

UCCE SAN JOAQUIN COUNTY ASPARAGUS RESEARCH PROGRESS REPORT, 2014
Brenna Aegerter, Farm Advisor, UCCE San Joaquin County

Asparagus Variety Evaluation Trial established in 2007

This trial was established with one-year-old crowns in March of 2007 at Klein Family Farms, on Rindge Tract near Stockton. Asparagus lines included were from the breeding programs of UC Riverside, Rutgers University, California Asparagus Seed and Transplants, Aspara Pacific Ltd. and Brock Seed Company. The trial contains forty-four lines in total; sixteen in replicated blocks and twenty-nine in the observational block. At planting, the one-year-old crowns were placed just over 8" apart within the row on 5.5 foot beds (center to center), for a plant population equivalent to 11,647 plants per acre. Stand establishment was evaluated during the summer of 2007 and was good to excellent for all varieties. The soil type at the trial site on Rindge Tract is an Egbert Muck.

In 2014, the variety trial was harvested for the seventh year; we cut the trial 32 times over a 74-day period from March 3rd to May 16th. Once again, the best performing line was FCE4 x M256, which ranked first in quality and second in total yield. Over the seven years of harvest, the yield of FCE4 x M256 has been equal or higher than UC157 and the spear quality has been higher in each year. Average spear size tends to be fairly similar to UC157. Another promising line is FCE2 x M256. See Table 1 and Figure 1 for yield data for all seven years, and table 3 for 2014 data on yield, spear counts and spear weights.

In the observational block of the trial, where twenty-nine varieties are evaluated only in a single row plot, the highest yielding lines were F189 x MCE4, F582 x MCE4, and F608 x MCE4. In all, 22 observational varieties out-yielded UC157 this year, and many had spear quality ratings higher than UC157. See Table 2 for cumulative yield from observational plots and table 3 for 2014 data; note that data from the observational trial should be viewed with less confidence than replicated data.

Asparagus Variety Evaluation Trial established in 2013

This trial was established with one-year-old crowns in February, 2013 at Victoria Island Farms near Stockton. Asparagus lines included were from the UC Riverside breeding program as well as two lines from the Dutch company Limgroup. The trial contains thirty-four lines in total, seventeen in replicated blocks and seventeen in an observational block. Stand establishment was good for all varieties. The soil type at the trial site is an Itano silty clay loam. The trial was harvested for the first time in 2014 and we cut the trial area 8 times from March 3 to 7. Yield results are shown in Table 4, but should be regarded as preliminary since they are based on small plots cut only a few times.

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Table 1. Yield and spear quality of asparagus lines evaluated in a replicated trial planted in 2007 at Klein Family Farms, Rindge Tract.

Variety/line	Yield (lbs/acre) ^x								Quality ranking
	2008	2009	2010	2011	2012	2013	2014	7-yr cumulative	
NJ 1031	1,282 a	2,923 (11)	5,689 (6) ab	7,790 (1) a	5,395 (3)	6,190 (1) a	6,974 (1) a	36,243 a	15
FCE4 x M256	915 abc	3,659 (1)	6,044 (2) ab	6,929 (2) ab	5,778 (2)	5,878 (2) ab	6,028 (2) ab	35,232 a	2
NJ 953	1,355 a	3,531 (3)	6,044 (3) ab	6,928 (3) ab	4,661 (11)	5,304 (3) abc	5,649 (6) ab	33,471 ab	16
FCE6 x M256	833 abc	3,423 (6)	5,969 (4) ab	5,333 (13) abc	6,024 (1)	4,765 (9) abc	5,455 (8) ab	31,802 ab	10
DePaoli	891 abc	3,332 (7)	5,862 (5) ab	6,141 (5) abc	4,381 (13)	5,073 (5) abc	5,864 (3) ab	31,544 ab	5
FCE2 x M256	763 bc	3,576 (2)	6,685 (1) a	6,472 (4) abc	3,507 (16)	4,825 (8) abc	5,161 (10) ab	30,989 ab	6
Grande	1,015 abc	3,477 (4)	5,003 (9) ab	5,576 (8) abc	5,198 (6)	4,484 (13) abc	5,800 (4) ab	30,553 ab	11
UC 157	1,078 ab	3,459 (5)	5,218 (7) ab	5,684 (6) abc	4,725 (9)	4,834 (7) abc	5,424 (9) ab	30,421 ab	8
Pacific 2000	907 abc	3,271 (9)	4,879 (10) ab	5,624 (7) abc	4,664 (10)	5,124 (4) abc	5,560 (7) ab	30,030 ab	12
NJ 1019	627 bc	2,570 (15)	5,008 (8) ab	5,501 (9) abc	5,356 (4)	4,666 (11) abc	4,600 (13) ab	28,328 ab	9
FCE1 x M256	652 bc	2,821 (12)	4,687 (12) ab	5,383 (11) abc	4,006 (15)	4,752 (10) abc	5,715 (5) ab	28,016 ab	3
F582 x M256	661 bc	2,957 (10)	4,292 (15) ab	5,474 (10) abc	4,091 (14)	4,903 (6) abc	5,153 (11) ab	27,531 ab	7
FCE3 x M256	532 c	2,816 (13)	4,847 (11) ab	5,367 (12) abc	4,829 (7)	4,542 (12) abc	3,690 (16) b	26,623 ab	4
Atlas	1,167 ab	3,300 (8)	4,390 (14) ab	4,398 (15) bc	5,232 (5)	3,380 (16) c	4,167 (15) b	26,034 ab	13
Apollo	642 bc	2,629 (14)	4,442 (13) ab	4,969 (14) bc	4,443 (12)	3,777 (15) bc	4,609 (12) ab	25,512 ab	14
F132 x MCE4	740 bc	1,834 (16)	3,102 (16) b	3,752 (16) c	4,743 (8)	4,019 (14) abc	4,361 (14) ab	22,552 b	1
Mean	874	3,083	5,126	5,708	4,814	4,782	5,263	29,680	
<i>P value</i>	<0.0001	<i>NS</i>	0.034	0.0003	<i>NS</i>	<0.0001	0.0261	0.0064	
<i>CV (%)</i>	22.9	25.5	23.6	17.9	24.0	10.4	19.7	14.9	

