

DRIED PLUM CULTIVAR DEVELOPMENT AND EVALUATION

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INTRODUCTION

California is the world leader in dried plum production, but is almost entirely dependent on the use of a single cultivar, the Improved French prune. The utilization of this older cultivar and several other mutations from the French type represents 98% of the total dried plum acreage in California. This monoclonal situation with its genetic similarities lends itself to vulnerability of widespread disease and pest outbreaks and state wide yield decline due to the effects of negative weather. In addition to the risks of monoculture, the entire industry needs to harvest and dehydrate the crop within a few weeks since the single cultivar matures around the same time. The development of new acceptable or superior dried plum cultivars will increase the efficiency of California dried plum production and give some protection against the risks involved with a monoculture. The industry will also benefit from the development of new dried plum varieties that have cost saving characteristics in tree structure, processing qualities, and tolerance to pest and disease. There is also the possibility of broadening the consumer base by the introduction of new dried plums that differ in flavor or color to French.

The Dried Plum (*P. domestica*) Development and Evaluation program has enlarged the germplasm and bred new generations of progeny through traditional horticultural breeding methods since its conception in 1985. Through twenty years of evaluation and selection, the breeding program has increased the variability of desired characteristics in the germplasm. To insure that the germplasm and new cultivars are well adapted to California's dry, hot climate, the program evaluates elite selections at two locations; the UC Wolfskill Experimental Orchards, near Winters, in the north; and the Kearney Ag Center, near Parlier, in the southern San Joaquin Valley. The breeding program is now entering what is expected to be a very productive period for producing new cultivars that are specifically adapted for California growing conditions and markets.

The successful development of the Sutter Prune cultivar came from the earlier stages of the breeding program. Sutter is a productive, high quality drying plum that matures seven to ten days ahead of Improved French. The fruit of Sutter is large, medium dark purple and covered with a medium waxy bloom. The fruit resembles French prune in shape and develops about 2 degrees more soluble solids than French when compared at the same location. The tree form and vigor of Sutter is similar to French and is a regular bearer. Sutter is self-compatible and is able set a heavy crop without additional pollination. Sutter has been successfully propagated on Marianna, Myrobalan 29C and Myrobalan seedling rootstock. Sutter has been successfully test processed using both the Ashlock and the Sunsweet pitters. Fruit of the new cultivar dries into a very high quality dried plum. Although the external appearance of the Sutter is similar to French, the dried flavor is lighter, sweeter, more fruity and complex.. The Sutter cultivar was released from this program in the year 2000 and is now becoming established in the California industry.

Muir Beauty (UCD # D6N-72) is an excellent dried plum that was released as a cultivar in 2004. The fruit of Muir Beauty matures in early August about 10 to 15 days before the industry standard, Improved French, when grown at the same location. The fruit is large, oval in shape, without a neck. The skin is a purple-rose color with a grayish, moderately thick, waxy bloom. The fresh fruit flesh color ranges from a dark gold to a golden-orange. The dried fruit is large, shiny black, with larger but fewer wrinkles than Improved French. The dried flesh retains the golden color of the fresh fruit. The pit of Muir Beauty is medium size and varies from semi-free to freestone. Limited pitting tests have resulted in easy pit removal. In taste tests, Muir Beauty is described to have a thick, meaty fruit texture with a pleasant well-balanced fruity flavor. The tree is a vigorous grower with an upright form and is a very productive, regular bearer. Muir Beauty has been grown successfully on plum rootstocks, Marianna and Myrobalan. The tree is more precocious than Improved French, flowering and fruiting at an early age. Muir Beauty is self-compatible and is able set a heavy crop without additional pollination.

We have recently discovered and are evaluating dried plum selections that include a wide variety of flavors and dried fruit characteristics that are superior to the commonly produced French cultivar. We believe these new dried plums have the potential of revitalizing the California dried plum industry.

PROGRAM OBJECTIVES

- 1.) To develop new dried plum varieties, through traditional horticultural breeding methods, with the following characteristics:
 - A) Tree characteristics that reduce labor cost involved in producing dried plums.
 - B) Increased fruit quality and improved fruit characteristics that increase efficiency and quality of drying and processing.
 - C) New specialty traits; with the dried product being equal or improved in quality to “Improved French”, but differing in taste or color.
 - D) Tolerance/resistance to disease.
 - E) Earlier/later fruit maturity dates than “Improved French” dried plum.
- 2.) Test and evaluate advanced selections resulting from the current breeding program at UC and grower locations in the Sacramento and San Joaquin Valleys.

PROCEDURES

Breeding methods, pollination and seedling cultivation, and selection evaluation have not been modified this year. They are described in detail in the Dried Plum Cultivar Development and Evaluation annual report in the 2004 Prune Research Reports published by the California Dried Plum Board.

Levels of Testing

Field testing and evaluation of dried plum selections developed within this program are being carried out at four levels. This testing procedure was not modified in 2005 but is reported as a reference for the result section of the report.

Level 1 testing involves evaluations made in the seedling blocks located at UC Davis. The initial fruit evaluation is made on the original self-rooted seedlings in the high density seedling blocks. Fresh and dried fruit characteristics are evaluated at this level of testing. If a positive evaluation results, the seedling becomes a “selection” and is then considered for re-propagation in dried plum selection blocks located at Kearney and at the Wolfskill Experimental Orchard at Winters, CA.

