

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 weather that can negatively effect fruit set and/or fruit retention. 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. Introducing new dried plums that differ in flavor or color to French could promote a broadening of the consumer base.

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 over 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 in 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 organoleptic 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 consumer interest California dried plum products.

In the last three out of four years dried plum orchard yields have been down because of poor weather conditions for fruit set during the bloom period. We believe that this has been largely due to high temperatures during fruit set and since the California industry is based on a single cultivar, the weather conditions during a specific period affect most of dried plum orchards in the same way. Because of this we have begun to evaluate our seedlings and selections for differences in bloom date so that with new cultivars we can introduce greater diversity of bloom timing so that the entire Californian crop will not be dependent on the same set of weather conditions during periods critical for fruit set and retention.

PROGRAM OBJECTIVES

- 1.) To develop new dried plum varieties, through traditional horticultural breeding methods, with the following characteristics:
 - A) Earlier/later bloom and fruit maturity dates than “Improved French” dried plum
 - B) Tree characteristics that reduce labor cost involved in producing dried plums.
 - C) Increased fruit quality and improved fruit characteristics that increase efficiency and quality of drying and processing.
 - D) New specialty traits; with the dried product being equal or improved in quality to “Improved French”, but differing in taste or color.
 - E) Tolerance/resistance to disease.
- 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 2006 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

The Plum/Prune Testing Group incorporates the 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 Plant Sciences (previously 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 have developed a new strategy for the final evaluation and future release of dried plum/prune cultivars derived from the breeding program. In 2005 we 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 a year since 2005 to develop testing strategies and evaluate advanced plum/prune selections. Participation in the group involves 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.

However, based on the discussions that we have had during the meetings of the testing group it is now clear that in order for the California Dried Plum industry to take full advantage of the results of the breeding program more emphasis must be placed in getting significant commercial field testing in place earlier in the evaluation process of advanced selections. Currently, even after growers show substantial interest in planting a new selection, they are hesitant because of uncertainty about their acceptability by processors. Similarly, processors are hesitant to commit to accepting the fruit from new cultivars until they have test processed significant amounts of fruit. Based on this “Catch 22” situation we believe that we need to increase efforts to “spread the risk” of developing test plantings of new selections to enable earlier decisions by processors regarding the advisability of planting new selections. We believe that it is in the best interest of the industry and processors to be able to give clear “up” or “down” signals regarding the acceptability of new cultivars as early as possible to take full advantage of introducing new cultivars into the industry and avoid the planting of cultivars that may not be favored by processors. In the next couple of years we plan to work toward enhancing our advanced testing protocols to accomplish quicker establishment of larger (2-10 acre) test plantings to accomplish this goal.

RESULTS

The weather this year greatly affected what was observed in the orchards. Over the winter, California valleys had an adequate amount of accumulated chilling hours. This chilling satisfied the chilling requirements for all of our selections and seedlings. March had very high average temperatures across that state allowing bloom to be early to normal timing with a condensed bloom that lasted over 5-7 days depending on the orchard. The peak hot temperatures coincided with the peak of full bloom for French. This led to low fruit set and a statewide reduction in dried plum production.

The weather following bloom was mild and dry which reduced the development of brown rot and russet scab. The fruit that was harvested this year was very clean and mostly free of disease and damage. This was good for the industry but reduced our ability to score these diseases within the program evaluations.

July and August were mild this year with the numbers of days over 100 °F being less than normal. This allowed the fruit to develop at optimal temperatures and resulted in high final sugar levels in the fruit. The below average temperature in August may have promoted a rapid drop in fruit pressures in French and particularly in Sutter. The harvest dates of the cultivars and the elite selections were very normal this year.

Bloom Data

The importance of bloom data has grown in the last 5 years because of the changing weather patterns that California has experienced. It has become more common to have heat spells in March that often have temperatures near 80°F. If high temperatures occur when French is blooming the biological mechanisms for successful pollination and fertilization are negatively affected. The result has been low fruit set across the state. Variation for time of bloom is naturally found within the breeding programs germplasm. Introducing new cultivars to the California dried plum industry that have bloom times earlier or later than Improved French could reduce the risk of having the entire crop reliant on good weather conditions occurring during French bloom.

Bloom data, including date of full bloom (90% flowers open), amount of bloom, and the first and final day of bloom has been recorded for all the Level 2-4 selections since 2003. Table 1 shows the average number of days each top selection blooms before or after Improved French's full bloom. Because bloom time varies from year to year depending on annual chilling accumulation and spring time temperatures the table also shows the range of number of days over the years each top selection blooms before or after Improved French's full bloom. Figure 1 shows a more visual presentation of the top selections' timing and extent of blooming in 2007. Note the number of items that bloom before French.

