

DRIED PLUM CULTIVAR DEVELOPMENT AND EVALUATION

T.M. DeJong and S.J. Castro

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. This monoclone situation lends itself to vulnerability to widespread disease, pest outbreaks and annual, statewide variations in yield caused by variable weather conditions that can negatively or positively affect fruit set and/or fruit retention. In addition to the risks of a monoculture system, the entire industry harvests and dehydrates the crop within a few weeks since the entire crop has a similar developmental pattern. 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 California dried plum industry is also facing increasing marketing competition from other regions of the world and must seek ways to reduce production costs to stay competitive. Thus the industry would also benefit from the development of new dried plum cultivars that have cost saving characteristics such as improved tree structure that would require less pruning, improved fruit dry matter content that would decrease drying costs, and increased tolerance to pests and diseases. Introducing new dried plums that differ in flavor or color could also promote a broadening of the consumer base.

The Dried Plum (*Prunus domestica*) Development and Evaluation program has enlarged its germplasm and bred new generations of progeny through traditional horticultural breeding methods since its conception in 1985. Through thirty years of evaluation and selection, the breeding program has increased the occurrence 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 has matured and is now entering what we anticipate to be a very productive period for producing potential new cultivars that are specifically adapted for California growing conditions and markets.

In recent years we have increased our focus on tree and fruit characteristics that will be particularly helpful in reducing grower costs while improving the dried fruit products. To this end we have put a greater emphasis on evaluating tree structure and fresh fruit characteristics that may influence dry-away ratios and ease of dried fruit handling.

In several years during the last decade dried plum orchard yields have been low because of poor weather conditions for fruit set during the bloom period. The consensus is that this has been largely due to high temperatures during bloom. Since the California industry is composed of one cultivar, in some years the whole industry suffered with poor crops during the years of high temperatures during bloom. Because the time of pollination and fruit set is so critical, we have increased the evaluation of our seedlings and selections for

differences in bloom date. In doing so, new cultivars can potentially 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

Objectives:

- 1.) To develop new dried plum varieties, through traditional horticultural breeding methods, with the following characteristics:
 - Tree characteristics that reduce labor costs involved in producing dried plums.
 - Increased fruit quality and fruit characteristics that increase efficiency and quality of drying and processing.
 - Earlier or later bloom dates and tolerance to high temperatures during bloom.
 - Earlier/later fruit maturity dates than “Improved French” dried plum.
 - Increased tolerance/resistance to disease.
 - New specialty traits; with the dried product being equal or improved in quality to “Improved French”, but different in taste and/or color.
- 2.) Test and evaluate advanced selections resulting from the current breeding program at UC and grower locations in the Sacramento and San Joaquin Valleys.
- 3.) Cooperate Dr. Ralph Scorza (USDA Kearneysville WV) and Drs. Hartmann and Neumuller to obtain sources of Plum Pox (Sharka) resistance that can be incorporated into the breeding program.

PROCEDURES

Breeding methods, pollination procedures, seedling cultivation, and selection evaluation have not been substantially modified for several years. They were 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. The following is a brief description of our testing and evaluation procedures as a reference for the Results section of this report.

Levels of Testing

Field testing and evaluation of dried plum selections developed within this program are being carried out at four levels.

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 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 the Kearney Research and Extension Center in Parlier, CA and at the Wolfskill Experimental Orchards in Winters, CA.

Level 2 testing occurs in the selection blocks at Kearney and Wolfskill. Depending on the perceived potential of the individual selection, two to four trees of any one selection are established on commercial rootstocks. This level of testing is concerned with fruit characteristics and tree growth habit. 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. Individual selections are evaluated using specific criteria that match the goals of the program. These criteria must be achieved before advancing to Level 3. Therefore there are multiple types of Level 2 trees: those that have yet to fruit in the selection block; others that are still being evaluated and have the potential to advance to grower's orchards and others that are kept for germplasm and breeding purposes.