Level 2 testing occurs in the selections blocks at Kearney and Wolfskill. Depending on the perceived potential of the individual selection, from two to four trees of any one selection are established on commercial rootstocks. This level of testing is concerned with fruit characteristics and whole tree characteristics. Variations in fruit size, tree vigor, maturity date and other characteristics may, and often do, occur when the selection is moved onto a rootstock from the original seedling. Most individual selections are re-fruited in the selection blocks prior to advanced testing with growers.

Level 3 testing involves the establishment of advanced selections in grower orchards in various dried plum growing locations. Testing at this level is still somewhat preliminary since these plantings are the first level at which selections are established on varying soil types and in varying climatic regions. Again, depending on the perceived value of the individual item, from two to fifty trees of any one selection are established at any one location. Level 3 grower tests are established in counties throughout the Sacramento and San Joaquin Valleys where dried plums are a commercial crop.

Level 4 testing involves the planting of small test acreage, usually of a single targeted selection. The size of these Level 4 tests depends on the apparent potential of the individual selection and the level of risk that the cooperating grower wishes to assume. Planting size ranges from twenty-five to several hundred trees. Commercial value of an item can be established in test markets with the expanded production of Level 4 testing.

Dried Plum/Prune Testing Group

This year we initiated a new testing group which incorporates participation of growers and processors to evaluate and test dried plum selections for their potential as new cultivars before patenting and public release.

For the past twenty years the University of California has been conducting the dried plum/prune breeding and evaluation program that has been jointly supported by the Department of Pomology and the California Dried Plum Board. This program was originally initiated at the request of the California Dried Plum Board with the primary goal of developing cultivars that would extend the harvest season with quality characteristics that equal or exceed those of the California standard, Improved French. This project has made substantial progress toward that goal with the release of

Sutter and Muir Beauty, which have the potential to be harvested up to two weeks earlier than Improved French while also improving dried product quality.

The process used in the final evaluation and release of these two cultivars was based on a traditional model that public breeding programs have used for the past 50 years. After identifying selections that appeared promising and evaluating those selections at the University and in limited grower trials, the selections deemed suitable for public use were patented and released, assuming that there would be enough interest from growers, packers and nurseries to promote the cultivars and allow them to receive the true test of time in the commercial marketplace. While this model is still valid in a general sense and will ultimately sort out the value of Sutter and Muir Beauty to the California industry in the long run, it is now apparent that it may not be the most efficient or effective model for the evaluation and release of dried plum cultivars in the future.

International patent law basically forces the University (or any plant breeder) to start the process of making the cultivars it releases available to the rest of the world within 5 years after release in the United States. Under the current system it may take up to ten years for the California industry to decide whether a newly released cultivar warrants widespread planting and so by the time that decision is made in California, the cultivars would also be made available in other countries. Thus it is apparent that continuing to use the traditional model to release cultivars will not allow California growers to take full advantage of the new cultivars that are developed in the dried plum breeding program. In addition, one could argue that there are considerable opportunity costs for the California industry to continue to plant old cultivars if improved cultivars are available but not accepted into the marketplace in a timely manner.

Therefore we are developing a new strategy for the final evaluation and future release of dried plum/prune cultivars derived from the breeding program. We have organized a Dried Plum/Prune Testing Group that will help develop a better strategy for the release of new cultivars and participate in carrying out that strategy.

The group has met two times in 2005 to develop a workable strategy for the group. In the following years participation in the group will probably involve two general meetings a year, one in the summer just before prune harvest to look at fresh fruit and tree characteristics and a second time in the fall, for the evaluation and discussion of dried product characteristics. The objective is to benefit from greater grower and processor input on individual selections as well as increase grower test plot participation so that by the time a selection is identified for release, the industry is well informed about the cultivar and comfortable about committing to plant, process and sell the cultivar commercially.

The advantage of this strategy will be that at the time a cultivar is released, the California industry will be in a position to take advantage of a 10+ year window of opportunity before other countries could effectively grow the cultivar (five of those years would come from a delay in registering a patent in foreign countries and an additional 5+ years would come from the time it would take for any foreign country to import, propagate and field test the cultivar under their conditions).

The advantage for participation in this testing group will be that growers and processors will gain first-hand information on all new selections in the program on which to base future planting/marketing strategies, participate in test plantings as well as have early access to new cultivars slated for release, and help direct the breeding and evaluation program to address germplasm-based issues in the future.

RESULTS

The weather this year greatly affected what was observed in the orchards. In general, California had a substantial amount of accumulated chilling hours over the winter. This chilling satisfied the chilling requirements for all of our selections and seedlings. February brought unusual warm weather causing the bloom to occur earlier than it has for many years. At bloom time, the weather was optimal for the early blooming selections but at the later, French bloom time, the temperatures were too high for successful fruit set for many of the selections that coincided with French. The spring weather subsequent to bloom was cold and wetter than usual which prolonged the early fruit growth curve and pushed the maturity date of a high percentage of our selections later than expected. Yet we saw that many of the early blooming cultivars were not affected in this way and their maturity dates were similar to other early blooming years. This difference may be due to the effect of the growing degree hours accumulated in the 30 days following bloom (see related studies for more information). The high temperatures in July hit a record for 'number of consecutive days over one hundred' in most of California growing regions. With this heat, the fruit grew rapidly causing fruit cracking in the French cultivar and a few of our selections. It also caused some of the selections to show a high percentage of pit burning and internal heat damage. Thus, this unusual weather allowed for evaluation of many traits that are not always seen annually. The wet cool spring brought on heavy russet scab in the Kearney blocks. The heat in July caused an abnormally high amount of stem end and tip cracking in the Davis seedling blocks and internal heat damage was easily detected in some selections at the Wolfskill blocks. All these factors aided in the selection process this year allowing selection against the negative characteristics such as cracking and russet scab in all the selection blocks.

