

**2014 GEM Report: Truman State University,
Annual GEM Cooperator meeting, ASTA, Dec. 10, Chicago, IL**

**Development and Evaluation of Specialty Starch Germplasm Utilizing GEM
Biodiversity to Optimize Grain Quality, Composition, and Yield.**

Duration 2011 – 2015

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General Objectives: Truman state has served as a public cooperator in GEM program in order for student to activity participate in demonstrating the economic value of exotic maize germplasm, educates students, the local, state and scientific community of the necessity to support the National Plant Germplasm System. Our work consist of developing parent lines and hybrids with altered starches that address current trends in industry and concerns of consumer and health specialists. Our source of used at Truman for line development relies exclusively on materials released by GEM cooperators. In addition, DH lines recently released from the allelic diversity study are being introgressed into our existing genetic materials which expands the diversity used to develop and improve novel specialty starch maize. Additionally, we have used landraces adapted to specific areas where this material could potentially serve as an affordable source of prebiotic in areas vulnerable to gastrointestinal illnesses such as cholera. Specifically, our breeding efforts fall into two categories which are believed to address the following consumer needs (1). Developing high-amyllose corn which has a number of niche applications, one of which includes its use as a source of resistant starch (RS) having prebiotic properties that have well documented health benefits and functional attributes making it well suited as a ‘nutraceutical’ dietary supplement (2). The second starch type involves developing sources of a slowly digested unmodified starch (SDS) from native genetic diversity. Rather than focusing on RS starch, the rate of starch hydrolysis and other components in the grain influencing retention which may determine its potential applications in controlling blood sugar. Although a number of applications exist, evaluation of our materials involved the glycemic-index (GI), glycemic load (GL), α -Amylase Inhibitors and the recent observations made regarding interactions observed in human metabolomics <http://www.hmdb.ca/metabolites/HMDB06857> and cereal carbohydrates. Our material may serve to assist in understanding strategies that best identify therapeutic food choices for diabetic and glycogen disorder patients suffering from nocturnal hypoglycemia. This past summer several ongoing studies and new approaches used in the development of germplasm has taken place. Highlighted are field studies that demonstrate agronomic potential of Amylomaize lines developed using only GEM parents under varied environmental conditions. Continued effort involving collaboration of Truman State with A.T. Still Medical College and ISU is being accomplished.

Hybrid Evaluation

Evaluation of hybrids had previously been made from crosses between SS and NS lines believed to have alleles fixed resulting in starch amylose at or exceeding 70% during the 2009/10 winter nursery with good success and the results reported in the 2012 GEM report. A

series of unfortunate events have made progress in this area challenging since then. From the earlier study, an additional crossing block was prepared using two of GEM amylo maize lines exhibiting good general combining together with a number of SS and NS intended for planting during the 2011/12 winter nursery in Puerto Rico (Table 1). This seed, however, was lost in transit, eventually recovered, and planted during the 2012/13 season instead. The seed was successfully planted; however, during flowering insect damage greatly limited the amount of successful crosses. Some of this material was planted in Ames, IA during the summer of 2013. The results of this study are provided in Table 2. Due to the unfortunate loss of a fellow GEM private cooperator and friend, no winter crossing blocks have been made since. It will soon be necessary to identify an alternative plan, perhaps through in kind support of a GEM cooperator to ensure continued hybrid field experiments as new inbreds are developed.

Table 1. Crossing block grown during the 2012/13 winter nursery and numbers of successful ears recovered following crossing are shown.

No	Crossing block, Puerto Rico, 2012/2013	ears harvested - tassel damage army worm
1	CHIS775:S1911b-120-1-B-B-B/////AR16035:S02-615-1-B-B///GEMS-67	Male Entry
2	CHIS775:S1911b-120-1-B-B-B/////AR16035:S02-615-1-B-B///GEMS-67	
3	CHIS775:S1911b-120-1-B-B-B/////AR16035:S02-615-1-B-B///GEMS-67	
4	CHIS775:S1911b-120-1-B-B-B/////AR16035:S02-615-1-B-B///GEMS-67	
5	CHIS775:S1911b-120-1-B-B-B/////AR16035:S02-615-1-B-B///GEMS-67	
6	9353-01/97_DK888N11F2S3_7451-17-b-b/////CH05015:N1204-57-1-B-B/////DKXL370:N11a20-31-1-B-B-SIB///GEMS-67	0
7	BARBGP2:N08a18-332-001-B-B-B/////CH05015:N1204-57-1-B-B/////DKXL370:N11a20-31-1-B-B-SIB///GEMS-67	0
8	FS8B(T):N11a-087-001-b-b-sib-b-b/////CH05015:N1204-57-1-B-B/////DKXL370:N11a20-31-1-B-B-SIB///GEMS-67	0
9	CHO5015:N1204-057-001-b-b-b/////AR03056:N09-24-1-B-B-B/////DKXL370:N11a20-31-1-B-B-SIB///GEMS-67	0
10	DKXL370:N11a20-199-002-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////DKXL370:N11a20-31-1-B-B-SIB///GEMS-67	0
11	BR51675:N0620-033-001/////AR03056:N09-24-1-B-B-B/////DKXL370:N11a20-31-1-B-B-SIB///GEMS-67	0
12	MDI022:N21-B-002-003/////DKXL370:N11a20-234-2-B-B-B/////DKXL370:N11a20-31-1-B-B-SIB///GEMS-67	0
13	CH0515:N1502-086-001-b-b-b/////UR13085:N0215-14-1-B-B-B-B/////DKXL370:N11a20-31-1-B-B-SIB///GEMS-67	0
14	DK888:N11-B-027-001-B-001/////DREP150:N2011d-624-1-B-B/////DKXL370:N11a20-31-1-B-B-SIB///GEMS-67	0
15	DREP150:N2011d-624-1-B-B/////DKXL370:N11a20-31-1-B-B-SIB///GEMS-67	0
16	CHO5015:N1204-057-001-b-b-b/////UR13085:N0215-14-1-B///GEMS-67	0
17	9353-01/97_DK888N11F2S3_7451-17-b-b/////UR13085:N0215-14-1-B///GEMS-67	0
18	BARBGP2:N08a18-332-001-b-b-b/////UR13085:N0215-14-1-B///GEMS-67	0
19	BR51675:N0620-033-001/////UR13085:N0215-14-1-B///GEMS-67	0
20	CL-G1607(CML420):N11-008-001-007/////UR13085:N0215-14-1-B///GEMS-67	0
21	CH0515:N1502-086-001-b-b-b/////UR10001:S1813-257-1///GEMS-67	0
22	CH05015:N1502-086-001-B-B-B/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	0
23	CH05015:N1502-086-001-B-B-B/////AR03056:N09-24-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	0
24	DK212T:N11a12-191-001-B-B-B/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	0
25	DK212T:N11a12-191-001-B-B-B/////AR03056:N09-24-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	0
26	DKXL370:N11a20-199-002-B-B-B-Sib/////AR03056:N09-24-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS67	0
27	BR51403(PE001):N16-B-044-004-001-001C-001/////CH05015:N15-3-1-B-B///GEMS-67	0
28	DKXL370:N11a20-199-002-B-B-B-Sib/////FS8A(S):S09-362-1-B///GEMS-67	0
29	DKXL380:N11-B-007-010-B-002/////CHRIS775:S1911b-120-1-B-B-B/////CUBA164:S2012-444-1-B///GEMS-67	0
30	AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B- Male Entry	10