Level 3 testing involves the establishment of advanced selections in grower orchards in various locations. This level involves items that have been extensively tested in the selection blocks and are ready for more in-depth evaluation. Despite this, testing at this level is still somewhat preliminary since these plantings are the first instance in which selections are established in varying soil types and in varying climatic regions. Again, depending on the perceived value of the individual item, two to one hundred 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. In recent years we have increased our selectivity of trees advancing to Level 3 status. The specificity of criteria for new advanced selections is quite narrow and we have chosen to not promote trees to this level until we have confidence in the desirability of their structure, production and process-ability.

Level 4 testing involves the planting of extensive test acreage, usually of a single targeted selection. The size of these Level 4 plantings depends on the apparent potential of the individual selection and the level of risk that the cooperating grower is willing to assume. Ideally these plantings would be as large as 20-40 acres. At this level, thorough tests of process-ability and acceptability in the commercial market are conducted. These tests are designed to gauge the commercial value of the item prior to formal release. The promotion of items to Level 4 is based on the industry's input and feedback. When the California Dried Plum Board decides a selection is ready for such extensive testing, the University and breeders will develop a research agreement with the Dried Plum Board and the grower. Release of the selection for full-scale commercial production will be delayed until a decision by the Dried Plum Board is made concerning the suitability and desirability of the selection for further commercial production.

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 first twenty years of this project the University of California conducted the dried plum/prune breeding and evaluation program with joint support from 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 made substantial progress toward that goal with the development of Sutter and Muir Beauty, which have the potential to be harvested up to two weeks earlier than Improved French.

The process used in the final evaluation and release of Sutter and Muir Beauty 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. This assumed 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, 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.

Therefore we have developed a different 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 helped to develop a better process 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 or winter, 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 Dried Plum/Prune Testing Group is currently the primary group that will make recommendations to the California Dried Plum Board for initiating large-scale Level 4 commercial testing of new selections. The advantage for participation in this testing group is that growers and processors gain first-hand information on all new selections in the program on which to base future planting/marketing strategies, participate in test plantings, 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

Bloom Data

The importance of bloom data has grown in the last decade 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 Improved French is blooming the biological mechanisms for successful pollination and fertilization are negatively affected. Historically, the result has been low fruit set across

the state. Variation for time of bloom is naturally found within the breeding program's 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 Imp. French bloom. Similarly to last year's low chill winter, 2015 saw another low chill winter, creating a long bloom period with some trees having a spread bloom time. Despite adverse weather, most selection trees at our Winters and Kearney locations bore fruit. Because of high heat at bloom the Kearney crop was substantially lower than normal in some trees. But overall we were able to evaluate fruit on almost all selection trees at the Fresno county location.

Bloom data, including date of full bloom (90% flowers open), amount of bloom, and the first and final day of bloom have been recorded for all the Level 2-4 selections since 2003. Table 1 shows the number of days each top selection blooms, days before or after Improved French's full bloom as well as the number of days in bloom, the 90% full bloom date and the average bloom date relative to Improved French over the last 2-5 years when known.

Table 1. Bloom data at the Winters selection orchard for the 2015 top selections.

Item ID	2015 Full Bloom Date (90%)	Days in Bloom 2015	Days from Imp. French 2015	Average Days from Imp. French
G47S-61	9-Mar	12	-8	-10
H13S- 58	15-Mar	16	-2	-6
F11S- 38	6-Mar	11	-11	-18
G2S- 8	11-Mar	11	-16	-8
G47S- 4	15-Mar	16	-2	-10
G39S- 70	12-Mar	7	-5	n/a
G16N- 19	12-Mar	11	-5	-8
H10N- 38	17-Mar	12	-1	-3
Imp. French	18-Mar	12	+/-2	+/-2
G47S- 45	5-Mar	8	-12	-18
I6N- 83	8-Mar	7	-9	n/a
H8S- 75	12-Mar	14	-5	-7

Level 4 Testing

As of now, there are no active Level 4 selections. We would however recommend to the industry to start discussing the promotion G16N- 19 which consistently produces low dry away ratios and great processing qualities. As with any new cultivar, new drying and processing protocols would need to be developed upon the establishment of this item.

