Fruit Varieties Journal 43(3):90-95 1989

'Barcelona' Hazelnut

SHAWN A. MEHLENBACHER AND ANITA N. MILLER[1]

'Barcelona' is the leading cultivar of the European hazelnut (*Corylus avellana* L.) grown in Oregon. Members of this species are known by many names, owing to the great diversity in size and shape of the nuts, husk length, and geographic origin, and the rich folklore associated with it. Synonyms include filbert, lambert nut, and Pontic nut.

The term hazel is derived from the Anglo-Saxon *haesel,* a hood or bonnet. Variations of the term are used throughout Northern Europe. The word "filbert" is believed to be a corruption of the English "full-bearded" (Coote, 1898), referring to the long, fringed husks which extend past and enclose the nuts. For centuries, the short-husked types were called hazelnuts and the long-husked types were called filberts. Another possible origin of the word "filbert" was pointed out by Bunyard (1920). He noted that it may not be mere coincidence that St. Philibert's day falls on August 22, coinciding with the ripening of the nuts. Hazelnut production in the Italian province of Campania has been important in the village of Avellino for centuries. The Spanish word for hazelnut is avellano. These two, and the species name adopted by Linnaeus, are believed to be derived from Abellana, the location in Asia from which the nuts were supposedly introduced to Europe. The term lambert nut is thought to be a corruption of "long-bearded" or the German equivalent *Langbart.* Others attribute it to the Italian Lombard family who introduced the nut to Britain. The term Pontic nut is used for hazelnuts from Turkey, where they are extensively grown between the Pontic mountains and the Black Sea coast. Additional synonyms and their origins are discussed by Lagerstedt (1975).

In the early years of hazelnut production in Oregon, growers adopted the term "filbert" to distinguish their superior product from the native wild "hazelnuts." However, in order to improve marketing, there has been a recent shift to using hazelnut, the more universally recognized name.

History

'Barcelona' and, indeed, the entire hazelnut industry in the Pacific Northwest can be traced to one man, Felix Gillet (1835-1908) (Fig. 1). Born in Roucheford, France, he emigrated to the United States in 1852. During a two year stay in Boston, he learned the barbers' trade and in 1859, he moved and set up shop in Nevada City, California. Although barbering remained his full time occupation until 1870, his interests shifted to the plants he knew as a boy. In 1864, he returned to France for 10 months to thoroughly learn the nursery business. By 1870, he had saved enough money to buy a 16 acre piece of rocky, barren land on the outskirts of Nevada City. Although he continued to work as a barber, his spare time was devoted to clearing and tilling as one day he expected to own and operate a nursery which would command attention (1). His neighbors predicted failure. Fairchild (1938) describes the subsequent events as follows: "Then, with the confidence of a man who knows that he can grow

Received for publication , 1989. Oregon Agricultural Experiment Station Technical Paper No. 8895. The authors wish to thank H. B. Lagerstedt for providing photographs and historical literature and both H. B. Lagerstedt and M. M. Thompson for reviewing the manuscript.

[1]Assistant Professors, Department of Horticulture, Oregon State University Corvalis, Oregon 97331.

Figure 1. Pioneer nurseryman Felix Gillet and his wife. Mr. Gillet is credited with the introduction of the 'Barcelona' hazelnut to the western United States.

plants, he sent an order for $3,000 worth of stock to a nurseryman in France. He had no money for an irrigation system and, when there was a spell of dry weather, he nearly killed himself working day and night watering his plants by hand from a well which he had dug on the place. In the course of a few years his bare, ugly hillside became a paradise of trees and shrubs, and he began distributing rare varieties of nut trees up and down the Pacific Coast." The business became so extensive and profitable that, in 1882, he closed his barber shop and devoted his energies full time to the nursery, which later was named the Barren Hill Nursery. Gillet's knowledge of horticulture was recognized far and wide, and he was a regular contributor to newspapers and journals (11).