	B///GEMS-67	
31	AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	7
32	AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	4
33	AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	6
34	AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	0
35	2011-01_SE32_S17_F2S4_9148/////CHIS775:S1911b-120-1-B-B-B/////AR16035:S02-615-1-B-B///GEMS-67	2
36	2011-01_SE32_S17_F2S4_9148-Blk22/00/////CUBA164:S1511b-325-1-B-B/////AR16035:S02-615-1-B-B///GEMS-67	8
37	CUBA164:S1511b-325-1-B-B/////AR16035:S02-615-1-B-B///GEMS-67	0
38	CUBA164:S2012-966-1-B-B/////AR16035:S02-615-1-B-B///GEMS-67	0
39	DKB844:S1601-073-001-B-B-B-B/////CUBA164:S1511b-325-1-B-B/////AR16035:S02-615-1-B-B///GEMS-67	0
40	BR105:S1612-008-001-B-B/////DKB844:S1601-73-1-B-B-B/////AR16035:S02-615-1-B-B///GEMS-67	6
41	DKB844:S1601-73-1-B-B-B/////AR16035:S02-615-1-B-B///GEMS-67	0
42	2088-01_DK212T_S11_F2S4_9157-Blk29/00-sib-B-B-B/////DKB844:S1601-73-1-B-B-B/////AR16035:S02-615-1-B-B///GEMS-67	7
43	2011-01_SE32_S17_F2S4_9148-Blk22/00/////AR16035:S02-615-1-B-B///GEMS-67	0
44	GUAT209:S13 08a-120-001-B-B/////CHIS740:S1411a-783-2-B-B/////AR16035:S02-615-1-B-B///GEMS-67	0
45	2011-01_SE32_S17_F2S4_9148-Blk22/00-sib///GEMS-67	0
46	CHIS775:S1911b-120-001-B-B-B-B/////2011-01_SE32_S17_F2S4_9148-Blk22/00-sib///GEMS-67	0
47	2011-01_SE32_S17_F2S4_9148-Blk22/00/////2011-01_SE32_S17_F2S4_9148-Blk22/00-sib///GEMS-67	7
48	CUBA164:S2012-444-001-B-B-Sib/////2011-01_SE32_S17_F2S4_9148-Blk22/00-sib///GEMS-67	1
49	CHIS740:S11411a-783-002-b-b-b/////2011-01_SE32_S17_F2S4_9148-Blk22/00-sib///GEMS-67	1
50	CUBA164:S2012-444-1-B///GEMS-67	0
51	CHRIS775:S1911b-120-1-B-B-B/////CUBA164:S2012-444-1-B///GEMS-67	3
52	CUBA164:S1511b-325-001-B-B-B-B-Sib/////CHRIS775:S1911b-120-1-B-B-B/////CUBA164:S2012-444-1-B///GEMS-67	1
53	FS8A(S):S09-362-1-B///GEMS-67	0
54	2011-01_SE32_S17_F2S4_9148-Blk22/00/////FS8A(S):S09-362-1-B///GEMS-67	1
55	CHIS740:S11411a-783-002-b-b-b/////CUBA164:S1511b-325-1-B-B/////FS8A(S):S09-362-1-B///GEMS-67	4
56	BVIR155:S2012-029-001-B-B/////UR10001:S1813-257-1///GEMS-67	8
57	CHIS740:S11411a-783-002-b-b-b/////UR10001:S1813-257-1///GEMS-67	3
58	DKB844:S1601-073-001-B-B-B-B/////UR10001:S1813-257-1///GEMS-67	0
59	UR10001:S1813-257-1///GEMS-67	0
60	2011-01_SE32_S17_F2S4_9148-Blk22/00/////UR10001:S1813-257-1///GEMS-67	11
61	UR11003:S0302-1011-001-b-b-b/////UR10001:S1813-257-1///GEMS-67	2
62	BR51675:N0620-033-001/////UR10001:S1813-257-1///GEMS-67	1
63	BR52060:S0210-143-001-b-b-b/////UR10001:S1813-257-1///GEMS-67	0
64	GUAT209:S13 08a-120-001-B-B/////UR10001:S1813-257-1///GEMS-67	3
65	CUBA164:S2008c-289-001-B-B/////AR03056:N09-24-1-B-B-B/////DKXL370:N11a20-31-1-B-B-SIB///GEMS-67	5
66	H99 ae///GEMS-67	1

Results from the yield evaluation grown in Ames, IA in 2013 are provided in **Table 2**. Seed obtained from the 2012/13 crossing block (**Table 1**) was intended to be used as a source for hybrid entries which are indicated by the purple entry numbers in **Table 2**. The delayed arrival and extensive insect damage required that seed from 2009/10 was used (green entry numbers) to complete the experiment. Entry 47 (**AR03056:N09-24-1-B-B-B/////DKXL370:N11a20-31-1-B-B-SIB///GEM67** X **CUBA164:S2012-444-1-B///GEM67**) displayed the greatest yield with a plot average of 156.0 bu/ac.

Of the entries from the later crossing block, entry 16 (**BVIR155:S2012-029-001-B-B/////UR10001:S1813-257-1///GEMS-67** x **AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67**) displayed the

greatest yield at 153.2 bu/ac. In fact, a number of independent ears having similar parentage were used as independent entries due to the insect damage that resulted in a lack of successful crosses. This provides useful information regardless of the poor hybrid cross attempts since [BVIR155:S2012-029-001-B-B/////UR10001:S1813-257-1///GEMS-67](#) had not been used in any experimental hybrids in the past and suggests that lines derived from this pedigree be further prioritized for increasing yield performance.