Selection G16N- 19 has looked very promising for the last five years. We feel the harvest time will be a good fit for the industry because it harvests a week or two after Improved French. The size is a little larger than Improved French. The fruit size from this tree will rarely dip below a D screen and has normal to extra-large A screen fruit (Table 2). The fruit does not soften very quickly, and can be harvested earlier, but the longer the fruit hangs on the tree, the lower the dry away ratio. In both 2010 and 2011 the fruit was tested for its sugar ratio, it has comparable levels of sorbitol to Improved French but also has more sucrose than Improved French (suggesting it will have better flavor). The tree structure of this selection is unique and pruning protocols would need to be established upon release of this tree. It's unique growing habit that might be compatible with a mechanical pruning or central leader type system. In spring 2015, three rows of nursery budded trees were planted in Winters to start testing its tree structure. Parts of the block will be trained for a central leader training system and the others for a traditional tree structure. More detailed evaluation of these three rows will continue as they mature.

This year, data was collected on the five G16N-19 trees that are bearing fruit. Our Kearney selection block has a tree on M40 rootstock, Marianna 2624 rootstock and Nemaguard rootstock. The Wolfskill selection block has trees on 29c and M40. All fruit looked comparable on the various plum rootstocks with peach rootstock. The fruit from the Nemaguard tree had lower sugar levels during the growing season and had odd looking fruit coming out of the dehydrator. Across the different trees bearing fruit, the sugar levels in BRIX ranged from 22-26 and dry away ratios ranged from 2.8-3.0. The trees were harvested 6 days after Imp. French at Kearney and 4 days after Imp. French at Wolfskill. Those harvest dates were selected because the fruit was starting to drop. In the future, harvest will be put off until 7-14 days after Imp. French in attempt to further lower the dry away ratio.

Dried fruit from 2014 was evaluated by some of Sunsweet's processing managers, the overall pitting assessment was positive, but more fruit is needed more conclusive evaluations. The 2015 fruit was pitted with an Ashlock pitter with reasonable results. Forty lbs of fruit from 5 different trees were evaluated for defects by the Dried Fruit Association (DFA) facility in Yuba City (Table 2). The fresh fruit was hand-picked, only discarding insect damaged and bird damaged fruit, so one might see more culls in a machine harvested setting.

Table 2. Dried Fruit Association's evaluation numbers performed on the 2015 crop of G16N-19 from Kearney and Winters.

	Test Base	MD 1-2	SEC 3	OMD 4-7	CULLS 8-10	CULLS 8-A	No of Prunes	Weight	Size	% of sample
A**	400	0	0	20	0	0	1585	35.89	44	89.5%
B	100	2	0	4	0	0	181	2.54	71	6.3%
C	100	0	0	3	0	0	101	1.2	84	3.0%
D	41	3	0	3	0	0	41	0.47	105	1.2%
Undersize								0.09		

** this category included 24% of the A screen fruit that were larger than size 40 and might not be able to be pitted by some processors.

Total Sample Weight: 40.1

In the 2015 harvest, G16N- 19 had some slight cracks during the harvesting process. This did not seem to show up in the DFA evaluation, but nevertheless these cracks are undesirable, so in 2016 we plan to pull the irrigation from the trees before harvest to better dry down the fruit and then shaker harvest the trees to see if this is indeed an issue. If these cracks prove to be a problem, some of the Level 3 items with low dry away ratio fruit can be promoted to Level 4 to take its place.

Level 3 Testing

Level 3 testing items are selections that are ready for small trials in grower's orchards. We have chosen to only promote selections to Level 3 status when the tree has proven to meet specific criteria over multiple years. This has limited the number of active Level 3 selections. We only plant trees in grower's orchards when we are fairly confident in their fruit and tree quality. The top selections that are now at Level 3 are G47S- 61, H13S- 58, and H10S- 38.

Table 3. Level 3 selection performance for 2015 at university selection blocks. 'Days from French' refers to the difference between the Imp. French harvest date and the harvest date of the selection at the same location. The harvest date listed is specific for locations where samples were collected.