^x Numbers represent the mean of four observations, except for the following varieties in 2009 and 2010 for which the number represents the least-squares mean of three observations: DePaoli, Atlas, Pacific 2000, and FCE6 x M256. Means in the same column followed by the same letter are not significantly different according to Tukey-Kramer method ($\alpha = 0.05$)

^y Spear quality ratings based primarily on head tightness. Varieties ranked based on daily quality ratings averaged over the entire season (1 = highest quality)

Table 2. Yield and spear quality of asparagus lines evaluated in an observational trial planted in 2007 at Klein Family Farms, Rindge Tract. Data are from a single plot and should be viewed with less confidence than replicated data.

Variety/line	Yield (lbs/acre)							7-yr cumulative	Quality ranking ^z
	2008	2009	2010	2011	2012	2013	2014		
F582 x MCE4	2,183	4,711	6,714	9,209	7,304	7,519	8,778	46,419	2
F189 x MCE4	1,603	3,270	8,817	7,307	7,165	7,597	8,781	44,541	1
FCE7 x M120	1,705	4,618	7,625	8,706	7,827	6,517	7,305	44,303	10
NJ 956	1,432	3,718	7,189	8,665	6,933	7,205	7,702	42,844	18
F597 x MCE4	1,885	4,941	6,891	7,732	6,843	7,307	7,200	42,800	3
F181 x MCE4	1,276	4,839	6,421	8,723	6,915	6,030	7,528	41,732	5
NJ 951	1,237	4,276	9,017	7,441	6,517	6,272	6,793	41,552	22
FCE5 x M256	1,180	3,971	7,350	8,434	6,350	6,225	7,026	40,536	12
F172 x MCE4	2,069	5,218	6,279	7,005	5,709	6,084	7,775	40,138	4
F608 x MCE4	1,227	3,783	5,490	7,858	6,439	6,675	8,453	39,925	6
F132 x MCE2	1,264	3,275	6,267	7,652	5,827	6,539	6,870	37,693	14
F586 x MCE1	1,060	4,515	6,388	7,231	4,638	6,071	5,795	35,699	17
FCE4 x A1	1,164	3,944	6,393	6,764	5,634	5,905	5,463	35,267	21
FCE1 x A1	1,208	3,323	6,237	6,347	4,952	6,989	6,129	35,185	20
3 x Phy20	872	3,579	7,065	7,359	5,709	4,551	5,662	34,796	25
F608 x MCE2	1,089	3,206	4,535	6,289	5,402	5,825	7,719	34,064	11
FCE7 x M256	989	3,446	4,386	6,533	6,232	5,296	6,914	33,794	15
FCE5 x A1	1,010	2,866	5,977	7,286	5,380	5,221	6,044	33,784	24
F583 x MCE4	1,599	3,598	4,518	6,046	5,199	6,212	6,267	33,439	7
F177 x MCE4	983	3,467	5,836	6,416	5,011	5,440	5,444	32,597	9
F582 x A1	959	3,486	6,114	7,076	5,086	4,596	4,479	31,796	26
F609 x MCE2	1,218	3,257	4,145	5,868	4,677	5,908	6,237	31,310	16
F597 x MCE2	1,693	2,845	4,530	5,137	6,198	5,835	4,626	30,864	8
FCE3 x A1	784	3,415	5,034	6,229	4,191	4,543	5,846	30,042	19
FCE6 x A1	910	3,301	4,360	4,695	4,731	4,588	5,125	27,710	13
F600 x A1	814	2,248	4,452	4,665	4,147	4,512	4,781	25,619	27
74 X 22	626	2,526	3,495	3,814	3,731	2,576	3,919	20,688	29
73 X 22	487	2,348	3,676	4,024	3,465	3,098	3,342	20,440	28
EARLY CALIFORNIA	1,871	2,928	3,895	2,998	2,782	2,025	975	17,473	23

