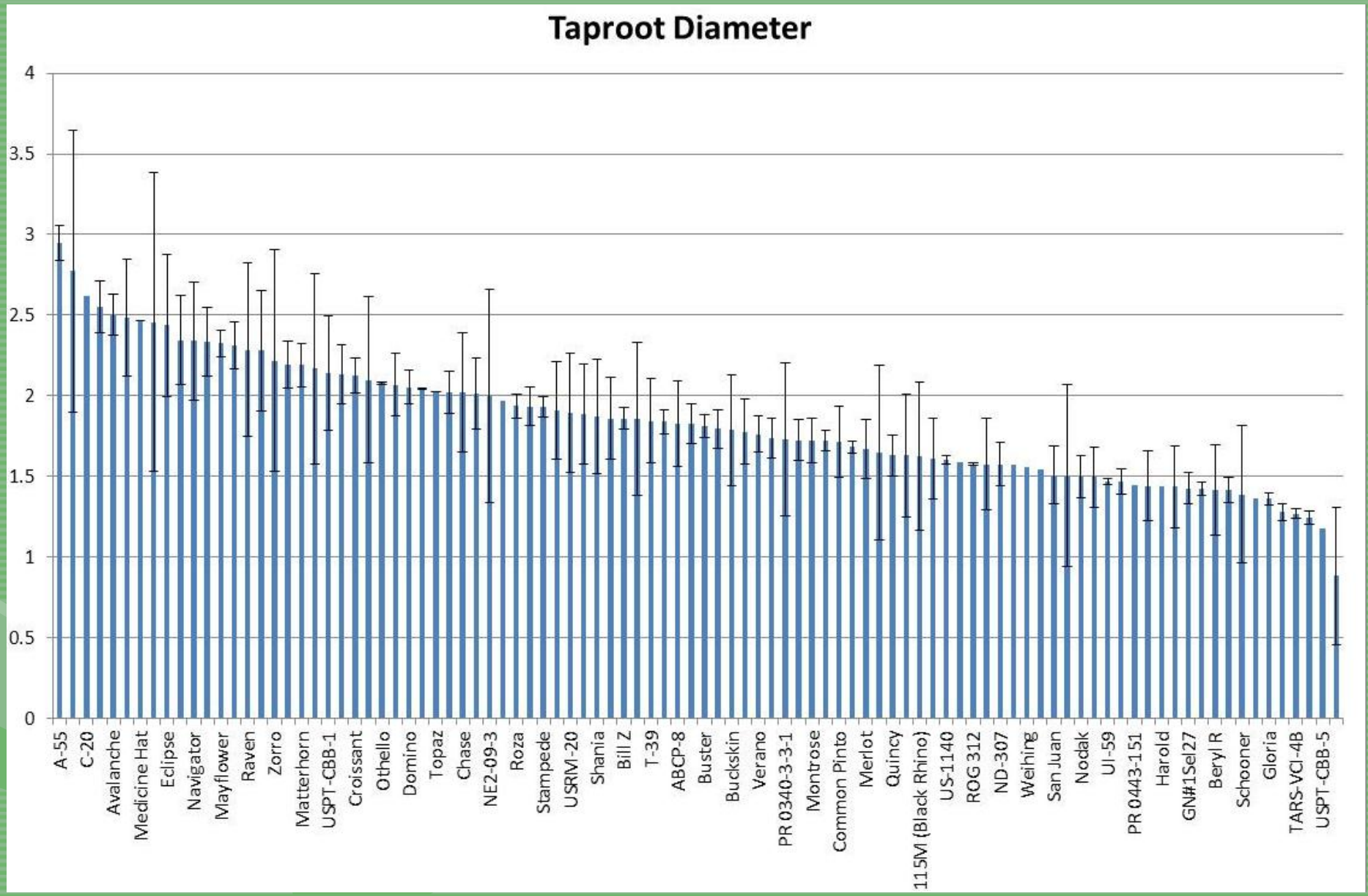
Montcalm MI - No irrigation

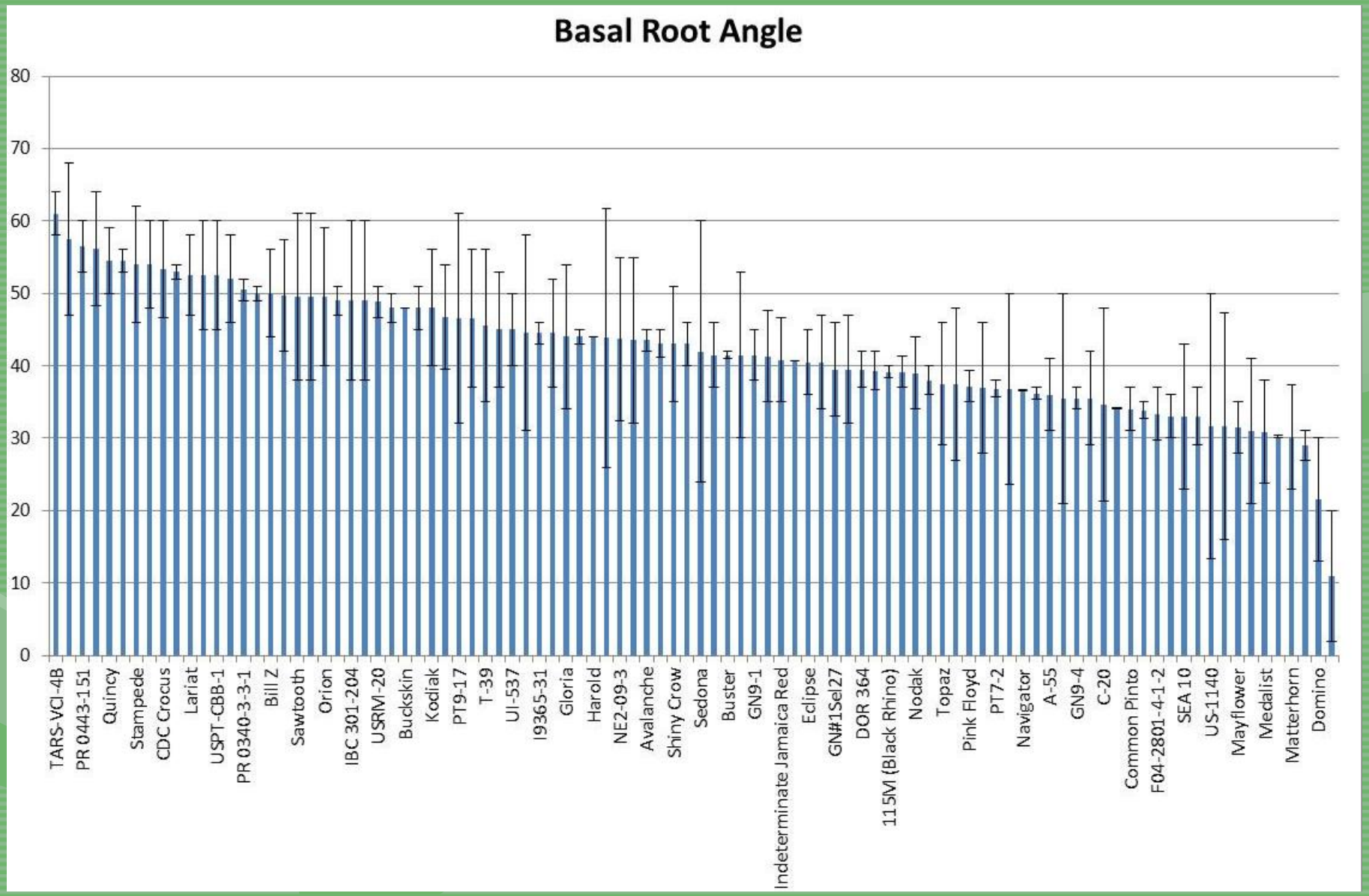
BeanCAP Drought Trial- 2011



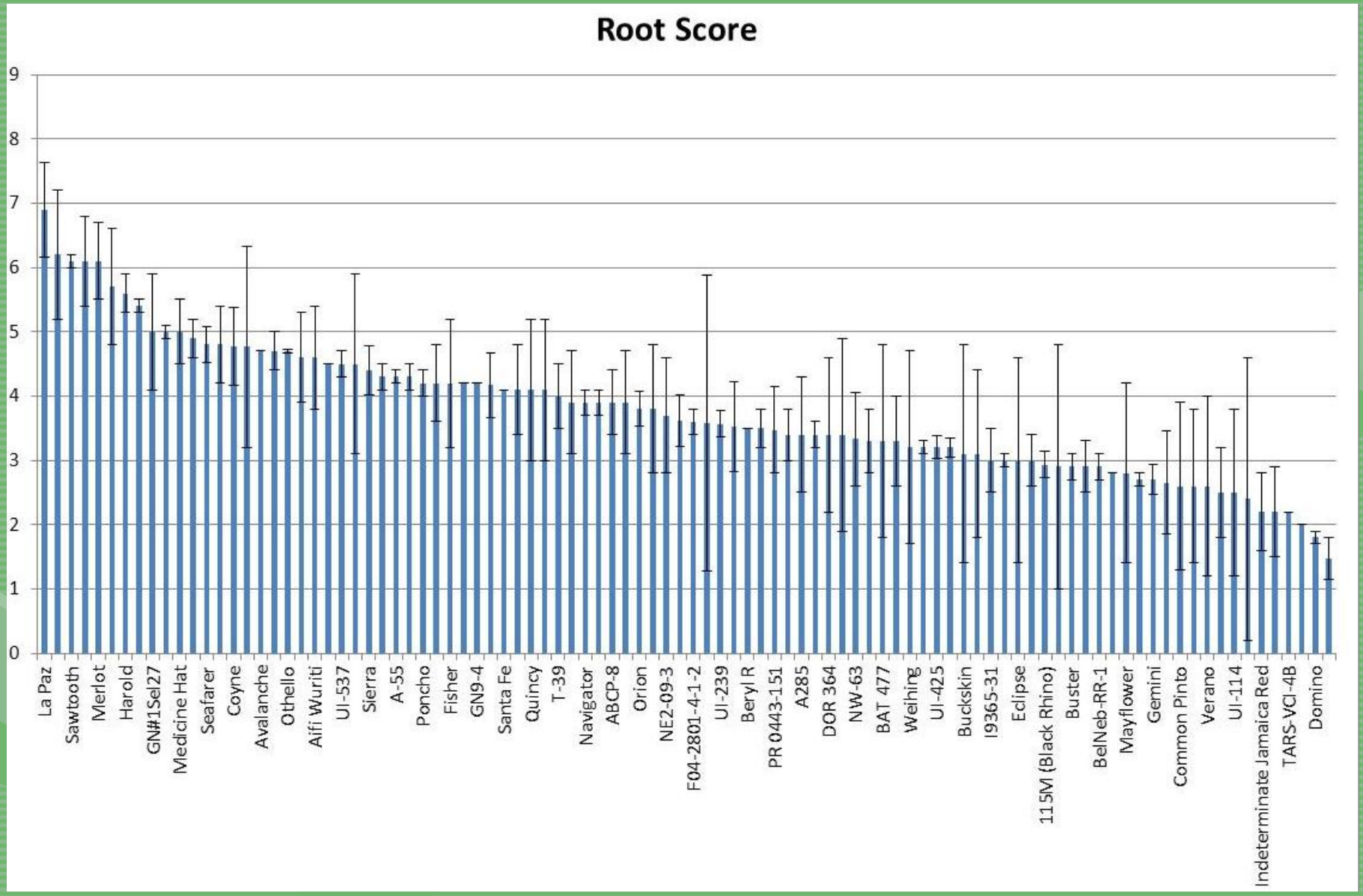
Montcalm MI - 96-entries, 2 reps

Shovelomics – Montcalm MI 2011


Taproot Diameter
Millimeters
4
3.5
3
2.5
2
1.5
1
0.5
0
A-55
C-20
Avalanche
Medicine Hat
Eclipse
Navigator
Mayflower
Raven
Zorro
Matterhorn
USPT-CBB-1
Croissant
Othello
Domino
Topaz
Chase
NE2-09-3
Roza
Stampede
USRM-20
Shania
Bill Z
T-39
ABCP-8
Buster
Buckskin
Verano
PR 0340-3-3-1
Montrose
Common Pinto
Merlot
Quincy
115M (Black Rhino)
US-1140
ROG 312
ND-307
Weihing
San Juan
Nodak
UI-59
PR 0443-151
Harold
GN#1Sel27
Beryl R
Schooner
Gloria
TARS-VCI-4B
USPT-CBB-5