Date	Days from French	Name	Dry away ratio	Dried Count per lb.	Weight (g/frt)	Press-ure	Sugar in Brix	Comments
7/13	-27	F8N- 68	3.2	30.0	54.8	1.7	22.4	Not for commercial use, for gourmet fresh or dried
7/13	-27	F11S- 38	2.1	53.6	20.4	2.6	34.2	Dried on the tree, low dry away ratio
7/27	-13	G47S-61	2.6	39.6	30.7	4.8	24.7	Dense flesh, bushy tree
8/3	-7	H13S- 58	2.6	52.9	22.4	5.8	24.0	Long pit, good dried qualities for such a low dry away ratio
8/7	0		2.4	46.1	27.5	3.3	30.2	
8/25	+18	H10N-38	2.7	43.7	28.9	7.1	25.8	High pressure flesh will not soften,

G47S-61: This is the second year this fruit has looked good. It has a French shape with very dense flesh when fresh, so the fruit does not lose very much size upon dehydration giving it a low dry away ratio. In 2015 we saw a few weak pits. This will be monitored in 2016. The ability to self-pollinate has not been tested, so that will be determined this spring by caging the tree. The bloom time for the last few years has been 10 days before Imp. French.

H13S-58: This is a good tasting dried fruit with a low dry away ratio. It is a yellow fresh fruit that can be a little astringent if picked too early. The high sugars are usually due to the fruit starting to dry on the tree before harvest. This was its second year of evaluation. The ability to self-pollinate has not been tested, so that will be determined this spring by caging the tree, the bloom time is usually 6 days before Imp. French.

H10N- 38: This is the second year this tree has looked promising. It harvests at a high pressure because the fruit does not soften very much before harvest maturity. It has a low dry away ratio and good dried fruit characteristics. This is a very late harvesting selection, the industry will need to determine if it is too late. The tree structure looks fairly bushy, so if promising in 2016 we will have this selection nursery budded to further evaluate the tree structure. The ability to self-pollinate has not been tested, so that will be determined this spring by caging the tree. The bloom difference between this item and Imp. French is only three days. This might not seem like much, but sometimes just a few days difference is all that is needed to have successful fruit set, instead of a crop failure.

F11S-38 has an extremely low dry away ratio, usually around 2.0-2.5. This item has unusually low fresh moisture content, and thus will need less drying time or lower drying temperatures than Improved French. The industry has stressed the importance of any new cultivar needing to have a low dry away ratio. Despite the fact that the program has increasingly more low dry away ratio plum selections, this tree was the first of many that has good dried characteristics while also having an extremely low dry away ratio. We feel a thorough processing and field trial test of this fruit would be beneficial in establishing a cultivar that would drastically cut costs for growers. For more information about this selection see reports from 2012 and 2013. This tree was caged in 2012 and was able to pollinate itself.

F8N- 68 is a large purple fruit with excellent fresh and dried scores. It has been tested multiple years and always sets a heavy crop of large fruit. This selection would be recommended only for a grower who desire to develop a diversified market where gourmet type fruit could be sold. This tree has never been tested for it's ability to self-pollinate, so that will be determined this spring by caging the tree.

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. Once the tree has matured and has started producing fruit, the whole tree and fruit characteristics are evaluated. Table 4 shows the harvest data of the top Level 2 selections this year. This is a very exciting time in our program where many of our Level 2 trees are starting to bear fruit

in the selection block. Since 2012, the increase of selections in Winters and Kearney have made for a lot of evaluations during harvest. These evaluations are important to determine if the promising characteristics observed in Level 1 seedlings transferred over to the grafted Level 2 trees in the selection block. Only three of the 10 trees in Table 4 were evaluated in 2014; notice the low dry away ratios in all Level 2 selections. With many of these low dry away ratios, there is a tendency for the fruit to dry on the tree and have dense fruit flesh. These characteristics will likely change how pressure is used as a harvest indicator in the future.

Table 4. 2015 Level 2 selection performance in University blocks. 'Days from French' refers to the difference between the Imp. French harvest date and the harvest date of the selection at the same location. The harvest date listed is specific for locations where samples were collected.

