

**Sugar beet activities of the USDA-ARS East Lansing conducted in cooperation with
Saginaw Valley Bean and Beet Farm during 2005**

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Six evaluation plots were planted at the Saginaw Valley Bean and Beet Research Farm in 2004; four agronomic trials, one disease nursery, and one large plot selection trial. All seed planted was untreated to maximize stand and seedling vigor traits inherent in the breeding germplasm. Agronomic trials were planted into Range 2, following normal fall tillage and seedbed preparations, on May 4 - 6, 2005. The remaining tests were planted on June 2. Blocking and thinning was completed by June 18. Harvest was completed by October 6, and sucrose determinations were done on brei samples taken one day later, frozen, and sent to Hilleshög for analyses. The contributions of Hilleshög and Michigan Sugar are gratefully acknowledged.

Test 05BB01: This test was conducted to re-evaluate promising first generation populations as identified in the 2004 Saginaw Valley Bean and Beet Farm agronomic trial. Thirty-seven entries (Table 1) were tested in a completely randomized block design with four replications of single 24-foot long rows. Commercial check varieties were Beta 5736 and Hilleshög E17. The majority of experimental entries were created to improve agronomic performance of elite smooth-rooted (SR) releases, through recombination and re-selection of high sucrose SR96 and SR97 with high yield rhizomania resistant EL0204. Six of the top 10 entries, ranked by Recoverable White Sucrose per Acre (RWSA) in Table 1, demonstrated the efficacy of this approach. Of the four other top 10 performers in this trial, two were checks (SR97 and B5736), and two were smooth-root populations constructed for resistance to *Rhizoctonia* crown and root rot. Entry 4 (Table 1) was released to industry in 2005 as EL53 (see release notice below). Entry 5 will be released as SR98 in 2006 pending additional disease resistance data. Of the remaining 27 entries tested, most were examined to select from recombined lines pairing traditional elite East Lansing germplasm derived from G. Hogaboam era materials with smooth-root. Exceptions included EL50/2, a reselection of the highly *Cercospora* resistant release EL50, and Hero, a potentially new *Aphanomyces* resistant material selected from crosses between wild and sugar beet over the past eight years. These materials will be released to industry in 2006.

In general, performance was excellent. All entries showed good to excellent emergence (Table 2). Maximal emergence for most lines occurred by 21-days after planting. The ratio of 28 day stand count to 21 day stand count is a measure of stand persistence, or alternatively a measure of seedling disease resistance, and differences here were statistically significant at the 0.1 level. Stand declines were not as pronounced in 2005 as they have been in previous years, perhaps due to the cool weather during the early season limiting loss due to *Rhizoctonia* seedling disease.

One observation of note is evident again in 2005 in Table 1. Water content (as a proportion of total root weight) was included in the analyses for the second time this year, and did not vary greatly among any germplasm, however differences were highly precise and robust. Noteworthy is that the commercial germplasms B5736 and E17 had at least 1% reduced water

content relative to all experimental lines and checks. The significance of this observation is not yet entirely clear, but higher dry matter (DM) content appears to be a character amenable to selection.

Test 05BB02: This test was conducted to evaluate entries for possible inclusion into the germplasm release stream, specifically for improved seed parent germplasm. It has become apparent over the past four years that East Lansing materials based on the Cytoplasmic Male Sterility (CMS) and O-type restorer systems for hybrid seed production are deficient in a number of respects that limit their wider adoption. The first limitation has been the inability to store roots throughout the winter for the next year's seed production. The second limitation has been the inability to obtain highly vigorous seed of these lines. 184 entries were grown as single rows. Emergence was dismal and the test was harvested for stecklings July 28. Most entries were originally constructed as combining ability tests, and represent a diverse array of germplasm. Future goals of these materials are to select for higher seedling vigor for release to industry.

Test 05BB03: This test was conducted to validate field emergence on lines selected by European breeding companies for a 'ring test' to evaluate the water germination stress test developed at East Lansing for predicting relative field emergence. Water and hydrogen peroxide tests were conducted prior to field emergence testing at the Bean and Beet Farm and in East Lansing. Some of this information was presented to the IIRB Seed Quality and Testing Group in Seville Spain in May 2005.