Table 1. Bloom data for the 2007 top selections.

Selection	Average number of days different compared to French full bloom date	Range over the years for number of days different compared to French full bloom date
Muir Beauty	-7.3	-17 to -3
Tulare Giant	-5.3	-13 to -2
Sutter	-0.5	-4 to 2
French	0.2*	-2 to 3 *
G3S- 2	-8.8	-13 to -3
F13N- 24	-7.8	-13 to 0
D2N- 76	-6.6	-16 to -3
D15N- 80	-6.3	-15 to -3
D18S- 12	-6.1	-13 to -3
F2N- 10	-5.3	-13 to 0
F2S- 20	-4.5	-7 to -2
D18S- 50	-3.3	-8 to 0
D10S- 8	-2.9	-7 to 0
E3N- 42	-2.8	-6 to 0
D18S- 7	-2.2	-7 to -1
F13S- 46	-1.8	-4 to 0
D6N-103	-1.0	-4 to 3

* within orchard variation

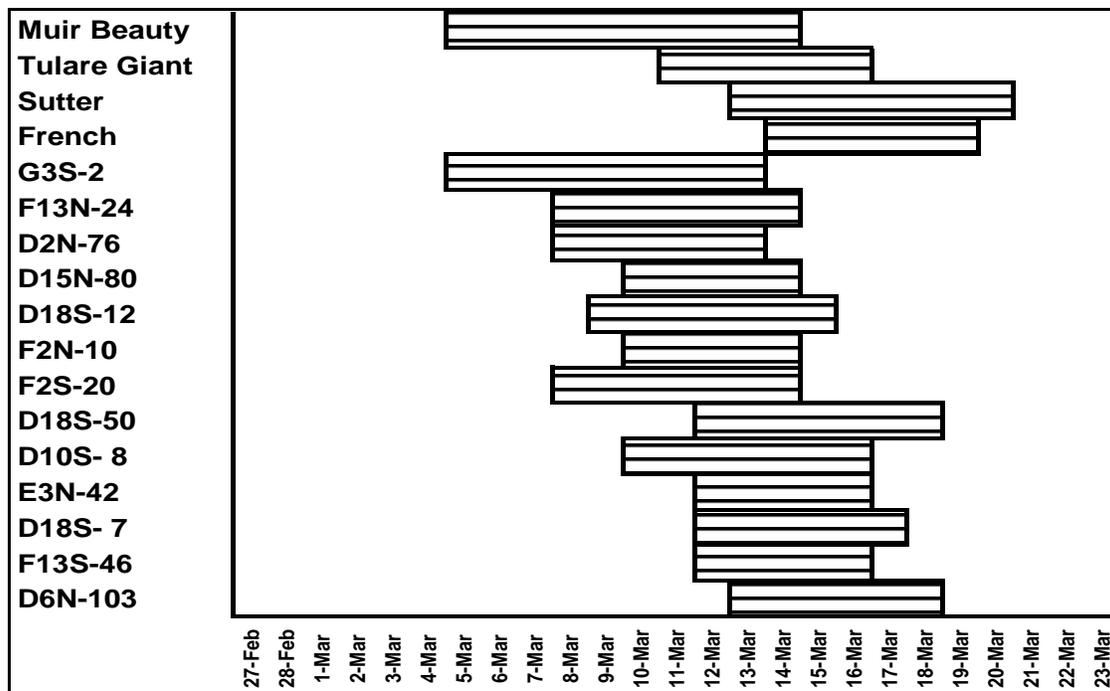


Figure 1. The 2007 bloom data for the top selections shown as number of days in bloom.

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 Muir Beauty (UCD # D6N-72), the cultivar that was released in January 2004. The second is the dried plum cultivar, released in 2000 Sutter. The third is Tulare Giant, a fresh market cultivar released in 2000.

Muir Beauty (D6N-72)

Muir Beauty dried plum set a good crop on the mature trees at Kearney and Wolfskill. The harvest date for Muir Beauty was 14 days before French at both the UC locations (Table 2). This harvest difference was within the normal range (10-15 days) described previously for this cultivar. Full bloom of Muir Beauty occurred in early March overlapping with Tulare Giant bloom and the beginning bloom of French and Sutter. Muir Beauty bloomed slightly earlier than Tulare Giant this year with their overlap extending over five days.

Table 2. Muir Beauty 2007 harvest dates and fresh fruit data compared to French harvest data.