2015 Test Date	Days from French	Name	Dry away ratio	Dry Size ct/lb	Weight (g/frt)	Pressure	Sugar in Brix	Notes
7/6	-32	G41N- 27	2.8	40.4	30.2	4.0	27.9	Previous top item. Thick flesh, white scab seen 2015
7/27	-13	H15N- 28	2.7	42.1	30.6	2.8	26.6	Slight neck on pit, good dried scores, tough skin
7/27	-13	G39S- 70	2.2	48.1	19.5	5.0	33.2	Bushy tree, high sugars
8/3	-7	G47S- 45	2.5	43.9	21.0	4.7	28.8	Good sugar, tough flesh
8/7	0	H20S- 58	3.0	36.3	36.9	2.6	25.5	Fairly large pit, good tasting
8/10	0	H7S- 1	3.0	44.5	31.2	5.7	24.4	Doesn't soften, harvested when dropping
8/10	0	I6N- 83	2.2	32.4	43.2	11.8	31.2	Fruit dries on tree, does not soften
8/10	0	H8S- 75	2.3	39.1	28.1	7.8	30.7	Good dried characteristics
8/10	0	H13S- 65	2.8	47.8	25.4	3.8	26.4	Promising new item
8/13	+6	G21N- 20	2.9	42.8	33.6	3.4	21.2	Large and round fruit, good tasting
8/17	+7	G47S- 4	2.7	56.3	21.3	6.3	22.1	Dense & crunchy when ripe, mixes well with Imp. French

G47S- 4: Despite this being its first year of selection block evaluation, this tree is very promising. The fruit looks very similar to Imp. French with a high sugar content and low dry away ratio. The fresh fruit of this tree looks different than French, the flesh is very dense and almost crunchy at harvest. We still have a lot to learn about this tree, but it appears very promising.

G39S- 70: This fruit has one of the best dry away ratios in the program. The low dry away ratio combined with its good dried scores makes it a very promising selection as a future cultivar or to use as a breeding source. Adoption of such a low dry away ratio item would take extra trials and testing on how to best handle and process such a unique item.

H15N- 28: Is a promising selection with good fresh and dried scores. The dry away ratio this year was 2.4 & 2.7 at our Kearney & Winters locations, respectively. The harvest ranged from 13-3 days before Imp. French. Since this is its first year of evaluation, we still have a lot to learn about this tree, more specifically the ideal harvest date. The structure of the grafted selection tree is fairly upright, so we will see how the tree handles a large amount of fruit in 2016.

G47S-45: Has a dry away ratio of 2.4, and good dry tasting evaluation scores. We have observed a few split pits, so that will continue to be monitored. The tree structure looks strong with good branch angles. This fruit is small when it is fresh, but has a good count per pound when dry due to its dense flesh and low water content.

H8S- 75 Last year this tree produced a few fruit and the fruit looked good again this year. This year was the first year it produced enough fruit to be dried. In 2014 it had a sugar BRIX of 28 and this year it was 30.7. It had a dry away ratio of 2.3, and good dried scores. The fresh fruit has an odd shape, but this is not noticeable in the dried fruit. The pit tends to have a slight neck on the stem end, we will continue to monitor this in 2016.

H13S- 65 Is a new selection with good dried evaluations from our Winters block. It had a dry away of 2.8 and a BRIX of 26.4. The Kearney tree had low sugar, so this issue will continue to be monitored. Fruit from both trees had low dry away ratios, purple fresh skin, and small, free pits.

Level 1 Testing

Level 1 testing evaluates the young seedling trees 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 for thinning. Fruit samples of 250 trees were taken from the Level 1 seedling blocks for fresh evaluations. Of those, 158 samples were dried and processed for the rehydrated in-house tasting evaluation in October. Thirty-four of the 158 items were chosen to be grafted into the selection blocks. Table 5 shows the harvest data of the top 34 seedlings evaluated at Level 1. Twenty-three selections listed in Table 5 will be grafted into both selection orchards for further potential cultivar evaluation. Eleven items were selected from the seedling block for breeding, these germplasm selections all contain fruit traits that are comparable or superior to the breeding germplasm currently used in Winters and Kearney. The items selected this year have substantially lower dry away ratios than we have seen in the past. This is the result of continued development of an advanced prune germplasm collection that has enabled selection of parent genotypes to create new selections that can substantially improve fruit dry away ratios and potentially impact grower profitability.

Table 5. 2015: Harvest data for advanced selections in Level 1 testing at Davis.