Level 4 Testing

Level 4 testing evaluates the commercial value of advanced selections and looks at the potential markets for the item. The program is evaluating three items at this level. The first is the newly released cultivar, Muir Beauty (UCD # D6N-72), that was released in January 2004. The second is the 2000 released dried plum cultivar, Sutter. The third is Tulare Giant, a 2000 fresh market release.

Muir Beauty (D6N-72)

Muir Beauty dried plum set a good crop on the mature trees at Kearney and the younger trees at Wolfskill. The maturity date ranged 18-30 days before French depending on location. In the past years the difference has ranged within the described 10-15 days before French. This difference may be due to the earlier bloom of Muir Beauty which was 7-8 days before French. The weather following the bloom would have had 7-10 days of hot weather before the cool weather returned. This meant that the accumulated growing degree hours within the first 30 days after bloom were quite different for Muir Beauty than French. The harvest date is shown in Table 1 for Muir Beauty at both of the research stations and one grower trial.

Table 1. Muir Beauty 2005 harvest dates and fresh fruit data.

Location	Selection	Testing Date	Soluble Solids (Brix)	Fresh Fruit Weight (grams)	Crop Size
Kearney Ag. Center	Muir Beauty	8/3	23.0	43.0	Medium
	French	8/3	16.0	21.3	Heavy
Madera County	Muir Beauty	8/3	21.0	46.8	Light
	French	8/3	17.0	24.5	Medium
Winters Research Orchards	Muir Beauty	8/1	23.0	41.2	Medium
	French	8/1	16.1	17.8	Heavy

Sutter

Sutter was released from this program in 2000 and many growers have taken the opportunity to plant acreage of Sutter. The California acreage is small but growing and in the next few years the first crops will be harvested and sent to the processors.

The fruit set for Sutter at all of the UC locations was quite heavy and needed to be thinned. French also set a heavy crop along side Sutter at Kearney and Wolfskill. In Davis, Sutter set a large crop but French set a very light crop. At Kearney and Wolfskill, these two cultivars were not affected by the hot weather at bloom. The days at full bloom were hot but there must have been enough hours of suitable temperatures to enable fruit set. Table 2 shows the harvest data of Sutter at all the research stations. Sutter maturity was 13-17 days ahead of French on mature trees at both Kearney and Wolfskill. This is a wider gap than predicted but is within the high end of the range that we have seen in previous years.

Table 2. Sutter 2005 harvest dates and fresh fruit data compared to French.

Location	Selection	Testing Date	Soluble Solids (Brix)	Fresh Fruit Weight (grams)	Crop Size
Kearney Ag. Center	Sutter	8/10	24.9	27.6	Medium
	French	8/10	19.0	20.1	Heavy
Winters Research Orchards	Sutter	8/12	25.6	28.4	Medium
	French	8/12	21.0	20.9	Heavy
Davis	Sutter	8/15	20.0	28.5	Heavy
	French	8/15	18.7	22.6	Heavy

In a related study, a collective analysis of fruit ripening was performed using data from French and Sutter collected from 1997 to 2005 at Kearney. A comparison of fruit firmness and soluble solids taken over the growing season confirmed that a distinctly different but parallel relationship exists between the ripening pattern of the two cultivars. Sutter averages soluble solids of 2-3 brix higher than French through out the growing season (Figure 1). This was reported previously in the Sutter prune description but it has not been illustrated so clearly before.

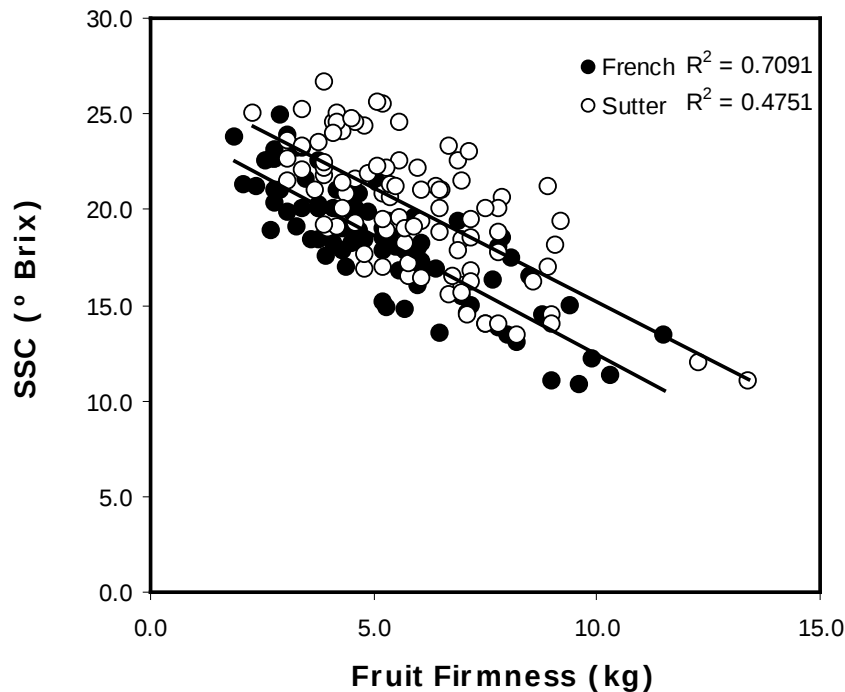


Figure 1. Comparison of French and Sutter showing the relationship between fruit firmness and soluble solids at Kearney over the years of 1997-2005.

