Inbred Line Development and Hybrid Evaluation in GEM Breeding Crosses

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Objectives:

Identify GEM breeding crosses and lines with desirable agronomic characteristics, resistance to abiotic and biotic stresses, and high, consistent yield performance.

Materials and Methods:

Sixty-six GEM breeding crosses were evaluated for adaptability, maturity, flowering synchrony, standability, plant and ear height, pest resistance, stay green, grain quality, and drydown. Inbreeding was also initiated on three Stiff Stalk and three non-Stiff Stalk GEM breeding crosses. Three to four hundred plants per population were selfed. S_1 ears were harvested from selected plants based on agronomic traits, disease and European corn borer (ECB) resistance. The major diseases were gray leaf spot and anthracnose stalk rot. S_1 lines from four breeding crosses were advanced through a modified single seed descent bulk (MSSDB) method. Two hundred nineteen MSSD(S_2) lines from six breeding crosses were advanced and selected per se on agronomic performance. One hundred thirty-four S_2 lines from FS8A(T):N1804 crossed to HC33 were evaluated at Delaware and USDA-ARS GEM at Ames, IA (two reps/location) and Fairfield, IA (one rep). The lines per se were advanced and evaluated in the summer 2008 nursery. Five hundred thirty-five hybrids were evaluated at an irrigated location in collaboration with the Southern GEM Program.

Results:

A joint project to evaluate GEM breeding crosses was conducted by the University of Delaware, USDA-GEM at Ames, Memphis, TN, and Mycogen Seeds at Mount Vernon, IN. Results and recommendations will be presented jointly by the cooperators at the December TSG GEM meeting. We gave higher ratings for AR01150:N0402, BARBGP2:N08a46, BIGWHITE:S(PHW17), BR105:N(PHZ51)(PHZ51), BR105:N1643, BR105:S(PHB47)(PHB47), BR105:S1643, BR105:S1646, BR106:N(PHZ51)(PHZ51), CL-G1703:S17c43, CML323:N1550, DK888:S08a46, DKXL212:S0950, GEMN-0131/DKXL212:N11a-139-1-1-B-B-B-B-B-B-B)B, GEMS-030/GEMS-0091)-B, TZISTRI112:N(PHZ51), and TZISTRI112:s(PHb47) based on per se rating performance. We also suggest crossing GUAT209:N(PHZ51) to a lower eared line. Based on per se evaluations for plant height, ear placement, stalk and root strength, ear traits, maturity, disease and ECB resistance, 1053 S_1 selections were made from three Stiff Stalk (DK212T:S0640, DKXL212:S0928, and DKXL212:S09) and three non-Stiff Stalk (BR105:N16a16b, CL00331:N1834, and CML329:N1834) breeding crosses. Three hundred nine S_2 ears were selected from four breeding crosses (DKXL212:S09(MSSDS1B), AR16021:S099j(MSSDS1B), AR16021:S0908c(MSSDS1B), AR16021:S08b09b(MSSDS1B)) that had been advanced from the S_1 stage by a modified single seed descent bulk procedure. Ninety S_3 ears were selected from six breeding crosses (ANTIG03:N1216(MSSDS1B), CUBA110:N1711c(MSSDS1B), CUBA164:S2008d(MSSDS1B), DKXL212:S11b(MSSDS1B), BR105:S1612(MSSDS1B), and AR13035:S11b(MSSDS1B)). The AR13035:S11b(MSSDS1B) was very susceptible to gray leaf spot and was discarded. We are using a modified single seed descent method to more efficiently advance S_1 families to the S_2 stage. Yield and agronomic performance of lines derived from FS8A(T):N1804 testcrossed to HC33 results from Magnolia, DE and Fairfield and Ames, IA indicate that some of the FS8A(T):N1804 x HC33 hybrids yielded better than the commercial checks. Results are presented in Tables 1, 2, and 3. The top 20% from each test will be selected and further evaluated for yield.

Acknowledgements: We thank the USDA-GEM Project at Iowa State for their cooperation with yield trials in Iowa.