Test DATE	Days from French	ITEM ID	Dry Away Ratio	Dry size count/lb	Weight (g/fruit)	Pressure	Sugar in BRIX
7/21/15	-24	H18S- 60	2.9	55.5	23.6	3.3	24.1
7/21/15	-24	H18S- 75	2.9	50.0	27.7	3.8	23.6
7/22/15	-23	I11N- 63	2.8	57.3	24.2	2.7	24.4
7/22/15	-23	I11N- 9	2.8	36.1	22.7	3.9	25.0
7/28/15	-17	H16N- 67	2.2	29.6	43.0	2.6	33.4
7/29/15	-16	I7N- 58	3.0	39.4	36.5	3.8	21.8
7/31/15	-15	H3N- 30	2.4	52.8	24.0	5.7	23.9
8/2/15	-13	H8S- 29	2.3	35.8	33.8	5.2	28.1
8/4/15	-11	H13S- 18	2.5	64.3	18.4	2.4	30.3
8/4/15	-11	H14N- 48	2.5	33.7	38.2	3.1	26.8
8/4/15	-11	H17N- 62	2.7	45.6	29.3	3.9	28.3
8/4/15	-11	H18S-50	3.1	57.2	25.9	3.4	24.4
8/5/15	-10	H19N- 21	2.9	65.0	22.1	3.0	24.0
8/5/15	-10	H19N- 99	2.4	64.0	18.5	3.2	27.8
8/6/15	-9	I9S- 50	3.0	39.8	34.9	1.2	25.2
8/18/15	3	H7S- 12	1.9	44.8	21.3	7.3	36.5
8/19/15	4	H15S- 38	2.9	63.3	23.4	4.1	26.3
8/19/15	4	H11N- 66	3.1	72.7	21.0	4.8	24.5
8/19/15	4	H11N- 80	2.4	60.4	21.5	4.9	29.6
8/25/15	10	I7N- 52	3.0	47.6	27.9	4.6	24.3
8/26/15	11	H11N- 87	2.8	51.1	24.1	6.3	25.1
8/26/15	11	H15S- 71	2.3	39.1	25.3	6.6	24.1
8/26/15	11	H17N- 78	2.5	42.0	25.9	7.8	27.9
7/28/15	-17	H13N- 15*	2.8	42.8	31.0	3.8	22.3
7/29/15	-16	I3S- 43*	1.8	51.0	20.7	1.9	32.3
8/4/15	-11	H16N- 4*	2.2	42.3	26.7	3.9	33.7
8/5/15	-10	H12N-102*	2.3	29.6	30.6	6.4	25.1
8/6/15	-9	I6S- 56*	3.0	64.9	22.3	3.5	24.0
8/11/15	-4	H15S- 45*	2.7	44.1	29.8	4.4	26.0
8/11/15	-4	H9N- 8*	3.0	27.9	49.5	6.2	26.7
8/12/15	-3	H1S- 67*	3.0	71.6	21.0	5.1	22.4
8/19/15	4	I5S- 58*	3.0	64.6	18.9	4.2	21.7
8/19/15	4	H12N- 23*	2.1	39.9	26.0	3.7	37.1
8/26/15	11	H15S- 10*	2.5	42.3	32.5	5.9	24.8

*Item chosen for breeding purposes only.

Levels Summary

In 2011 the program was challenged to aggressively pursue reducing grower input costs by reducing the dry away ratio and reducing the costs of pruning through new cultivar development. This program has responded to the challenge and nearly all of our top Level

2 and Level 3 items have a dry away ratio of less than 3.0. In doing this, the program has bred new selections that could save California growers money by reducing the cost of dehydration. Items F11S- 38 and G39S- 70, with their dry away ratio of 2.0, are examples of selections that could dramatically reduce the cost of drying however the industry will have to decide if it can handle dealing with such unique items. Extra tests need to be performed to determine the best drying times and temperature for fruit that have already lost a significant portion of their water content by harvest time.

In regards to cost savings through pruning less, the three new rows of G16N-19 are an example of the program looking into new training systems and/or a mechanically pruned system in order to save growers' money with the new selections. We look forward to further testing the even newer selections such as H10N- 38, G47S- 4, G47S- 61 and H13S- 58. All four selections have dense fruit and will slightly dry on the tree. Thus they all have low dry away ratios while still having a pleasant taste after dehydration. It is a very exciting time in our breeding program where we have many trees of promise.