^z Spear quality ratings based primarily on head tightness. Varieties ranked based on daily quality ratings averaged over the entire season (1 = highest quality)

Table 3. 2014 harvest of 2007 trial planted at Klein Family Farms, Rindge Tract. Data on observational varieties are from a single plot and should be viewed with less confidence than replicated data.

REPLICATED VARIETIES (four plots per variety)					
Variety/line	Yield (lbs/ac)		Spears per acre	Spear weight (g)	Quality ranking
NJ 1031	6,974	a	158,406	20.9	16
FCE4 x M256	6,028	ab	115,776	23.6	2
DePaoli	5,864	ab	122,415	21.7	3
Grande	5,800	ab	93,646	28.3	11
FCE1 x M256	5,715	ab	102,847	25.4	4
NJ 953	5,649	ab	142,449	18.0	13
Pacific 2000	5,560	ab	133,131	19.1	12
FCE6 x M256	5,455	ab	112,515	21.9	10
UC 157	5,424	ab	109,137	22.7	6
FCE2 x M256	5,161	ab	107,390	21.8	7
F582 x M256	5,153	ab	101,916	23.0	9
Apollo	4,609	ab	86,192	24.2	15
NJ 1019	4,600	ab	102,964	20.4	8
F132 x MCE4	4,361	ab	107,390	18.3	1
Atlas	4,167	b	80,251	23.5	14
FCE3 x M256	3,690	b	86,541	19.0	5

OBSERVATIONAL VARIETIES (single plot per variety)					
Variety/line	Yield (lbs/ac)		Spears per acre	Spear weight (g)	Quality ranking
F189 x MCE4	8,781		175,178	22.7	3
F582 x MCE4	8,778		183,565	21.7	1
F608 x MCE4	8,453		195,678	19.6	2
F172 x MCE4	7,775		143,031	24.7	4
F608 x MCE2	7,719		129,520	27.0	9
NJ 956	7,702		160,270	21.8	16
F181 x MCE4	7,528		150,020	22.8	5
FCE7 x M120	7,305		135,577	24.4	11
F597 x MCE4	7,200		147,690	22.1	6
FCE5 x M256	7,026		163,065	19.5	13
FCE7 x M256	6,914		124,395	25.2	10
F132 x MCE2	6,870		156,542	19.9	14
NJ 951	6,793		134,179	23.0	20
F583 x MCE4	6,267		112,282	25.3	8
F609 x MCE2	6,237		135,111	20.9	18
FCE1 x A1	6,129		128,123	21.7	22
FCE5 x A1	6,044		171,451	16.0	24
FCE3 x A1	5,846		124,861	21.2	12
F586 x MCE1	5,795		105,759	24.9	17
3 x Phy20	5,662		130,918	19.6	21
FCE4 x A1	5,463		109,487	22.6	19
F177 x MCE4	5,444		124,395	19.8	7
FCE6 x A1	5,125		98,305	23.6	15
F600 x A1	4,781		116,009	18.7	26
F597 x MCE2	4,626		90,851	23.1	12
F582 x A1	4,479		81,533	24.9	27
74 X 22	3,919		90,851	19.6	28
73 X 22	3,342		87,123	17.4	25
EARLY CALIFORNIA	975		40,999	10.8	23

Table 4. Yield and spear quality of asparagus lines evaluated in a trial planted in 2013 at Victoria Island Farms. First year of harvest, cut 8 times over a two week period in early March, 2014.