During the period 1880-1905, Gillet introduced nearly 20 cultivars of hazelnut (Fig. 2). Most of these had little to recommend them. His 1880-81 catalogue lists four cultivars: 'Red Aveline,' 'White Aveline,' 'Grosse of Piedmont,' and 'Sicily.' The exact year of the introduction of the 'Barcelona' hazelnut is not known. It appears to be one of the early introductions and 1885 is the date most often cited. It was first listed for sale under the name 'Barcelona' in the 1895 catalogue.

During that period of time, A. A. Quarnberg of Vancouver, Washington was very active in the introduction and testing of hazelnuts in the Pacific Northwest. In a letter written by Quarnberg to Prof. C. I. Lewis, of the Oregon Agricultural College, in December, 1916, he states: "Mr. Gillet says that in the spring of 1886, Geo. A. Steel of Portland, Oregon, bought 165 second generation seedlings together with 65 Red Aveline, 19 White Aveline, and 2 Purple Leaf Aveline filbert trees. These probably were the first filbert trees brought to the Pacific Northwest.

"In a letter dated March 19, 1905, Mr. Gillet writes: 'The best for market I think are DuChilly Cobnut, Grosse Blanche of England, named by me Barcelona,' etc., because, as he writes in other letters, it originated in Barcelona, Spain. Consequently, Mr. Gillet named the Barcelona, which fact is not generally known. I also find that I most probably planted the the first DuChilly trees in the Northwest in 1894 and Henry Biddle of Clark County, the first Barcelona in 1895" (2).

Of the cultivars introduced by Gillet, 'Barcelona' had the greatest number of good characteristics (6) and was widely planted in the Willamette Valley. Other cultivars introduced by Gillet include 'DuChilly' and 'Montebello,' which are grown to a small extent, and 'Daviana' and 'Hall's Giant,' which are commonly used as pollinizers. George Dorris of Springfield, OR, another pioneer in the northwest