Program Inventory

All the seedling blocks are located in the UC Davis campus research orchards (Table 6). In the summer of 2015, over 800 seedling trees were discarded after evaluation of the seedlings showed negative fruit or tree characteristics. Crosses were made in spring of 2014, the seeds were germinated in January 2015; unfortunately, many of the seedlings died in the greenhouse due to damping off. The surviving trees were potted and will spend 2016 in the screen house at the UCD pomology headquarters. They will then be planted along with the 2015 seedlings in the J block, in fall, 2016. The inventories of selections at each level of testing were re-inventoried and 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 was separated into two categories, breeding and germplasm. The breeding trees are actively being used for breeding whereas the germplasm items are old selections or cultivars collected from other programs that have negative characteristics that prevent them from currently being used in breeding. There is value in preserving them in our germplasm collection to keep the species-wide germplasm diversified; they may someday be important parents for future generations.

Table 6. Seedling block inventories for 2015 located in the Davis UC research orchards.

Block	Acres	Year Planted	Seedlings Planted	Seedlings Remaining	Advanced Selections
H	3	2005- 2008	4,083	1,224	98
I	3	2008-2012	2,656	2,382	12
J	4	2013-cont.	2,698	2,698	
Seeds		2015		(2452) ^c	
Totals	11		9,437	6,304 ^d	

^cnumber of seeds in stratification for 2016 planting

^dnot including seeds

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

Level of Testing	Number of Items	Number of new 2015 additions
Level 1	6,304	50 (~ 2452 seeds)
Level 2	116	24
Level 3 & 4	7	3
Fresh Items	12	1
Breeding Items	90	11
Germplasm Items	117	2

Disease Screening

This year, the dry winter and warm spring weather did not promote very much disease pressure. Therefore no statistical data was collected on brown rot. If we saw any hits of brown rot in the seedling block, the individuals with those hits were rogued from the program. There were also very few incidences of scab in our orchards this year, nonetheless, a few selections were evaluated for scab. If an item showed either scab or brown rot it was noted and the item was marked as more susceptible than the general population. Any genotypes documented as being more sensitive to scab than Improved French were discarded.

Dried Plum/Prune Testing Group Evaluations

The Dried Plum/Prune Testing Group met in July this year at the Wolfskill Experimental Orchards to discuss 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. Starting in 2011, the November meeting was moved to combine with the Dried Plum Research and Workgroup meeting in December. This was done to help reduce travel for those located far from Davis. The workgroup evaluated our top 15 selections and the results of this tasting are located at the end of this document (Table 9). Table 8 provides details on the fresh and dried characteristics of each of the selections chosen for the December taste testing.

Table 8. The characteristics of the fruit for the selections shown at the Dried Plum/Prune Testing Group meeting in December 2015.