Table 1. Yield and Agronomic Performance of FS8A(T):N1804 lines crossed to HC33, Magnolia, DE

Entry	Hybrid	Bu/A	% H2O	Y/M	Pop	% St ldg	% Rt ldg
49	DKC 61-66	252.3	19.9	12.7	28250.0	0.0	0.0
15	**FS8A(T):N1804)-39-2 xHC33**	**239.7**	**18.9**	**12.7**	**28000.0**	**2.8**	**0.0**
50	DKC 63-39	231.8	21.3	10.9	27000.0	0.0	10.9
18	**FS8A(T):N1804)-48-1 xHC33**	**231.0**	**18.9**	**12.2**	**28750.0**	**4.4**	**4.3**
36	**FS8A(T):N1804)-135-1 xHC33**	**229.0**	**19.2**	**12.0**	**27250.0**	**0.9**	**3.7**
1	**FS8A(T):N1804)-6-1 xHC33**	**228.5**	**17.8**	**12.8**	**27000.0**	**3.7**	**5.6**
37	**FS8A(T):N1804)-136-1 xHC33**	**227.2**	**19.5**	**11.7**	**26750.0**	**2.8**	**0.0**
44	FS8A(T):N1804)-146-1 xHC33	225.7	19.9	11.4	28250.0	8.0	4.5
16	**FS8A(T):N1804)-40-1 xHC33**	**224.8**	**19.3**	**11.7**	**26250.0**	**3.8**	**4.7**
27	**FS8A(T):N1804)-94-1 xHC33**	**224.8**	**19.1**	**11.8**	**28750.0**	**2.6**	**1.7**
41	**FS8A(T):N1804)-144-2 xHC33**	**224.0**	**19.0**	**11.9**	**28750.0**	**0.9**	**0.9**
40	FS8A(T):N1804)-139-1 xHC33	223.3	21.2	10.6	28250.0	2.7	11.5
13	FS8A(T):N1804)-35-1 xHC33	223.2	19.2	11.6	28250.0	9.0	12.4
26	**FS8A(T):N1804)-83-1 xHC33**	**222.6**	**18.8**	**11.8**	**29500.0**	**2.6**	**10.2**
5	**FS8A(T):N1804)-14-1 xHC33**	**221.9**	**18.2**	**12.2**	**31000.0**	**4.9**	**0.0**
8	**FS8A(T):N1804)-20-1 xHC33**	**221.4**	**19.5**	**11.4**	**23000.0**	**1.0**	**1.0**
25	**FS8A(T):N1804)-82-1 xHC33**	**221.0**	**19.0**	**11.7**	**27750.0**	**0.9**	**0.0**
19	FS8A(T):N1804)-56-1 xHC33	220.5	21.6	10.3	27000.0	3.7	1.0
11	FS8A(T):N1804)-30-2 xHC33	220.1	19.3	11.5	28500.0	1.8	1.8
12	FS8A(T):N1804)-33-1 xHC33	220.1	20.7	10.7	30250.0	5.8	0.0
47	FS8A(T):N1804)-157-1 xHC33	219.9	19.1	11.6	29250.0	3.5	5.8
10	FS8A(T):N1804)-30-1 xHC33	219.8	20.2	10.9	28750.0	6.1	20.2
9	FS8A(T):N1804)-22-1 xHC33	218.7	19.2	11.4	28750.0	1.8	6.2