A stress test able to predict germination and emergence of sugar beet in the field would be useful to a number of workers in the industry, including seeds' people, agronomists, breeders, and growers. A number of procedures are available that have some predictive power however field conditions are difficult to mimic in the laboratory. Germination of sugar beet seed in aqueous solutions shows promise as an additional tool for examining seedling vigor, as well as deduce some of the underlying differences that contribute to the genetic basis of vigor and differences between seedlots of the same genetic makeup. The objective of this test was to compare results among laboratories for two aqueous germination regimes using a common set of seedlots.

A planning meeting was held at the IIRB office in Brussels in September 2004 to discuss experimental designs for an aqueous germination (e.g. stress) ring test. It was agreed that a number of seedlots would be tested, with at least one seedlot with high genetic potential and another with low genetic potential being contributed, at the choice and discretion, of participating seed companies. Further, two seedlots for each genetic choice would be tested, one with higher emergence potential (e.g. vigor) and another with lower vigor. Thus, from each participant, four seed samples would be received; one with high genetic potential and high seedlot potential (designated **high-high**), one with high genetic potential and low seedlot potential (**high-low**), one with low genetic and high seedlot potentials (**low-high**), and one with low genetic and seedlot potentials (**low-low**). Ultimately, seedlots were generously contributed by Strube Dieckmann (SD) and SES, yielding eight experimental entries.

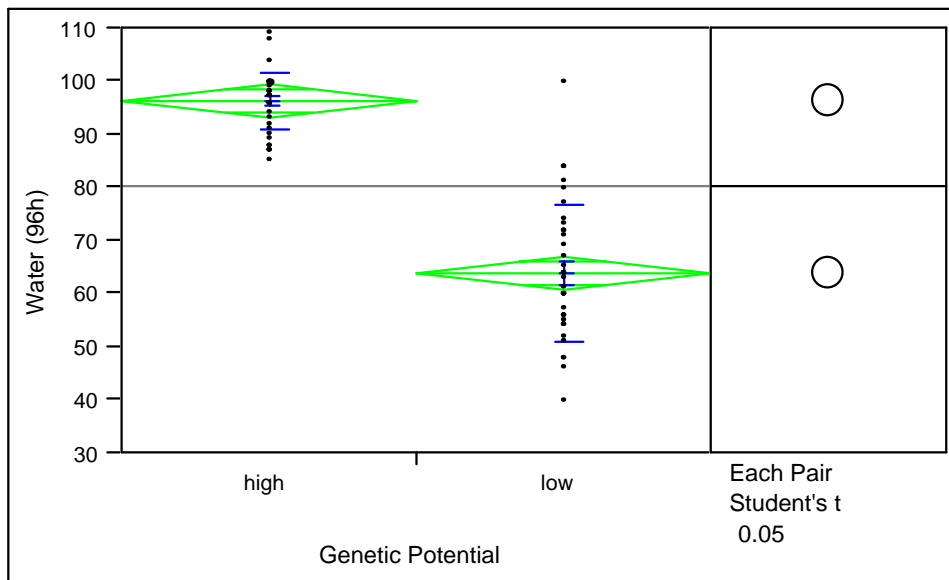
It was agreed that participants in the ring test would follow a standard protocol. The protocol chosen was to germinate 100 seeds in 40 ml of solution in a 250 ml flask at 20 C with constant agitation, suggested by shaking seed on a rotary platform at 100 rpm, with four

replications of each entry. Counts of seeds with visible radicles were to be made at 48 h and 96 h after immersion, suggested with a change of solution at the first count time-point. Two solutions would be tested, one of water of discretionary quality and one of 0.3% hydrogen peroxide, freshly prepared. Results were to be recorded in a standard format Excel spreadsheet and forwarded to M. McGrath for statistical analyses. Three laboratories participated in performing the test; Danisco (c/o Morten Jorsboe), SES (c/o Bert Vandebussche); and USDA-ARS (Kevin Cook performed the experiments under supervision from Mitch McGrath), and their efforts are gratefully acknowledged.

In general, the test(s) worked well, and confirmed the germination enhancement by hydrogen peroxide in sugar beet. Water germination was significantly different compared with hydrogen peroxide results. There was little difference in results of the basic test between laboratories, indicating good concordance and repeatability of the testing procedure. The source of commercial seed was irrelevant to the comparisons (e.g. not significant), suggesting the methods could be applied to most germplasm sources. Genetic potential was easily discriminated in water solutions (Figure 1 and data not shown). Seedlot potential was also easy to discriminate in solution, however the differences were smaller than for genetic potential differences (data available on request). Counting times earlier than 96 h showed less dramatic but similar trends. Lower temperature conditions appear to alter these conclusions in a number of cases suggesting an in depth focus on temperature and aqueous germination could provide additional insight into the process of stress germination.

