

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. This monoclinal 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/late 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. Chris Dardick (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 Wolfskill and Kearney. 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. 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. Bloom set was reduced in two of the last five years in specific areas of California due to low chill winters. The 2016 statewide crop was one of the lowest we have seen in years, but that conversely was not due to low chill but was due to persistent storms at bloom. Regardless of the reason for a specific year's crop failure, the need for a spread in bloom remains essential for industry-wide success in maintaining crop security from year to year.

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 bloomed, 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 2017 top selections.

Item Name	2017 Full Bloom Date (90%)	Days in Bloom 2017	Days from Imp. French 2017	Average Days from Imp. French
G37S- 45	14-Mar	9	-5	-6
F11S- 38	16-Mar	9	-3	-10
G43S- 15	15-Mar	11	-4	-7
H13S- 65	13-Mar	12	-6	-10
H13S- 58	19-Mar	11	0	-4
H21N-101	12-Mar	11	-7	-9
H9S-27	15-Mar	7	-4	-6
H16N- 83	15-Mar	11	-4	-10
H3S- 70	14-Mar	15	-5	-9
H18N- 42	15-Mar	13	-4	-8
G21N-20	20-Mar	11	+1	+2
H7S- 1	19-Mar	9	0	0
H10N- 88	12-Mar	9	-7	-9

Level 4 Testing

As of now, there are no active Level 4 selections. However, we did recommend to the industry the advancement of H13S- 58 to large scale testing in 2018. It has a very low dry away ratio, wide harvest window, partially dries on the tree, self-pollinates, and harvests with or after Improved French (Table 2). Historically, this fruit has an average dry away ratio of 2.5 but can get as low as 2.2. Currently, there are about 70 nursery budded trees available for grower planting trials this year. This program recommends that if this selection is promoted to Level 4, we should test it again for self-pollination and complete more pitting tests when adequate crop becomes available. This year, the tree at Wolfskill was harvested over a period of three weeks, stripping isolated branches week by week. At the CDPB meeting in December, tasting participants were asked to guess the harvest dates for each week by taste alone. Only 4 out of 13 participants were able to guess this correctly. The reason the tree was harvested over three different weeks was to determine the best harvest timing; the fruit can hang remarkably well on the tree, and does not soften like a typical Improved French. The results from the tasting confirm the wide 3 week harvest window. As the fruit matures, it tends to dry on the tree, thus making the fruit firmer and sometimes even making the fruit pressure rise. After drying all the fruit at the UC Davis pilot plant, the fruit from each harvest date was combined and run through a commercial Ashlock pitter. The pitted fruit was beautiful and seemed to be able to withstand that type of pitting process.

Table 2. 2017 Harvest data for Level 4 candidate H13S-58.

Harvest date	Location grown	Days +/- French	Weight (g/frt)	Pressure	Sugar in Brix	Dry away ratio	Dry count per lb.	Comments
8/10/17	Kearney	-6	29.6	4.3	26.0	2.4	40.4	Harvested too early
8/31/17	Kearney	+15	26.2	3.0	31.2	2.2	41.1	Harvested slightly late
8/21/17	Winters	+1	23.2	4.4	24.0	2.5	49.2	Harvested 1/4 of tree by picking an entire branch
8/28/17	Winters	+8	21.7	5.4	27.9	2.7	61.1	Harvested 1/4 of tree by picking an entire branch
9/5/17	Winters	+16	20.0	6.1	30.9	2.5	53.3	Harvested remainder of the fruit

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 selection at Level 3 is H13S- 58. Previous top items such as H8S-75, G26N-8 and H5N-83 were removed from their Level 3 & 2 status because their pollen was not self-compatible. So after losing those promising items, we have promoted G37S- 45 and G43S-15 to Level 3.

Table 3. Level 3 selection performance for 2017 at university selection blocks. ‘Days from French’ refers to the difference between the Imp. French harvest date (8/16 at Kearney and 8/20 at Winters) and the harvest date of the selection at the same location.