7	FS8A(T):N1804)-16-2 xHC33	216.1	20.8	10.5	29000.0	1.7	0.9
2	FS8A(T):N1804)-9-1 xHC33	215.5	19.9	10.9	26000.0	0.9	8.6
48	FS8A(T):N1804)-158-1 xHC33	212.4	18.3	11.6	26750.0	1.8	1.9
4	FS8A(T):N1804)-10-1 xHC33	211.9	20.3	10.5	28000.0	1.8	0.9
45	FS8A(T):N1804)-148-1 xHC33	210.9	19.4	10.9	28500.0	2.7	30.7
32	FS8A(T):N1804)-116-1 xHC33	210.4	20.2	10.4	27250.0	1.8	0.0
38	FS8A(T):N1804)-137-1 xHC33	210.1	21.0	10.1	27500.0	2.8	1.0
3	FS8A(T):N1804)-9-2 xHC33	210.0	19.2	10.9	28000.0	10.2	0.0
30	FS8A(T):N1804)-105-1 xHC33	209.9	18.3	11.5	29250.0	1.7	0.0
22	FS8A(T):N1804)-66-1 xHC33	209.7	19.3	10.9	27000.0	6.5	5.5
23	FS8A(T):N1804)-68-1 xHC33	209.0	18.6	11.2	28250.0	4.1	3.6
28	FS8A(T):N1804)-103-1 xHC33	207.3	19.3	10.8	27500.0	0.0	0.0
29	FS8A(T):N1804)-104-1 xHC33	206.6	18.9	11.0	28750.0	0.0	0.0
46	FS8A(T):N1804)-154-2 xHC33	205.9	19.2	10.8	28500.0	6.3	7.1
43	FS8A(T):N1804)-145-2 xHC33	205.8	19.7	10.5	28000.0	1.0	1.0
39	FS8A(T):N1804)-137-2 xHC33	205.3	19.2	10.7	27500.0	4.6	0.9
20	FS8A(T):N1804)-60-1 xHC33	205.0	19.5	10.5	28250.0	0.0	0.0
34	FS8A(T):N1804)-120-2 xHC33	204.0	20.1	10.2	26750.0	1.9	0.0
14	FS8A(T):N1804)-39-1 xHC33	202.4	18.9	10.8	27500.0	4.6	2.7
17	FS8A(T):N1804)-46-1 xHC33	198.7	19.0	10.5	28750.0	8.8	11.1
24	FS8A(T):N1804)-73-1 xHC33	197.1	19.3	10.3	24750.0	2.2	0.0
42	FS8A(T):N1804)-145-1 xHC33	195.7	19.7	10.0	27250.0	4.7	0.0
21	FS8A(T):N1804)-65-1 xHC33	195.6	18.8	10.4	25750.0	0.0	0.0
31	FS8A(T):N1804)-107-1 xHC33	193.9	18.5	10.5	28750.0	8.8	0.0
6	FS8A(T):N1804)-16-1 xHC33	192.5	20.3	9.5	28750.0	5.2	7.8
33	FS8A(T):N1804)-116-2 xHC33	191.7	21.0	9.2	28250.0	1.0	0.0
35	FS8A(T):N1804)-133-1 xHC33	182.3	18.7	9.8	30250.0	2.6	2.5
	CHECK MEAN	**242.0**	**20.6**	**11.8**	**27625.0**	**0.0**	**5.5**
	% CV	**6.8**	**2.2**	**7.3**	**4.9**	**104.2**	**136.4**
	GRAND MEAN	**214.1**	**19.5**	**11.0**	**27920.0**	**3.2**	**3.8**
	LSD (0.05)	**29.2**	**0.9**	**1.6**	**2733.0**	**6.7**	**10.5**