Table 3 was made to examine SS lines that had a common parent constituting 50% of their pedigree. The lines possessing [2088-01_DK212T_S11_F2S4_9157-Blk29/00-sib-B-B-B/////DKB844:S1601-73-1-B-B-B/////AR16035:S02-615-1-B-B///GEMS-67](#) averaged the greatest yield of 147.0 bu/ac. In addition, lines with [GUAT209:S1308a-120-001-B-B](#) and [BVIR155:S2012-029-001-B-B/////UR10001:S1813-257-1///GEMS-67](#) consistently performed well.

During the summer of 2014, an effort was made to include remaining seed of experimental hybrids that had not yet been examined. Stand counts suffered for many as a result of as a result of seed aging. Early planting if followed by cool damp conditions also make emergence of amylo maize stands suffer. There were a few hybrids that yielded fairly well. In some cases, seeding rates routinely used may be excessive for amylo maize VII material and, therefore, yields may have increased with decrease seed viability.

**[CHIS775:S1911b-120-1-B-B-B/////AR16035:S02-615-1-B-B/// GEM67 X](#)
[AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B/// GEM67](#)**

Yield	150.1	
	165.9	
%stand	45.8	63.9

**[CHIS775:S1911b-120-1-B-B-B/////AR16035:S02-615-1-B-B/// GEM67 X](#)
[DKB844:S1601-073-001-B-B-B-B-B/////CUBA164:S1511b-325-1-B-B/////AR16035:S02-615-1-B-B/// GEM67](#)**

Yield	163.6	
	164.2	
%stand	69.4	51.3

[CH05015:N1204-57-1-B-B/////CH05015:N15-3-1-B-B///GEM67 X](#) [CUBA164:S1511b-325-1-B-B/////AR163035:S02-615-1-B-B///GEM67](#)

Yield	154.6	
	138.9	
%stand	51.02	56.0

Table 2. Experimental amylo maize GEMN x GEMS hybrids grown in a randomized complete block design near Ames, IA 2013

Hybrid (Amylo maize GEMN x GEMS) Yield Evaluation,	Entry 09/10 12/13	WT	Yield (bu/ac)	MOIST	Y/M	TWT
AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67 x CHIS775:S1911b-120-1-B-B-B/////AR16035:S02-615-1-B-B///GEMS-67	1	15.9	104.2	28.7	3.7	50.4
AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67 x CHIS775:S1911b-120-1-B-B-B/////AR16035:S02-615-1-B-B///GEMS-67	2	20.3	133.6	28.6	4.7	52.9
AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67 x CHIS775:S1911b-120-1-B-B-B/////AR16035:S02-615-1-B-B///GEMS-67	3	18.8	122.2	29.6	4.2	50.4
AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67 x UR11003:S0302-1011-001-b-b-b/////UR10001:S1813-257-1///GEMS-67	4	19.6	125.3	30.7	4.1	51.8
2011-01_SE32_S17_F2S4_9148-Blk22/00/////CUBA164:S1511b-325-1-B-B/////AR16035:S02-615-1-B-B///GEMS-67 x AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	5	15.4	101.2	28.7	3.6	52.5
BR105:S1612-008-001-B-B/////DKB844:S1601-73-1-B-B-B/////AR16035:S02-615-1-B-B///GEMS-67 x AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	6	20.1	127.7	31.1	4.1	50.7
2088-01_DK212T_S11_F2S4_9157-Blk29/00-sib-B-B-B/////DKB844:S1601-73-1-B-B-B/////AR16035:S02-615-1-B-B///GEMS-67 x AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	7	23.5	150.7	30.6	5.0	51.5
2011-01_SE32_S17_F2S4_9148-Blk22/00/////2011-01_SE32_S17_F2S4_9148-Blk22/00-sib///GEMS-67x AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	8	23.0	149.0	29.8	5.0	50.1
2011-01_SE32_S17_F2S4_9148-Blk22/00/////2011-01_SE32_S17_F2S4_9148-Blk22/00-sib///GEMS-67x AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	9	19.2	122.3	30.7	4.0	49.6
CUBA164:S2008c-289-001-B-B/////AR03056:N09-24-1-B-B-B/////DKXL370:N11a20-31-1-B-B-SIB///GEMS-67 x AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	10	21.5	139.9	29.4	4.8	51.9

CUBA164:S2008c-289-001-B-B/////AR03056:N09-24-1-B-B-B/////DKXL370:N11a20-31-1-B-B-SIB///GEMS-67 x AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	11	21.9	137.7	31.7	4.4	51.3
2011-01_SE32_S17_F2S4_9148-Blk22/00/////UR10001:S1813-257-1///GEMS-67 x AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	12	20.8	133.7	30.1	4.4	50.0
2011-01_SE32_S17_F2S4_9148-Blk22/00/////UR10001:S1813-257-1///GEMS-67 x AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	13	21.7	144.3	27.7	5.2	51.6
2011-01_SE32_S17_F2S4_9148-Blk22/00/////UR10001:S1813-257-1///GEMS-67 x AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	14	22.0	139.9	30.8	4.5	50.0
BVIR155:S2012-029-001-B-B/////UR10001:S1813-257-1///GEMS-67 x AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	15	23.7	<u>150.6</u>	31.0	4.9	51.0
BVIR155:S2012-029-001-B-B/////UR10001:S1813-257-1///GEMS-67 x AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	16	24.1	<u>153.2</u>	31.0	5.0	50.5
BVIR155:S2012-029-001-B-B/////UR10001:S1813-257-1///GEMS-67 x AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	17	22.1	142.3	30.1	4.8	51.6
BVIR155:S2012-029-001-B-B/////UR10001:S1813-257-1///GEMS-67 x AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	18	18.1	115.9	30.6	3.9	51.1
BVIR155:S2012-029-001-B-B/////UR10001:S1813-257-1///GEMS-67 x AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	19	21.0	134.4	30.4	4.4	51.3
CHIS740:S11411a-783-002-b-b-b/////UR10001:S1813-257-1///GEMS-67x AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	20	19.1	121.7	31.0	4.0	49.6
2088-01_DK212T_S11_F2S4_9157-Blk29/00-sib-B-B-B/////DKB844:S1601-73-1-B-B-B/////AR16035:S02-615-1-B-B///GEMS-67 x AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEMS-67	21	22.7	143.7	31.4	4.6	49.5
amylomaize I	22	17.2	109.7	30.6	3.6	49.2
amylomaize II	23	11.4	73.7	29.8	2.5	49.9
UR11003:S0302-1011-001-b-b-b/////UR10001:S1813-257-1///GEMS-67 x AR03056:N09-191-001-B-B-B-Sib/////AR03056:N09-182-1-B-B-B/////CH05015:N15-3-1-B-B///GEM67	24	22.1	144.9	28.8	5.1	51.2
AR03056:N09-24-1-B-B-B/////DKX L370:N11a20-31-1-B-B-SIB///GEM67 X UR10001:S1813-257-1///GEM67	25	15.4	101.0	28.9	3.5	50.7