Harvest date	Item Name	Location grown	Days +/- French	Weight (g/frt)	Pressure	Sugar in Brix	Dry away ratio	Dry count per lb.	Comments
7/19/17	G37S- 45	Kearney	-28	28.3	4.3	20.0	2.8	47.4	Harvested too early at Kearney, wide branching tree
8/21/17	G37S- 45	Winters	+1	25.4	5.8	26.7	2.4	45.4	
8/31/17	G43S- 15	Kearney	+15	32.7	3.2	27.0	2.3	32.3	Fruit size might be too big for processing
8/28/17	G43S- 15	Winters	+8	32.4	5.1	26.3	2.7	37.8	
8/31/17	H13S- 65	Kearney	+15	30.3	2.7	23.0	2.9	45.0	Self-compatible, but should be retested
8/28/17	H13S- 65	Winters	+8	28.8	3.5	24.4	2.6	37.8	
8/31/17	H13S- 58	Kearney	+15	26.2	3.0	31.2	2.2	41.1	Wide harvest window, yellow fresh color, (see Table 2).
9/5/17	H13S- 58	Winters	+16	20.0	6.1	30.9	2.5	53.3	

H13S-58: This top item is an offspring of open pollinated D2N- 76, which was a former top item. 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 fourth year of evaluation and complete current-year data can be seen in Table 2. In 2016 it was caged, and was determined to be self-pollinating. Bloom time is typically 4 days before Imp. French and harvest ranges from -3 to 16 days after Imp. French. Expansion plantings of H13S-58 were started in 2016, so extra of fruit of this selection will start to be evaluated as early as 2018.

H13S- 65 is a sibling of H13S- 58. This good looking tree was caged this year and had a low fruit set. So it is likely self-pollinating, but will need to be retested. Fruit is medium-large with low dry away ratios (2.7-2.9), purple fresh skin, thick flesh and small, free pits. The tree has an upright and spreading structure that could help reduce pruning as compared to Improved French.

G37S- 45 was grafted into the seedling blocks in 2012. This year it looked really good with a low moisture fruit and small pit. It has historically had a low dry away ratio 2.6, 2.5, and 2.0 in 2014, 2015 and 2016 respectively. It has had some mediocre dry evaluations in the past for skin peel, but this year looked really good. The tree structure is wide and spreading, it will be grafted in a commercial nursery this year so the program can start to determine the best way to prune and manage its structure. The tree at Wolfskill was harvested this year, and all fruit was dried at the Sunsweet drying facility in Winters, CA. The fruit was then rehydrated and pitted in an Ashlock pitter. The dried, pitted fruit looked very similar to the Improved French pitted at the same facility.

G43S-15 is a tree that was grafted over to the selection blocks in 2012. It harvests 7-13 days before Improved French. It is a product of a cross between D4N-46 and Muir Beauty. Over the years it has had low dry away ratios of 2.9, 2.8, and 2.5 in 2014, 2015, and 2016 respectively. The main concern with this selection is that it may be too large for some pitting operations. This year it had a medium to light crop, so we anticipate with a heavier crop, the fruit will be slightly smaller.

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 since many of our newer 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. With many of these fruit with 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. 2017 Level 2 selection performance in University blocks. ‘Days from French’ refers to the difference between the Imp. French harvest date (8/16 at Kearney and 8/20 at Winters) and the harvest date of the selection at the same location.

Harvest date	Item Name	Location grown	Days +/- French	Weight (g/frt)	Pressure	Sugar in Brix	Dry away ratio	Dry count per lb.
7/11/17	H21N-101	Kearney	-36	25.5	0.9	32.1	2.4	55.5
8/21/17	H18N- 42	Winters	+1	22.3	2.8	29.9	2.5	55.1
8/21/17	H9S-27	Winters	+1	20.6	5.1	28.8	2.4	52.5
8/21/17	H16N- 83	Winters	+1	37.7	3.7	24.9	2.6	31.2
8/22/17	H3S- 70	Winters	+2	21.4	4.1	22.5	3.0	68.9
8/28/17	G21N-20	Winters	+8	27.8	4.9	24.2	2.9	41.6
9/5/17	H7S- 1	Winters	+14	27.1	6.7	32.4	2.4	37.9
9/6/17	H10N- 88	Winters	+15	31.0	4.4	28.3	2.4	34.6

H21N- 101 This tree produces fruit that will dry on the tree and is ready for harvest a full month or more before Improved French. It was so early that the dehydrator was not set to run when the fruit was ripe at Winters. The fruit has low dry away ratios and has a great dried taste especially for its early harvest and drying on the tree nature. This tree has many great attributes, but will probably not be suitable for the industry because of its harvest timing.

G18N- 42 was spotted in the seedling block by Joe Turkovich in 2013 and had enough fruit for evaluation this year. It should not be long pruned because it produces fruit on first year wood. The

fruit tends to dry on the tree, creating a dry away ratio of 2.5 this year. It had a really good dried evaluation this year.

H9S-27 was grafted into the selection block in 2014. This is its second year of evaluation in the selection block. It has stood out because of its low dry away ratio in 2016 of 2.4. The fruit is slightly small, but comparable to Imp. French.