Stress conditions of water germinated seeds at room temperature counted at 96 h after immersion appeared to be a good predictor of seedlot potential and a better predictor of genetic potential.

Figure 1: Discrimination of genetic potential for emergence in solution. Y-axis is the number of seeds germinated in water after 96 hours of imbibition. Non-overlapping Student's t-test circles indicate statistical significance. The widest part of the diamond indicates the mean response. All data is presented as dots.



For the field emergence tests, 100 seeds were planted in four replications at sites on the Bean and Beet Farm and on the Michigan State University Campus. Emergence counts were made 12, 19, 26, and 33 days after planting, and the average of all four counts was used here. Differences in emergence were not apparent at the Bean and Beet Farm (Figure 2), but they were evident at the Michigan State University site (Figure 3).

Figure 2: Emergence of IIRB seedlots at the Bean and Beet farm.

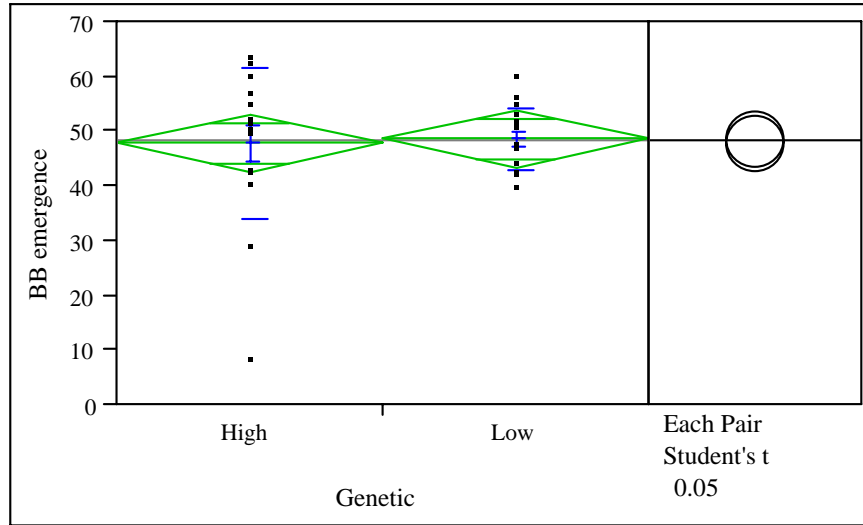
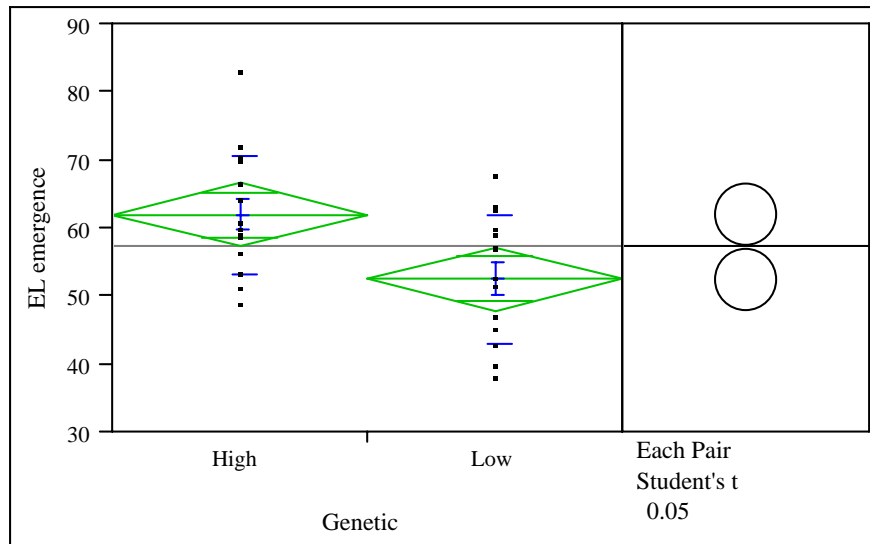


Figure 3: Emergence of IIRB seedlots at Michigan State University Farm.



These results indicate that an emergence stress test such as the one developed may help predict field emergence. The stress test appears to be more rigorous in defining genetic potential than actual field emergence, in some instances.

