

The History of Plum Growing for the Fresh Market in California

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Abstract

The fresh market plum (mostly *Prunus salicina*) industry began to flourish after the California gold rush in the 1860s. It grew rapidly during this time, largely due to the prolific breeding work of Luther Burbank. Fresh market plum production experienced another rapid period of growth and change during the 1970s and 1980s with the introduction of large, black cultivars. However, this industry has declined in the last decade because of stiff competition from many other types of fresh fruits. Breeding programs have recently introduced some new cultivars for the fresh market including pluots (plum × apricot hybrids) and high sugar *P. domestica* types. Originally, plums were grown near the coast and in foothill regions close to the urban populations of San Francisco and Sacramento. In the 1960s large water projects were developed which allowed for extensive irrigation inland. The plum growing areas then shifted almost entirely to the central valleys. Today, the fresh plum industry is largely south of Fresno in the San Joaquin Valley. With the shift in location, many cultural practices and marketing methods have changed as well. Extensive soil cultivation has been replaced by non-cultivation and widespread use of herbicides. This has allowed for somewhat closer plantings although the rootstocks used have always been non-dwarfing types. A few semi-dwarfing stocks such as ‘Citation’ have started to gain popularity in recent years. Packaging has changed from small, hand packed baskets to the current method of tightly packed, volume filled boxes. As we look to the future there is an increasing interest in developing plum and plum hybrids with unique characteristics including varied skin colors, red flesh, and high soluble solids concentrations.

INTRODUCTION

California produces more than 95% of the plums grown in the United States (NASS). Both *Prunus domestica* and *Prunus salicina* are grown in the state, and this manuscript will focus on the latter. Cultivated plums, all *P. domestica*, were first introduced to California by the Spaniards as they were developing missions along the California coast. Since the population was low, these were primarily for local use. In the early 1850s, following the discovery of gold near Sacramento, the California “Gold Rush” occurred and the market for cultivated fruit truly began. The completion of the transcontinental railroad in 1869 linked California to the rest of the union and allowed for fruit to be exported. It was during this period that *P. salicina* began to be cultivated and the fresh market plum industry began to rapidly develop and flourish.

CALIFORNIA GEOGRAPHY

The topography and climate make California an ideal place to grow plums. California has a Mediterranean climate made possible by the moderating influence of the Pacific Ocean. The interior valley, the “Great Central Valley,” is approximately 700 km long and is where the majority of plums are grown. It is 70-100 km wide and is separated into the Sacramento Valley in the north, and the San Joaquin Valley to south. The Sierra Nevada Mountains run along the eastern edge of the Central Valley and have peaks greater than 4,400 m. These mountains capture winter snowfall and are the source of most of the water for the state. Rainfall typically occurs only from late fall to early spring and annually ranges on average from about 15 cm in the south to 100 cm in the north. The

Central Valley also allows for abundant winter chilling, except to the extreme south, with dormant trees commonly exposed to 800-1000 h below 7°C in most years. Summer temperatures of 37°C are common, and occasionally exceed 42°C for brief periods of time.

CULTIVARS AND PLANT BREEDERS

Following the Gold Rush, commercial nurseries began producing fruit trees. ‘Kelsey’ was the first cultivar of *P. salicina* grown in the state; it was imported in 1870 and had its first commercial crop in 1876 (Butterfield, 1938). A few years later in 1883, the legendary and prolific plant breeder Luther Burbank began working with many *Prunus* species, including plums. During the 50+ years he worked in California, he introduced a number of plum cultivars including ‘Wickson’, ‘Burbank’ and ‘Santa Rosa’, the cultivar destined to become the long-time industry standard (Figs. 1 and 2), (Butterfield, 1938). ‘Santa Rosa’ was introduced in 1907 and rapidly became the most widely grown plum in the state and remained so until the mid-1980s when it was finally considered to be too small and too soft. Burbank also introduced the red-fleshed cultivars ‘Satsuma’ and ‘Elephant Heart’, developed the ‘Improved French Prune,’ and made numerous interspecific crosses, including plum × apricot (*P. salicina* × *P. armeniaca*) crosses from which the cultivars ‘Apex’ and ‘Orange Plumcot’ were developed.