REPLICATED (four plots per variety)		
Variety/line	Yield (lbs/acre)	Quality ranking
F181 x MCE4	1,457.9	7
F608 x MCE4	1,401.5	3
F132 x MCE4	1,339.1	1
F597 x MCE4	1,269.8	9
F582 x MCE4	1,199.5	4
F132 x MCE2	1,133.0	8
FCE2 x MM4.256.9	1,084.6	14
FCE2 x M256	1,041.9	16
FCE4 x M256	1,033.1	5
UC 157	990.7	17
MM2.256.F103 x MCE4	946.3	2
FCE4 x MM4.256.9	865.9	15
F132 x MM4.256.9	864.6	13
DePaoli	862.9	12
FCE3 x MM2.CE4.1	854.3	10
F189 x MCE4	846.3	6
FCE1 x M256	735.9	11
OBSERVATIONAL (single plot per variety)		
Variety/line	Yield (lbs/acre)	Quality ranking
UCR 2011 trial code 140	1,815.4	2
Vegalim F1 (Limseeds)	1,779.1	9
UCR 2011 trial code 137	1,704.4	6
UCR 2011 trial code 82	1,597.7	11
UCR 2011 trial code 106	1,465.4	5
UCR 2011 trial code 179	1,463.2	7
K809 F1 (Limseeds)	1,406.3	12
UCR 2011 trial code 168	1,387.1	3
UCR 2011 trial code 98	1,386.4	8
UCR 2011 trial code 66	1,205.7	10
UCR 2011 trial code 65	1,173.0	13
UCR 2011 trial code 136	1,145.3	4
FCE6 x MM2.CE4.1	1,016.5	14
FCE1 x MM4.256.9	1,013.7	1
UCR 2011 trial code 50	898.4	16
UCR 2011 trial code 121	870.7	15
UCR 2011 trial code 97	853.6	17

Evaluation of insecticides for control of European asparagus aphid

The loss of disulfoton (Di-Syston) and continued pressure from the Central Valley Regional Water Quality Control Board to reduce the use of chlorpyrifos (Lorsban) have given the hunt for new insecticides for asparagus great urgency. A replicated field trial was conducted in an asparagus field located on Roberts Island (37° 53' 24" N 121° 23' 14" W). Plots measured 30 ft long by a single row and each insecticide treatment was replicated four times in a randomized complete block design. Insecticides were applied on August 24th with a CO²-pressurized backpack sprayer and a hand-held boom operated at a pressure of 34 psi at the boom. A single nozzle was directed over the top of the fern and two nozzles were between the rows and directed horizontally; the rows of fern were sprayed on each side. Water volumes were equivalent to 50 gallons per acre. Each application included a non-ionic surfactant at a rate of 0.25% v/v. Aphids were counted at various intervals after the insecticide application: 3 days post-treatment (dpt), 9 dpt, and 15 dpt. At each sampling time point, three spots within each plot were beat three times and aphids were caught on a beating sheet. Aphids were counted when feasible, or when populations were extremely high, the count was estimated by counting a portion of the grid and extrapolating the number out to the entire beating sheet. Aphid populations prior to the application were high, averaging about 273 aphids per three beatings. Although counts varied from fern to fern, in general the aphids were spread fairly evenly throughout the four replicate blocks. After treatment, counts continued to be somewhat variable from fern to fern, but nonetheless some clear conclusions can still be drawn from the data.

Lorsban, Warrior, Closer and Sivanto were the most effective with almost complete control observed at only 3 days post-treatment. Fulfill was slower acting and less effective, and it appeared that aphid populations began to rebound by the 2-week mark. Note that Closer (Dow) and Sivanto (Bayer) are not registered for use on asparagus. However, if registered they would provide reduced-risk alternatives to chlorpyrifos. They are also in different chemical groups so they would be useful in an insecticide resistance management program.

Product (rate per acre)	active ingredient	Number of aphids at days post-treatment (dpt)		
		<i>3 dpt</i>	<i>9 dpt</i>	<i>15 dpt</i>
Nontreated control	none	398	282	683
Fulfill (2.75 oz)	pymetrozine	217	26	126
Closer (2 fl oz)	sulfoxaflor	2	0	0
Closer (1.5 fl oz)	sulfoxaflor	1	0	0
Lorsban Advanced (2 pt)	chlorpyrifos	1	0	0
Sivanto (14 oz)	flupyradifurone	0	0	0
Warrior II (1.92 oz)	lambda-cyhalothrin	0	0	0
Sivanto (10.5 fl oz)	flupyradifurone	0	0	0