Test 05BB04: This test was done to evaluate 440 self fertile lines for field performance, with the exception that full agronomic measures were not uniformly applied. 247 lines were selfed five generations from a cross between sugar beet and table (red) beet. Deep inbreds such as these are not typically used in sugar beet breeding, and the effects of inbreeding were of interest. In general, emergence or seedling vigor was not seriously affected suggesting inbreds will be useful for specific genetic investigations in the future. Since red is genetically dominant, many of the tested lines were pigmented, with the unusual feature that they were cylindrical in shape. When tested, their sucrose content was high for table beets, and the combination of higher sucrose and cylindrical shape suggested a possible use for canning. These lines were combined and released to industry as TBEL-1 in 2005 (the release notice is given below). The remaining self fertile lines tested here represented a wide range of early generation inbreeding populations from crosses of sugar beet with fodder beet, chard, wild beet, and a series of other sugar beets with resistance to various diseases. These represent intermediates in the development of populations that will be used to dissect agronomic traits in sugar beet, and a generation of growing under field conditions was important to remove lines with poor vigor. Three to five roots were harvested for further inbreeding and seed production in the 2006 greenhouse.

Test 05BB05 and 05BB06: These tests were conducted on ground immediately north of the irrigation pond where beet growth has historically been difficult. Late planting was desired to maximize the effect of *Aphanomyces* on emergence and stand establishment. Both trials were planted into dry ground on June 2, 2005. Heavy rains followed shortly thereafter, and few plants emerged. This test was abandoned, with the exception that all plants that had emerged and survived were collected for seed production in the 2006 greenhouse. These tests will be replanted in 2006 at the Bean and Beet Farm as seed is available.

NOTICE OF RELEASE OF EL53 SUGARBEET GERMPLASM WITH SMOOTH-ROOT AND IMPROVED RESISTANCE TO RHIZOCTONIA CROWN AND ROOT ROT

The Agricultural Research Service of the U. S. Department of Agriculture and the Beet Sugar Development Foundation announce the joint release of EL53 sugarbeet germplasm substantially derived from previously released smooth-rooted, low soil tare germplasm releases with two cycles of selection for freedom from crown and root rot disease caused by *Rhizoctonia solani* Kühn (AG2-2). Previous low soil tare releases have been uniformly susceptible to *Rhizoctonia* crown and root rot, and the moderately resistant germplasm EL52 was used as a source of resistance during the development of EL53. EL53 was developed at the USDA-ARS Sugarbeet and Bean Research Unit, East Lansing, Michigan by J.M. McGrath. EL53 has shown good agronomic performance, and it is expected to be a resource for developing low soil tare parental lines for hybrid cultivars with economically recoverable levels of sucrose.

EL53 is diploid self-sterile with predominantly red hypocotyls (>80% red), and segregates for monogerm seed type as well as the smooth-root trait. EL53 has a complex pedigree involving seven previously released smooth-root germplasm lines, two unreleased smooth-root breeding populations, and three traditional East Lansing germplasm releases. Most

(59%) of EL53's parentage stems from smooth rooted materials. Specifically, contributors and their proportional contribution to EL53 are as follows: SR80 (PI 607898), 6%; SR87 (PI 607899), 12%; SR94 (PI 598076), 6%; SR95 (PI 603947), 3%; SR96 (PI 628272), 3%; SR97 (PI 628273), 3%; EL0204 (PI 632750), 9%; EL50 (PI 598073), 9%; EL52 (PI 628274), 15%, and USH20 (PI 631354), 18%. Two breeding populations were also used; 99J19-00 (3%) and 99J31-00 (12%). These two breeding populations were derived from mother roots simultaneously selected at East Lansing over two cycles for smooth-root and *Rhizoctonia* crown and root rot resistance, originating from separate F₂ populations of crosses between 95H07 and 85B1-R25, respectively.