Basal Root Angle
Degrees
80
70
60
50
40
30
20
10
0
TARS-VCI-4B
PR 0443-151
Quincy
Stampede
CDC Crocus
Lariat
USPT-CBB-1
PR 0340-3-3-1
Bill Z
Sawtooth
Orion
IBC 301-204
USRMI-20
Buckskin
Kodiak
PT9-17
T-39
UI-537
I9365-31
Gloria
Harold
NE2-09-3
Avalanche
Shiny Crow
Sedona
Buster
GN9-1
Indeterminate Jamaica Red
Eclipse
GN#1Sel27
DOR 364
115M (Black Rhino)
Nodak
Topaz
Pink Floyd
PT7-2
Navigator
A-55
GN9-4
C-20
Common Pinto
F04-2801-4-1-2
SEA 10
US-1140
Mayflower
Medalist
Matterhorn
Domino

Root Rating Score (1-9):



1 – Weak ; 10 - Vigorous

BeanCAP – Mark Brick
CSU – Fort Collins CO

Expt.	Treat	Entries	High	Low	Mean	CV
DII	0.55			Yield (kg/ha)		%
Meso	Stress	25	1887	898	1446	18.0
Meso	NS	108	5131	1508	3226	18.4
Durango	Stress	71	2594	177	1312	32.9
Durango	NS	200	5124	720	2966	22.7

Heavy rainfall (33mm) one week following planting caused soil crusting that hindered emergence of all entries and caused severe stand loss in small and large-seeded entries. Irrigation was withheld from the drought plots at flowering (July 6). Rust infestation was heavy throughout the plots (inoculated). 2m section of plots were harvested by hand at physiological maturity (Aug 15- Oct). Seed is being shipped to Mike Grusak.

BeanCAP – Carlos Urrea
UNL – Mitchell NE

Expt.	Treat-ment	Entries	High	Low	Mean	CV
			Yield (kg/ha)			%
Mesos	Normal	108	4721	1906	3238	23.7
Durango	Normal	200	5090	1738	3444	22.3
Andean	Normal	49	4079	1906	3023	14.5

Irrigated plots received 9 irrigations of 38 mm each total 228 mm (13.5”). Precipitation from planting (June 15) until harvest was 103 mm – total 331 mm. Common bacterial blight readings were taken on all entries in all trials. Seed has been shipped to Mike Grusak.

BeanCAP – Juan Osorno
NDSU – Carrington ND

Expt.	Treat-ment	Entries	High	Low	Mean	CV
				Yield (kg/ha)		%
Mesos	Normal	108	2365	642	1455	18.6
Durango	Normal	200	2807	582	1724	17.2
Andean	Normal	49	2131	176	1079	30.5

Park Rapids-MN for Andean trial. All these trials were on irrigated ground. Conditions during season: Very rainy season which caused flooding in some areas. The trials as Carrington were also affected by hail twice during pod filling, but plants were able to recover. Specific issues -relevant to the nurseries - Brown Spot was very prevalent in all trials and differences from tolerance/resistance could be noticed among genotypes. Drought trial at Carrington was lost due to flooding. Seed has been shipped to Mike Grusak.

BeanCAP – Jim Kelly
MSU – Frankenmuth MI

Expt.	Treat-ment	Entries	High	Low	Mean	CV
			Yield (kg/ha)			%
Mesos	Normal	108	3898	549	2453	10.4
Durango	Normal	200	3629	661	2173	23.3
Andean	Normal	41	2236	506	1245	23.9

Plots at Frankenmuth suffered from an early season drought through late-July but recovered well. The drought reversed maturities with full-season Mesos maturing ahead of Durangos. Overall Mesos better adapted – lower CVs. Wide range of maturities, plant types in Durangos, some lacking adaptation – high CVs as plots were all direct harvested. Andean trial was conducted under low-N (10 lbs/a) by Karen Cichy. Seed is being shipped to Mike Grusak.

BeanCAP Lines
Growth Habit & Maturity Differences

Plans for 2012

- Interest to Repeat Some Major Field Trials
- Drought test in PR & MI - 96 Genotypes
- Participate in Yield Gains in Major Crops – CSSA Publication – Brick & Miklas
- Parental material
- Personal comments

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Michigan State University
AgBioResearch

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