Table 2. Yield and Agronomic Performance of FS8A(T):N1804 lines crossed to HC33, Magnolia, DE

Entry	Hybrid	Bu/A	% H2O	Y/M	Pop	% St ldg	% Rt ldg
44	FS8A(T):N1804)-299-1 xHC33	242.0	21.2	11.5	28000.0	2.7	8.0
17	FS8A(T):N1804)-177-1 xHC33	235.0	22.5	10.5	28000.0	0.0	0.0
2	**FS8A(T):N1804)-116-1 xHC33**	**234.7**	**19.9**	**11.9**	**27000.0**	**0.0**	**5.6**
49	DKC 61-66	227.3	19.1	12.0	27250.0	5.4	2.8
1	**FS8A(T):N1804)-104-1 xHC33**	**225.5**	**19.8**	**11.4**	**28000.0**	**1.0**	**1.0**
27	**FS8A(T):N1804)-226-1 xHC33**	**225.4**	**19.4**	**11.7**	**26500.0**	**0.0**	**9.8**
33	**FS8A(T):N1804)-264-1 xHC33**	**223.1**	**18.9**	**11.8**	**27750.0**	**3.6**	**2.7**
31	**FS8A(T):N1804)-250-1 xHC33**	**222.9**	**19.5**	**11.5**	**28750.0**	**0.0**	**1.8**
35	**FS8A(T):N1804)-270-1 xHC33**	**222.1**	**18.6**	**12.0**	**30000.0**	**1.7**	**4.2**
23	FS8A(T):N1804)-200-1 xHC33	220.2	21.8	10.3	28500.0	3.7	14.9
43	FS8A(T):N1804)-296-1 xHC33	220.1	19.7	11.2	27500.0	1.9	20.0
32	FS8A(T):N1804)-253-1 xHC33	218.5	20.7	10.6	26250.0	0.0	21.2
3	FS8A(T):N1804)-120-1 xHC33	217.1	18.8	11.6	28750.0	0.9	27.1
8	FS8A(T):N1804)-144-1 xHC33	214.9	18.2	11.8	29000.0	0.0	28.1
19	FS8A(T):N1804)-188-1 xHC33	214.0	17.4	12.3	27500.0	2.7	17.2
13	FS8A(T):N1804)-158-1 xHC33	213.5	18.1	11.9	28000.0	0.0	18.2
42	**FS8A(T):N1804)-292-1 xHC33**	**212.4**	**18.8**	**11.3**	**29000.0**	**0.0**	**6.8**
46	FS8A(T):N1804)-301-1 xHC33	211.9	20.5	10.4	29000.0	1.7	3.6
24	**FS8A(T):N1804)-212-1 xHC33**	**211.7**	**18.8**	**11.3**	**29250.0**	**0.0**	**0.9**
10	FS8A(T):N1804)-150-1 xHC33	210.9	22.4	9.5	29000.0	2.6	6.0
26	FS8A(T):N1804)-225-1 xHC33	210.4	19.4	10.9	29000.0	7.8	6.0
50	DKC 63-39	210.4	20.1	10.6	28250.0	0.0	0.9
39	FS8A(T):N1804)-279-1 xHC33	209.4	21.6	10.0	27250.0	0.0	32.9
5	FS8A(T):N1804)-129-1 xHC33	209.3	18.0	11.7	28500.0	9.6	1.8
7	FS8A(T):N1804)-138-1 xHC33	207.2	20.9	9.9	27500.0	0.9	18.1
20	FS8A(T):N1804)-193-1 xHC33	205.5	19.0	10.9	28500.0	4.4	3.4
47	FS8A(T):N1804)-302-1 xHC33	205.3	20.1	10.2	28750.0	1.8	30.3
40	FS8A(T):N1804)-287-1 xHC33	203.7	19.0	10.7	27000.0	4.6	9.2
38	FS8A(T):N1804)-276-1 xHC33	203.3	19.1	10.8	27750.0	10.8	15.8
14	FS8A(T):N1804)-159-1 xHC33	199.4	18.9	10.6	28250.0	6.4	1.8
29	FS8A(T):N1804)-241-1 xHC33	198.3	20.1	9.9	26750.0	5.5	1.0
16	FS8A(T):N1804)-175-1 xHC33	198.0	18.7	10.6	26250.0	4.8	8.5
34	FS8A(T):N1804)-269-1 xHC33	198.0	18.0	11.0	28250.0	1.8	0.0
15	FS8A(T):N1804)-164-1 xHC33	194.5	20.9	9.4	28500.0	3.5	16.7
25	FS8A(T):N1804)-215-1 xHC33	189.8	21.2	9.0	28750.0	10.5	0.0
45	FS8A(T):N1804)-300-1 xHC33	189.3	19.3	9.8	28250.0	2.7	3.5
22	FS8A(T):N1804)-199-1 xHC33	188.8	19.2	9.9	27750.0	0.0	12.3
6	FS8A(T):N1804)-136-1 xHC33	188.3	19.4	9.8	25000.0	0.0	29.0
30	FS8A(T):N1804)-242-1 xHC33	187.4	18.9	10.0	28250.0	6.1	7.2
4	FS8A(T):N1804)-121-1 xHC33	186.7	18.9	9.9	29250.0	8.4	3.5
36	FS8A(T):N1804)-271-1 xHC33	185.4	18.0	10.3	28500.0	4.4	13.3
12	FS8A(T):N1804)-157-1 xHC33	182.9	18.6	9.9	29000.0	4.4	36.2
18	FS8A(T):N1804)-179-1 xHC33	181.9	20.7	8.8	28000.0	0.9	21.8
28	FS8A(T):N1804)-235-1 xHC33	178.3	17.9	10.0	25500.0	0.0	6.2
11	FS8A(T):N1804)-154-1 xHC33	174.6	19.2	9.1	27750.0	15.3	20.0
41	FS8A(T):N1804)-290-1 xHC33	167.4	19.8	8.5	27750.0	7.3	31.3
37	FS8A(T):N1804)-274-1 xHC33	167.0	18.4	9.1	27500.0	5.5	10.9
21	FS8A(T):N1804)-197-1 xHC33	166.3	19.8	8.4	28000.0	2.8	24.1
9	FS8A(T):N1804)-148-1 xHC33	163.7	20.0	8.2	29250.0	3.6	53.5
48	FS8A(T):N1804)-308-1 xHC33	152.2	19.8	7.7	28500.0	14.9	29.9
	CHECK MEAN	**218.8**	**19.6**	**11.3**	**27750.0**	**2.7**	**1.8**
	% CV	**9.0**	**4.6**	**9.7**	**5.0**	**117.0**	**78.1**
	GRAND MEAN	**202.5**	**19.5**	**10.4**	**28010.0**	**3.5**	**13.0**
	LSD (0.05)	**36.7**	**1.8**	**2.0**	**2794.0**	**8.3**	**20.3**