EL53 was selected solely under conditions promoting development of *Rhizoctonia* crown and root rot in the East Lansing disease nurseries in 2001 (Test 01EL31) and 2002 (Test 02EL43). In 2001, 33 roots were selected in the proportions indicated above, randomly inter-pollinated in the greenhouse, and seed harvested from individual plants. The 33 roots were selected from within a four-fold replicated completely randomized block with 14 entries. The average stand count 30 days after inoculation with millet-infested *Rhizoctonia solani* AG2-2 was 8.8 plants per plot (Root Mean Square Error = 6.0). Thus, the selection intensity was ca. 6.25% of plants surviving after inoculation. This seed increase was designated 01B024. In 2002, seed from each individual plant harvest was planted to a single 24-foot long row, and selections were taken from 26 of the original 33 progeny lines evaluated for resistance in the 2002 *Rhizoctonia* nursery. Seventy-six roots were selected solely on freedom of crown and root rot symptoms, and randomly divided into two groups of 38 roots each. The final stand at harvest and selection was 332 plants, thus the selection pressure was 23% of surviving plants. The first group of 38 roots was intercrossed in the 2003 greenhouse, designated 02B094, and this seed was increased at the West Coast Beet Seed, Co. in Salem, OR (designated WC040022). The other 38 roots were randomly inter-pollinated in a plot in St. Johns, MI during the summer of 2003, and this seed was designated 03B017. EL53 has been tested as 01B024, 02B094, and 03B017.

EL53 is moderately resistant to *Rhizoctonia* crown and root rot, *Cercospora* leaf spot, and *Aphanomyces* diseases as evaluated over two years (2005 only for *Aphanomyces*) in the USDA-ARS, Ft. Collins and Betaseed, Shakopee, MN disease nurseries in 2004 and 2005. In all cases, EL53 was more susceptible, but not significantly different from, the moderately resistant check, or in the case of the *Aphanomyces* nursery where the resistant check was not scored, EL53 was better but not significantly different from the moderately susceptible check, in each year considered separately.

EL53 was evaluated for agronomic performance at the Saginaw Valley Bean and Beet Farm (Saginaw, MI) in 2003, 2004, and 2005. Over all, EL53 showed 91% of the sugar content (16.1% vs. 18.1%), 105% of the harvested root yield (21.9 vs. 20.9 tons per acre), and 92% of the sugar yield per acre (6509 vs. 7080 lbs. sucrose) of the check varieties E17 and B5736, averaged over the three years. EL53 has excellent emergence and stand persistence.

EL53 is being released as a germplasm source for breeders to use in developing parental lines combining smoothrootedness with higher levels of *Rhizoctonia* crown and root rot resistance than is currently available in smooth-root material. EL53 also contains

a series of useful characters at low allele frequencies derived from EL53's components, such as those necessary to breed for seed parents used to create cytoplasmic male sterility-mediated hybrids as well as the *Rz1* source of rhizomania resistance. Seed will be available for use by writing to Dr. J. Mitchell McGrath, USDA-ARS, 494 PSSB, Michigan State University, East Lansing, MI 48824-1325. Efforts of Drs. L. Hanson and L. Panella of the USDA-ARS, J. Miller and M. Rekoske of Betaseed, Inc., and T. Duckert and T. Koppin at East Lansing in providing valuable disease nursery and agronomic testing assistance is gratefully acknowledged. Genetic material of this release has been deposited in the National Plant Germplasm System where it will be available for research purposes, including development and commercialization of new cultivars. It is requested that the author be notified if this germplasm contributes to the development of a new breeding line or cultivar.

NOTICE OF RELEASE OF TBEL1 TABLE BEET GERMPLASM with HIGH SWEETNESS AND CYLINDRICAL SHAPE

The Agricultural Research Service of the U. S. Department of Agriculture and Michigan State University jointly announce the release of TBEL1, a table beet germplasm selected for cylindrical shape and moderate sucrose content. TBEL1 was derived from an experimental hybrid between sugar beet and table beet as part of investigations into the inheritance of sucrose content and other characters in *Beta vulgaris*. The progenitors of TBEL1 and the advanced inbred lines that comprise TBEL1 have been evaluated and selected under field conditions typical of sugar beet production over four years at East Lansing, MI and Saginaw, MI. It is expected TBEL1 will be a source for development of new varieties of red table beets for canning, where the cylindrical shape results in less waste during the canning process compared with the standard globe beet shape, and better consumer acceptance due to higher sucrose content than available cylindrical beet types.