H16N-83 was a Level 2 item last year. It had a dry away ratio average of 2.8 in the last three years. It had a burnt flavor after drying last year, but had no problems this year. So in order for this tree to be promoted, the drying times would need to be thoroughly evaluated. The tree looks to be spur bearing and the fruit is not set in clusters which are all good structural attributes for commercial production.

H3S-70 was grafted into the selection block in 2014; it was selected for its excellent thick skin. This is the first year of selection block fruit evaluation. The fruit harvested a few days after Imp. French and had a dry away ratio of 3.0.

G21N- 20 consistently looks good from year to year. The tree is small and spreading and has great looking round purple fruit. The dry away ratio is acceptable, but with other items having lower dry away ratios this tree might not get promoted due to the 2.9 dry away.

H7S-1 and H10N-88 both harvest significantly later than Improved French and have low dry-away ratios. They have not been in production long enough to draw conclusions but both show promise and will continue to be evaluated.

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 medium to heavy crops and minimal thinning was done. Fruit samples of 129 trees were taken from the Level 1 seedling blocks for fresh evaluations. Of those, 103 samples were dried and processed for the rehydrated in-house tasting evaluation in October. Forty-one of the 103 items were chosen to be grafted into the selection blocks. Table 5 shows the harvest data of the top 33 Level 1 seedlings. All items listed 'Dried' in the 'Fruit Type' column of Table 5 will be grafted into selection orchards for further potential cultivar evaluation. Seven 'gourmet' items were selected from the seedling block for their unique fruit characteristics. These gourmet types will be grafted at a bare-root nursery for future evaluation. Many fruit from items selected in the last few years have substantially lower dry away ratios than we have seen in prior years. 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. 2017: Harvest data for advanced selections in Level 1 seedling testing at Davis arranged by date. Improved French harvest date for that block was 8/25/17. 'Fruit type' describes if the fruit is deemed acceptable for standard commercial use, or for a specialized gourmet market.

Harvest date	Item name	Days +/- French	Weight (g/frt)	Pressure	Sugar in Brix	Dry away ratio	Dry count per lb.	Fruit type
7/6/17	J8N- 197	-50	39.1	5.1	22.0	2.8	42.4	Gourmet
7/18/17	I1S- 39	-37	26.4	3.8	23.2	2.9	51.7	Dried
7/30/17	I15S- 33	-26	30.8	4.4	24.8	3.0	50.9	Dried
8/8/17	J1S- 96	-17	30.0	5.0	26.5	2.7	42.8	Dried
8/8/17	J1S- 54	-17	21.6	5.8	24.2	3.1	69.3	Gourmet
8/10/17	I13N-18	-15	28.0	2.7	22.1	3.0	49.9	Dried
8/10/17	I11N- 4	-15	21.6	1.8	24.2	2.8	56.9	Dried
8/10/17	I6N- 69	-15	25.2	6.4	21.4	3.1	46.0	Dried
8/10/17	I12N- 50	-15	23.6	5.0	22.1	2.3	38.9	Gourmet
8/11/17	I7N- 5	-14	26.5	6.0	32.5	2.0	41.4	Dried
8/11/17	I9N- 73	-14	26.8	2.8	26.7	2.4	51.8	Dried
8/11/17	I7S- 29	-14	26.7	4.1	20.6	3.0	54.3	Dried
8/11/17	J3N-140	-14	34.2	3.8	23.5	2.9	42.5	Dried
8/11/17	J3S- 60	-14	24.0	2.4	25.7	2.6	53.1	Dried
8/15/17	I4N- 6	-10	29.9	2.7	23.7	2.9	46.3	Dried
8/15/17	J4N-189	-10	38.1	5.2	24.0	2.8	33.5	Dried
8/15/17	J6N- 174	-10	25.6	6.0	25.3	2.6	48.8	Dried
8/15/17	J6N-124	-10	25.2	4.5	22.3	2.9	50.8	Dried
8/15/17	J7N-116	-10	24.4	5.2	25.1	2.7	57.7	Dried
8/15/17	J6N- 118	-10	34.0	6.5	24.2	2.6	30.3	Dried
8/15/17	J4N-176	-10	23.7	3.4	29.3	2.8	70.0	Gourmet
8/15/17	J6S- 37	-10	17.5	4.7	22.7	2.8	72.1	Gourmet
8/15/17	J7N- 112	-10	30.4	4.5	27.3	2.3	35.1	Gourmet
8/23/17	I14N- 23	-2	25.3	4.9	23.8	3.0	57.0	Dried
8/23/17	I14N- 31	-2	20.5	2.1	26.4	3.0	72.5	Dried
8/23/17	I5S- 27	-2	33.4	5.1	26.7	2.7	37.7	Dried
8/23/17	I14S- 28	-2	20.7	5.0	26.6	2.4	52.9	Dried
8/24/17	I2S- 44	-1	25.2	3.6	23.8	2.9	50.0	Dried
8/24/17	J3N- 110	-1	28.9	2.2	27.0	2.7	47.9	Gourmet
8/29/17	I12N- 78	+4	24.8	5.9	29.7	2.5	47.5	Dried
8/29/17	I14S- 52	+4	41.9	4.4	26.7	2.3	24.4	Dried
8/29/17	I14S-58	+4	31.2	5.5	24.5	2.9	44.8	Dried