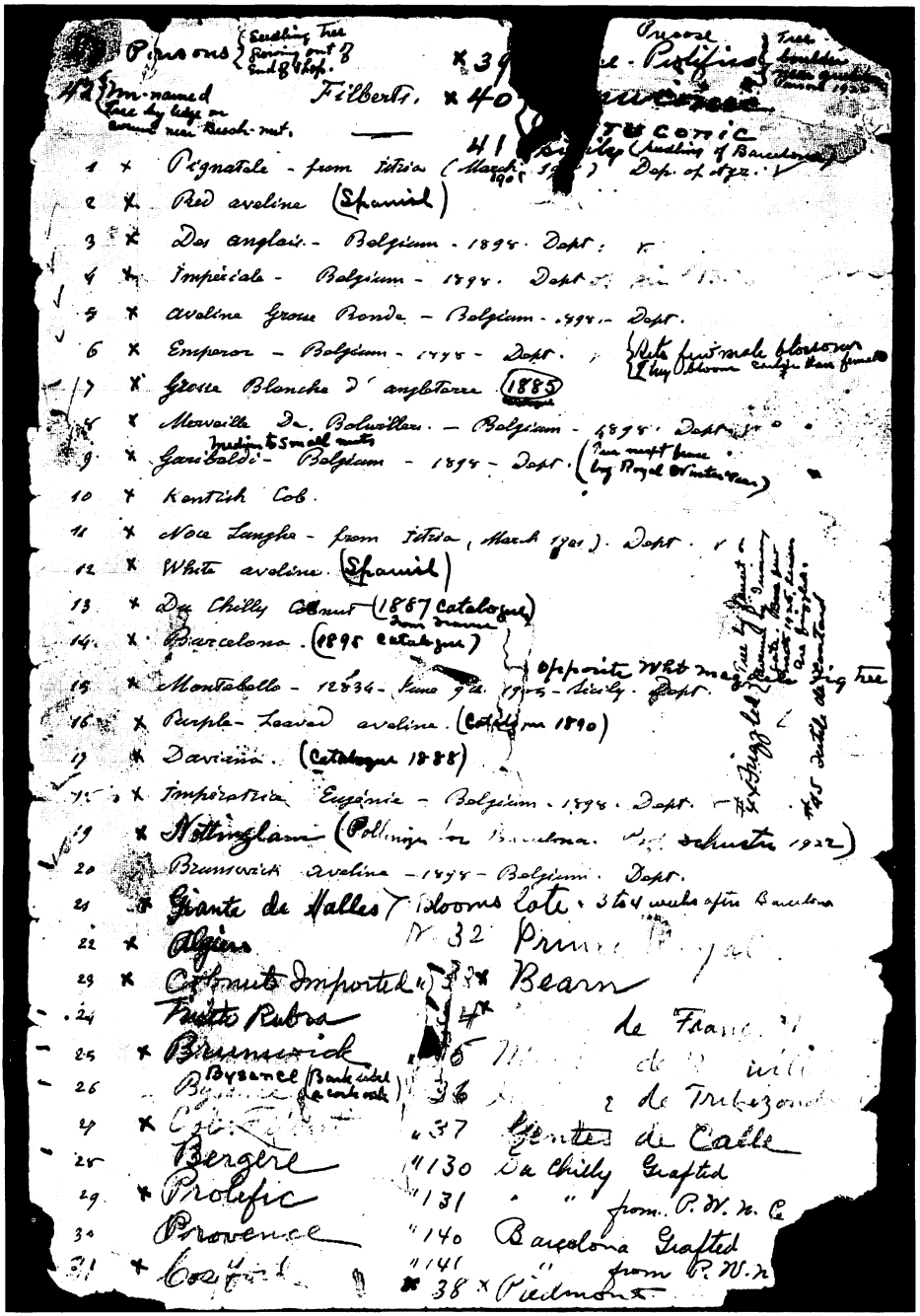

Figure 2. The original nursery list of the hazelnut cultivars introduced by Felix Gillet. Cultivars numbered 1-18 and 20 are in Mr. Gillet's fine penmanship. 'Barcelona' is listed as #14. Additions to the list were made by C. E. Parsons, Mr. Gillet's successor, who renamed the Barren Hill Nursery in honor of its founder. In 1968, after 97 years of continuous service, the Felix Gillett Nursery ceased business.

hazelnut industry, believed 'Daviana' to be the best pollinizer for 'Barcelona.' Schuster's (1924) pollination studies verified that 'Daviana' was a superior pollinizer, and it has held that position for 50 years. Even today, the most commonly found older orchards in Oregon are 'Barcelona' with 'Daviana' pollinizers.

World Importance and Synonyms

The U.S. ranks fourth in hazelnut production behind Turkey, Italy, and Spain. Approximately 25,000 acres are currently bearing nuts (10). Ninety-eight percent of the U.S. production is in Oregon, while the remaining comes from Washington. The majority of the hazelnut orchards are located in Oregon's Willamette Valley, where cool summers and mild winters prevail.

'Barcelona' is commercially important only in the U.S. and southwestern France, where it represents 82 and 51% of the trees, respectively. In Oregon, some growers prefer 'Ennis' over 'Barcelona' for the in-shell market, but 'Barcelona' continues to be widely planted. In France, 'Barcelona' represents only 10% of newer plantings. It has largely been replaced by 'Ennis' and to a lesser extent by 'Corabel.' Since the combined production of Oregon and France is roughly 3.2% of the world crop, 'Barcelona' accounts for only 2.4% of the hazelnuts grown in the world.

'Barcelona' is a very old cultivar and was probably widely distributed throughout western Europe in the 19th century. Gillet thought that it resembled nuts grown around Barcelona, Spain and evidence exists to support this. Spain's production is centered around the town of Reus, along the Mediterranean in the northeastern part of the country. However, 'Barcelona' is not commercially important there. Only a few trees can be found in orchards and home gardens throughout the region, where it is known as 'Castanyera' (12). In the northern province of Asturias, it is known as 'Grande' because of its large nut size. In France, 'Barcelona' is known as 'Fertile de Coutard.' As in Spain, 'Barcelona' is widespread throughout the country in backyards and gardens (3). According to Quarnberg's letter of 1916, Gillet imported the variety as 'Grosse Blanche d'Angleterre,' which translates as Large White of England. Spain is more likely the origin than England. 'Barcelona' is similar, if not identical, to the cultivar 'Grosse Bunte Zellernuss,' a cultivar described and illustrated by Goeschke (1887) and for which he gave 'Barcelloner Zellernuss' as a synonym.