During the period following World War II the University of California had a prominent plum breeding program led by Claron Hesse. His notable introductions included ‘El Dorado,’ ‘Laroda’, ‘Nubiana’ and ‘Queen Ann’. Of these, ‘Laroda’ was the most successful commercially and it remained an important cultivar for decades (Fig. 1).

The black-skinned cultivar ‘Friar’ was introduced by the USDA plant breeder John Weinberger in 1968 and caused a monumental shift in the California plum industry. Prior to ‘Friar’ most plums had red or purple skin color, but subsequently, black became the preferred color. Of the cultivars listed in Figure 2, all are black except for ‘Santa Rosa,’ and that dominance remains to this day with eight of the top ten cultivars grown in the state having black skin (UC Fruit Report).

More recently, Floyd Zaiger has introduced a number of new cultivars, specializing in complex interspecific hybrids of *P. salicina*, *P. armeniaca*, and others. Frequently these include back-crosses so that one species is predominant, and Zaiger Genetics have developed trademarked names such as “Pluot®,” and “Aprium®” to describe those releases that include a dominance of *P. salicina* and *P. armeniaca*, respectively.

FRUIT PRODUCTION AREAS

As the California plum industry developed following the Gold Rush, the foothill region around and to the east of Sacramento, known as the “Placer” region, was the leading production area. As years passed, the Santa Clara Valley to the south of San Francisco, known better today as the “Silicon Valley,” also became a leading production area during the latter part of the 19th century. During the 1920s production in the southern San Joaquin Valley began growing and it is now the main production region for the state, (Fig. 3). Some smaller producers still remain in the traditional areas and they commonly focus on supplying very high-quality, high-maturity fruit to local consumers and restaurants, completely bypassing “traditional” marketing chains and markets.

CULTURAL AND HARVEST PRACTICES

The first plantings of plums consisted of tall, wide-spaced trees (~7⁺ x 7⁺m). While inefficient from a production standpoint, these spacings were required to perform mechanical cultivation for weed control. Initially this was done by horse/mule until tractors were introduced in the 1930s and 40s. These wide spacings demanded large trees so that available sunlight could be captured and efficiently used, and tree heights in excess of 5-6 m were the norm. Seedling rootstocks were common, and tree vigor was prized since there were no synthetic fertilizers available. Fruit size was commonly small

and in the 50-70 g range. Fruits were harvested using ladders and placed into wood crates containing approximately 10-12 kg of fruit for later packing in the field or shed. Fruit were hand-sized and packed into neatly arranged rows in small wood veneer “baskets” that measured ~10 cm deep and ~20 cm square. These baskets were placed into heavier wood crates for shipping (Duruz, 1922). In California, plum fruit size categories were initially standardized according to fruit dimension based on how many fruit fit into these baskets. For example, a 4 x 4 size meant that there were four columns of four rows in each layer of the basket; a 2 x 3 size contained larger plums and had two columns and three rows. This size nomenclature was retained even after baskets became obsolete in the 1960s, but grew increasingly confusing for both the industry and consumers. In the 1990s the industry switched to a system based on fruit mass, and expressed as the number of fruit contained in a 4.54 kg (10 lbs) sample. For example a size 50 plum can contain no more than 50 fruit in a 4.54 kg sample. This system uses whole numbers in multiples of five, and sizes commonly range from 20 to 80, large to small, respectively.

Synthetic herbicides were introduced after the Second World War and these led to changes in planting distances since mechanical cultivation was no longer the sole way to control weeds. Orchard spacings became closer and trees were commonly planted at ~6 m distances. Common rootstocks included the plum cultivars ‘Myrobalan 29C’, ‘Marianna 2624’ and ‘Nemaguard’ peach. Fruit size began to become even more prized and fruit thinning became a necessary practice. By the 1950s and 60s fruit were still harvested by hand from ladders, but large bulk bins that contained ~400 kg of fruit became the preferred method for transportation from field to shed. It was during this same time that mechanical sizing and fruit washing/waxing was developed. Fruit were then packed into “volume fill” boxes containing ~12.75 kg fruit (Crisosto and Day, 2012).