AR03056:N09-24-1-B-B-B////DKX L370:N11a20-31-1-B-B-SIB///GEM67 X GUAT209:S1308a-120-001-B-B-B////UR10001:S1813-257-1///GEM67	26	23.9	151.5	31.3	4.9	51.7
AR03056:N09-24-1-B-B-B////DKX L370:N11a20-31-1-B-B-SIB///GEM67 X DKB844:S1601-073-001-B-B-B-B-B////CUBA164:S1511b-325-1-B-B-B////AR16035:S02-615-1-B-B-B///GEM67	27	20.1	127.3	31.3	4.1	50.4
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B-B///GEM67 X UR13085:N0215-14-1-B-B-B///GEM67	28	17.4	109.6	31.7	3.5	49.2
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B-B///GEM67 X DK212T:N11a12-191-001-B-B-B-B-B////CH05015:N1204-57-1-B-B-B////DK L370:N11a20-31-1-B-B-SIB///GEM67	29	21.1	134.9	30.4	4.5	49.8
AR03056:N09-24-1-B-B-B////DKX L370:N11a20-31-1-B-B-SIB///GEM67 X GUAT209:S1308a-047-001-B-B-B-B-B////CHIS740:S1411a-783-2-B-B-B////AR16035:S02-615-1-B-B-B///GEM67	30	19.7	127.9	29.7	4.3	50.9
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B-B///GEM67 X CH05015:N1204-57-1-B-B-B////DKXL370:N11a20-31-1-B-B-SIB/// GEM67	31	19.6	125.2	30.7	4.1	50.3
CHIS740:S11411a-783-002-b-b-b-b////UR10001:S1813-257-1///GEMS-67 X AR03056:N09-191-001-B-B-B-Sib////AR03056:N09-182-1-B-B-B-B////CH05015:N15-3-1-B-B-B///GEMS-67	32	18.7	120.0	30.2	4.0	50.9
CUBA164:S1511b-325-1-B-B-B////AR16035:S02-615-1-B-B-B///GEM67 X AR03056:N09-24-1-B-B-B-B////(CH05015:N15-3-1-B-B-B/// GEMS-67	33	14.9	94.8	31.0	3.1	50.9
CUBA164:S1511b-325-1-B-B-B////AR16035:S02-615-1-B-B-B///GEM67 X AR03056:N09-182-1-B-B-B-B////(CH05015:N15-3-1-B-B-B/// GEMS-67	34	18.6	121.3	29.4	4.2	50.8
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B-B///GEM67 X UR13085:N0215-14-1-B-B-B///GEM67	35	15.4	98.5	30.8	3.2	49.5
AR03056:N09-24-1-B-B-B////DKX L370:N11a20-31-1-B-B-SIB///GEM67 X CUBA164:S2012-444-1-B-B-B///GEM67	36	18.8	118.6	31.4	3.8	51.3
CUBA164:S1511b-325-001-B-B-B-B-B-Sib////CHRIS775:S1911b-120-1-B-B-B-B-B//// CUBA164:S2012-444-1-B-B-B-B-B-Sib////GEMS-67 X AR03056:N09-191-001-B-B-B-Sib//// AR03056:N09-182-1-B-B-B-B-B////CH05015:N15-3-1-B-B-B-B-B////GEMS-67	37	9.3	59.7	30.7	2.0	49.8
CUBA164:S1511b-325-1-B-B-B-B-B-Sib////AR16035:S02-615-1-B-B-B-B-B-Sib////GEM67 X DKXL370:N11a20-31-1-B-B-SIB///GEM67	38	17.2	111.7	29.5	3.8	51.4
CUBA164:S1511b-325-1-B-B-B-B-B-Sib////AR16035:S02-615-1-B-B-B-B-B-Sib////GEM67 X FS8B(T):N11a-322-1-B-B-B-B-B-Sib////DKXL370:N11a20-31-1-B-B-SIB///GEM67	39	17.1	110.6	29.7	3.7	50.2
CUBA164:S1511b-325-1-B-B-B-B-B-Sib////AR16035:S02-615-1-B-B-B-B-B-Sib//// GEM67 X DREP150:N2011d-624-1-B-B-B-B-B-Sib////DKXL370:N11a20-31-1-B-B-SIB/// GEM67	40	14.6	96.4	28.0	3.5	50.1

CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B///GEM67 X AR03056:N09-191-1-B-B-B////DK L370:N11a20-31-1-B-B-SIB///GEM67	41	17.2	108.9	31.4	3.5	49.6
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B///GEM67 X DREP150:N2011d-624-1-B-B-B////DK L370:N11a20-31-1-B-B-SIB///GEM67	42	16.6	108.0	29.2	3.7	51.5
AR03056:N09-24-1-B-B-B////DKX L370:N11a20-31-1-B-B-SIB///GEM67 X 2011-01_SE32_S17_F2S4_9148-Blk22/00-sib///GEM67	43	19.2	124.2	29.8	4.2	51.2
CH05015:N1204-57-1-B-B-B////(CH05015:N15-3-1-B-B///GEM67 X CUBA164:S1511b-325-1-B-B-B////AR16035:S02-615-1-B-B///GEM67	44	23.3	148.2	30.8	4.8	51.1
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B///GEM67 X AR03056:N09-24-1-B-B-B//// CH05015:N15-3-1-B-B///GEM67	45	12.7	82.6	29.8	2.8	48.1
AR03056:N09-24-1-B-B-B////DKX L370:N11a20-31-1-B-B-SIB///GEM67 X CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B///GEM67	46	19.1	123.2	30.2	4.1	49.4
AR03056:N09-24-1-B-B-B////DKX L370:N11a20-31-1-B-B-SIB///GEM67 X CUBA164:S2012-444-1-B-B///GEM67	47	24.5	156.5	30.6	5.1	51.2
AR03056:N09-24-1-B-B-B////DKX L370:N11a20-31-1-B-B-SIB///GEM67 X CUBA164:S1511b-325-1-B-B-B////AR16035:S02-615-1-B-B///GEM67	48	12.1	76.3	31.5	2.4	49.1
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B///GEM67 X DK212T:N11a12-191-001-B-B-B////AR03056:N09-24-1-B-B-B////CH05015:N15-3-1-B-B///GEM67	49	19.4	125.5	30.0	4.2	50.3
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B///GEM67 X AR03056:N09-191-001-B-B-B-Sib////AR03056:N09-182-1-B-B-B////CH05015:N15-3-1-B-B///GEM67	50	23.6	152.6	29.8	5.2	51.1
mean	19.1	19.1	122.7	30.2	4.1	50.6
S	4.0	3.5	22.4	1.0	0.7	0.9
CV%	21.1	18.4	18.2	3.2	18.2	1.9
Entry	**	**	**	**	**	**
Block	**	**	**	ns	**	**

Table 3. Amylomaize VII SS lines grouped having in their pedigree at least half being derived from a common ancestor. In other words, these are average performance values of line having a common parent.