Table 2 Cont. Yield and Agronomic Performance of FS8A(T):N1804 lines crossed to HC33, Fairfield, IA

Entry	Hybrid	Bu/A	% H2O	Y/M	Pop	% Stldg	% Rtldg	% Erdrp
43	FS8A(T):N1804)-296-1 xHC33	217.6	21.5	10.1	27500.0	0.0	0.0	0.0
10	FS8A(T):N1804)-150-1 xHC33	214.9	23.0	9.3	30000.0	0.0	0.0	0.0
27	FS8A(T):N1804)-226-1 xHC33	194.5	21.7	9.0	26500.0	0.0	0.0	0.0
49	DKC 61-66	189.1	18.8	10.1	26500.0	0.0	0.0	0.0
35	FS8A(T):N1804)-270-1 xHC33	187.3	20.0	9.4	30000.0	0.0	0.0	0.0
33	FS8A(T):N1804)-264-1 xHC33	185.7	21.0	8.8	30000.0	0.0	0.0	0.0
11	FS8A(T):N1804)-154-1 xHC33	183.3	19.2	9.5	30000.0	1.7	1.7	0.0
17	FS8A(T):N1804)-177-1 xHC33	182.5	23.8	7.7	30000.0	0.0	0.0	0.0
44	FS8A(T):N1804)-299-1 xHC33	182.5	23.6	7.7	30000.0	0.0	1.7	0.0
12	FS8A(T):N1804)-157-1 xHC33	182.0	20.3	9.0	29500.0	0.0	0.0	0.0
47	FS8A(T):N1804)-302-1 xHC33	181.7	22.1	8.2	30000.0	0.0	0.0	0.0
4	FS8A(T):N1804)-121-1 xHC33	179.9	21.0	8.6	30000.0	0.0	0.0	0.0
13	FS8A(T):N1804)-158-1 xHC33	179.1	21.1	8.5	29500.0	0.0	1.7	0.0
36	FS8A(T):N1804)-271-1 xHC33	178.0	20.5	8.7	29500.0	0.0	0.0	0.0
50	DKC 63-39	177.1	22.3	7.9	27000.0	3.7	0.0	0.0
3	FS8A(T):N1804)-120-1 xHC33	176.4	21.2	8.3	27500.0	0.0	0.0	0.0
39	FS8A(T):N1804)-279-1 xHC33	175.6	20.7	8.5	30000.0	0.0	0.0	0.0
31	FS8A(T):N1804)-250-1 xHC33	174.6	19.8	8.8	30000.0	1.7	0.0	0.0
6	FS8A(T):N1804)-136-1 xHC33	173.5	21.5	8.1	30000.0	0.0	1.7	0.0
2	FS8A(T):N1804)-116-1 xHC33	171.3	22.7	7.5	30000.0	0.0	1.7	1.7
21	FS8A(T):N1804)-197-1 xHC33	170.2	21.6	7.9	28500.0	0.0	0.0	0.0
5	FS8A(T):N1804)-129-1 xHC33	169.9	20.6	8.2	28000.0	1.8	0.0	0.0
7	FS8A(T):N1804)-138-1 xHC33	168.3	21.1	8.0	28000.0	3.6	0.0	0.0
16	FS8A(T):N1804)-175-1 xHC33	168.3	19.2	8.8	27000.0	0.0	0.0	0.0
46	FS8A(T):N1804)-301-1 xHC33	167.6	21.4	7.8	28000.0	0.0	0.0	0.0
