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SOYBEAN VARIETY YIELD TEST IN 1999

by

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Introduction

The annual testing of Roundup Ready and non-Roundup Ready varieties and experimental lines of soybeans was conducted at four locations in New York State in 1999. Entries in Maturity Groups 00, 0 and I were tested at all locations. Entries in Group II were included at Aurora and Mt. Morris, the sites that represent the warmer parts of Upstate New York. Also, food grade soybean varieties (mostly Group II) were tested at Aurora and Mt. Morris. All seed companies known to be distributing soybeans in the state were invited to enter their selections in these tests, at a fee. Some unsponsored varieties, mainly those from public (state and provincial college, or Canadian federal) breeding programs, were also included in the tests.

At each location we planted all entries of the same maturity Group in a separate test. Also, Roundup Ready, non-Roundup Ready, and food grade varieties were evaluated in separate tests. Each individual plot at Canton and Chazy consisted of four 20-foot rows spaced 14 inches apart; at Aurora and Mt. Morris there were 10 rows spaced 7 inches apart. There were four replications of each entry at each location. We used preemergence applications of herbicides in the non-Roundup Ready tests, whereas we relied exclusively on 3 pints/acre of Roundup Ultra for weed control in the Roundup Ready tests.

During the season, notes on development were made at intervals. Yields were determined by harvesting a measured section of the center rows in each plot. All plots were harvested with a Hege plot combine.

Aurora and Mt. Morris

Both sites were exceptionally dry and warm from May through July, especially at the Aurora site. The Aurora site received only 4.7 in. of precipitation from May through July, 5.6 in. below normal, and 1457 GDD, about 140 GDD above normal (Table 1). Although the Mt. Morris site also received below normal precipitation and above average GDD during the same period, the deep soils with high water-holding capacity prevented the occurrence of severe drought at this site. Because of the warm and dry conditions, the Group O and Group I varieties attained the R6 growth stage by mid-August at the Aurora site, about 3 weeks earlier than normal. Despite normal temperatures and 2.7 in. of precipitation in August at Aurora, the soybeans never recovered from drought-stress at this site. Consequently, the 1999 soybean varieties at Aurora were the shortest on record with the lowest yields ever. Because of the deep soils at Mt. Morris, the yields at that site were close to normal.

In the non-Roundup Ready trials, Group O soybeans averaged 26 bu/acre in yield compared with 30 bu/acre for Group I varieties and 39 bu/acre for Group II varieties at the Aurora site (Table 2). Under stress-free conditions, yields usually increase about 3 to 4 bu/acre as

¹ These test are the product of cooperative efforts of many individuals at Ithaca and outlying locations in New York State: D.J. Otis, Aurora and Mt. Morris; G.K. Thompson, Canton; Mike Davis, D.G. Meseck and M.L. LaDuke, Chazy (Minor Institute); John English, Mt. Morris; K.H. Rhodes, statistical analysis.

the Maturity Group increases from Group O to Group I to Group II varieties. The much greater yields for the Group II varieties, which were about 7 days later in development compared with the Group I varieties, probably reflects somewhat more favorable climate conditions during the R3 to R6 stage for Group II compared with Group I varieties. In the Roundup Ready trials, however, Group O varieties averaged 23 bu/acre in yield compared with 31 bu/acre for Group I varieties and 33 bu/acre for Group II varieties (Table 3). As in the two previous years at the Aurora site, which were droughty during August, the Roundup Ready varieties at Aurora yielded about 3 bu/acre less than the non-Roundup Ready varieties. Because the Roundup Ready and non-Roundup Ready varieties generally yield the same at the Mt. Morris site where droughty conditions usually don't occur, the lower yields for Roundup Ready varieties at the Aurora site may be stress-induced.