TBEL1 is self-fertile (S^f). Hypocotyls and roots are uniformly deep red in color due to the presence of betalin pigments. TBEL1 is a seed mixture of inbred lines derived by single seed decent for four generations from a single hybrid plant derived from a cross between C6869 sugar beet as the seed parent and W357B red table beet as the pollen parent. C6869 is an early generation selection leading to the USDA-ARS sugar beet germplasm release C869 (PI 628754). C6869 is self-fertile (Sf) and segregates for the multigermline character ($M_ :mm$), genic-male-sterility ($A_ :aa$), red hypocotyl ($R_ :rr$), and resistance to rhizomania conferred by the *Rz1* allele. It is moderately resistant to the curly top virus, has wide variability for reaction to powdery mildew, Erwinia, and bolting, and has moderate levels of sucrose relative to modern sugar beet hybrids. C869 was derived from C6869 by four additional cycles of selection for these characters as well as for O-type (xx, zz) that confers cytoplasmic male sterility in an S-type sterile cytoplasm. W357B is a red table beet germplasm developed in the table beet breeding program at the University of Wisconsin by Dr. Buck Gabelman. The kind generosity of Dr. Gableman and Dr. Irwin Goldman in allowing this germplasm to contribute to the development of TBEL-1 is gratefully acknowledged. W357B is self-fertile (S^f), multigermline (MM), and O-type (xx, zz ; referred to as a B-line in table beet breeding). It

has been widely used in the generation of commercial table beet hybrids. Inbreeding was enforced in the greenhouse at East Lansing, MI by placing a white paper bag over each selected plant in each generation leading up to the S₅ generation of TBEL1.

TBEL1 comprises equal proportions of seed from 11 S₄ inbreds selected for elongated (length > twice diameter, ratio mean = 2.56 cm, standard deviation = 0.48 cm), dark red color, and emergence at the Saginaw Valley Bean and Beet Farm in Saginaw, MI in 2005. The 11 inbreds were evaluated as progeny from the S₄ plants 03B107-04, 03B112-02, 03B116-03, 03B137-03, 03B146-04, 03B156-02, 03B157-02, 03B157-03, 03B176-02, 03B187-02, and 03B203-02 in single replication plots of 3 m length and 1 m between rows. Each plant in these progeny plots was similar with respect to root shape and leaf morphology. Differences in smoothness of the skin were evident between inbreds. Mean fresh weight sucrose content in TBEL1 determined via near-infrared reflectance spectroscopy of five roots from each inbred line was 13.69% (standard deviation = 1.24%). Mean root weight in TBEL1 was 731.4 g (standard deviation = 171.1. g) from the same roots analyzed for sucrose content. It should be noted that agronomic management of sugar and table beets is sufficiently different such that yield comparisons may be misleading. In this case, TBEL1 was evaluated at 126 days after planting.

The 11 S₄ components of TBEL1 stem from 10 S₃ lines, each S₃ from a different S₂ plant except in the case of 03B157-02 and 03B157-03 that share a common S₃ parent and 03B116-03 and 03B156-02 that share a common S₂ parent. Thus, TBEL1 is expected to contain a range of sugar and table beet alleles from which further selections can be effected. Sucrose content (fresh weight) in the S₃ populations leading to TBEL1 ranged from 8% to 19% (mean=12.15, std. dev.=2.82). All inbreds of TBEL1 are derived from a single S₁ individual, 99B004, which gave rise to 145 S₂ individuals used as a genetic mapping population. Due to the inbred nature of W357B, all of its alleles are expected to have been present in 98B004, which is not true for the heterozygous C6869 parent, and in this case only one sugar beet gamete was sampled in the lineage leading to TBEL1.

TBEL1 was developed by the ARS sugar beet breeding program at East Lansing, MI by Dr. J.M. McGrath with assistance from Dr. D. Trebbi of Michigan State University's Plant Breeding and Genetics Graduate Program. TBEL1 is being released as a germplasm source for breeders to use in developing improved table beet germplasm for processing and canning. Limited amounts of seed are available for use by submitting a request to Dr. J. Mitchell McGrath, USDA-ARS, 494 PSSB, Michigan State University, East Lansing, MI 48824-1325 (mitchmcg@msu.edu). Genetic material of this release will be deposited in the National Plant Germplasm System where it will be available for research purposes, including development and commercialization of new cultivars. It is requested that appropriate recognition be made if this germplasm contributes to the development of a new breeding line or cultivar. Plant variety protection will not be sought for this material.