Location	Selection	Harvest Date	Internal Pressure (PSI)	Soluble Solids (Brix)	Fruit Size (ct/lb)	Crop Size
Kearney Ag. Center	Muir Beauty	8/10	3.1	22.0	39	Heavy
	French	8/24	3.5	22.6	67	Light
Winters Research Orchards	Muir Beauty (mature)	8/9	3.4	23.0	45	Heavy
	French (mature)	8/23	3.5	25.8	67	Medium
	Muir Beauty (young)	8/9	4.4	24.1	47	Medium +
	French (young)	8/23	4.6	27.4	56	Medium

Sutter

Sutter's bloom overlaps with French but is extended prior to and past French bloom by about a day. This bloom time places Sutter in the same weather window as French. In the past few years when high temperatures at bloom has reduced French fruit set, Sutter fruit set has also been reduced. Sutter harvest compared to French showed its traditional 7-10 day difference this year at all locations with higher soluble solids than French at all locations (Table 3). Though the Sutter variety does not reduce the risk of high temperatures at bloom it does add to the dried plum industry with an earlier harvest date and high soluble solids.

Table 3. Sutter 2007 harvest dates and fresh fruit data compared to French harvest data.

Location	Selection	Harvest Date	Internal Pressure (PSI)	Soluble Solids (Brix)	Fruit Size (ct/lb)	Crop Size
Kearney Ag. Center	Sutter	8/17	4.3	26.5	42	Light
	French	8/24	3.5	22.6	67	Light
Winters Research Orchards	Sutter (mature)	8/16	3.0	29.8	miss	Heavy
	French (mature)	8/23	3.5	25.8	67	Medium
	Sutter (young)	8/16	3.3	30.3	40	Medium
	French (young)	8/23	4.6	27.4	56	Medium

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's bloom time overlaps Tulare Giant's bloom time quite well and with a large quantity of flowers it makes a very good pollinizer. A pollen compatibility test was done in 2004 proved that Muir Beauty used as a pollinizer sets a very heavy crop on Tulare Giant. Hand thinning is recommended 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.

Tulare Giant and Muir Beauty bloom overlapped quite well this year with Muir Beauty overlapping the first 5 days of Tulare Giant bloom and French overlapping the final two days of bloom. The harvest was normal with the fruit at Kearney Ag Center mature on July 7 (7.9 PSI) and on July 5 (7.5 PSI) at Wolfskill. The soluble solids ranged between 16-18 ° Brix.

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, D18S-50, D10S- 8, D18S-7 and D2N-76. Three items have been removed from this level. Selections E13S-60 and D6S-87 showed high susceptibility to russet scab and 6-21-56 has shown a great propensity for early fruit drop. Harvest data are shown in Table 4.

Table 4. Level 3 selection performance for 2007 at university selection blocks. The location designation after harvest date indicates W (Wolfskill), K (Kearney). ‘Days from French’ refer to the difference between French harvest date and the harvest date of the selection at the same location. Harvest date listed is specific for locations where samples were collected.

Selection	Harvest Date	Days from French	Press (PSI)	Soluble Solids (Brix)	Fruit Size (ct/lb)	Crop size
D18S- 7	8/2 (W)	-21	3.8	22.7	44	Medium
D18S- 7	8/10 (K)	-14	3.6	26.1	35	Heavy
D2N- 76	8/11 (W)	-12	3.6	26.3	51	Light
D10S- 8	8/17 (K)	-7	3.5	24.6	37	Light
D18S- 12	8.23 (W)	0	3.5	23.9	28	Medium
French	8/23 (W)	0	3.5	25.8	67	Medium
French	8/24 (K)	0	3.5	22.6	67	Light
D18S- 50	8/29 (W)	6	4.8	29.4	38	Heavy
D6N-103	8/29 (W)	6	3.7	26.7	33	Light

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 “Gourmet” market. This year two pollen isolation cage experiments were done. The first repeated last year’s trial with the exclusion of all pollen. The results showed that D6N-103 is not self compatible and requires a pollinizer. The other isolation cage experiment had additional pollen added from Improved French in the form of bouquets. The tree in this cage set a full crop showing that Improved French is a compatible pollinizer of D6N-103.

D18S-7 is a rose colored fresh fruit that creates a shiny brown dried fruit. The flavor of the dried plum is smooth, sweet with a slight baked flavor. D18S-7 has had high dried flavor ratings for the last four years. The harvest date is earlier than French but varies from year to year. New grower trials will clarify the harvest date in the coming years.

D2N-76 harvests earlier than French in normal years by about a week or more. The dried plum looks and tastes very similar to French. The pit is small and semi-free. This would be a very good dried plum to mix with French at processing.