Tulare Giant

The results of the 2003 pollen self-compatibility experiment showed that Tulare Giant is only partially self-fertile. Without a pollinizer the cultivar did set a minimal amount of fruit but the reduced set could not be considered an economically profitable crop. Thus Tulare Giant requires another *Prunus domestica* cultivar as a pollinizer to set an economic crop. Muir Beauty is the recommended pollinizer for Tulare Giant. Muir Beauty bloom time overlaps Tulare Giant's bloom time quite well and with a large quantity of flowers it would be a very good pollinizer. A pollen isolation cage was placed over a Tulare Giant tree at the Wolfskill orchard and bouquets of Muir Beauty were placed within the cage. The resulting fruit set was very heavy and hand thinning was required to reduce the final crop size to a commercial level. Studies have not been done to determine the best planting ratio of pollinizer to main variety but our best guess is every third tree in every third row.

Level 3 Testing

Level 3 testing is the evaluation of selections that are being grown and tested in grower's orchards. The selections that are now at Level 3 testing are D6N-103, 6-21-56, E13S-60 and D6S-87. Harvest data is shown in Table 3.

D6N-103 is a high sugar prune that looks very similar to French in shape and color. The dried fruit is a shiny dark brown appearance with a meaty flesh. It is a larger prune than French and may do very well in a specialty market. This year a pollen isolation cage experiment was put over a mature tree at Wolfskill. The results show that D6N-103 is most likely self-incompatible because it had a heavy bloom yet set few fruit. This experiment will be repeated in 2006.

6-21-56 is a beautiful, shiny dried fruit with remarkable flavor, scoring among the top choices for flavor in the last three years. In 2005, mature trees at both research locations were showing signs of pre-harvest drop before fruit maturity. This may have been intensified by the high temperature in July but it needs to be carefully evaluated in the coming years.

D6S-87 has wonderful dried fruit quality and is the earliest maturing fruit in Level 3 testing but this year the mature trees began showing signs of high intra-tree variations in fruit maturity. This potential problem will be monitored in the coming years as the crops increase on the test trees.

E13S-60 is the most recently grafted tree in our test orchards. It has shown very high quality fruit and good cropping on the seedling tree for the last 3 years.

Three previous items that have been tentatively identified for Level 3 testing are D9S-95, D9S-61, and D10N-16. D9S-95 is an early maturing, fruity flavored prune. D9S-61 matures a few days before Muir Beauty and has high quality processed appearance. D10N-16 matures between Sutter and French and has a rich flavor. These selections are now being evaluated at the research orchards and will be grafted into grower orchards after the trees are cropped and evaluated for one more year to ensure that they are worthy of the increased investment of a long term grower trial.

Table 3. Level 3 selection performance for 2005 at university selection blocks. The Location designation after Harvest date indicates W (Wolfskill), K (Kearney), and D (Davis).

Selection	Harvest Date	Days from French	Soluble Solids (Brix)	Fruit Size (ct/lb)	Crop size
D6S-87	8/1/05(W)	-30	28.0	39	Medium
E13S-60	8/8/05(D)	-14	23.1	52	Medium
D6N-103	8/17/05(K)	-4	23.9	30	Medium
French	8/21/05(K)	0	20.5	75	Heavy
6-21-56	8/25/05(K)	4	21.1	50	Medium

Note the 'Days from French' refer to the difference between French harvest date and the harvest date of the selection at the same location of the selection. Harvest date listed is specific for locations where samples were collected.

Level 2 testing

Level 2 testing evaluates a selection after it has been promoted from the Davis seedling blocks to the advanced selection blocks at Kearney and Wolfskill. Whole tree characteristics along with continued fruit characteristics are evaluated. Table 3 shows the harvest data of the top selections this year. Three selections, D18S-7, D2N-76, and D10S-8 have been promoted to Level 3 testing this year and will be grafted into grower orchards this winter in small numbers. D18S-7 is a rose colored plum that has had good dried flavor ratings for the last four years. D2N-76 is also a rose colored plum that has good dried fruit qualities and the tree has shown good annual cropping ability over the past four years. D10S-8, a purple plum, is the most recently propagated tree yet in the both selection blocks this year the young graft set a medium size crop with soluble solids averaging between 25-27 Brix. All three trees harvest earlier than French but their true range of harvest dates will be determined over the next few years of testing.

Table 4. 2005 Harvest data for advanced selections in Level 2 testing. The Location designation after Harvest date indicates W (Wolfskill), K (Kearney), and D (Davis).

Selection	Harvest Date	Days From French	Soluble Solids %	Fruit Size (ct/lb)	Crop Load
D9S- 95	7/21/05(W)	-41	22.0	48	Light
F9S- 62	7/21/05(W)	-41	23.3	52	Medium
D18S- 7*	7/20/05(K)	-32	25.4	37	Light
D2N- 76*	8/5/05(W)	-27	27.9	52	Medium+
D4N-101	8/5/05(W)	-27	23.9	50	Light
D10N- 16	8/12/05(W)	-17	23.7	45	Medium
D7N- 64	8/12/05(W)	-17	24.1	36	Heavy
D10S- 8*	8/19/05(W)	-13	25.1	41	Medium
D18S- 12	9/1/05(W)	0	28.0	35	Medium+
French	9/1/05(W)	0	23.5	56	Medium
D18S-50	9/8/05(W)	7	26.4	32	Medium
F2N-10	9/10/05(D)	16	21.6	41	Heavy
D8S- 3	9/20/05(W)	22	28.1	25	Light
D7N- 33	9/20/05(W)	22	24.6	52	Light

* Items that will be promoted to level 3 in 2006.

