

ASPARAGUS

Variety Evaluation Trials
in San Joaquin County



2008 RESEARCH PROGRESS REPORT



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UCCE SAN JOAQUIN COUNTY ASPARAGUS RESEARCH PROGRESS REPORT

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2002 UCCE ASPARAGUS CULTIVAR EVALUATION TRIAL

This trial was planted in 2002 with one-year-old asparagus crowns at Zuckerman-Heritage Farms on McDonald Island, west of Stockton, California. The crowns were provided by California Vegetable Specialties from their fumigated nursery site near Delhi, California, and some were obtained from Zuckerman-Heritage Farms' crown nursery on McDonald Island. The trial contains eleven lines that are replicated in four blocks and another twenty-nine observational lines that are planted in only one or two plots each. The lines were obtained from the breeding programs of UC Riverside, Rutgers University, and California Asparagus Seed. This field is irrigated with a buried drip-irrigation system. In-row plant spacing is one foot, with five feet between bed centers, for a plant population equivalent to 8,700 plants per acre.

This past winter and spring saw very dry and cool weather conditions with no measureable rain recorded after the month of February. This was the final year of harvest for the trial, as well the last year for the grower's field. The trial area was harvested three days a week (Monday, Wednesday, Friday), but only one harvest each week was weighed, graded and recorded for this report. Therefore, only ten harvests over a fifty-day period are represented here and therefore the yield figures are quite low. This trial did receive supplemental irrigation from a buried drip irrigation system. Crop quality was fair to good but yields were down considerably from 2007, even taking into account the lower number of harvests. Best yield among the eleven replicated lines was attained by Grande at 1,230 lbs/acre, followed by UC 157_{F1} (919 lbs/acre), NJ953 (909 lbs/acre), Apollo (900 lbs/acre) and Purple Passion (889 lbs/acre). Lines with the largest spear size were Purple Passion, Atlas, Grande, and Apollo. Lines with the best spear quality were Purple Passion, De Paoli, UC 157_{F1}, and F141 x M256. Complete data from the replicated trial at Zuckerman-Heritage Farms is shown in **Table 1**.

In the twenty-three line observational block, yields again were reduced significantly over the previous year due to a poor plant stand and low vigor. The block was harvested ten times over a fifty-day period as above. The top yielding varieties were NJ937 at 2,214 lbs/acre, followed by NJ963 (1,771 lbs/acre), and FCE2 x HMJ (1,693 lbs/acre) (Table 2). Lines with the largest spear size were FCE2 x HMJ, FCE1 x A1, and F133 x M256. Lines with the best spear quality were FCE1 x M256, NJ976, FCE3 x M256, and F137 x MCE4. Averages for all lines in this trial are presented in **Table 2**.

CROWN SOURCE COMPARISON

Our recommendations have been to establish asparagus plantings with crowns grown on fumigated, mineral soil that has not previously been used to grow asparagus. This is in part to avoid infection of the crowns by the pathogens causing decline: *Fusarium* wilt (caused by *Fusarium oxysporum* f. sp. *asparagi*) and *Fusarium* crown and root rot (caused by *Fusarium proliferatum*). Land with a history of asparagus production is more likely to have these fungi present in the soil. Although such fields can be fumigated, high organic matter content reduces the efficacy of fumigation. However, many growers do produce their own crowns in grower nurseries on peat soils in the Sacramento-San Joaquin Delta. To evaluate the effect on long-term yield of the two approaches, a trial was established to compare four UC lines established with crowns from two different nursery sites. This trial is adjacent to the trials above, established in 2002 on McDonald Island. One crown source was a grower nursery in the Delta on land with a history of asparagus production, while the second source was a nursery in Delhi, California, where the crowns were grown in fumigated mineral soil on land with no history of asparagus production. The initial growth from the crowns grown in Delhi was more vigorous than that from the crowns grown in the Delta. In the first year of harvest in 2003, yields of the UC 157_{F1} Delhi crowns were 27% higher than the UC 157_{F1} Delta crowns. However, from 2004 to 2006 the gap between the crown sources narrowed and then in 2007 and 2008 the Delta crowns yielded higher than the Delhi crowns. Looking at the cumulative yield of UC 157_{F1} and De Paoli from 2003 to 2008, the crowns grown in fumigated soil yielded 13% more than the grower-produced crowns. It seems that, at least in this case, the benefit of growing crowns in fumigated, non-asparagus ground was considerable when the planting was young but diminished over time. This may have been in part due to presence of the decline pathogens in the production field, though we don't know what the pathogen level was at planting. If one is planting into soil where the pathogens are present, then the effect of clean crowns will obviously be minimal.