D10S- 8 is a round purple colored fresh plum. In previous years, it has harvested before French but this year the harvest date fell after French. The dried plum is very sweet with soluble solids ranging between 24-27 Brix and the dried fruit has a very sweet taste. The first pollination

isolation experiment this spring has revealed that D10S- 8 is not self fertile. Further studies will be done to verify this and test pollinizer for compatibility.

D18S- 50 is a super sweet dried plum that usually harvests about 6 to 12 days after French. It is a long oval plum with a longer pit than Sutter or French yet the pit is very free and may not be a hindrance to processing. The flavor is very sweet and fruity with the dried appearance being very shiny. This dried plum could lengthen the dried plum harvest and contribute a high quality and high sugar product to the industry.

D18S-12 is a large round prune that is a sibling of D18S- 7. They are similar in shape and size but D18S-12 has a darker purple fresh color and a thinner skin. The dried flavor is exceptional and the texture soft and gooey. Very distinct from French lending itself to a gourmet market where flavor is desired above appearance.

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 and fruit characteristics are evaluated. Table 5 shows the harvest data of the top selections this year.

Table 5. 2007 Harvest data for advanced selections in Level 2 testing. The location designation after the harvest date indicates W (Wolfskill), K (Kearney). ‘Days from French’ refer to the difference between French harvest date and the harvest date of the selection at the same location. Harvest date listed is specific for locations where samples were collected.

Selection	Harvest Date	Days From French	Soluble Solids %	Fruit Size (ct/lb)	Crop Load
G3S- 2	7/11 (W)	-43	24.1	57	Medium
F10S- 89	7/11 (W)	-43	21.4	37	Medium
F11S- 38	7/27 (K)	-28	27.1	54	Light
F13S- 46	7/26 (W)	-26	24.1	40	Medium
G10S- 22	7/28 (W)	-26	24.6	46	Medium
F2S- 20	8/1 (W)	-21	21.6	33	Medium +
D15N- 80	8/9 (W)	-14	26.6	54	Light
E3N- 42	8/9 (W)	-12	29.6	45	Medium
French	8/23 (W)	0	25.8	67	Medium
F13N- 24	8/23 (W)	0	26.4	54	Medium
F2N- 10	8/29 (W)	7	28.2	34	Medium

The selection F13N-24 is a very interesting one with lots of potential. It harvests at the same time as French but blooms earlier. It has a similar shape to French and has a small free pit. It is similar to French in appearance and flavor and could easily be packaged with French dried plum. This might be a selection that could spread the risk at spring time by blooming in a different temperature weather window than French.

D15N- 80 is another French dried plum look alike but blooms earlier and matures earlier than French. It has moderate soluble solids but seems to hold on to the tree very well as it matures so that harvesting around 3 lbs pressure should not be a problem thus maximizing soluble solids.

Level 1 Testing

Level 1 testing evaluates the young seedling selections at Davis with fruit quality being the primary selection criteria at this level. The seedlings set nice, medium sized crops this year with little need of thinning. Table 6 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 2008.

Table 6. 2007 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
G4S- 57	7/25	-27	24.2	52	Medium
G11N- 39	7/25	-27	24.9	54	Medium
G20S- 27	7/31	-21	32.1	46	Medium
G2S- 7	7/31	-21	21.4	59	Medium
F13N- 23	8/11	-10	23.5	60	Light
F11S- 65	8/11	-10	27.3	55	Medium
G20S- 79	8/20	-1	24.0	31	Light
F12N- 75	8/25	4	25.7	59	Medium
G3S- 16	8/27	6	22.4	63	Heavy
G2S- 8	8/30	9	26.4	37	Light
G2N- 24	8/30	9	26.9	36	Light
G25N- 16	8/30	9	25.9	45	Light
G2S- 44	8/30	9	25.0	38	Light
G2N- 43	9/5	15	23.4	53	Medium
G3N- 52	9/5	15	21.9	70	Medium

Program Inventory

All the seedling blocks are located in the UC Davis campus research orchards. In the summer of 2007, 581 seedling trees were discarded after evaluation of the seedlings showed negative fruit or tree characteristics. The 2006 seed collected from controlled pollinations made in spring of 2006 were grown over the summer in pots at Duarte Nursery. These young trees were planted in October 2007 into our seedling blocks at Davis. This added 549 new seedlings to block 'H' (Table 7). One hundred and forty five fruit samples were processed for the advanced rehydrated tasting evaluation in October with 104 of the samples coming from Level 1 seedlings.

Table 7. Seedling block inventories for 2007 located in the Davis UC research orchards.