Note the 'Days from French' refer to the difference between French harvest date and the harvest date of the selection at the same location of the selection. Harvest date listed is specific for locations where samples were collected.

Level 1 Testing

Level 1 testing evaluates the young seedling selections at Davis with fruit quality being the primary selection criteria at this level. This year there was a large amount of stem end, tip, and suture cracking that made it possible to select against the items that are genetically predisposed to cracking. Russet scab was also observed and selected against in some seedlings. Table 4 shows the harvest data of the top seedlings evaluated at Level 1 this year. All of these seedlings will be promoted to Level 2 testing in 2006.

Table 5. 2005 Harvest data for advanced selections in Level 1 testing at Davis.

Selection	Harvest Date	Days From French	Soluble Solids %	Fruit Size (ct/lb)	Crop Load
F10S- 89	7/14/05	-41	20.2	50	Medium
E1N- 34	7/19/05	-37	23.2	54	Light
E12S- 26	7/19/05	-37	24.6	52	Light
E7S- 37	7/19/05	-37	22.5	67	Light
F11S- 27	7/23/05	-31	27.8	64	Medium
F9N- 21	7/23/05	-31	25.3	56	Light
F11S- 85	7/23/05	-30	22.1	76	Medium
E4S- 18	8/4/05	-20	24.9	54	Light
F3S- 38	8/9/05	-14	30.3	59	Light
E9S- 64	8/8/05	-14	29.5	44	Light
G1S- 83	8/16/05	-9	23.6	32	Medium
E6S- 12	8/18/05	-6	27.5	62	Medium
F11S- 57	8/23/05	-1	24.1	56	Medium
French	8/24/05	0	25.2	56	Medium
E6N- 22	8/25/05	1	27.9	46	Light
E2N- 20	8/25/05	1	25.2	52	Light
E1S- 22	8/25/05	1	24.3	63	Heavy
E14S- 94	9/2/05	8	28.3	61	Light
E7N- 28	9/2/05	8	24.8	61	Medium
E11S- 47	9/10/05	16	23.8	45	Medium
E4S- 63	9/20/05	29	26.4	40	Medium

Program Inventory

All the seedling blocks are located in the UC Davis campus research orchards. In the summer of 2005, 1039 seedling trees were discarded because the seedlings showed negative fruit or tree characteristics. In February of 2005, 905 one-year-old seedlings were added to the youngest block, G. In addition, because the 2004 seed was planted in pots, the young seedlings that would have been planted in winter of 2006 have been planted in October 2005 adding 1,289 more seedlings to G block and beginning Block H with 458 seedlings (Table 6). This new planting time will hopefully be a permanent change in the program's procedures. One hundred and forty

five fruit samples were processed for the advanced rehydrated tasting evaluation in October of the samples 98 were from Level 1 tests.

Table 6. Seedling block inventories located in Davis UC research orchards.

Block	Acres	Year Planted	Seedlings Planted	Seedlings Remaining	Advanced Selections
E	2.2	1999-2000	2,100	625	19
F	2.4	2000-2001	2,240	893	13
G	8.0	2001-2005	6,756*	6,423	2
H	1.0	2005- cont.	458*	458	
Seeds		2006	($\approx$ 3000) [♦]		
Totals	13.6		11,554 ^Δ	8,399	34

*includes 2005 February and October planting

♦number of seeds in stratification for 2006 planting

^Δnot including seeds

The inventories of selections at each level of testing are shown in Table 7. The numbers in this table represent the number of unique selections and not the number of trees. The “breeding population” category incorporates selections from our program and cultivars collected from other programs. The selections in the breeding population that come from this program have some negative characteristics that do not allow them to become cultivars but show other positive characteristics that may make them important parents for future generations.

Table 7. Number of unique selections in the dried plum program and their level of testing including the breeding population.

Level of Testing	Number of Items	Number of new 2005 additions
Level 1	8,399	1,789 ($\approx$ 3000 seeds)
Level 2	78	20
Level 3	4	3
Level 4	2	
Breeding Population	99	5

Table 8. The characteristics of the fresh fruit of the top 20 dried plum selection shown at the Dried Plum/Prune Testing Group meeting in November.