2007 UCCE ASPARAGUS CULTIVAR EVALUATION TRIAL

This trial was established with one-year-old crowns in March of 2007 at Klein Family Farms, on Rindge Tract near Stockton, California. Lines included were from the breeding programs of UC Riverside, Rutgers University, California Asparagus Seed, Aspara Pacific Ltd. and Brock Seed Company. The trial contains forty-four lines in total; sixteen in the replicated blocks of green asparagus varieties, and twenty-eight in the observational block of green varieties. There are an additional seven replicated purple lines in a specialty asparagus variety evaluation trial.

The crowns were grown at a fumigated nursery site with loamy sand soil near Manteca. 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.

In 2008, the green variety trial was harvested eight times over a 26-day period. In the replicated trial, the highest yielding varieties were NJ953 at 1,354 lbs/acre, followed by NJ1031 (1,280 lbs/acre), and UC 157_{F1} (1,077 lbs/acre) (see Table 4 for all varieties). Lines with the largest spear size were Grande, NJ1031, Atlas, and UC 157_{F1}. In general, spear quality in the trial was quite good; leading the way were the varieties F132 x MCE4, FCE4 x M256, FCE3 x M256, FCE1 x M256 and De Paoli. Data on all varieties is presented in **Table 4**.

In the observational block of the trial, where each variety is evaluated only in a single row plot, the highest yielding lines were F582 x MCE4 (2,183 lbs/acre), F172 x MCE4 (2,069 lbs/acre), F597 x MCE4 (1,885 lbs/acre), and Early California (1,871 lbs/acre). Varieties with the largest spear size were FCE7 x M120, F583 x MCE4 and Early California. Best spear quality was observed with F189 x MCE4, F582 x MCE4, F597 x MCE4, F597 x MCE2, F583 x MCE4, F172xMCE4 and F181 x MCE4. **Table 5** contains the data for all varieties in the green variety observational block.

Seven purple asparagus varieties are being evaluated in four replicate blocks, which were harvested eight times over a 27-day period in 2008. The Rutgers varieties were the top-yielding, with NJ1062 leading the way at 1,053 lbs/acre, followed by NJ1092 (998 lbs/acre) and NJ1064 (874 lbs/acre). Lines with the largest spear size were NJ1016, NJ1069, and Purple Passion. In general, spear quality in these blocks was fair to good, led by Pacific Purple, Purple Passion and NJ1064. Data on all the purple lines is in **Table 6**.

After the limited cutting period at these new trials on Rindge Tract, a visual rating of all varieties was done to assess crop stand and vigor. These ratings, done in April 2008 are presented in **Tables 7 and 8**. These trials will be continued in 2009, with approximately 20 harvests being planned. In 2010 and thereafter all of these blocks will be harvested for a full cutting season.

COMPARISON OF UC 157_{F1} AND DE PAOLI

Over the years, UC 157_{F1} and De Paoli have been evaluated side by side at four of our variety trial locations. In trials conducted by UC Riverside on their campus, De Paoli has done very well. Here in the Sacramento-San Joaquin Delta the results have been mixed. **Tables 9a** through **9d** provide the reader a comparison of yield and spear size of these two varieties in the various trials in the Delta. Keep in mind that each trial field has its own unique conditions of soil type, crop histories, irrigation methods and other factors which influence the performance of a variety. Particular field conditions may favor one line over the other.

Table 1.