Description

'Barcelona,' like all of the world's major cultivars, has several desirable, as well as undesirable, characteristics. All things considered, it was the best of those introduced by Gillet. 'Barcelona' trees are moderately vigorous and precocious with a desirable growth of habit being intermediate between upright and spreading. Like all European hazelnut trees, 'Barcelona' is monoecious and self-incompatible (14). Many S-alleles have been identified in the control of the sporophytic stigmas but, because of dominance, only the S1 allele is expressed in the pollen. Hazelnut trees bloom in midwinter and are wind pollinated. Relative to other commercially available cultivars, 'Barcelona' sheds its pollen early and female flowers are receptive early.

Nuts are mostly borne in clusters of two or three. The husks are roughly 1-1/2 times as long as the nuts. At maturity, the nuts fall freely to the ground and can be harvested mechanically. The nuts are nearly round and average 3.2 g when dried. 'Barcelona' outyields most of the older European cultivars, but is considered only moderately productive in Oregon. On the average, a mature 'Barcelona' orchard

yields 0.8 tons/A (.3T/ha). 'Ennis' and 'Casina' will outyield 'Barcelona' by up to 50%. Alternate bearing is common.

'Barcelona' matures in mid-late season, and is generally harvested the first week of October. In Oregon, this late maturity is a disadvantage because it is often coincident with the start of the rainy season. Nuts which fall in mud are not only difficult to harvest, but soil particles adhere to the pubescence at the apical end of the nuts. As the soil is impossible to remove, the nut takes on a dull appearance.

Oregon's industry has traditionally produced large, nearly round, attractive nuts for the in-shell market. 'Barcelona' is well suited for this purpose. However, the in-shell market is quite limited and currently half of the crop must be cracked and sold on the kernel market. 'Barcelona' is not well suited for the kernel market. The shell is moderately thick (43% kernel by weight) compared with the leading European cultivars, which average between 45 and 56%, although the flavor is good, the raw kernels have a fibrous covering on the pellicle. Furthermore, since only half of the pellicle can be removed by dry heat (130°C for 14 min.), a process known as blanching, the product does not have the clean, white appearance of the imported kernels of other cultivars. Also, the kernels are larger than desirable and the texture is chewy rather than crisp. Another disadvantage to producers and processors is that 'Barcelona' yields a high percentage (25-40%) of defective nuts. The most common defect is blank nuts, i.e. shells containing no kernels. 'Barcelona' averages 10-25% blanks, depending on the year. Other defects include poorly developed, shriveled, and/or moldy kernels, and twins (two kernels in one shell). In certain years, 'Barcelona' is especially susceptible to a physiological disorder called "brown stain" which terminates kernel development and leads to blanks.

Diseases and Pests

'Barcelona' is susceptible to bacterial blight caused by *Xanthomonas campestris* pv. *pruni*, a disease which is most serious in nurseries and young orchards. Although 'Barcelona' is moderately resistant to Eastern Filbert Blight caused by the fungus *Anisogramma anomala*, trees will eventually succumb to it. This disease is native to the eastern United States, where the wild American hazel (*C. americana*) serves as its host. Introduced to southwestern Washington in the late 1960's, the disease has been spreading southward and has now been reported throughout the northern end of the Willamette Valley.

'Barcelona' is highly resistant to the big bud mites, *Phytoptus avellanae* and *Cecidophyopsis vermiformis*. 'Daviana,' the principal pollinizer, is highly susceptible.

Breeding

Beginning early this century, in hopes of finding varieties superior to 'Barcelona,' several growers made selections such as 'Royal,' 'Ennis,' 'Butler,' 'Nonpareil,' 'Lansing #1,' and 'Jemtegaard #5' in populations of open-pollinated seedlings. Because 'Barcelona' and 'Daviana' have been the most widely planted cultivars, it is probable that these selections are hybrids of these two. Their morphological traits are consistent with those of seedlings from the controlled cross. Also, their incompatibility alleles support this assumption. Each selection has one allele in common with 'Barcelona' and one in common with 'Daviana.' Of these selections, only 'Ennis' has been planted widely as a main-crop cultivar.