In the non-Roundup Ready trials, Group O varieties averaged 75 bu/acre in yield compared with 81 bu/acre for Group I and 84 bu/acre for Group II varieties at the Mt. Morris site (Table 2). In the Roundup Ready trials, Group O varieties averaged 78 bu/acre in yield compared with 80 bu/acre for Group I and 84 bu/acre for Group II varieties (Table 3). Generally, the varieties that yielded the greatest at the Mt. Morris site also yielded best at the droughty Aurora site in both the Roundup and non-Roundup Ready trials. This indicates excellent yield stability for the highest yielding varieties at Aurora and Mt. Morris.

We initiated a food grade soybean variety trial at Aurora and Mt. Morris because we anticipate that the demand for food grade soybeans will increase greatly in the coming years with the recent FDA ruling. In October, 1999, the FDA proclaimed that products that contain 6.25 g of soybean can carry labels claiming the health benefits of the product. Consequently, we expect increased acreage of food grade soybean varieties in the coming years.

We tested 20 food grade soybean varieties at Aurora and Mt. Morris with the majority of varieties coming from the food grade variety breeding program from Iowa State University. We also included three varieties from Pioneer, which had clear or buff-colored hilums, an essential characteristic of food grade varieties, but weren't bred for high-protein and large seed characteristics. Consequently, the Pioneer hybrids served as excellent yield checks for the food grade varieties. We also included Vinton 81, the standard food grade variety for organic tofu use in Japan, as a quality check for the other food grade varieties.

When averaged across the two locations, three Pioneer varieties (Group II and early Group III varieties) yielded more than the food grade varieties, which were Group II varieties (Table 3). Pioneer 9163, a mid-Group I variety, yielded the same as most of the food grade varieties. IA 2041 and IA 2020 did yield more than Vinton 81. The food grade varieties generally had somewhat poor stand establishment compared with the Pioneer varieties under the dry May conditions, which may have contributed to their lower yields.

When averaged across sites, IA 2041 and Harrowvinton, an improved Vinton 81 variety from Canada, had the greatest protein concentration among varieties (Table 4). The greater yield potential and higher protein concentration of IA 2041 compared with Vinton 81 makes this variety an excellent candidate to replace Vinton 81 as the standard food grade variety. Unfortunately, IA 2041 had about the lowest seed weight or seed size among food grade varieties, another important characteristic of food grade soybeans. IA 2020, which also yielded greater than Vinton 81, had a slightly larger seed than Vinton 81. Unfortunately, IA 2020 had less protein concentration when compared with Vinton 81. We will conduct this study a couple of more years to determine the best adapted food grade soybean varieties in New York.

Canton and Chazy

Both sites were exceptionally warm but much wetter than most regions in the state during June and July (Table 1). Both sites, however, did dry out during August. Consequently, soybean yields at the Canton site, which had a somewhat droughty soil, were exceptionally low because of the dry August conditions (Table 5). In contrast, yields were exceptionally high at the Chazy site, which has a deep soil with high water holding capacity (Table 5).

When averaged across sites, Sentry, a Group 0 variety, yielded the greatest among Group 0 varieties. Sentry, however, yielded much more than the other varieties at the high-yielding Chazy site but similarly as the other varieties in the low-yielding Canton environment. Evidently, Sentry does not have as great a yield stability as some leading varieties have shown in recent years. Nevertheless, Sentry, which averaged 3 to 7 bu/acre more in yield than other Group 0 varieties, yielded about 10 bu/acre more at Chazy compared with other varieties, except for Telstar. As in the past, the Group I varieties offered no yield advantage compared with the Group 0 varieties at Canton and Chazy. AG 1301 yielded the most in the Roundup Ready trial at Canton and the same as the other Roundup Ready varieties at Chazy. Overall, the Roundup Ready varieties yielded as well as the non-Roundup Ready varieties at both sites.

Table 1. Monthly and total precipitation and growing degree days (86-50 system) at the four soybean variety testing sites in New York in 1999.