Currently, plantings have become denser and mechanical cultivation has almost disappeared. Common spacings are 5-6 m between rows and 3-5 m down the row, and there is a strong effort to keep tree height less than 3 m to reduce ladder work and save on labor costs. To aid in reducing vigor the most common rootstock for *P. salicina* is now ‘Citation,’ which is 15-20% less vigorous than traditional rootstocks and has larger fruit (Day and DeJong, 1999). Fruit size is now of critical importance and some new cultivars have fruit more than 150 g – nearly three-fold larger than the average sized ‘Santa Rosa’. Fruit are hand harvested into either large bulk bins or into smaller plastic boxes containing about 10 kg called “totes” that can help reduce fruit damage prior to packing. Pack styles still include volume-fill, but many retailers are demanding custom packs into smaller and more elaborate plastic boxes or trays (Crisosto and Day, 2012).

FUTURE DEVELOPMENTS

Beginning in the 1930s there was a self-imposed marketing order that administered and regulated the packing and marketing of plums. It also funded research and kept detailed industry statistics. Following the 2010 season the marketing order was rescinded by a majority vote of the industry. Since then there have been no industry statistics or funded research. The full ramifications of this action still are being felt and debated.

There is tremendous industry interest in high-quality cultivars with increased soluble solids concentrations in order to provide a better eating experience for consumers. “Specialty” items like interspecific hybrids and cultivars with red-flesh are also of great potential interest. Producers are also considering fruits with various skin colors including red, black, green, yellow, and combinations thereof. Some growers even suggest that the emphasis on large fruit will lessen and that very small, “bite-sized” fruit, of exceptional quality will become popular.

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Figures

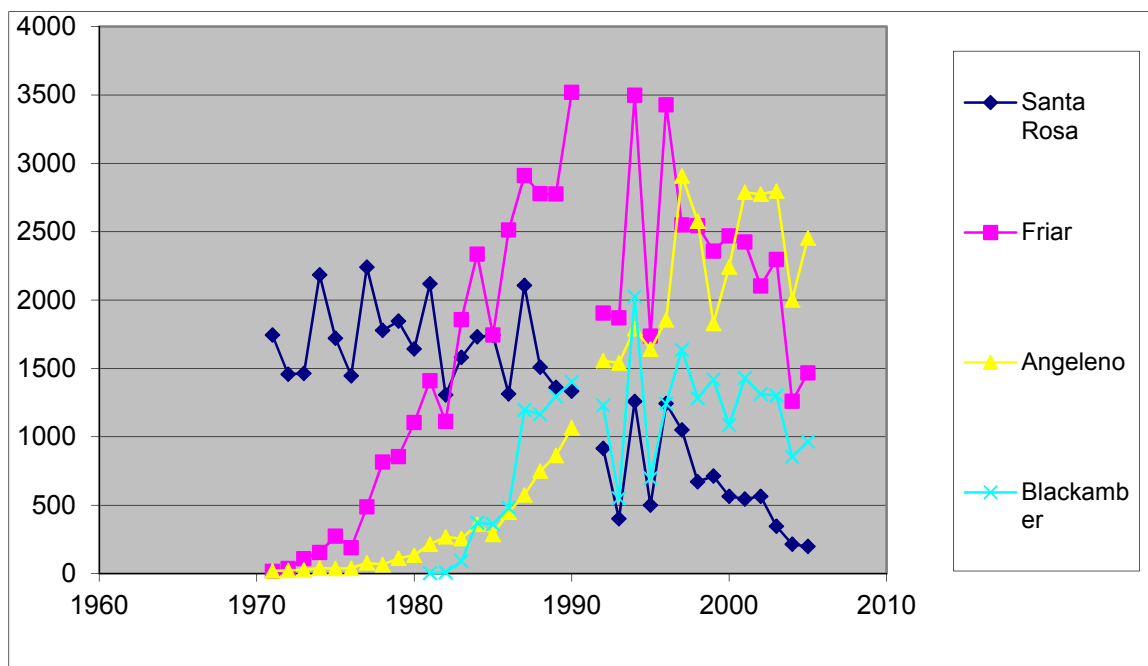


Fig. 1. California plum production of selected cultivars by year. Figures are 12.75 kg boxes (1000's) (Derived from Blair, 1956 and NASS).