2008 ASPARAGUS CULTIVAR EVALUATION TRIAL
Zuckerman – Heritage Farms; McDonald Island

(10 harvests over 50 days)

Replicated Varieties

Cultivar	Yield ¹		No. Spears ¹	Average ¹	Spear
	Lbs/Acre		per Acre	Spear Wt. (g.)	Quality ²
Grande	1,230	A	26,484	21.1	3.11
UC 157F ₁	919	AB	23,522	17.7	3.61
NJ 953	909	AB	26,049	15.8	2.94
Apollo	900	AB	19,863	20.6	2.95
Purple Passion	889	AB	13,678	29.5	3.86
F141 x M256	800	B	19,166	19.0	3.46
Jersey Supreme	757	B	19,428	17.7	2.73
Atlas	720	B	15,420	21.2	3.04
F586 x M256	705	B	16,204	19.8	3.37
De Paoli	601	B	15,507	17.6	3.72
NJ 977	199	C	5,837	15.5	3.32
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LSD @ 0.05:	346		7,051		
C.V. =	30.6%		26.7%		

¹ Average of four replications

² Average of 10 harvests/replication

SPEAR QUALITY	
Rating Scale:	very good = 6.00
	good = 5.00
	good/fair = 4.50
	fair/good = 4.00
	fair = 3.00
	fair/poor = 2.50
	poor/fair = 2.00
	poor = 1.50

Table 2. 2008 ASPARAGUS CULTIVAR EVALUATION TRIAL
Zuckerman – Heritage Farms; McDonald Island

(10 harvests --50 days)

Observation Varieties

Cultivar	Yield ¹ Lbs/Acre	No. Spears ¹ per Acre	Average ¹ Spear Wt. (g.)	Spear Quality ³
NJ 937	2,214	52,969	19.0	3.15
NJ 963	1,771	46,348	17.3	2.70
FCE2 x HMJ ²	1,693	30,841	24.9	2.88
FCE3 x M256 ²	1,473	36,068	18.5	3.80
F133 x M256	1,448	32,060	20.5	3.45
FCE1 x A1 ²	1,440	30,318	21.6	3.35
NJ 1021	1,370	31,712	19.6	3.15
FCE1 x M256	1,367	32,060	19.4	4.35
FCE1 x M120 ²	1,349	30,144	20.3	3.35
F177 x M256	1,189	27,181	19.9	3.55
F172 x M256 ²	1,102	28,402	17.6	2.83
NJ 956 ²	1,014	28,924	15.9	3.50
NJ 982	939	31,712	13.4	2.55
F137 x MCE4 ²	913	22,477	18.4	3.66
F133 x HMJ	778	20,560	17.2	2.70
FCE7 x M256	713	20,909	15.5	3.30
F177 x MCE2	693	16,727	18.8	3.10
NJ 1018	580	17,424	15.1	2.50
NJ 978	555	16,379	15.4	3.45
F82-2 x M256	452	14,636	14.0	3.61
NJ 976	391	13,939	12.7	3.85
F177 x MCE1	375	12,197	14.0	3.11
NJ 990	186	5,924	14.2	3.14

¹ Average of only one replication

² Average of two replications

³ Average of 10 harvests/replication

Rating Scale:	very good =	6.00
	good =	5.00
	good/fair =	4.50
	fair/good =	4.00
	fair =	3.00
	fair/poor =	2.50
	poor/fair =	2.00
	poor =	1.50

Table 3.

2008 ASPARAGUS CULTIVAR EVALUATION TRIAL
 Zuckerman – Heritage Farms; McDonald Island
 (10 harvests – 50 days)

SELECTED CULTIVAR COMPARISON OF CROWNS
FROM TWO DIFFERENT NURSERIES

Cultivar	Yield ¹ Lbs/Acre	No. Spears ¹ per Acre	Average ¹ Spear Wt. (grams)	Spear ⁴ Quality
De Paoli Delhi Nursery	1,016	24,742	18.6	3.65
De Paoli McDonald Island	1,244	33,454	16.9	3.55
F141 x M256 Delhi Nursery	1,053	26,136	18.3	2.85
F141 x M256 McDonald Island	1,312	29,272	20.3	3.50
F586 x M256 Delhi Nursery	897	19,166	21.2	3.75
F586 x M256 McDonald Island	1,184	23,348	23.0	3.55
UC 157F ₁ ² Delhi Nursery	904	22,129	18.5	3.37
UC 157F ₁ ³ McDonald Island	1,091	25,962	19.1	3.34