Block	Acres	Year Planted	Seedlings Planted	Seedlings Remaining	Advanced Selections
F	2.4	2000-2001	2,240	200	26
G	8.0	2001-2005	6,756	5,849	15
H Seeds	4.0	2005- cont. 2007	2,555* (\approx 2,397) [♦]	2,555	
Totals	14.4		11,551^Δ	8,604	41

*includes 2007 October planting

[♦]number of seeds in stratification for 2008 planting

^Δnot including seeds

The inventories of selections at each level of testing are shown in Table 8. 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 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 8. 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 2007 additions
Level 1	8,604	549 (\approx 2,397 seeds)
Level 2	75	15
Level 3	6	0
Level 4	3	0
Breeding Population	100	12

Disease Screening

This year the warm spring weather with little rain at bloom time did not promote disease in any of our test orchards. No data was collected on russet scab or brown rot. If an item showed either of these diseases it was noted and the item was marked as more susceptible than the general population.

Dried Plum/Prune Testing Group

The Dried Plum/Prune Testing Group met in early August this year at the Wolfskill Experimental Orchards to discuss possible strategies for testing and to tour the program's orchard. The group looked at fresh fruit and tree characteristics of top selections and discussed their potential as cultivars. The group met again in November in Davis to evaluate the top 23 selections (including French as a standard) and discussed their dried product characteristics. Tables 9 and 10 provide details on 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 11 which is sorted by 'Average over all' score.

The top rated dried plum this year was Muir Beauty. This top place has been held by Sutter for most of the years. The testing group's evaluation of these two cultivars validates the program's ability to breed new and better dried plums. French has routinely been rated in the lower third of the dried plums evaluated. This is important to understand that even in a group of tasters that are very familiar with the Improved French cultivar characteristics they prefer new and fruitier flavors above the old standard. Consumers should follow this preference trend when new cultivars are made available to them. This is exciting since it allows for the opportunity for the industry to think about new marketing opportunities and increasing the dried plum consumer base.

Table 9. The characteristics of the fresh fruit of the top 23 dried plum selection shown at the Dried Plum/Prune Testing Group meeting in November 2007.

	Show number	Selection	Level of testing	Harvest Date	Bloom Days from French	Harvest Days from French	Location	Crop Size	Fresh Skin color	Fruit Shape	Weight (g/fruit)	Internal Pressure (PSI)	% Soluble Solids (Brix)
Cultivar	1	MUIR	4	8/16/07	-7.3	-7	Winters	Medium	Purple	Round	31.8	2.4	25.3
	2	SUTTER	4	8/16/07	-0.5	-7	Winters	Medium	Purple/red	Sutter	31.3	3.3	30.3
	3	FRENCH	4	8/23/07	0.0	0	Winters	Medium	Rose	French	22.8	4.6	27.4
Similar to French	4	G3S- 2	2	7/11/07	-8.8	-43	Winters	Medium	Purple	Round	29.4	3.9	24.1
	5	G11N- 39	1	7/25/07		-27	Davis	Medium	Purple	Round	26.6	4.2	24.9
	6	G4S- 57	1	7/25/07		-27	Davis	Medium	Yellow /Rose	French ±	25.8	3.4	24.2
	7	D15N- 80	2	7/28/07	-6.3	-26	Winters	Light	Rose	French ±	25.4	2.7	24.1
	8	E3N- 42	2	8/11/07	-2.8	-12	Winters	Medium	Purple	French ±	28.7	4.5	29.6
	9	D2N- 76	3	8/11/07	-6.6	-12	Winters	Medium	Lt. Rose	Oval	26.9	3.6	26.3
	10	D10S- 8	3	8/17/07	-2.9	-7	Kearney	Light	Purple	Oval	33.6	3.5	24.6
	11	F13N- 24	2	8/23/07	-7.8	0	Winters	Medium	Rose	French ±	24.9	3.4	26.4
	12	F2N- 10	2	8/30/07	-5.3	7	Winters	Medium	Purple/Green	Oval	33.4	6.2	28.2
	Gourmet	13	D18S- 7	3	8/2/07	-2.2	-21	Winters	Medium	Rose/Green	Oval	33.5	3.8
14		F2S- 20	2	8/2/07	-4.5	-21	Winters	Medium	Yellow/Rose	Lrg. Oval	48.6	3.1	21.6
15		D18S- 12	3	8/23/07	-6.1	0	Winters	Medium	Rose	Oval	50.6	3.5	23.9
16		D6N-103	3	8/29/07	-1.0	6	Winters	Light	Rose/Green	Lrg. French	35.3	3.7	26.7
17		G2S- 8	1	8/30/07		9	Davis	Medium	Yellow	Oval	34.7	6.0	26.4
Ones of Interest	18	F13S- 46	2	7/28/07	-1.8	-26	Winters	Medium	Yellow	French ±	33.4	5.1	24.1
	19	D18S- 50	3	8/29/07	-3.3	6	Winters	Heavy	Purple	Long Oval	32.3	4.8	29.4
	20	G2N- 24	1	8/30/07		9	Davis	Medium	Purple	Oval	35.5	3.7	26.9
	21	G2N- 44	1	8/30/07		9	Davis	Medium	Purple	Oval	35.3	4.8	25.0
	22	G2N- 43	1	9/5/07		15	Davis	Medium	Yellow	Oval	27.3	3.0	23.4
	23	G3N- 52	1	9/5/07		15	Davis	Medium	Yellow/Green	French ±	22.9	2.3	21.9