Month	PRECIPITATION				GROWING DEGREE DAYS			
	Aurora	Mt.Morris	Canton	Chazy	Aurora	Mt.Morris	Canton	Chazy
May	1.1	2.4	2.6	0.7	381	368	368	361
June	1.6	1.9	2.8	2.4	607	568	555	575
July	2.0	2.5	4.3	4.5	734	708	659	664
August	2.7	3.8	1.8	0.7	577	535	481	528
Sept	---	---	---	---	<u>471</u>	<u>436</u>	<u>430</u>	<u>408</u>
	7.4	10.6	11.5	8.3	2770	2615	2493	2536

Table 2. Soybean yields, height, lodging, and physiological maturity of early, medium, and late maturing non-Roundup Ready and Roundup Ready soybean varieties at Aurora, and Mt. Morris, New York in 1999.

Variety	Yield		Avg.	Height (in.)		Lodging (1-5)		Maturity (date)	
	Aurora	Mt.Morris		Aurora	Mt.Morris	Aurora	Mt.Morris	Aurora	Mt.Morris
	----- bu/acre -----								
Early (Group I)									
OAC 97-06	28	79	54	23	42	1.0	3.5	9/4	9/20
Telstar	28	78	53	22	43	1.0	2.5	9/5	9/20
Sentry	29	76	53	23	41	1.0	3.0	9/6	9/21
PR9746	24	79	52	23	42	1.0	1.7	9/4	9/20
APK020	27	75	51	21	38	1.0	3.1	9/2	9/18
OAC Auburn	24	77	51	20	37	1.0	1.8	9/2	9/19
Enterprise	26	73	50	21	37	1.0	3.3	9/2	9/17
Bayfield	28	71	50	21	37	1.0	3.3	9/2	9/17
OAC Embryo	24	72	48	20	35	1.0	1.5	8/30	9/16
Korada	22	72	48	20	35	1.0	1.5	8/30	9/16
LSD 0.05	5	7	4	NS	5	NS	0.7		
Medium (Group I)									
APK184	35	84	60	23	37	1.0	2.5	9/10	9/25
S19-90	31	82	57	22	43	1.0	2.0	9/7	9/23
APKX172	27	83	55	21	37	1.0	2.5	9/8	9/23
APKX174	27	79	53	21	36	1.0	2.3	9/8	9/24
Secan 97-59	28	78	53	23	40	1.0	2.3	9/4	9/21
LSD 0.05	5	NS	4	NS	5	NS	NS		
Late (Group II)									
APK 259	37	88	63	23	42	1.0	2.6	9/11	9/29
X9818	41	82	62	24	44	1.0	.5	9/9	9/28
S24-92	41	82	62	25	40	1.0	2.7	9/12	9/30
LSD 0.05	NS	NS	NS	NS	4	NS	NS		

Table 2 cont.		Yield		Height		Lodging		Maturity	
Variety	Aurora	Mt.Morris ----- bu/acre -----	Avg.	Aurora	Mt.Morris (in.)	Aurora	Mt.Morris (1-5)	Aurora	Mt.Morris (date)
<u>Roundup Ready Group 0</u>									
APKX171RR	27	80	54	22	43	1.0	1.5	9/5	9/20
CX085RR	22	78	50	19	37	1.0	1.5	9/4	9/20
APK112RR	23	76	50	21	40	1.0	1.8	9/3	9/18
90B93	19	77	48	20	35	1.0	1.3	9/3	9/19
LSD 0.05	4	NS	3	NS	3	NS	NS		
<u>Roundup Ready Group I</u>									
AG1901	36	83	60	24	48	1.0	2.2	9/10	9/25
X9919RR	30	87	59	22	41	1.0	2.3	9/10	9/25
S20-B9	30	85	58	23	46	1.0	2.2	9-13	9/27
APKX173RR	35	80	58	21	42	1.0	2.2	9/9	9/23
APK190RR	32	83	58	23	43	1.0	2.2	9/13	9/27
APK198RR	33	81	57	24	50	1.0	3.4	9/12	9/27
APK143RR	33	80	57	22	41	1.0	2.4	9/9	9/25
CX198RR	29	79	54	21	41	1.0	2.3	9/11	9/26
CX150RR	26	80	53	20	48	1.0	2.5	9/7	9/23
91B64	28	75	52	21	40	1.0	2.2	9/8	9/24
CX194RR	29	74	52	21	48	1.0	3.8	9/10	9/25
AG1301	30	73	52	22	37	1.0	2.0	9/6	9/23
LSD 0.05	5	9	4	2	4	NS	0.7		