¹ Average of only one replication

² Average of two replications

³ Average of four replications

⁴ Rating Scale:
 (Average of 10 harvests/replication)

very good 6.00
 good = 5.00
 good/fair = 4.50
 fair/good = 4.00
 fair = 3.00
 fair/poor = 2.50
 poor/fair = 2.00
 poor = 1.50

Table 4. 2008 ASPARAGUS CULTIVAR EVALUATION TRIAL
Klein Ranch – Rindge Tract

(8 harvests - 26 days)
Replicated Lines

Cultivar	Yield ¹ Lbs/Acre		No. Spears ¹ per Acre	Average ¹ Spear Wt. (g.)	Spear Quality ²
NJ 953	1,354	A	29,118	21.1	3.00
NJ 1031	1,280	AB	22,129	26.3	3.09
UC157 _{F1}	1,077	ABC	19,683	24.8	3.67
Atlas	1,022	BCD	17,820	26.0	3.16
Grande	1,014	BCD	15,374	29.9	3.31
FCE4xM256	915	CDE	17,587	23.6	4.16
Pacific 2000	886	CDE	21,198	19.0	2.85
DePaoli	763	CDEF	17,351	20.0	3.91
FCE2xM256	762	DEF	16,423	21.1	3.67
F132xMCE4	740	DEF	19,684	17.1	4.34
FCE6xM256	732	DEF	16,306	20.4	3.18
F582xM256	660	EF	13,744	21.8	3.74
FCE1xM256	652	EF	12,463	23.8	4.14
Apollo	641	EF	12,229	23.8	2.97
NJ1019	627	EF	14,792	19.2	3.40
FCE3xM256	531	F	12,812	18.8	4.15
LSD @ 5%:	314		5,672		
C.V. =	25.9%		23.5%		

¹ Average of four replications

² Average of eight harvests per replication

Rating Scale	very good	6.00
	good	5.00
	good/fair	4.50
	fair/good	4.00
	fair	3.00
	fair/poor	2.50
	poor/fair	2.00
	poor	1.50

Table 5. 2008 ASPARAGUS CULTIVAR EVALUATION TRIAL
Klein Ranch – Rindge Tract

(8 harvests --26 days)

Observation Lines

Cultivar	Yield ¹ Lbs/Acre	No. Spears ¹ per Acre	Average ¹ Spear Wt. (g.)	Spear Quality ²
F582xMCE4	2,183	38,668	25.6	4.56
F172xMCE4	2,069	35,407	26.5	4.06
F597xMCE4	1,885	33,543	25.5	4.38
Early California	1,871	28,419	29.9	3.63
FCE7xM120	1,705	24,692	31.3	3.94
F597xMCE2	1,693	27,021	28.4	4.38
F189xMCE4	1,603	30,282	24.0	5.06
F583xMCE4	1,599	23,294	31.2	4.31
NJ956	1,432	27,487	23.6	3.31
F181xMCE4	1,276	23,760	24.4	4.06
F132xMCE2	1,264	27,487	20.9	3.63
NJ951	1,237	23,760	23.6	3.19
F608xMCE4	1,227	27,487	20.3	3.63
F609xMCE2	1,218	25,158	22.0	3.88
FCE1xA1	1,208	24,692	22.2	3.56
FCE5xM256	1,180	24,226	22.1	3.44
FCE4xA1	1,164	23,294	22.7	2.88
F608xMCE2	1,089	19,101	25.9	3.94
F586xMCE1	1,060	20,499	23.5	3.19
FCE5xA1	1,010	21,896	20.9	3.13
FCE7xM256	989	16,772	26.8	3.44
F177xMCE4	983	20,499	21.8	3.38
F582xA1	959	18,635	23.4	2.88
FCE6xA1	910	19,101	21.6	3.13
3xPHY20	872	17,703	23.4	2.44
F600xA1	814	19,101	19.3	2.63
FCE3xA1	784	17,703	20.1	3.31
74x22	626	11,181	25.4	2.88
73x22	487	11,181	19.8	2.86