8/29/17	I12N- 46	+4	28.5	7.0	28.1	2.6	41.5	Dried
8/29/17	J2S- 62	+4	25.7	3.5	27.0	2.6	52.0	Dried
8/29/17	J5S- 104	+4	28.5	5.8	27.6	2.6	43.7	Dried
8/29/17	J6S- 54	+4	22.6	6.6	29.1	2.4	50.4	Dried
9/7/17	I8S- 28	+13	38.0	3.9	25.7	2.9	45.5	Dried
9/7/17	J1S- 46	+13	24.3	5.5	29.3	2.4	48.6	Dried
9/7/17	I12S- 58	+13	38.3	5.0	25.4	2.8	36.2	Dried
9/7/17	J1S- 22	+13	28.7	3.0	30.6	2.3	35.2	Dried

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 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. Item H13S-58, with its dry away ratio of 2.5 and wide harvest window, is an example of a selection that could dramatically reduce the cost of drying, however the industry will have to decide if it can handle dealing with a new item. 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 reduced pruning costs, we have many new items with more spur bearing tree structures and/or have upright growing habits. For example, H13S- 65 and G43S-15 both have upright growing habits. Additionally, most of our selections will produce fruit on one-year-old wood. This means the trees will start to bear fruit at a younger age than Improved French.

Program Inventory

All the seedling blocks are located in the UC Davis campus research orchards (Table 6). In the summer of 2017, over 1,000+ seedling trees were discarded after evaluation of the seedlings showed negative fruit or tree characteristics, and a large section of the I block that has been thoroughly evaluated will be cut out after this winter. Crosses were made in spring of 2016, the seeds were germinated in January and were planted in the fall at a local nursery. To cut program costs we will likely grow the trees in the nursery setting for a few more years and make selections directly out of those nursery blocks. The crosses made in 2017 are currently going through stratification for planting. 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 Level 2 category is high due the amount of trees grafted into the selection block that have not yet bore fruit. 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. Because of money and space constraints we plan to discard a segment of our germplasm and breeding stock. We have decided to cut out a majority of the trees in the Kearney selection block. The labor costs for that facility have been raised, so the only trees

that will be grafted at that station will be promising Level 2 selections that have already been evaluated at Wolfskill.

This program usually breeds trees using a mix of hand pollinations and crosses from pollination cages. This year, using a donation from Sierra Gold nurseries, this program made all of our crosses using new pollination cages. This created a large amount of seeds to plant this spring (Table 6). These seeds are currently in stratification and will be germinated starting in January.

Table 6. Seedling block inventories for 2017 located in the Davis UC research orchards.

Block	Acres	Year Planted	Seedlings Planted	Seedlings Remaining	New Advanced Selections
I	3	2008-2012	2,656	650	22
J	4	2013-cont.	5,022	3,371	19
Seeds		2016		(1,660) ^c	
		2017		(5,875) ^e	
Totals	7		7,678	4,021 ^d	

^cnumber of seedlings in the nursery row

^dnot including seeds & nursery items

^eseeds under stratification

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 2017 additions
Level 1	4,021	1,660 (5,875)
Level 2	109	34
Level 3 & 4	4	3
Fresh Items	11	2
Breeding Items	82	5
Germplasm Items	80	8
Items Removed	20	

Disease Screening

This year, little disease pressure was displayed in the orchard. Therefore no statistical data was collected on brown rot. Seedlings with visible brown rot 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.

Plum Pox Virus (PPV)

This program is taking action in preparation for when plum pox virus might come to California. As mentioned in previous reports, we have been incorporating Stanley and Jojo (sources of Plum Pox resistance) genetics into the germplasm. We have also been contributing to Dr. Chris Dardick's (formerly Dr. Ralph Scorza's) research on fast track genetically modified plum pox resistant plums.