Show No.	Selection ID	Harvest Date	Days from French	Testing Level	Location	Crop Size	Skin Color	Fruit Shape	Weight Grams /Fruit	PSI	Soluble Solids (Fresh)	Dry ratio
1	D9S- 95	7/22/05	-41	2	Winters	Light	Lt. Rose	Oval	30.7	2.2	22.0	3.31
2	F9S- 62	7/22/05	-41	2	Winters	Medium	Lt. Purple	Long Oval	30.5	3.4	23.3	3.36
3	D18S- 7	7/20/05	-32	2	Kearney	Light	Lt. Rose	Oval	38.6	2.9	25.4	
4	F11N- 27	7/25/05	-31	1	Davis	Medium	Lt. Rose	Oval	23.7	2.0	27.8	3.00
5	F11S- 85	7/26/05	-30	1	Davis	Medium	Lt. Rose	Oval	19.6	2.3	22.1	3.25
6	Muir Beauty	8/2/05	-30	4	Winters	Medium	Purple	Oval	41.2	4.1	23.9	3.19
7	D2N- 76	8/5/05	-27	2	Winters	Heavy	Lt. Rose	Oval	24.9	2.8	27.9	2.64
8	D10N- 16	8/15/05	-17	2	Winters	Medium	Drk.Purple	Sutter	28.3	3.4	23.7	3.03
9	E13S- 60	8/11/05	-14	3	Davis	Medium	Lt. Rose	Sutter +/-	25.4	2.3	23.1	2.95
10	D10S- 8	8/19/05	-13	2	Winters	Medium	Purple	French +/-	28.3	5.5	25.1	2.84
11	Sutter	8/19/05	-13	4	Winters	Medium	Purple	Sutter	29.9	3.7	25.0	3.19
12	E6S- 12	8/19/05	-6	1	Davis	Medium	Grn/ yellow	Oval	20.0	3.0	27.5	2.76
13	D6N-103	8/17/05	-4	3	Kearney	Medium	Lt. Rose	Lrg French	44.2	3.8	23.9	2.88
14	F11S- 57	8/23/05	-2	1	Davis	Medium	Yellow	Oval	24.5	2.4	24.1	3.13
15	French	9/1/05	0	Standard	Winters	Medium	Rose	French	20.7	3.4	25.3	2.82
16	E1S- 22	8/26/05	1	1	Davis	Heavy	Purple	Flat Oval	19.6	2.5	24.3	3.09
17	E2N- 20	8/26/05	1	1	Davis	Light	Purple	Oval	35.8	1.5	25.2	3.34
18	E6N- 22	8/26/05	1	1	Davis	Light	Rose	Long Oval	28.9	3.2	27.9	2.86
19	E11S- 47	9/10/05	16	1	Davis	Medium	Rose	Oval/ Round	32.6	3.7	23.8	3.40
20	E4S- 63	9/23/05	29	1	Davis	Medium	Yellow	French +/-	28.5	3.3	26.4	2.76

Table 9. The characteristics of the rehydrated dried fruit of the top 20 dried plum selection shown at the Dried Plum/Prune Testing Group meeting in November. (Average flavor score is on a rating scale of 1-5 with 1 being the worst tasting.)

Show No.	Selection ID	Dried Count per lb.	Skin Color	Surface Wrinkles	Surface Bright	Shape	Pit Size	Pit Type	Flesh Color	Flesh Quality	Ave. Flavor Score	DRY COMMENTS
1	D9S- 95	48	Lt. Brown	Regular/ Irregular	Medium	French +/-	Medium	Semi Free	Amber	Gooney/ Meaty	3.75	nice skin, nice flavor.
2	F9S- 62	52	Brown	Irregular	Medium	Long Oval	Medium Long	Free	Yellow/ Amber	Gooney	3.25	Fruity acid
3	D18S- 7	37	Brown	Regular	Bright	Round	Medium	Cling	Amber	Meaty/ Gooney	4	nice texture, sweet, good looking
4	F11N- 27	64	Lt. Brown	Regular/ Irregular	Medium	French +/-	Small	Semi Free	Yellow	Gooney	4	sweet, prune flavor, looks like French, Fruity, acid, mix
5	F11S- 85	76	Brown	Regular	Bright	French +/-	Medium	Free	Yellow	Gooney	3.25	nutty, unusual, squash
6	Muir Beauty	35	Brown/ Black	Regular	Bright	Round	Small	Semi Free	Orange	Meaty/ Gooney	4.25	
7	D2N- 76	52	Drk. Brown.	Regular	Medium	Oval	Small	Semi Free	Amber/ Gold	Meaty	3	fruity and prune flavor.
8	D10N- 16	45	Brown	Regular	Medium+	Long Sutter	Medium Long	Semi Free	Yellow	Meaty	3	prune, french like
9	E13S- 60	52	Lt Brown	Regular/ Irregular	Bright	Sutter	Medium	Free	Amber	Gooney	3.75	nice
10	D10S- 8	41	Lt. Brown	Regular	Medium+	Oval	Small	Free	Gold	Gooney	3.75	
11	Sutter	52	Drk. Brown	Fine/ Regular	Bright	Sutter	Medium	Free	Amber	Meaty	3.75	
12	E6S- 12	62	Date	Regular	Bright	French +/-	Small	Semi Free	Orange	Ave.	4.5	yellow fruit, pumpkin flv.
13	D6N-103	30	Brown	Regular	Bright	Lrg. French.	Large	Semi Free	Gold/ Yellow	Meaty	3.25	
14	F11S- 57	56	Brown	Regular	Medium	French +/-	Medium	Semi Free	A/G	Meaty	4	fig flavor, carmel, low acid, prune flavor, small end crack
15	French	57	Brown	Regular	Bright	French	Small	Cling	Yellow	Meaty	3	brown around pit, sweet
16	E1S- 22	63	Brown	Broad/ Regular	Medium	French +/-	Small	Semi Free	Bright Yellow	Ave.	4.5	small end crack, bake flavor, date flavor
17	E2N- 20	52	Drk. Brown	Regular	Dull	Oval	Medium	Semi Free	Amber	Gooney	3.75	Specialty type, sweet, acid, very nice, not fruity
18	E6N- 22	46	Lt. Brown	Fine/ Regular	Bright	Long Oval	Medium Long	Semi Free	Yellow	Meaty!	4	honey flavor, Muir Beauty flavor
19	E11S- 47	45	Date	Regular	Bright	Oval	Small	Semi Free	Orange /Amber	Meaty	4	low acid, alittle skin seperation
20	E4S- 63	40	Date	Broad/ Regular	Bright	Lrg. French.	Medium	Semi Free	Bright Yellow	Gooney	3.25	acid fruity, skin seperation

Table 10. The average group score ratings (1=worst, 5=best) given to the characteristics of the top 20 dried plum selection shown at the Dried Plum/Prune Testing Group meeting in November, sorted by flavor.