Mean hybrid performance sharing the following SS lines making up at least 50% of it background			Entry	WT	Yield (bu/ac)	MOIST	Y/M	TWT
2011-01_SE32_S17_F2S4_9148-Blk22/00-sib///GEM67	1	mean	14.9	20.2	130.6	29.6	4.4	50.7
		S	12.8	2.5	16.3	1.1	0.6	1.1
	n = 7	CV%	86.1	12.6	12.5	3.7	13.0	2.1
2088-01_DK212T_S11_F2S4_9157-Blk29/00-sib-B-B	2	mean	14.0	23.1	<u>147.2</u>	31.0	4.8	50.5
		S	9.9	0.6	4.9	0.6	0.3	1.4
	n =2	CV%	70.7	2.4	3.3	1.9	6.0	2.8
Amylomaize VII Checks	3	mean	22.5	14.3	91.7	30.2	3.0	49.5
		S	0.7	4.1	25.5	0.6	0.8	0.5
	n =2	CV%	9.9	9.9	9.9	9.9	9.9	9.9
BR105:S1612-008-001-B-B	4	mean	15.2	21.5	137.3	30.7	4.5	51.0
		S	4.7	4.7	2.3	14.2	0.4	0.4
	n =6	CV%	9.9	9.9	9.9	9.9	9.9	9.9
CHIS740:S11411a-783-002-b-b-b	5	mean	26.0	18.9	120.9	30.6	4.0	50.2
		S	8.5	0.3	1.2	0.6	0.0	1.0
	n =2	CV%	9.9	9.9	9.9	9.9	9.9	9.9
CHIS775:S1911b-120-1-B-B-B	6	mean	30.9	18.2	117.6	30.0	3.9	50.2
		S	18.0	2.8	18.2	0.9	0.6	1.2
	n =14	CV%	9.9	9.9	9.9	9.9	9.9	9.9
CUBA164:S2012-444-1-B///GEM67	7	mean	34.8	17.8	114.3	30.3	3.8	50.7
		S	12.3	4.6	29.2	1.1	1.0	0.8
	n =12	CV%	9.9	25.7	0.0	0.0	0.0	0.0
GUAT209:S1308a-047-001-B-B	8	mean	27	20.1	127.3	31.3	4.1	50.4
		S						
		CV%						

	n=1							
GUAT209:S1308a-120-001-B-B	9	mean	28.0	21.8	139.7	30.5	4.6	51.3
		S	2.8	3.0	16.7	1.2	0.4	0.6
	n =2	CV%	9.9	9.9	9.9	9.9	9.9	9.9
UR10001:S1813-257-1///GEM67	10	mean	25	22.1	101.0	28.9	3.5	50.7
	n=1							
UR11003:S0302-1011-001-b-b-b	11	mean	24.0	22.1	101.0	28.9	3.5	50.7
		S	0.0	1.0	13.9	1.3	0.7	0.5
	n =2	CV%	9.9	9.9	9.9	9.9	9.9	9.9

Table 4. Hybrid performance of amylomaize VII GEMN x GEMS lines in Ames, IA 2014 from seed of lines produced in a crossing block grown in a 2009/10 P.R. where most hybrids entries have been included in previous yield trials.

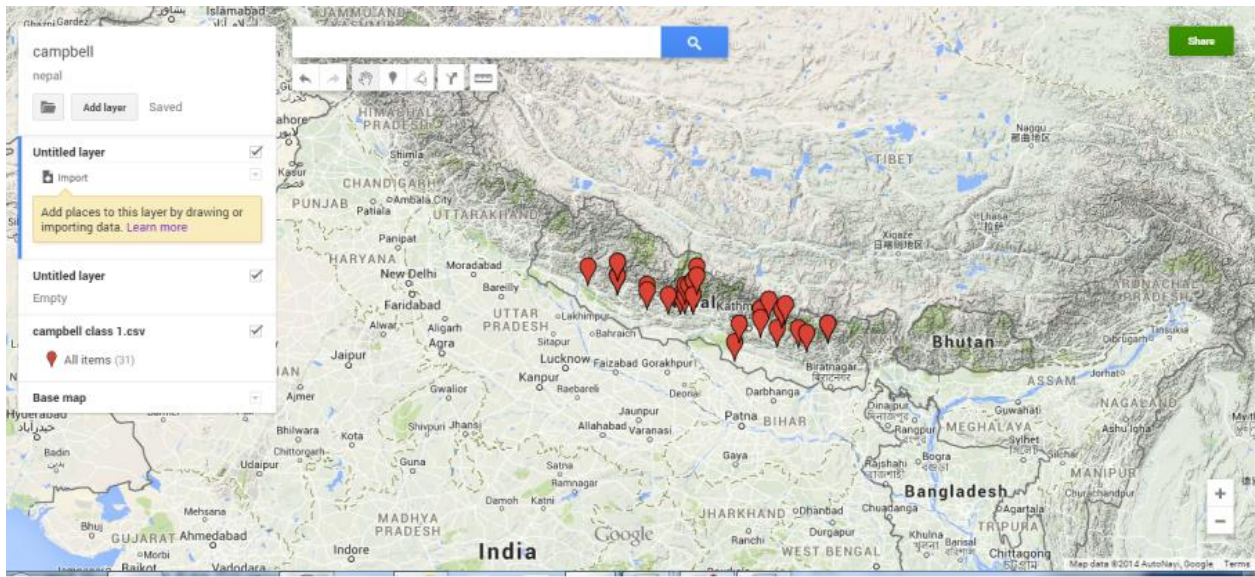
Ames, IA 2014	WT	Yield (bu/ac)	MOIST	Y/M	TWT	%stand	%skldg	%rtldg
AR03056:N09-24-1-B-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67 X CHIS740:S1411a-783-2-B-B////AR16035:S02-615-1-B-B////GEMS-67	9.9	64.9	28.5	2.3	48.3	17.4	0.0	0.0
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67 X AR03056:N09-24-1-B-B-B////(CH05015:N15-3-1-B-B////GEMS-67	9.0	61.1	26.0	2.4	47.9	14.6	0.0	4.2
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67 X (UR13085:N0215-14-1-B////GEMS-67	10.2	68.2	27.3	2.5	50.0	15.3	0.0	0.0
AR03056:N09-24-1-B-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67 X (CUBA164:S2012-444-1-B////GEMS-67	15.1	99.2	28.8	3.4	50.8	62.5	0.0	5.3
AR03056:N09-24-1-B-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67 X (CUBA164:S2012-444-1-B////GEMS-67	19.1	124.0	29.4	4.2	50.3	47.9	28.6	0.0
AR03056:N09-24-1-B-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67 X DKB844:S1601-073-001-B-B-B-B-B////CUBA164:S1511b-325-1-B-B////AR16035:S02-615-1-B-B////GEMS-67	16.2	107.3	27.9	3.8	50.2	16.7	0.0	0.0
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67 X GUAT209:S1308a-047-001-B-B////CHIS740:S1411a-783-2-B-B////AR16035:S02-615-1-B-B////GEMS-67	14.4	99.2	25.2	3.9	50.2	36.8	0.0	0.0
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67 X AR03056:N09-182-1-B-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67	11.6	76.4	27.3	2.7	48.7	17.4	0.0	0.0
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67 X AR03056:N09-191-1-B-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67	1.7	13.3	14.5	0.9	14.9	2.1	0.0	0.0
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67 X FS8B(T):N11a-322-1-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67	17.6	114.0	29.8	3.8	49.4	38.2	28.6	47.7

CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67 X DREP150:N2011d-624-1-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67	15.1	99.2	28.5	3.5	51.5	31.3	0.0	0.0
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67 X DKXL370:N11a20-31-1-B-B-SIB////GEMS-67	17.9	117.6	28.6	4.1	49.7	47.2	0.0	0.0
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67 X DK212T:N11a12-191-001-B-B-B////CH05015:N1204-57-1-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67	14.1	93.8	27.9	3.4	50.1	26.4	0.0	0.0
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67 X AR03056:N09-191-001-B-B-B-Sib////AR03056:N09-182-1-B-B-B////(CH05015:N15-3-1-B-B////GEMS-67	23.4	158.0	26.7	5.9	50.4	54.9	0.0	0.0
AR03056:N09-24-1-B-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67 X AR16035:S02-615-1-B-B////GEMS-67	15.1	100.8	27.9	3.6	49.7	44.4	0.0	0.0
AR03056:N09-24-1-B-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67 X CUBA164:S1511b-325-1-B-B////AR16035:S02-615-1-B-B////GEMS-67	3.8	26.4	24.5	1.1	30.7	29.2	0.0	0.0
AR03056:N09-24-1-B-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67 X UR10001:S1813-257-1////GEMS-67	17.7	120.9	25.9	4.7	50.6	47.2	0.0	0.0
AR03056:N09-24-1-B-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67 X (2011-01_SE32_S17_F2S4_9148-Blk22/00-sib////GEMS-67	18.5	123.4	27.6	4.5	49.2	72.2	0.0	0.0
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67 X (UR13085:N0215-14-1-B////GEMS-67	7.7	50.4	28.8	1.8	49.6	13.2	0.0	0.0
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67 X AR03056:N09-24-1-B-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67	15.4	105.8	25.5	4.2	51.0	29.9	0.0	0.0
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67 X DKXL370:N11a20-234-2-B-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67	20.5	135.4	28.2	4.8	48.5	53.5	0.0	6.1

CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67 X CH05015:N1204-57-1-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67	7.0	47.5	26.0	1.8	50.1	13.9	0.0	0.0
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67 X AR03056:N09-182-1-B-B-B////(CH05015:N15-3-1-B-B////GEMS-67	16.3	108.8	27.5	4.0	50.0	41.7	0.0	0.0
AR03056:N09-24-1-B-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67 X AR16035:S02-615-1-B-B////GEMS-67	23.3	153.7	28.4	5.4	49.3	89.6	0.0	0.0
AR03056:N09-24-1-B-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67 X AR16035:S02-615-1-B-B////GEMS-67	14.5	96.3	27.8	3.4	49.7	42.4	0.0	0.0
AR03056:N09-24-1-B-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67 X DKB844:S1601-073-001-B-B-B-B-B////CUBA164:S1511b-325-1-B-B////AR16035:S02-615-1-B-B////GEMS-67	24.6	163.9	27.7	5.9	50.9	60.4	0.0	0.0
AR03056:N09-24-1-B-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67 X CUBA164:S1511b-325-1-B-B////AR16035:S02-615-1-B-B////GEMS-67	2.4	16.9	17.1	0.8	20.9	3.5	0.0	0.0
AR03056:N09-24-1-B-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67 X UR10001:S1813-257-1////GEMS-67	16.9	114.3	26.7	4.3	49.9	53.5	1.4	1.4
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67 X AR03056:N09-24-1-B-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67	13.1	86.3	28.2	3.1	48.6	26.4	0.0	0.0
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67 X UR13085:N0215-14-1-B////GEMS-67	5.4	36.1	27.0	1.3	42.8	10.4	0.0	0.0
AR03056:N09-24-1-B-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67 X 2011-01_SE32_S17_F2S4_9148-Blk22/00-sib////GEMS-67	19.5	130.3	27.4	4.8	49.4	71.5	0.0	0.0
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67 X DKXL370:N11a20-234-2-B-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67	17.2	114.1	28.0	4.1	49.5	56.3	0.0	0.0
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67 X CH05015:N1204-57-1-B-B////DKXL370:N11a20-31-1-B-B-SIB////GEMS-67	5.1	35.1	20.1	1.5	32.3	6.9	0.0	0.0

CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67 X AR03056:N09-182-1-B-B-B////CH05015:N15-3-1-B-B////GEMS-67	15.1	100.4	27.7	3.6	48.7	36.1	0.0	1.6
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67 X AR03056:N09-182-1-B-B-B////CH05015:N15-3-1-B-B////GEMS-67	16.7	111.7	27.3	4.1	48.7	41.0	3.0	3.0
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67 X AR03056:N09-182-1-B-B-B////CH05015:N15-3-1-B-B////GEMS-67	16.0	106.9	27.4	3.9	49.9	36.1	0.0	0.0
AmyVI Check 1	2.4	17.9	18.7	1.0	22.2	3.5	0.0	0.0
AmyVI Check 2	1.1	8.8	8.9	1.0	9.2	1.4	0.0	0.0
CUBA164:S1511b-325-1-B-B-B////AR16035:S02-615-1-B-B////GEM67 X DKXL370:N11a20-31-1-B-B-SIB//GEM67	14.5	96.7	27.7	3.5	50.5	49.3	3.6	3.6
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67 X FS8B(T):N11a-322-1-B-B////DKXL370:N11a20-31-1-B-B-SIB//GEMS-67	16.4	104.2	31.2	3.3	49.1	52.1	32.5	42.5
CHIS775:S1911b-120-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67 X AR03056:N09-24-1-B-B-B////(CH05015:N15-3-1-B-B////GEMS-67	11.2	75.1	26.8	2.8	47.8	18.1	0.0	0.0
AR03056:N09-24-1-B-B-B////DKXL370:N11a20-31-1-B-B-SIB//GEMS-67 X UR10001:S1813-257-1//GEMS-67	15.5	104.6	26.9	3.9	49.7	47.9	0.0	2.7
AR03056:N09-24-1-B-B-B////DKXL370:N11a20-31-1-B-B-SIB//GEMS-67 X CHIS740:S1411a-783-2-B-B////AR16035:S02-615-1-B-B////GEMS-67	9.3	60.0	29.8	2.0	48.6	15.3	0.0	0.0
CH05015:N1204-57-1-B-B-B////CH05015:N15-3-1-B-B////GEM-67 X CUBA164:S1511b-325-1-B-B////AR16035:S02-615-1-B-B////GEM-67	22.0	146.8	27.6	5.3	49.9	54.2	1.4	1.4
4015/3042 DREP150:N2011d-624-1-B-B////DKXL370:N11a20-31-1-B-B-SIB//GEMS-67 X 2088-01_DK212T_S11_F2S4_9157-Blk29/00-sib-B-B-B////DKB844:S1601-73-1-B-B-B////AR16035:S02-615-1-B-B////GEMS-67	8.5	57.0	26.7	2.1	51.3	13.2	0.0	0.0
4044/4038 GUAT209:S13 08a-120-001-B-B////CHIS740:S1411a-783-2-B-B-B////AR16035:S02-615-1-B-B////GEMS-6 X CUBA164:S2012-966-1-B-	15.8	103.4	28.7	3.6	50.3	37.5	0.0	6.3

B////AR16035:S02-615-1-B-B///GEMS-67								
CUBA164:S1511b-325-1-B-B////AR16035:S02-615-1-B-B///GEM67 X FS8B(T):N11a-322-1-B-B////DKXL370:N11a20-31-1-B-B-SIB///GEM-67	19.1	128.0	27.4	4.7	50.6	57.6	0.0	3.5
4046/4016 CHIS775:S1911b-120-001-B-B-B-B////2011-01_SE32_S17_F2S4_9148-BIk22/00-sib///GEMS-67 X CHO5015:N1204-057-001-b-b-b/////UR13085:N0215-14-1-B///GEMS-67	16.9	110.7	29.0	3.8	50.4	55.6	1.9	1.9
Normal (Asgrow)	23.1	160.7	24.6	6.6	53.5	48.6	0.0	0.0
Mean	13.9	93.0	26.4	3.4	46.2	36.0	0.0	2.7
S	6.0	40.0	4.0	1.4	9.8	21.0	0.0	9.0
CV%	43.3	43.0	15.2	41.2	21.2	58.3		
Max	24.6	163.9	31.2	6.6	51.5	89.6	32.5	47.7
min	1.1	8.80	8.9	0.8	9.2	1.4	0.0	0.0
entry		**	**	**	**	**	ns	**
		ns	ns	ns	ns	ns	ns	ns



Accessions currently being used to introduce adaptation genes to various regions in Nepal. Map made using Excel Fusion and Google maps.

Appendix Table 1: Evaluation of GEM germplasm for resistance to aflatoxin accumulation at USDA-ARS and Mississippi State in 2014.

Pedigree	Seed Source	Aflatoxin (ng/g)	
		ln (y+1)	Geometric mean
((KO679Y/GEMS-0115)/GEMS-0181)-B-022	11GEM05826	5.13	169
GEMS-0030/KO679Y	12GEM04507	2.74	14
GEMN-0097/TF-2-0-T3-P74-G121	13GEM80057	5.31	202
GEMN-0097/TF-0-0-T2-P72-G122	13GEM80058	5.24	188
GEMN-0097/MSU_1	13GEM80059	3.78	43
GEMN-0097//GEMN-0130/MP494	13GEM80060	4.59	97
GEMN-0192//GEMN-0130/MP494	13GEM80062	3.92	49
GEMN-0205/TF-0-0-T2-P72-G122	13GEM80063	4.32	74
GEMS-0074//GEMN-0130/MP494	13GEM80064	2.29	9
(GEMS-0227/(Mp494/GEMS-0002)-001-002-001-001)	13GEM80065	5.08	160
GEMS-0227/TF-2-0-T3-P74-G121	13GEM80066	5.40	220
(GEMS-0227/(Mp717/GEMS-0002)-001-001-001-001)	13GEM80068	2.70	14
PHN46/(GEMN-0130/MP494)	13GEM80072	4.85	127
GEMN-0097/(GEMN-0130/MP494)	13GEM80076	4.95	141
GEMN-0205/(GEMN-0130/MP494)	13GEM80081	5.45	231
GEMS-0227/MSU_1	13GEM80085	3.90	48
GEMS-0227/TF-0-0-T2-P72-G122	13GEM80086	3.84	46
GEMS-0227/TF-0-0-T2-P72-G122	13GEM80088	4.25	69
LH61/(GEMN-0130/MP494)	13GEM80089	5.39	217
LH61/MSU_1	13GEM80090	6.03	416
(GEMN-0130/MP494)/GEMN-0205	13GEM80094	4.55	93
GEMN-0140/GEMN-0130	09GEM00182	4.19	65
GEMS-0030/GEMS-0091	07GEM02650	4.80	121
LH198/(UR13085:S99g99u-B-B-B-B-7-1)	HEN13:126 x 91	4.17	63
LH132/(TF-2-0-T3-P70-G121)	HEN13:101 x 61	5.91	367
PHV78/(UR13085:S99g99u-B-B-B-B-7-1)	HEN13:123 x 91	4.35	76
LH198/(TF-1-0-T3-P66-G95)	HEN13:126 x 87	5.60	269
LH198/(TF2-0-T3-P70-G121)	HEN13:126 x 61	4.66	105
(Mp494xGEM#47)-1-2-1-1-1-1	HEN13-14:35-1	4.43	83
(Mp717xGEM#47)-1-1-1-1-1-1	HEN13-14:31-1	3.88	47
(Mp317xGEM#45)-2-1-1	PW13:78-1	1.80	5
(Mp317xGEM#45)-1-5-2-1-1	PW13:65-1	1.49	3
(Mp317xGEM#45)-1-5-3-1-1	PW13:66-1	0.42	1
(Mp317xGEM#45)-1-5-5-1-1	PW13:67-1	3.86	47
(Mp317xGEM#45)-1-5-6-1-1	PW13:68-1	0.92	1
(Mp317xGEM#45)-1-5-7-1-1	PW13:69-1	1.60	4
(CUBA117:S15-101-001-B-B-B-B-B/BR51675:N0620-033-001-B-B-B)-B-20-1	PW13:86-1	3.18	23
UR13085:S99g99u-B-023-B-B-B	13GEM01695	5.18	176
UR13085:S99g99u-B-058-B-B-B	13GEM01696	4.13	61
UR13085:S99g99u-B-B-B-B-007-001-001-B	13GEM01697	3.96	51
KO679Y	11GEM06555	5.71	300
(GEMS-0002/GEMS-0003)-B-B-046-B-B	13GEM01531	3.49	32