Roundup Ready Group II

X9924RR	35	92	64	24	42	1.0	2.3	9/14	10/1
92B71	33	88	61	24	43	1.0	2.0	9/14	10/1
AG2702	36	85	61	28	50	1.0	2.6	9/16	10/4
CX285RR	31	87	59	25	46	1.0	2.5	9/14	9/30
X9923RR	33	85	59	23	47	1.0	2.2	9/11	9/28
92B21	31	86	59	21	40	1.0	2.0	9/11	9/29
APK256RR	31	85	58	21	41	1.0	2.2	9/13	10/1
CX242RR	33	83	58	24	43	1.0	2.4	9/13	10/1
CX257RR	33	82	58	25	45	1.0	2.5	9/15	10/3
AG2602	35	76	56	23	40	1.0	2.5	9/15	10/3
AG2301	30	79	55	20	41	1.0	2.3	9/14	10/1
LSD 0.05	4	8	4	3	5	NS	0.4		

Table 3. Soybean yields, height, lodging, and physiological maturity of food grade soybean varieties at Aurora and Mt. Morris, New York in 1999.

Variety	Yield		Avg.	Height (in.)		Lodging (1-5)		Maturity (date)	
	Aurora	Mt.Morris ----- bu/acre -----		Aurora	Mt.Morris	Aurora	Mt.Morris	Aurora	Mt.Morris
9244	36	95	66	23	42	1.0	2.0	9/17	10/1
9305	36	91	64	23	45	1.0	2.0	9/20	10/3
92B91	38	87	63	25	47	1.0	2.3	9/18	10/1
IA2041	35	84	60	26	42	1.0	1.8	9/18	10/2
IA2020	41	73	57	30	48	1.0	2.7	9/16	10/1
IA2012	32	80	56	23	39	1.0	2.0	9/14	9/30
IA2034	37	74	56	26	48	1.0	2.2	9/18	10/3
IA2029	36	74	55	23	52	1.0	2.3	9/17	10/1
IA 2042	37	73	55	23	44	1.0	2.5	9/15	9/30
9163	32	77	55	23	45	1.0	2.0	9/11	9/28
IA2040	35	73	54	24	46	1.0	2.5	9/19	10/2
HP204	35	73	54	27	48	1.0	3.0	9/14	9/30
Vinton81	33	75	54	27	46	1.0	2.5	9/16	10/1
IA 2032	32	74	53	24	46	1.0	2.5	9/17	10/1
IA 1007	31	75	53	23	41	1.0	2.0	9/18	10/2
IA 2027	30	72	51	24	49	1.0	2.0	9/16	10/1
AC 756	27	75	51	23	45	1.0	2.8	9/13	9/29
Harrowwinton	29	71	50	24	46	1.0	2.5	9/16	9/30
Aconrel	30	67	49	28	35	1.0	2.0	9/15	9/29
I 2025	33	64	49	23	42	1.0	2.3	9/17	10/1
LSD 0.05	6	10	6	5	6	NS	0.6		

Table 4. Protein concentration, oil concentration, and seed weight of food grade soybean varieties at Aurora and Mt. Morris, New York in 1999.