Tasting #	Days from French (site specific*)	Name	Location	Rootstock	Level	Dry away ratio	Dry size count/lb	Weight (g/fruit)	Pressure	Sugar in BRIX	Comments
1	+4	18S- 38	seedling block	own root	1	2.9	38.6	35.9	3.5	25.2	Compact tree, yellow fresh color
2	+11	H11N- 87	seedling block	own root	1	2.8	51.1	24.1	6.3	25.1	Late harvest, purple fresh color
3	-23	111N- 63	seedling block	own root	1	2.8	57.3	24.2	2.7	24.4	Early harvest, semi free pit
4	+7	G47S- 4	Winters	29C	2	2.7	56.3	21.3	6.3	22.1	Mixes well with Imp. French
5	-13	G39S- 70	Winters	M40	2	2.2	48.1	19.5	5	33.2	Will dry on the tree, low dry away ratio
6	-13	H15N- 28	Winters	29C	2	2.7	42.1	30.6	2.8	26.6	Good looking, upright tree
7	-4	G47S- 45	Winters	M2624	2	2.5	43.9	21	4.7	28.8	small dense fresh fruit with low dry away ratio
8	0	H8S- 75	Winters	29C	2	2.3	39.1	28.1	7.8	30.7	odd shaped pit, good dense flesh
9	0	H13S- 65	Winters	29C	2	2.8	47.8	25.4	3.8	26.4	Nice purple fruit
10	-27	F11S- 38	Winters	M40	3	2.1	53.7	20.4	2.6	34.2	Lowest dry away ratio
11	-27	F8N- 68	Winters	M40	3	3.3	30.1	54.8	1.7	22.4	Gourmet, special market item
12	-13	G47S- 61	Winters	M2624	3	2.6	39.6	30.7	4.8	24.7	Looked good the last two years
13	0	H13S- 58	Kearney	M2624	3	2.4	46.1	27.5	3.3	30.2	Pretty yellow fresh fruit
14	+18	H10N- 38	Kearney	M2624	3	2.7	43.7	28.9	7.1	25.8	Very late harvest
15	+6	G16N- 19	Kearney	Nema		3.3	54.4	28.9	3.8	22.1	
				M40		2.8	39.7	38.3	4.8	26.2	
				M2624	4	3	50.5	29.5	3.7	24.7	Next year will harvest 10-14 days after Imp. French. Dried at
				M40		3	50.8	29.5	3.8	22.1	Sunsweet dryer in Winters
00	+6	Imp. French	Kearney	M40	4	2.8	45.9	30.6	3.2	25.3	
						3.0	51.0	26.7	2.4	24.4	Industry standard

Table 9. Results from the industry tasting conducted by 18 members at the California Dried Plum Board annual meeting in December. Table listed by tasting number, comments are a compilation of responses.

Tasting order	Item Name	Flavor	Skin Color	Skin Quality	Fruit Size	Pitting Quality	Flesh Color	Flesh Texture	n	Comments
1	I8S- 38	4.5	4.2	3.8	4.5	4.0	4.4	4.1	18	smooth nice fruit, caramel notes, tough
2	H11N- 87	3.4	4.0	3.4	3.7	3.4	3.6	3.5	18	tapered pit, cling pit, super sweet, creamy texture
3	I11N- 63	3.1	3.8	3.5	3.2	3.1	3.6	3.3	18	little bland, skin tough, crescent shaped pit, small
4	G47S- 4	3.5	4.2	3.4	3.5	3.1	3.8	3.7	18	tough skin, good fresh plum notes, dark color flesh on some
5	G39S- 70	2.5	3.3	3.3	2.6	2.4	3.2	3.3	18	dark flesh, small round, cooked flavors, not great tasting
6	H15N- 28	3.4	4.1	3.8	4.3	2.3	3.8	3.7	17	spice notes, pit somewhat cling, big pit, good
7	G47S- 45	3.0	3.6	3.1	3.8	2.4	3.2	3.0	18	mild flavor, tough skin, chewy texture
8	H8S- 75	3.2	3.6	3.5	4.1	2.1	3.5	3.1	18	dense meat, sharp pit, tart finish, mild flavor
9	H13S- 65	3.6	3.9	3.7	4.0	4.2	3.8	3.8	18	free pit, sweet & tart, nicely balanced, like it
10	F11S- 38	2.9	3.3	3.7	3.2	3.1	3.6	3.5	18	tart, tangy, awesomely tart
11	F8N- 68*	3.6	3.6	3.2	3.4	3.1	3.8	3.6	18	too large, spectacular tasting, too soft, not processable
12	G47S- 61	3.1	4.1	3.4	3.7	4.3	3.2	3.3	18	soft skin, too crunchy flesh, too cling? Stems attached
13	H13S- 58*	2.8	3.6	3.1	3.9	3.3	3.6	3.3	18	soft skin might not process, pit maybe cling, odd taste
14	H10N-38*	3.6	3.6	3.5	3.8	3.6	3.6	3.4	17	good, soft texture, fruity & caramel notes, tart
15	G16N- 19*	4.3	3.8	4.0	4.2	3.3	4.1	4.1	17	good flavor, chewy, good balance
0	Imp. French	2.8	3.3	2.9	3.4	2.9	2.8	2.9	9	standard, dark flesh, sweet & tart balance

DONATIONS

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

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