In 2016, the program initiated the importation of hypersensitive cultivars from the German breeding program of Dr. Neumuller. These items have the potential to either be good California cultivars or good breeding sources for hypersensitive resistance. The trees are scheduled to come out of quarantine in Winter 2018-2019. We also have recently acquired trees of the 'Docera 6' rootstock that has hypersensitive resistance to PPV. We hope to plant Improved French and top items from the program on this rootstock to begin determining its adaptability to California conditions.

Dried Plum/Prune Testing Group Evaluations

The Dried Plum/Prune Testing Group met in August 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 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. Summary table of all the items tasted at the 2017 CDPB meeting in December. Items 1-7 were grown in the selection blocks using various rootstocks and different harvest dates. Numbers 8-12 were from seedling trees grown on their own root in Davis.

Item #	Harvest. date	Item Name	Location grown	Days +/- French	Weight (g/frt)	Pressure	Sugar in Brix	Dry away ratio	Dry count per lb.
1	8/21/17	G37S- 45	Winters	+1	25.4	5.8	26.7	2.4	45.4
2	8/28/17	G43S- 15	Winters	+8	32.4	5.1	26.3	2.7	37.8
3	8/28/17	H13S- 65	Winters	+8	28.8	3.5	24.4	2.6	37.8
4	8/31/17	H13S- 58	Kearney	+15	26.2	3.0	31.2	2.2	41.1
5	8/21/17	H18N- 42	Winters	+1	22.3	2.8	29.9	2.5	55.1
6	8/21/17	H9S-27	Winters	+1	20.6	5.1	28.8	2.4	52.5
7	8/22/17	H3S- 70	Winters	+2	21.4	4.1	22.5	3.0	68.9
8	8/15/17	J6N- 118	seedling	-10	34.0	6.5	24.2	2.6	30.3
9	9/7/17	J1S- 46	seedling	+13	24.3	5.5	29.3	2.4	48.6

10	8/11/17	I7N- 5	seedling	-14	26.5	6.0	32.5	2.0	41.4
11	8/15/17	I4N- 6	seedling	-10	29.9	2.7	23.7	2.9	46.3
12	8/8/17	J1S- 96	seedling	-17	30.0	5.0	26.5	2.7	42.8

Table 9. Results from the industry tasting conducted by members at the California Dried Plum Board annual meeting in December. Table listed by tasting number, comments are a compilation of responses. Ranking is 1-5, 1 being poorly rated and 5 being the best. The last three columns are responses from when the participants were asked to rank their top three items.

Item #	Item Name	# of ratings	Overall Taste	Skin Quality	Flesh Texture	General Appearance	Comments	#1	#2	#3
1	G37S- 45	22	3.5	3.2	3.5	3.5	mild, sweet, chewy, fruity,dull bright, good free pit	5	1	5
2	G43S- 15	22	3.9	3.9	4.0	4.1	good taste, better flavor than G37S-45, tough skin	7	3	1
3	H13S- 65	22	3.1	3.7	3.7	3.8	ok flavor, soft chewy weak taste narrow	2	4	1
4	H13S- 58	22	3.4	3.5	3.6	4.0	ok flavor, tough skin darker notes	2	7	6
5	H18N- 42	22	3.9	3.7	4.0	4.2	overall nice reddish color, chewy texture	4	4	6
6	H9S-27	22	2.9	3.4	3.5	3.2	ok taste,tough skin good flesh	1		3
7	H3S- 70	22	2.8	3.4	3.2	3.1	fair taste, funny taste tight pit			1
8	J6N- 118	19	4.2	4.2	4.1	3.9	bright taste, free pit, good flesh	The participants were asked to rank their top three selections (from #1-#7). The number of times each item was listed as #1 is in the first column, #2 in second column and #3 in third column		
9	J1S- 46	19	4.1	3.7	3.9	4.2	sweet, tough skin, gooey flesh			
10	I7N- 5	19	3.4	3.2	3.3	4.0	acid taste, good skin, citrus taste			
11	I4N- 6	18	3.5	3.0	3.2	3.8	too sweet, good flavor and balance, gooey			
12	J1S- 96	18	3.6	3.8	3.5	4.1	dark like Imp French, balanced taste, somewhat bland			

DONATIONS

We would like to thank Sierra Gold Nursery, for the donation of nursery care of the program's seedlings and donation of shade cloth for pollination isolation cages. Their generosity helps support UC research and the California dried plum industry's goal in developing new dried plum cultivars for California.