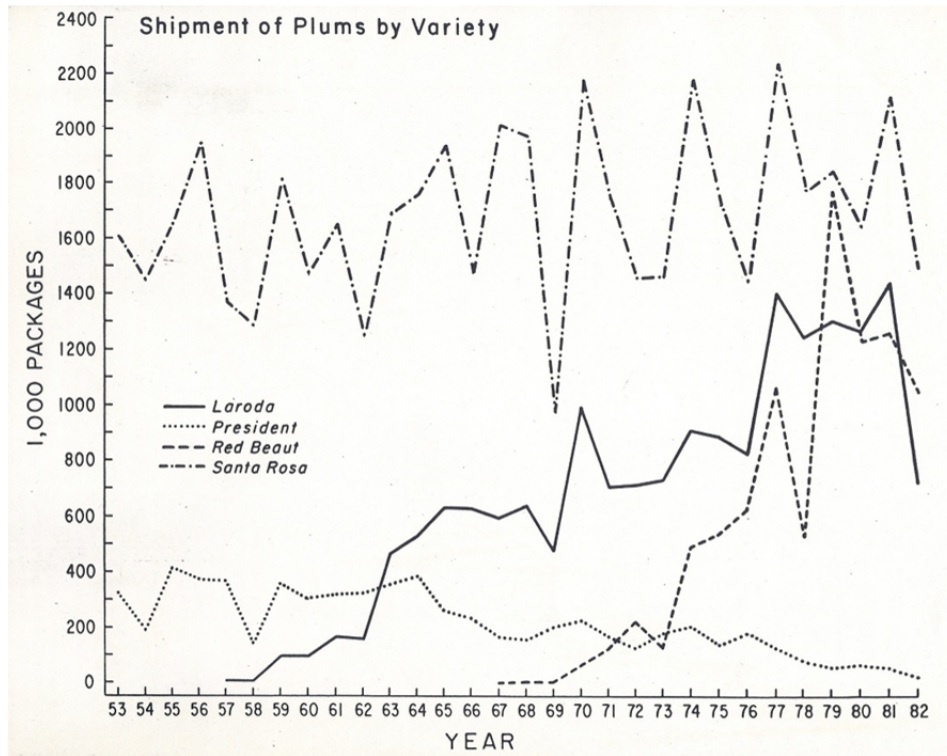


Fig. 2. California plum production of selected cultivars by year. Packages are 12.75 kg boxes (Derived from various sources including Blair, 1956 and NASS).

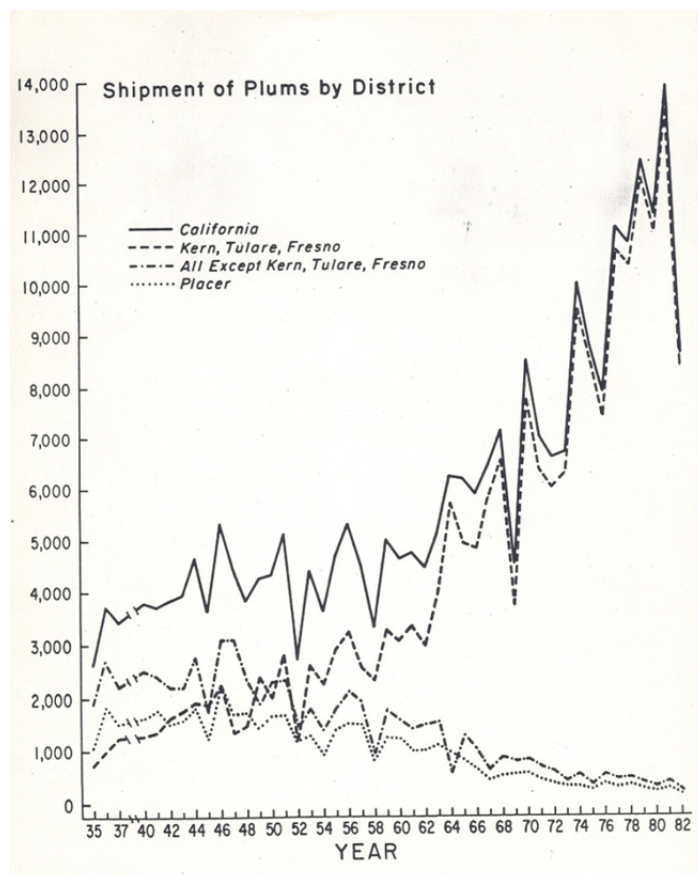


Fig. 3. California plum production of growing region by year. Figures are 12.75 kg boxes (Derived from various sources including Blair, 1956 and NASS).