Table 1

05BB01 Agronomic Trial
Agronomic Yield Data

USDA-ARS Sugarbeet

Entry	Seedlot	Name	Sucrose (%)	T/A	RWSA	RWST	K	Na	Amino-N	CJP (%)	Water (%)
16	EL-A013478	BI-SR96smrIP	16.48	26.6	8710.4	329.5	5.88	1.28	2.18	96.967	75.65
13	EL-A011964	B5736	17.82	24.4	8700.5	356.5	4.83	0.93	1.39	96.977	74.18
22	EL-A013499	OB-EL0204smrIP	16.21	26.7	8648.2	324.3	5.17	1.03	1.71	96.973	76.63
8	EL-A013514	RA-01B006smrIP	15.69	27.2	8528.2	313.8	5.39	1.46	1.94	96.970	77.23
23	EL-A013501	OB-SR96smrIP	16.69	25.2	8427.1	333.9	5.03	0.88	2.24	96.970	75.70
4	EL-A013523	2xSRrzc,smr (01B024)	15.31	27.3	8366.0	306.2	5.46	0.97	1.76	96.972	77.60
10	EL-A013503	OB-SR97smrIP	16.59	24.4	8123.4	331.7	5.23	0.93	1.94	96.971	75.85
7	EL-A013507	OS-EL0204smrIP	16.05	25.1	8064.2	320.9	6.29	3.18	3.72	96.949	75.93
6	EL-A012174	SR97	16.91	23.7	8032.7	338.2	5.13	0.83	1.69	96.974	75.05
5	EL-A012176	WC970457 96RHS21-7	16.51	24.2	7983.0	330.3	4.92	0.85	1.76	96.974	75.88
26	EL-A013510	OS-SR97smrIP	17.07	22.8	7784.1	341.4	5.25	0.80	1.69	96.974	75.35
9	EL-A013495	MF-SR97smrIP	16.11	23.9	7673.6	322.1	5.28	1.02	1.97	96.971	77.23
35	EL-A013704	GH-02B096smr-IP	16.03	23.3	7461.2	320.5	5.50	1.35	2.18	96.968	77.30
12	EL-A011875	HME17	17.47	20.6	7207.0	349.5	4.04	0.70	1.77	96.976	74.13
24	EL-A013506	OS-95HS2smrIP	17.11	20.6	7054.6	342.2	4.87	0.95	1.92	96.972	75.55
25	EL-A013508	OS-SR96smrIP	17.12	20.4	6981.4	342.3	4.55	0.82	2.12	96.972	75.43
34	EL-A013700	GH-02B097smr-IP	16.46	21.2	6963.8	329.3	5.12	1.18	2.42	96.967	76.40
36	EL-A013705	GH-02B103smr-IP	15.91	21.6	6897.5	318.1	5.28	1.43	1.71	96.972	77.48
27	EL-A013515	RA-01B007smrIP	14.97	23.1	6857.4	299.4	5.80	1.89	1.89	96.968	77.88
29	EL-A013517	RA-01B010smrIP	15.72	21.8	6850.7	314.3	5.62	1.18	2.22	96.968	77.03
28	EL-A013516	RA-01B009smrIP	15.18	22.5	6841.4	303.7	5.30	1.60	1.99	96.969	77.50
19	EL-A013489	MF-Trad-ELsmrIP	15.02	22.7	6834.6	300.4	5.57	1.61	1.91	96.969	78.03
33	EL-A013522	RA-SR96smrIP	16.64	20.2	6725.7	332.9	4.87	1.01	2.14	96.970	76.03
14	EL-A011969	WC-J19	14.62	23.0	6713.0	292.4	6.37	1.31	1.48	96.972	78.00
20	EL-A013491	BI-EL0204smrIP	15.68	21.3	6671.7	313.7	5.97	1.38	2.43	96.965	77.43
11	EL-A007774	GH-01B024smr (SR Rzc)	15.14	21.8	6578.6	302.8	5.50	1.18	1.41	96.974	78.03
21	EL-A013492	MF-SR96smrIP	16.64	19.3	6405.4	332.8	5.49	0.93	1.89	96.971	76.00
15	EL-A012346	GH-99J12	16.23	19.7	6398.2	324.6	6.05	1.12	2.95	96.961	75.85
2	EL-A014205	HERO	15.62	20.2	6281.7	312.4	4.93	1.02	1.74	96.973	77.10
31	EL-A013520	RA-01B013smrIP	15.97	19.3	6165.6	319.5	4.88	1.03	1.38	96.976	76.55
30	EL-A013518	RA-01B011smrIP	15.35	19.9	6137.5	307.1	5.47	1.13	1.85	96.971	77.45
32	EL-A013521	RA-EL0204smrIP	14.91	20.4	6074.7	298.2	5.41	1.22	1.54	96.974	78.03
18	EL-A013488	MF-00J12smrIP	15.34	19.5	5915.7	306.7	5.50	1.54	2.35	96.966	77.43
3	EL-A013698	HTSLsmr (00B041)	14.58	19.7	5746.6	291.7	5.13	1.12	1.70	96.973	77.75
0	EL-A013699	00B042 (89F2-2)	16.77	16.9	5683.9	335.5	4.01	0.83	1.85	96.975	75.83
17	EL-A013480	BI-SR97smrIP	15.39	18.0	5549.0	307.7	6.15	1.62	2.94	96.960	77.10
1	EL-A014990	EL50/2	15.09	12.1	3653.9	301.8	4.94	1.07	1.69	96.974	77.53
Grand Mean			16.01	21.9	7018.7	320.2	5.3	1.2	1.98	96.97	76.62
LSD (0.05)			0.71	6.01	1901	14.2	0.85	1.15	1.28	0.014	1.56
CV (%)			5.79	21.93	22.72	5.79	13.97	69.27	46.4	0.01	1.68
F value			10.60***	2.05**	2.56***	10.60***	3.05***	1.13ns	1.05ns	1.09ns	6.87***