In the late 1950's, more than a hundred additional cultivars were imported from Europe and evaluated to find a cultivar better than 'Barcelona.' Be-

cause the vast majority of them were decidedly inferior, a hazelnut breeding program was initiated at Oregon State University in 1969. The main objective is to develop cultivars for the kernel market. Such cultivars would have smaller, rounder, thin-shelled nuts and round, crisp, easily-blanched kernels. The nuts would mature earlier and have fewer defects than 'Barcelona.' Because of the recent spread of Eastern Filbert Blight into Oregon, resistance to this pathogen is now an important objective in the program. Big bud mite resistance is important not only because it can reduce yields but also because blasted buds provide a port of entry for Eastern Filbert Blight.

Literature Cited

1. Anonymous. 1908. Felix Gillet is called by death. The Daily Morning News of Grass Valley and Nevada City. January 28, 1908.
2. Anonymous. 1917. Early history of walnuts and filberts. The Walnut Book and Horticultural Digest 3(2):12-13.
3. Bergougnoux, F., E. Germain, and J. P. Sarraquigne. 1978. Le noisetier - production et culture INVUFLEC, Paris.
4. Bunyard, E. A. 1920. Cob-nuts and filberts. J. Royal Hort. Coc. 45:224-232.
5. Coote, G. 1898. The cultivation of the hazelnut. Oregon Agr. Expt. Stn. Bull. 52:1-7.
6. Crane, H. L., C. A. Reed, and M. N. Wood. 1937. Nut breeding. *In*: USDA Yearbook of Agriculture. U.S. Government Printing Office. pp. 827-889.
7. Fairchild, D.G. 1938. The world was my garden; travels of a plant explorer. C. Scribner's Sons, New York.
8. Goeschke, F. 1887. Die Haselnuss - ihre Arten und ihre Kulture. Verlag von Paul Parey, Berlin.
9. Lagerstedt, H. B. 1975. Filberts. *In*: J. Janick and J. N. Moore (eds.). Advances in Fruit Breeding. Purdue Univ. Press, West Lafayette, IN. pp. 456-489.
10. Moffett, M. H., K. K. Mohr, and S. J. Lawton. 1989. An industrial assessment of the Pacific Northwest hazelnut industry. Report to the Small Busines Administration. pp. 1-49.
11. Parsons, C. E. 1962. Felix Gillet. Nevada County Historical Society 16(4):1-3.
12. Rovira, M. 1988. Descripicio de varietats d'avellaner. Servicio Agropecuario Provincial de Tarragona, Reus.
13. Schuster, C. E. 1924. Filberts: 2. Experimental data on filbert pollination. Oregon Agr. Expt. Stn. Bull. 208.
14. Thompson, M. M. 1979. Incompatibility alleles in *Corylus avellana* L. cultivars. Theor. Appl. Genet. 55:29-33.

Comments on 'Fuji'

ROBERT A. NORTON

'Fuji' is destined to become one of the prominent varieties in the world, because of its sweet flavor, crisp, juicy texture, and excellent shelf life.

Since most 'Fuji' strains ripen later than 'Granny Smith,' only the warmer long season areas are likely to be successful with 'Fuji.'

Where it can be grown, it is sure to be successful financially.

Weak points — color, and a somewhat less than grower-friendly tree.

In Japan, a great deal of labor is expended for thinning, bagging, and leaf removal in order to achieve uniform color, size, and quality.

This variety now occupies nearly 50 percent of their production. Incidentally, very little is known about its winter hardiness, since extremely low temperatures do not occur in Japan.

There is great activity by U.S. nurserymen to propagate 'Fuji,' particularly the improved red strains, such as 'Akifu #1,' 'Nagafu #2, 6 and 12' and the early ripening strain, 'Yataka.' Unfortunately, very few of these strains are legally available as virus-free stock.