¹ Average of only one replication

² Average of 8 harvests/replication

Spear Quality	
Rating Scale:	very good = 6.00
	good = 5.00
	good/fair = 4.50
	fair/good = 4.00
	fair = 3.00
	fair/poor = 2.50
	poor/fair = 2.00
	poor = 1.50

Table 6. 2008 ASPARAGUS CULTIVAR EVALUATION TRIAL
 Klein Ranch – Rindge Tract
 Purple Cultivars

(8 harvests --27 days)
Replicated Lines

Cultivar	Yield ¹ Lbs/Acre	No. Spears ¹ per Acre	Average Spear ¹ Wt. (g.)	Spear Quality ²
NJ1062	1,053	16,422	29.1	2.66
NJ1092	998	17,121	26.5	3.58
NJ1064	874	14,209	27.9	3.83
NJ1069	815	10,716	34.5	2.95
NJ1016	770	9,434	37.1	3.37
Purple Passion	756	10,482	32.7	4.02
Pacific Purple	704	11,181	28.6	4.04
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LSD @ 0.05	n.s.	4,061		
C.V. =	23.1%	21.4%		

¹ Average of four replications

² Average of eight harvests/replication

SPEAR QUALITY	
Rating Scale: very good =	6.00
good =	5.00
good/fair =	4.50
fair/good =	4.00
fair =	3.00
fair/poor =	2.50
poor/fair =	2.00
poor =	1.50

Table 7.

2008 ASPARAGUS CULTIVAR EVALUATION TRIAL
Klein Family Farms – Rindge Tract
Crop Stand and Crop Vigor Ratings

Replicated Green Varieties	Crop Stand ¹	Crop Vigor ¹	Observation Green Varieties	Crop Stand ₂	Crop Vigor ₂
Grande	Good	Good	NJ 951	Very Good	Very Good
Apollo	Good	Good	NJ 956	Very Good	Very Good
UC 157F ₁	Good	Fair to Good	73 x 22	Good	Good
Atlas	Good +	Good	74 x 22	Very Good	Very Good
Pacific 2000	Good to Very Good	Fair to Good+	3 Phy 20	Very Good	Very Good
FCE1 x M256	Fair to Good+		F172 x MCE4	Very Good	Very Good
FCE2 x M256	Good	Fair to Good+	FCE3 x A1	Very Good	Very Good
FCE3 x M256	Good	Fair to Good+	F181 x MCE4	Very Good	Good
DePaoli	Fair to Good+	Fair to Good	F5997 x MCE4	Very Good	Very Good
NJ 1031	Good to Very Good	Good+	FCE7 x M120	Very Good	Very Good
NJ 953	Good to Very Good	Good	F608 x MCE4	Very Good	Very Good
NJ 1019	Fair to Good	Fair to Good	F582 x MCE4	Very Good	Very Good
F582 x M256	Good	Fair to Good	FCE7 x M256	Very Good	Good
FCE4 x M256	Good	Good to Very Good	F597 x MCE2	Very Good	Very Good
F132 x MCE4	Fair to Good	Fair to Good	F600 x A1	Good	Good
FCE6 x M256	Good	Fair to Good	F189 x MCE4	Very Good	Very Good
			FCE1 x A1	Good	Good
			F582 x A1	Very Good	Very Good
			FCE5 x A1	Very Good	Good
			F609 x MCE2	Very Good	Good
			FCE4 x A1	Very Good	Good
			F177 x MCE4	Very Good	Very Good
			F586 x MCE1	Very Good	Good
			FCE6 x A1	Good	Good
			F583 x MCE4	Good	Good
			FCE5 x M256	Very Good	Good
			F608 x MCE2	Very Good	Good
			F132 x MCE2	Very Good	Good
			Early California	Very Good	Very Good