Show No.	Item	Flavor	Skin color	Skin quality	Fruit size	Pitting quality	Flesh Texture	Flesh Color	Average over all	Comments
11	Sutter	3.46	3.23	3.18	3.69	3.19	3.58	3.31	3.38	good balance (2), french like, nectarines, fruity, good, chewy, large size, dark color
1	D9S- 95	3.43	3.68	3.89	4.23	3.21	3.69	3.27	3.63	good, fruity, french like, really sweet, large size, tender
12	E6S- 12	3.43	2.77	3.35	3.12	3.38	3.29	3.35	3.24	tropical (2), very good taste (2), apricot (2), tangy, good taste, fruity, very good flavor, sticky, soft flesh, date like
20	E4S- 63	3.38	3.91	3.08	3.89	2.81	3.42	3.85	3.48	good, apple? Pinapple?, too much acid (2), tart (2), apricot, light redish brown might have possiblity, tough skin, bright yellow flesh, very good
13	D6N-103	3.33	3.46	2.75	3.92	3.17	3.46	3.54	3.38	not french, mellow, good acidic balance, poor, unlikable, chewy, too elongated, pit too big, large fruit, too tough
3	D18S- 7	3.31	3.43	3.50	4.17	3.00	3.33	3.46	3.46	mello, meaty, citrus, earthy?, chewy
19	E11S- 47	3.23	3.58	3.73	3.92	3.35	3.33	3.17	3.47	good (2), excellent, tobacco, carmel, fruity pear, good, easy to chew
6	Muir Beauty	3.21	3.25	3.32	4.36	3.46	3.07	2.85	3.36	rum/date, fruity, carmelized, apricot like (2), nutty, sweet, dark color, not tough, large size, creamy/chewy texture
10	D10S- 8	3.11	3.18	3.04	3.61	3.08	3.21	3.04	3.18	ok, carmelized (2), date like, hard pit to free, chewy flesh, a little sticky, very good skin quality, large pit
2	F9S- 62	3.08	3.21	2.86	3.36	3.15	3.15	3.08	3.13	distinct, wonderful, tart, very elongated, pit too long, loose skin
5	F11S- 85	3.04	3.15	3.15	1.69	2.85	2.85	2.85	2.80	fruity (2), brandy, not very intense, apricot, loose skin, small size, easy to pit, mushy texture, not tough skin
9	E13S- 60	3.00	3.23	3.29	3.38	3.55	3.21	3.46	3.30	good, nice balance (2), woody, a good piece of fruit, light flesh color, sticky texture
18	E6N- 22	2.92	3.46	3.13	3.31	2.88	2.92	3.35	3.14	ok (2), date-like, butter scotch, large size, tight pit, funny shape, long pit, dry texture
4	F11N- 27	2.78	3.18	3.00	1.67	2.79	3.00	3.08	2.79	tarter taste, small size, not very fleshy
14	F11S- 57	2.77	3.23	2.92	2.25	2.62	2.92	3.08	2.83	good, neat!, date like flavor, hard to pit, wow!, chewy dense, sticky, dull skin color
15	French	2.77	2.85	3.00	2.77	2.85	2.92	2.69	2.83	bland, too mild, chewy dense
7	D2N- 76	2.68	3.29	2.79	2.79	3.12	3.08	3.00	2.96	french like, acidy, meaty, chewy
17	E2N- 20	2.58	3.23	2.82	2.92	2.96	2.88	2.54	2.85	sweet can't say, french flavor (2), more intense flavor carmel, over ripe, too dark and rubbery, chewy dense, tough skin
8	D10N- 16	2.54	2.93	2.54	3.08	2.65	2.79	2.64	2.74	ok, no real flavor, odd shape (2), terrible, a little tough, smooth, too elongated, not much flesh around pit
16	E1S- 22	2.46	2.62	2.77	2.92	3.23	2.67	2.62	2.75	not 'fruity', not very sweet almost sour, apricot, looks and feels like a date (2), large size, easy free pit, not as chewy

Dried Plum/Prune Testing Group

The inception of the Dried Plum/Prune Testing Group occurred this year in July when a small group of interested growers and processors met at the Wolfskill Experimental Orchards to discuss possible strategies for testing and to tour the program's orchard looking at fresh fruit and tree characteristics of top selections and discussing their potential as cultivars. The group met again in November in Davis to evaluate the top 20 selections (including French as a standard) and discuss their dried product characteristics. Tables 8 and 9 detail each of these selection's physical characteristics, fresh and dried. The group's evaluations and ratings for each of these selections are shown in Table 10.

The most striking point of interest is that Sutter was again the highest rated dried plum for flavor. This evaluation has been successfully held for three years, 2002, 2003 and 2005, and in every year Sutter has been rated highest for flavor. Only in one year did another dried plum share this rating with Sutter and that was Muir Beauty in 2003. French, on the other end of the rating scale, has been rated in the middle or the lower end of the scale for flavor over the years. This preference may be shared by consumers and may help increase consumption of dried plums once Sutter is available in the market.