41	FS8A(T):N1804)-290-1 xHC33	167.4	22.6	7.4	30000.0	0.0	0.0	0.0
14	FS8A(T):N1804)-159-1 xHC33	163.8	20.5	8.0	28000.0	0.0	0.0	0.0
32	FS8A(T):N1804)-253-1 xHC33	163.4	21.4	7.6	27500.0	1.8	0.0	0.0
15	FS8A(T):N1804)-164-1 xHC33	163.1	23.5	6.9	30000.0	0.0	0.0	0.0
8	FS8A(T):N1804)-144-1 xHC33	162.7	20.2	8.1	27500.0	0.0	0.0	0.0
20	FS8A(T):N1804)-193-1 xHC33	162.0	20.2	8.0	28000.0	0.0	0.0	0.0
45	FS8A(T):N1804)-300-1 xHC33	162.0	21.7	7.5	30000.0	0.0	0.0	0.0
19	FS8A(T):N1804)-188-1 xHC33	158.9	19.7	8.1	28000.0	0.0	0.0	0.0
42	FS8A(T):N1804)-292-1 xHC33	153.0	19.6	7.8	26000.0	1.9	0.0	0.0
18	FS8A(T):N1804)-179-1 xHC33	152.4	22.2	6.9	28000.0	0.0	0.0	0.0
28	FS8A(T):N1804)-235-1 xHC33	152.4	19.1	8.0	23000.0	4.3	2.2	0.0
34	FS8A(T):N1804)-269-1 xHC33	152.4	21.1	7.2	29000.0	1.7	1.7	0.0
9	FS8A(T):N1804)-148-1 xHC33	151.5	22.9	6.6	28000.0	1.8	0.0	0.0
23	FS8A(T):N1804)-200-1 xHC33	150.9	22.5	6.7	29000.0	0.0	0.0	0.0
40	FS8A(T):N1804)-287-1 xHC33	150.2	21.2	7.1	27000.0	0.0	0.0	0.0
29	FS8A(T):N1804)-241-1 xHC33	149.6	20.7	7.2	27500.0	1.8	0.0	0.0
37	FS8A(T):N1804)-274-1 xHC33	149.2	20.5	7.3	26500.0	0.0	0.0	0.0
48	FS8A(T):N1804)-308-1 xHC33	147.9	20.1	7.4	30000.0	3.3	0.0	0.0
26	FS8A(T):N1804)-225-1 xHC33	146.5	21.0	7.0	28000.0	3.6	0.0	0.0
22	FS8A(T):N1804)-199-1 xHC33	145.4	20.8	7.0	30000.0	0.0	0.0	0.0
1	FS8A(T):N1804)-104-1 xHC33	144.2	21.7	6.6	29000.0	0.0	0.0	0.0
24	FS8A(T):N1804)-212-1 xHC33	134.4	22.5	6.0	29000.0	0.0	0.0	0.0
38	FS8A(T):N1804)-276-1 xHC33	133.1	19.0	7.0	29000.0	0.0	0.0	0.0
25	FS8A(T):N1804)-215-1 xHC33	126.2	21.0	6.0	30000.0	0.0	0.0	0.0
30	FS8A(T):N1804)-242-1 xHC33	97.6	21.0	4.6	16000.0	0.0	0.0	0.0
	CHECK MEAN	**183.1**	**20.6**	**9.0**	**26750.0**	**1.9**	**0.0**	**0.0**
	GRAND MEAN	**165.4**	**21.1**	**7.8**	**28340.0**	**0.7**	**0.2**	**1.7**