----- STAND COUNTS -----						
Entry	Name	12-day	21-day	28-day	Ratio: 28/21	Final
1	EL50/2	23.0	36.3	46.8	1.30	26.3
19	MF-Trad-ELsmrIP	31.5	34.5	40.0	1.13	25.0
17	BI-SR97smrIP	18.5	20.3	22.3	1.07	12.5
24	OS-95HS2smrIP	23.0	30.5	30.8	1.04	24.8
26	OS-SR97smrIP	29.8	31.3	29.3	0.96	18.0
21	MF-SR96smrIP	30.0	31.0	29.8	0.96	17.8
30	RA-01B011smrIP	29.0	40.0	36.5	0.94	24.8
14	WC-J19	33.8	47.0	43.3	0.92	26.8
13	B5736	34.8	39.0	35.0	0.91	27.3
25	OS-SR96smrIP	31.5	40.8	33.5	0.91	25.0
20	BI-EL0204smrIP	30.8	36.0	30.3	0.87	23.5
22	OB-EL0204smrIP	44.3	53.0	45.0	0.85	32.5
15	GH-99J12	17.3	37.0	27.5	0.85	23.8
11	GH-01B024smr (SR Rzc	31.0	51.5	41.8	0.84	34.3
2	HERO	25.3	47.0	38.8	0.84	32.3
27	RA-01B007smrIP	32.3	36.0	30.0	0.84	20.8
18	MF-00J12smrIP	17.3	21.3	16.8	0.82	16.0
28	RA-01B009smrIP	29.3	37.0	29.5	0.82	23.8
8	RA-01B006smrIP	64.8	62.5	50.0	0.80	37.3
23	OB-SR96smrIP	51.8	64.3	47.5	0.79	37.0
33	RA-SR96smrIP	25.8	31.0	23.3	0.79	21.5
12	HME17	59.3	73.3	54.8	0.78	36.8
32	RA-EL0204smrIP	31.3	38.3	29.5	0.78	25.0
34	GH-02B097smr-IP	36.3	56.5	39.5	0.76	37.0
3	HTSLsmr (00B041)	115.3	119.8	90.0	0.76	44.8
16	BI-SR96smrIP	40.8	41.5	31.3	0.76	29.3
36	GH-02B103smr-IP	33.3	54.5	36.3	0.75	27.3
9	MF-SR97smrIP	43.5	49.3	35.0	0.74	28.8
10	OB-SR97smrIP	37.3	51.3	37.5	0.73	27.5
31	RA-01B013smrIP	48.3	55.8	38.8	0.73	30.8
6	SR97	98.5	120.5	73.8	0.68	43.8
7	OS-EL0204smrIP	81.8	88.8	55.0	0.65	45.3
29	RA-01B010smrIP	37.3	45.3	28.8	0.64	25.8
5	WC970457 96RHS21-7	105.8	110.0	67.5	0.64	42.8
35	GH-02B096smr-IP	44.8	65.0	40.0	0.62	30.3
4	2xSRrzc,smr (01B024)	99.0	129.5	70.0	0.56	45.5
0	00B042 (89F2-2)	nd	nd	nd	nd	nd
Grand mean		43.51	53.50	40.41	0.83	29.19
LSD (0.05)		19.00	20.70	13.58	0.35	7.81
CV (%)		64.23	56.64	43.12	31.65	33.18
F value		14.28***	14.11***	10.13***	1.43	9.26***