Table 10. The characteristics of the rehydrated dried fruit of the top 23 dried plum selection shown at the Dried Plum/Prune Testing Group meeting in November 2007. (Average flavor score by DeBuse, DeJong and Doyle is on a rating scale of 1-5 with 5 being the best.)

	Show number	Selection	Dried Count per lbs	Dry ratio	Color	Surface Wrinkles	Skin Peel	Surface Brightness	Shape	Pit Size	Pit Type	Flesh Color	Flesh Quality	Average Flavor Score	COMMENTS
Cultivar	1	MUIR	45	3.27	Black	Regular	Slight	Bright	Flat Oval	Medium	Cling	Orange	Goey	3.7	
	2	SUTTER	40	2.60	Black	Regular	None	Bright	Sutter	Medium	Semi-cling	Amber/Orange	Meaty	4.2	Fruity
	3	FRENCH	56	2.61	Brown	Regular	Slight	Bright	French	Small	Cling	Yellow	Meaty	3.0	
Similar to French	4	G3S- 2	57	3.27	Brown/Black	Irregular	Slight	Medium	Oval	Small Thick	Free	Yellow/Brown	Goey	4.0	Fruity
	5	G11N- 39	54	2.87	Brown	Regular	Some	Dull	Oval	Small	Semi-cling	Gold/Yellow	Goey	3.5	Nice fruit flavor
	6	G4S- 57	52	3.03	Lt. Brown	Irregular	Slight	Medium	French	Small	Semi-cling	Lt. Amber	Meaty/Stringy	3.5	Fruity flavor, seperation of skin
	7	D15N- 80	51	2.91	Brown	Regular	None	Medium	French	Small	Free	Orange/Amber	Meaty	3.7	Nice pit, fruity rich, looks like French
	8	E3N- 42	45	2.79	Lt. Brown	Regular	None	Bright	French	Medium	Semi-cling	Orange	Meaty/Goey	4.0	Slight fruity, acid, nice, mix/French
	9	D2N- 76	51	2.73	Lt. Brown	Regular	None	Bright	Oval	Small	Semi-cling	Orange/Amber	Meaty/Goey	4.5	Very French like
	10	D10S- 8	37	2.84	Brown	Regular	Slight	Bright	French	Large	Cling	Brown/Gold	Meaty	3.6	Pumpkin, Sweet potatoes
	11	F13N- 24	54	2.75	Brown	Regular	None	Bright	French	small	Free	Yellow /Gold	Meaty/Goey	3.5	Nice flavor, Easy to mix with French
	12	F2N- 10	34	2.46	Brown	Regular	None	Bright	Oval	Medium	Semi-cling	Yellow /Amber	Meaty	3.5	Pumpkin, buttery flavor
	Gourmet	13	D18S- 7	44	3.04	Dr Bw	Broad/Regular	Slight	Medium	Oval	Medium	Cling	Amber	Meaty	4.2
14		F2S- 20	33	3.58	Brown	Irregular	Slight	Dull	Oval	Medium	Semi-cling	Amber/orange	Goey	4.2	thin skin, Fruity acid, skin seperation
15		D18S- 12	28	3.00	Brown	Irregular	Some	Medium	Oval	Medium	Semi-cling	Amber	Goey	4.8	thin skin, gourmet candy flv.
16		D6N-103	33	2.58	Lt. Brown /Brown	Regular	None	Bright	Lrg. French	Medium	Free	Yellow/Amber	Meaty	4.0	French prune like but larger
17		G2S- 8	37	2.78	Date	Regular	Slight	Bright	Oval	Small	Semi-cling	Amber	Goey/Meaty	4.6	Fruity
Ones of Interest	18	F13S- 46	40	3.07	Lt. Brown	Irregular	None	Medium	French	Medium	Cling	Gold	Goey	3.8	Very sweet, bled a little
	19	D18S- 50	38	2.54	Black/Brown	Regular	None	Bright	Long Oval	Long Medium	Free	Amber	Goey/Meaty	5.0	Sweet
	20	G2N- 24	36	2.66	Brown	Regular	None	Bright	Sutter	Medium	Semi-cling	Gold	Goey	3.5	Sweet, slight bland, nice looking
	21	G2N- 44	38	2.79	Brown	Regular	None	Bright	French	Medium	Free	Orange/Amber	Dry Meaty	3.3	
	22	G2N- 43	53	3.23	Lt. Brown	Regular	None	Bright	French	Medium	Free	Gold	Meaty	3.9	Sweet
	23	G3N- 52	70	3.33	Brown	Regular	None	Bright	French	Small	Free	Brown/Gold	Meaty	3.8	Good skin, banana flavor