Variety	Protein (%)			Oil (%)			100 Seed wt (g)		
	Aurora	Mt.Morris	Avg.	Aurora	Mt.Morris	Avg.	Aurora	Mt.Morris	Avg.
Harrowvinton	42.2	41.0	41.6	15.2	15.2	15.2	30.8	32.5	31.7
IA 2041	41.5	41.6	41.6	16.3	15.6	16.0	26.8	30.2	28.5
I 2025	41.7	40.5	41.1	16.8	16.1	16.5	26.8	30.2	28.5
Vinton 81	41.2	40.1	40.7	15.8	15.5	15.7	30.8	32.5	31.7
IA 2034	40.8	40.3	40.6	15.7	14.8	15.3	27.1	29.6	28.3
AC756	40.8	40.0	40.4	15.6	15.7	15.7	29.6	31.3	30.5
HP204	41.2	39.5	40.3	16.1	16.1	16.1	30.0	31.4	30.7
IA 2042	40.8	39.6	40.2	16.5	15.8	16.2	28.7	33.6	31.2
Aconrel	39.8	40.2	40.0	15.7	14.8	15.3	34.0	40.3	37.2
IA 2032	40.4	39.0	39.7	16.4	16.3	16.4	28.3	33.4	30.1
IA 2029	40.6	38.7	39.7	16.8	16.6	16.7	28.7	29.9	29.3
IA 2020	39.8	39.0	39.4	16.9	16.2	16.6	30.5	33.6	32.0
IA 2027	40.0	38.2	39.1	16.7	17.0	16.9	27.6	31.9	29.8
IA 1007	39.9	38.3	39.1	15.5	16.1	15.8	36.1	38.7	37.4
AC 756	38.4	38.8	38.6	15.6	15.7	15.7	29.6	31.3	30.5
IA 2012	38.1	38.6	38.4	16.5	15.6	16.3	34.1	38.4	36.2
9305	37.8	37.5	37.6	17.9	17.4	17.7	23.8	26.1	24.9
9244	37.1	35.8	36.4	18.2	17.8	18.0	21.3	22.7	22.0
92B91	36.0	35.6	35.8	19.5	17.9	18.7	17.8	20.4	19.1
9163	35.2	35.4	35.3	18.7	18.3	18.5	20.7	22.8	21.8
LSD 0.05	0.9	0.7	0.6	0.5	0.4	0.3	1.8	1.8	1.5

Table 5. Soybean yields, height, lodging, and physiological maturity of early, medium, and Roundup Ready soybean varieties at Canton, and Chazy, New York in 1999.

Variety	Canton	Yield		Avg.	Height (in.)		Lodging (1-5)		Maturity (date)		
		bu/acre	Chazy		Canton	Chazy	Canton	Chazy	Canton	Chazy	

<u>Early (Group O)</u>											
Sentry	32	78		55	29	45	1.0	1.0	9/24	9/13	
Telstar	30	73		52	30	48	1.0	1.0	9/24	9/13	
APK020	35	67		51	28	43	1.0	1.0	9/20	9/7	
OAC Auburn	34	68		51	30	43	1.0	1.0	9/20	9/7	
OAC 97.06	33	67		50	29	44	1.0	1.0	9/20	9/7	
OAC Embryo	31	69		50	30	44	1.0	1.0	9/25	9/13	
OAC Bayfield	33	66		50	30	42	1.0	1.0	9/20	9/7	
Enterprise	32	66		49	27	41	1.0	1.0	9/25	9/13	
Korada	35	61		48	25	39	1.0	1.0	9/20	9/7	
PR9746	26	64		45	29	44	1.0	1.0	9/20	9/7	
LSD 0.05	6	7		5	4	5	NS	NS			
<u>Medium (Group I)</u>											
APKX174	31	73		52	29	41	1.0	1.0	10/1	9/15	
APKX172	35	67		51	29	40	1.0	1.0	10/1	9/15	
Secan 97-59	34	68		51	30	50	1.0	1.0	9/24	9/7	
LSD 0.05	NS	NS		NS	NS	4	NS	NS			
<u>Roundup Ready</u>											
AG1301	34	71		53	31	40	1.0	1.0	9/24	9/10	
91B64	27	74		51	27	40	1.0	1.0	9/27	9/15	
APKX171RR	26	70		48	26	47	1.0	1.0	9/25	6/11	
90B93	28	67		48	24	38	1.0	1.0	9/19	9/6	
LSD 0.05	7	NS		5	3	4	NS	NS			