¹ Average of four replications

² Average of only one replication

Table 8. 2008 ASPARAGUS CULTIVAR EVALUATION TRIAL
 Klein Family Farms – Rindge Tract
 Crop Stand and Crop Vigor Ratings

Replicated Purple Varieties	Crop Stand ¹	Crop Vigor ¹
Pacific Purple	Very Good	Good+
Purple Passion	Good	Fair to Good+
NJ 1069	Good	Good+
NJ 1016	Good	Good
NJ 1062	Very Good	Very Good
NJ 1092	Good to Very Good	Very Good
NJ 1064	Very Good	Good+

¹ Average of four replications

Tables 9a-9d. COMPARISON OF UC157 AND DE PAOLI IN UCCE VARIETY EVALUATION TRIALS 1997-2008					
A) ABF FARMS (trial established 1995, furrow irrigated)					
	<u>lbs per acre</u>			<u>Average spear size (grams)</u>	
Year	UC157 _{F1} ¹	DePaoli		UC157 _{F1}	DePaoli
1997	2,294	2,512		22.6	19.8
1998	4,479	3,136		26.9	23.5
1999	4,326	2,824		25.8	25.1
2000	5,001	2,990		27.3	24.6
2001	5,239	4,160		31.4	26.9
2002 ²	1,664	1,457		26.6	31.6
average	3,834	2,847		26.8	25.3
¹ Note that UC157 _{F1} was replicated four times while De Paoli was replicated only twice					
² Yields adversely affected by cold weather, disease and centipede, also only 25 harvests over 61 days. Heavy textured sedimentary soil at this location.					
B) VICTORIA ISLAND FARMS (trial established 1998, drip-irrigated)					
	<u>lbs per acre</u>			<u>Average spear size (grams)</u>	
Year	UC157 _{F1}	DePaoli		UC157 _{F1}	DePaoli (4 reps)
2000	6,199	5,760		28.2	27.9
2001	5,880	7,398		35.2	37.3
2002	7,810	10,239		29.5	30.9
2003	5,805	9,373		21.3	23.6
2004	5,698	8,262		23.7	24.5
2005	2,647	5,101		21.5	21.1
average	5,673	7,689		26.6	27.6
C) ZUCKERMAN-HERITAGE FARMS (trial established 2002, drip-irrigated)					
	<u>lbs per acre</u>			<u>Average spear size (grams)</u>	
Year	UC157 _{F1}	DePaoli (4 reps)		UC157 _{F1}	DePaoli (4 reps)
2004 ¹	3,047	2,879		32.3	30.2
2005	5,538	5,181		29.4	28.0
2006 ²	3,844	4,171		25.4	26.2
2007	5,638	4,422		22.0	22.2
2008 ³	2,757	1,803		17.7	17.6
average	4,165	3,691		25.4	24.8
¹ only 50 day harvest due to garden centipede damage					
² only 59 day harvest, cool wet weather					
³ harvest only recorded 10 times, so multiplied harvest times three to simulate a normal harvest					
D) KLEIN FAMILY FARMS (trial established 2007, furrow-irrigated)					
	<u>lbs per acre</u>			<u>Average spear size (grams)</u>	
Year	UC157 _{F1}	DePaoli (4 reps)		UC157 _{F1}	DePaoli (4 reps)
2008 ¹	1,077	763		24.8	20.0
¹ first cutting season of only 8 harvests					

Consult your County Agricultural Commissioner for correct methods of disposing of leftover spray material and empty containers. Never burn pesticide containers.

PHYTOTOXICITY

Certain chemicals may cause plant injury if used at the wrong stage of plant development or when temperatures are too high or when overcast conditions occur. Injury may also result from excessive amounts or the wrong formulation or mixing incompatible materials. Inert ingredients such as wetters, spreaders, emulsifiers, diluents, and solvents, can cause plant injury. Since formulations are often changed by manufacturers, it is possible that plant injury may occur, even though no injury was noted in previous seasons.

No endorsement of named products is intended, nor is criticism implied of similar products which are not mentioned.

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Cooperative Extension Work in Agriculture and Home Economics, U.S. Department of
Agriculture, University of California and San Joaquin County Cooperating