Table 11. The average testing group scores (1=worst, 5=best) given to the characteristics of the top23 dried plum selection shown at the Dried Plum/Prune Testing Group meeting in November 2007, sorted by 'Average over all'.

Show Number	Item	Flavor	Skin color	Skin quality	Fruit size	Pitting quality	Flesh Color	Flesh Texture	Average over all	Comments
1	Muir Beauty	4.32	4.18	3.80	4.25	3.67	3.73	3.82	3.97	The best of show, very good, taste of brown sugar, cola flavor, dark, smooth, gooey, little soft, great flavor
2	Sutter	4.25	4.25	4.00	4.27	3.50	3.83	3.50	3.94	fruity, sweet, a touch of coffee, raisin flavor, cocoa flavor, great flavor balance, smooth texture
8	E3N- 42	3.63	4.08	3.92	4.08	3.20	3.62	3.33	3.69	very fruity(2), good flavor, dried fig flavor, glossy appearance, brown flesh
17	G2S- 8	3.57	3.71	3.64	3.50	3.82	3.86	3.54	3.66	good flavor(2), good balance, cinnamon flavor, nice amber flesh, very French like, small pit, good color
15	D18S- 12	4.12	3.00	3.23	4.54	3.70	3.31	3.23	3.59	good flavor, fruity, sweet, gooey flesh, very soft(4), large fruit size, slabbed, dull appearance
11	F13N- 24	3.23	3.65	3.58	3.58	4.40	3.23	3.17	3.55	much better than French, sweet, honey, light fruity flavor, skin separates from flesh, small pit(2), amber flesh
19	D18S- 50	3.31	3.69	3.46	4.42	3.20	3.08	3.50	3.52	good flavor, very sweet, cherry flavor, fruity, very intense, most unique one shown, long pit, brown flesh
22	G2N- 43	3.21	3.50	3.21	3.50	3.80	3.57	3.38	3.45	sweet, no acid balance, bland, okay flavor, slightly brown color, fairly small fruit size
18	F13S- 46	3.62	2.85	3.08	4.08	3.60	3.31	3.42	3.42	good flavor(3), apple acidic flavor, unique flavor, may need to be marketed separate than French, dull appearance, thin skin, amber flesh
20	G2N- 24	2.90	3.27	3.36	4.27	2.89	3.73	3.30	3.39	slightly dull, dull flavor, nice amber flesh
21	G2N- 44	3.17	3.25	3.40	4.08	3.20	3.25	3.09	3.35	bland flavor, dull appearance
16	D6N- 103	2.92	3.85	3.62	4.31	2.80	2.92	3.00	3.35	burnt flavor, taste like French, bicolor, long pit, nice glossy appearance
13	D18S- 7	3.00	3.64	3.18	4.29	2.45	3.46	3.25	3.32	too thick of skin, not easy to eat
6	G4S- 57	3.04	3.12	3.25	3.19	3.80	3.35	3.38	3.30	good flavor, thin skin, brown flesh
12	F2N- 10	2.67	3.79	3.67	4.08	2.90	2.92	3.09	3.30	mild flavor, dried peach flavor, unexciting, slight caramelized, large fruit size
14	F2S- 20	3.83	1.93	2.14	4.38	4.30	3.14	3.08	3.26	nice flavor balance, floral flavor, not appealing color, dull appearance, stringy flesh
5	G11N- 39	2.91	3.27	3.45	3.00	3.30	3.36	3.45	3.25	mild flavor, pretty standard flavor, brown flesh
9	D2N- 76	2.96	3.21	3.08	3.58	3.89	3.04	2.91	3.24	fruity, good flavor, slight acidic flavor, brown flesh, tough skin
3	French	3.17	3.25	3.33	3.17	2.91	3.58	3.18	3.23	fig flavor, peach flavor, fruity, gold/amber flesh
7	D15N- 80	2.93	3.64	3.31	3.50	2.73	3.29	3.15	3.22	mild flavor, looks good, thick skin, tough texture, slight caramelized flavor
10	D10S- 8	3.00	3.23	3.15	4.23	3.18	2.62	3.08	3.21	very sweet (2), dried leaves flavor, honey, dull sheen, large pit, dark flesh, tough skin
23	G3N- 52	3.08	3.38	3.31	2.25	3.67	3.08	3.17	3.13	date-like, sweet, citrus flavor, not as sweet as others, appealing orange/yellow skin color, too thick skin, large pit
4	G3S- 2	3.00	2.83	3.10	3.08	3.36	3.08	3.36	3.12	dried fig flavor, graham cracker flavor, dull color, maybe too soft, not bursting with flavor