Mp313E	12-13:623	3.57	35
Mp717	12-13:715	4.77	117
Mp719	11-12:466	2.46	11
Mp420	13:005	4.25	69
B73	11-12:480	6.12	452
Va35	13:2101	5.55	256
Mp 313E x Mp 717	12-13:211	2.01	6
B73 x Va35	12-13:169	4.60	98
LSD (0.05)		1.79	

Developing ears were inoculated with *Aspergillus flavus* using the side-needle technique 7 days after mid-silk. Ears were hand harvested at maturity, dried, and shelled. Grain was ground and aflatoxin concentration was determined using the Vicam Aflatest. Values for aflatoxin concentration were transformed [$\ln(y+1)$, where y = aflatoxin concentration] prior to analysis of variance. Geometric means were calculated by converting the transformed means to the original units of measure.

Appendix Table 2: 3rd Millennium Genetics 2014 Fall Armyworm Data

Source ID	Pedigre	Entry	6" tall	At
09GEM07680	GEMN-0140/GEMN-0130	1	8.25	9
11GEM06358	GEMS-0218	2	7.25	8.
11GEM06540	GEMN-0133	3	6.	7.25
11GEM80044	KUI44:N99ap99bj	4	8.25	8.25
11GEM80045	KUI44:N99ap99bk	5	8	8.25
11GEM80077	CML373:S99y99bd	6	8.	8
11GEM80102	Ki 14:S21z03	7	8.	8
11GEM80144	TZAR104:N99bb99bk	8	8.25	8.25
11GEM80146	TZAR104:S99az99bl	9	9	8.25
12GEM03091	NEI9004:N0803-B-039-B	1	8.25	8.25
12GEM03193	ANTIG03:N1242-B-007-B-B	1	8.	8.
12GEM03233	GEMS-0240	1	7.75	8.
12GEM03241	GEMS-0241	1	8.	8.
12GEM03315	GEMN-0238	1	8.75	8.
12GEM03323	GEMN-0239	1	8	7.75
12GEM03396	(LH61/KO679Y)/GEMN-0205	1	8.75	8.
12GEM03978	GEMN-0152/ANTIG03:N1242-B-007-B	1	8.75	8
12GEM03993	DJ7/CML373//GEMS-0162	1	8	8
12GEM09129	GEMN-0152/ANTIG03:N1242-B-007-B	1	8.75	8.25
12GEM09132	PHB47/NC296//GEMS-0149	2	7.75	8.25
12GEM80008	ATL100:N99ba99bq	2	9	8.
12GEM80011	ATL100:N99bb99br	2	8.25	8.25
12GEM80031	CML373:S99bd99ah	2	8.75	8.25
12GEM80037	PUER5:N99bb99bq	2	8.75	8.75
12GEM80046	TZAR104:N99bb99br	2	8.	8.75
12GEM80047	TZAR104:N99bb99z	2	8	8.
12GEM80056	CML287:N99ai42	2	8	7.
12GEM80057	SX1078:N99bb42	2	8	8.
12GEM80064	BR51039:S99bd99bs	2	8.75	8.
12TPX1570	GEMS-0215/ANTIG03:N1242-B-007-B	3	8.	8.75

12TPX1571	GEMS-0219/ANTIG03:N1242-B-007-B	3	8.75	8.
12TPX1622	(ANTIG03:N1242-B-007-B/3IIH6)	3	8	8.25
13GEM01519	BS20(S)C2:S99u-B-060-B-B	3	8.25	8.
13GEM01525	DKXL212:S0928-B-040-B-B	3	8	8
13GEM01531	GEMS-0002/GEMS-0003	3	7.75	8
13GEM01537	GEMS-0147/GEMS-0115	3	8.25	8.75
13GEM01538	GEMS-0147/GEMS-0115	3	7.75	7.
13GEM01552	CL-00331:N1834-B-058-B-B	3	8.75	8.75
13GEM01562	NEI9004:N0803-B-019-B-B	3	8	8
13GEM01570	CL-G1703:S17c43-B-039-B-B	4	8.	8.75
13GEM01585	GEMS-0002/GEMS-0149	4	8.	8
13GEM01610	GEMN-0249	4	7.25	7.75
13GEM01611	BR105:N1643-B-023-B-B	4	8.	8.
13GEM80037	GEMS-0162/GEMS-0226	4	8.75	8.75
13GEM80043	GEMS-0203/GEMS-0226	4	7.75	8
13GEM80060	GEMN-0097//GEMN-0130/MP494	4	8.75	8
13GEM80062	GEMN-0192//GEMN-0130/MP494	4	9	8
13GEM80072	PHN46/(GEMN-0130/MP494)	4	8	8.75
13GEM80089	LH61/(GEMN-0130/MP494)	4	8.	8.25
13GEM80094	GEMN-0130/MP494//GEMN-0205	5	8.25	7.
	Early Check - Moderate Tolerance	5	6.75	7
	Late Check - Moderate Tolerance	5	8	8.
	Early Check - Moderate Tolerance	5	8.	8.75
	Early Check - Moderate Tolerance	5	7.75	8
	Mid Mat Check - Moderate Tolerance	5	8	7.75
	Mid Mat Check - Good Tolerance	5	7.25	7
	Mid Mat Check - Good Tolerance	5	8	8.75
	Mid Mat Check - Moderate Tolerance	6	7.	7.75
	Mid Mat Check - ModerateTolerance	6	7	8
	Early Check - Moderate Tolerance	6	7.25	7
	Mid Mat Check - Moderate Tolerance	6	8.25	9
	Mid Mat Check - Moderate Tolerance	6	7.25	7.75
	Mid Mat Check - Moderate Tolerance	65	7.25	7.25

	Early Check - Good Tolerance	66	8.25	8.25
	Late Check - Good Tolerance	6	7.75	8
	Mid Mat Check - Good Tolerance	6	8.75	9
	Mid Mat Check - Good Tolerance	6	8	8.75
	Late Check - Moderate Tolerance	7	8	8.75
	Late Check - Good Tolerance	7	8.75	8.75