Table 3. Yield and Agronomic Performance of FS8A(T):N1804 lines crossed to HC33, Magnolia, DE

Entry	Hybrid	Bu/A	% H2O	Y/M	Pop	% St ldg	% Rt ldg
13	**FS8A(T)N1804-B-63 xHC33**	**246.6**	**19.7**	**12.6**	**27000.0**	**1.0**	**5.7**
27	**FS8A(T)N1804-B-118 xHC33**	**240.8**	**20.2**	**12.0**	**27000.0**	**2.8**	**0.0**
29	**FS8A(T)N1804-B-127 xHC33**	**233.1**	**20.1**	**11.7**	**27750.0**	**1.9**	**1.0**
39	DKC 61-66	233.0	21.4	10.9	27250.0	0.9	0.0
37	**FS8A(T)N1804-B-175 xHC33**	**230.8**	**21.8**	**10.7**	**29500.0**	**1.7**	**3.5**
9	**FS8A(T)N1804-B-48 xHC33**	**230.0**	**20.1**	**11.5**	**26500.0**	**2.8**	**0.9**
30	FS8A(T)N1804-B-128 xHC33	229.5	20.0	11.5	25250.0	5.1	18.9
24	FS8A(T)N1804-B-108 xHC33	226.4	21.7	10.5	28750.0	7.1	17.9
33	**FS8A(T)N1804-B-145 xHC33**	**224.6**	**20.7**	**10.9**	**28500.0**	**3.6**	**4.4**
16	**FS8A(T)N1804-B-70 xHC33**	**224.1**	**18.5**	**12.2**	**26000.0**	**0.0**	**0.0**
28	FS8A(T)N1804-B-120 xHC33	221.2	21.8	10.2	27250.0	0.0	0.0
38	FS8A(T)N1804-B-177 xHC33	216.5	21.5	10.1	28000.0	3.7	3.5
22	FS8A(T)N1804-B-97 xHC33	214.9	21.4	10.1	28750.0	0.0	3.7
23	**FS8A(T)N1804-B-100 xHC33**	**214.6**	**19.6**	**11.0**	**27500.0**	**4.4**	**0.0**
26	FS8A(T)N1804-B-117 xHC33	214.4	21.1	10.2	28750.0	3.6	4.6
31	FS8A(T)N1804-B-136 xHC33	214.0	19.8	10.8	26500.0	6.6	1.9
40	DKC 63-39	213.6	21.8	9.8	27000.0	1.0	0.0
10	FS8A(T)N1804-B-56 xHC33	213.3	21.3	10.0	26750.0	6.7	2.0
21	FS8A(T)N1804-B-89 xHC33	213.2	21.4	10.0	26500.0	1.9	1.0
25	FS8A(T)N1804-B-109 xHC33	211.9	19.0	11.2	26250.0	1.8	4.2
5	FS8A(T)N1804-B-19 xHC33	211.0	21.4	9.9	26750.0	1.0	6.4
7	FS8A(T)N1804-B-27 xHC33	209.6	21.5	9.8	27250.0	0.9	9.4
14	FS8A(T)N1804-B-66 xHC33	209.4	21.2	9.9	27500.0	2.9	8.3
19	FS8A(T)N1804-B-82 xHC33	207.8	22.5	9.3	27750.0	0.0	6.4
34	FS8A(T)N1804-B-151 xHC33	206.5	20.3	10.2	27500.0	1.8	2.7
3	FS8A(T)N1804-B-168 xHC33	206.4	21.7	9.5	28000.0	1.7	0.9
17	FS8A(T)N1804-B-72 xHC33	204.5	19.7	10.4	24500.0	3.1	1.1
8	FS8A(T)N1804-B-36 xHC33	201.1	19.8	10.2	26500.0	0.9	0.0
2	FS8A(T)N1804-B-6 xHC33	199.0	19.6	10.2	28000.0	2.8	0.9
12	FS8A(T)N1804-B-61 xHC33	197.6	20.6	9.6	28750.0	5.3	14.5
20	FS8A(T)N1804-B-83 xHC33	197.5	20.3	9.7	28250.0	1.7	2.6
4	FS8A(T)N1804-B-15 xHC33	196.5	18.8	10.5	27250.0	0.9	0.9
15	FS8A(T)N1804-B-68 xHC33	196.4	21.8	9.1	28500.0	7.9	4.4
6	FS8A(T)N1804-B-24 xHC33	196.0	21.3	9.2	27500.0	2.7	1.8
11	FS8A(T)N1804-B-60 xHC33	192.3	20.9	9.2	28000.0	2.7	0.0
1	FS8A(T)N1804-B-1 xHC33	181.3	21.5	8.5	25500.0	3.0	1.0
32	FS8A(T)N1804-B-142 xHC33	181.1	21.3	8.6	28750.0	5.2	3.5
35	FS8A(T)N1804-B-163 xHC33	178.5	22.4	8.0	25250.0	4.0	16.8
18	FS8A(T)N1804-B-78 xHC33	177.8	20.1	8.9	27750.0	10.9	3.9
36	FS8A(T)N1804-B-170 xHC33	170.7	22.7	7.5	28250.0	2.6	1.0
	CHECK MEAN	**223.3**	**21.6**	**10.4**	**27125.0**	**0.9**	**0.0**
	% CV	**7.1**	**2.3**	**8.4**	**5.3**	**126.0**	**137.1**
	GRAND MEAN	**209.7**	**20.8**	**10.1**	**27356.0**	**2.9**	**4.0**
	LSD (0.05)	**30.3**	**1.0**	**1.7**	**2908.0**	**7.5**	**11.0**