Disease Screening

The cool wet spring created optimum conditions for russet scab in the older Kearney selection block and disease evaluation was done on all selections and cultivars in the block. No causal agent is known to cause the disease and it has been shown that rain in the first week after full bloom can induce the russetting. The screening methods used were described by T. Michailides (1991). Individual fruit sampled throughout the season was scored from 0-4 on severity of the disease (0=none, 4=severest). Michailides showed that fruit scoring a 3 or 4 were unmarketable so to evaluate a selection the percent of fruit scoring 3 or 4 was recorded. The overall summary of the results are shown in Figure 2 where the number of selections are grouped in categories of the percent of unmarketable fruit damaged by russet scab.

The results show that there is variation within the germplasm for the presence and severity of russet scab. This may have been due to differing bloom times or genetic characteristics of individual selections conferring resistance or susceptibility to the disease. This year's observations point out that differences do exist among genotypes and it is possible to evaluate the selections if the disease is present. With no preventative treatments Sutter and French showed similar susceptibility in the range between 51-60% unmarketable fruit while Muir Beauty and Tulare Giant both showed no symptoms of scab and had 0% unmarketable fruit. The bloom time of both these cultivar pairs correlate to each other and may show the importance of bloom time in the avoidance of this disease. Further evaluations in subsequent years should show a more complete picture of the susceptibility or resistance to the disease for these important cultivars.



Figure 2. Number of selections scored at Kearney for russet scab in 2005 and their associated percentage of fruit that scored either 3 or 4. These percentages can also be understood to be the percentage of fruit that would have been culled as unmarketable due to russet scab.

RELATED STUDIES

Relationship between accumulated growing degree hours 30 days after full bloom and harvest date

It has been established in peaches, Japanese plums, and nectarines that the accumulated temperatures (GDH or growing degree hours) in the first 30 days after full bloom are highly correlated to the date of harvest (Ben Mimoun and DeJong, 1999). This correlation can be used as a predictor of future harvest dates. To see if a similar relationship exists in dried plums/prune, the harvest dates of French collected in Wolfskill and Kearney over the last eight years were correlated to the associated accumulated GDH 30 days after full bloom for each year. A relationship was found in French prune that is similar to what has been found in the other *Prunus* crops (Figure 3).

This relationship signifies that the spring temperatures in the first 30 days after bloom govern fruit developmental rates and ultimately the harvest date in any given year. This can be used as a tool for growers to estimate harvest date for French early in the season. They can easily accomplish this by going to the UCD Fruit and Nut Research and Information Center web page 30 days after bloom (<http://fruitsandnuts.ucdavis.edu>). Once there, go to the 'Weather Services' page and link to the 'Harvest Prediction Model'. Choose the location and fill in the date of full bloom. The information that will be shown is the accumulated GDH during the first 30 days after bloom. Using this number, you can extrapolate from the figure below (Figure 3) how many days from full bloom to harvest for that year. As a resource, this figure will be linked to the page labelled 'About Growing Degree Hours' found under 'Weather Services'.

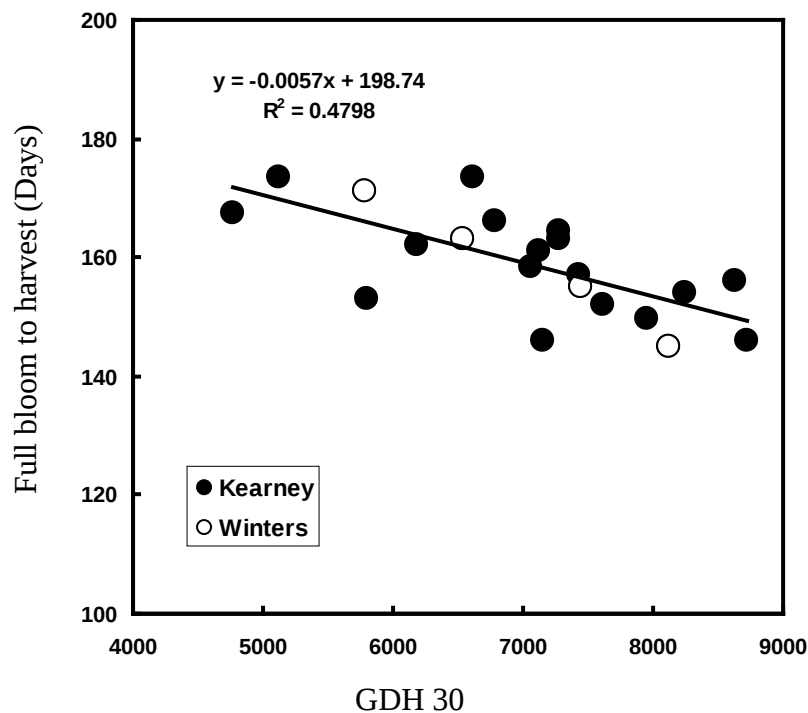


Figure 3. Relationship between growing degree hours (GDH) 30 days after full bloom and the number of days from full bloom to harvest for the cultivar 'Improved French' at Kearney and Winters.

REFERENCES

- Ben Mimoun, M. and T.M. DeJong, (1999), "Using the relationship between growing degree hours and harvest date to estimate run-times for *PEACH*: a tree growth and yield simulation model". *Acta Horticulturae*, 499:107-114
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