RELATED STUDIES

Relationship between accumulated growing degree hours 30 days after full bloom and harvest date for “Improved French” prune

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 the future harvest date. To see if a similar relationship exists in dried plums/prune, the harvest dates of French collected at UC’s Wolfskill Orchard (Winters, Yolo County) and Kearney Research and Extension Center (Parlier, Fresno County) 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 2).

This relationship signifies that the spring temperatures in the first 30 days after full bloom govern fruit developmental rates and are a major factor in determining the harvest date in any given year. The relationship can be used as a tool, early in the season, for growers to estimate harvest date for French. This can be easily accomplished, 30 days after bloom, by going to the UC Fruit & Nut Research and Information Center web site- (<http://fruitsandnuts.ucdavis.edu>). Once there, select ‘Weather Services,’ then ‘Harvest Prediction Model.’ Select the location of your nearest California Irrigation Management Information System (CIMIS) weather station and enter the date of full bloom. The data that will be shown are the accumulated GDH during the first 30 days after bloom. Using this number, you can extrapolate from the figure below (Figure 2) and estimate how many days there will be 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’.

The prediction of this years Improved French harvest date using this method was estimated at August 15th at Wolfskill, approximately 150 days from full bloom to harvest. For Kearney the harvest date of French was predicted to be about August 18th , approximately 155 days from full bloom to harvest. This estimate was 8 and 6 days early, respectively, of the actual harvest at these locations. Actual harvest for Wolfskill was August 23rd and for Kearney August 24th. Dried plum growers had begun harvesting before our harvest date in the surrounding areas of both locations.

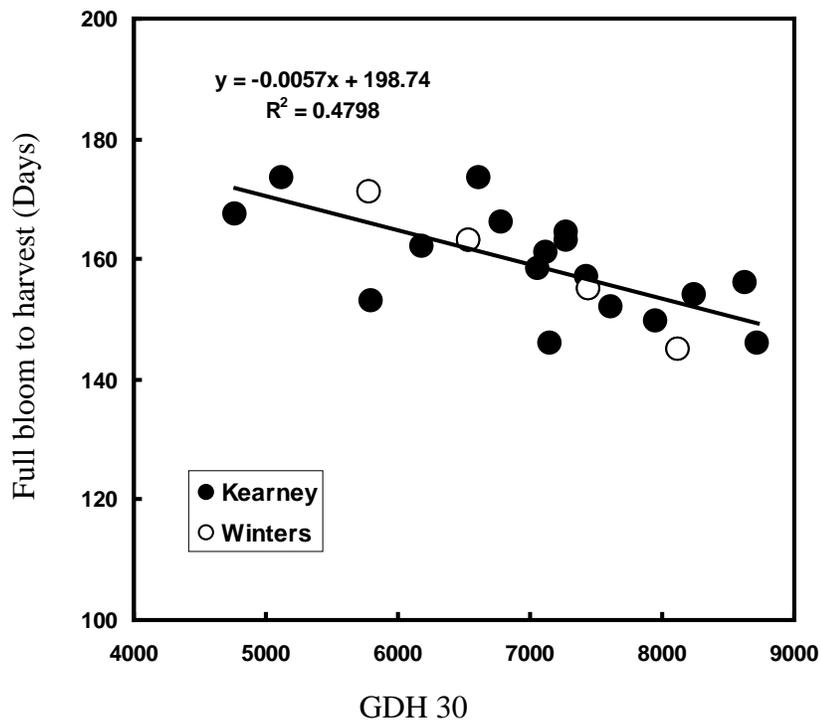


Figure 2. Relationship between growing degree hours (GDH) 30 days after full bloom and the number of days from full bloom to harvest for the cultivar ‘Improved French’ at Kearney and Winters.

DONATIONS

We would like to thank Duarte Nursery Inc, for the donation of nursery care of the program’s 2007 seedlings. We would also like to thank Pacific Western Container for donating the tree protectors for the 2007 seedling planting at Davis. Their generosity helps support UC research and the California dried plum industry’s goal in developing new dried plum cultivars for California.

REFERENCES

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