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'Ennis' Hazelnut

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The hazelnut (*Corylus avellana* L.) industry in the Pacific Northwest can be traced to one leading cultivar: 'Barcelona,' and its pollinizer 'Daviana.' In 1980 Dr. Harry Lagerstedt, a U.S. Department of Agriculture, Agricultural Research Service Horticulturist, now retired, introduced *C. avellana* 'Ennis' hazelnut as a replacement for 'Barcelona'. 'Ennis' now comprises more than 15 % of the Oregon hazelnut crop - despite the encroachment of eastern filbert blight [*Anisogrammina anomala* (Pk.) Muller], a fungal disease to which this cultivar is highly susceptible. This cultivar was co-released with 'Butler' (1).

Origin

'Ennis' was one of a number of "grower selections" contributed in response to Lagerstedt's request for superior, unusual or high-yielding trees (1). After about 20 years of grower, processor, and researcher hazelnut evaluation and input, Lagerstedt chose to release 'Ennis' primarily for its large nut size and high yielding capacity.

The parentage of 'Ennis' is unknown, although Mehlenbacher and Miller (2) hypothesize that this selection may be a hybrid of 'Barcelona' x 'Daviana.' The morphological traits for 'Ennis' are consistent with those of seedlings from the controlled cross and incompatibility alleles support this assumption (2). The original tree for 'Ennis' is believed to have been from a nursery in Clark County, Washington, and probably originated sometime about 1940 (1). The cultivar was named prior to Lagerstedt's receipt of the germplasm for evaluation trials. The authors speculate that the cultivar name may refer to Ennis, Ireland, or to a personal or family name.

Description

'Ennis' has large nuts with 60% or more grading out to giant, 0.93 in. (23.8 mm) in diameter or jumbo, 0.87 in. (22.2 mm) in diameter. In contrast 'Barcelona' averages 12% in those grades (1). A 100-nut sample of 'Ennis' weighs over 400 g, while that of 'Barcelona' is about 320 g. The bearing habit of 'Ennis' is different than that of 'Barcelona.' Most 'Ennis' nuts form singly from a floret on the catkin peduncle while those of 'Barcellona' tend to form from flower clusters on 1-year shoots. 'Ennis' nuts tend to be larger and have a uniform slightly elongated shape because more of them form singly rather than in multiple nut clusters. 'Ennis' shells are attractive. They are light brown with striations and a fairly flat basal scar. They are less pubescent than 'Barcelona' nuts. While 'Barcelona' husks are slightly longer than the nuts, 'Ennis' husks are about 50% longer and rather tubular (Mehlenbacher, per. com.).

'Ennis' kernels are large, long, and somewhat pointed. They are plump and appear less wrinkled than kernels of other large-size nuts. Shrinkage during drying is minimal but tends to accentuate elongation of the kernel. 'Ennis' has about 46% kernel weight in sound nuts, and has a 2 to 4 % blank count; 'Barcelona' has about 44% kernel weight, with 10 to 20 % blanks. The pellicles on 'Ennis' kernels are not removed by dry heat, a process called "blanching," as well as those of 'Barcelona' (1) or 'Willamette' (3).

'Ennis' husks are about 1.5 times the length of the nut and open at maturity allowing the nuts to fall freely. The peduncle of the 'Ennis' husk is very short. In Oregon, nuts from both cultivars are harvested in September and early October. For younger trees the main part of the 'Ennis' harvest can be one week later than that of 'Barcelona', although in older or-

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chards both cultivars mature at about the same time.

Diseases and Pests

Eastern filbert blight (EFB) is the most devastating disease of cultivated hazelnuts in the United Sates. It is endemic to eastern North America where it co-exists with *Corylus americana* Marsh. EFB was observed in southwestern Washington in 1970 and is now established in the northern half of Oregon's Willamette Valley. The disease continues to spread south. 'Ennis' is highly susceptible and should not be planted where this disease is present (3) or in adjacent areas. Newly released cultivars from the Oregon State University program have genetic resistance to EFB (3, 4, 5).

Bacterial blight, caused by *Xanthomonas campestris* pv. *corylina* Dowson is an important disease of young hazelnuts. 'Ennis' is rated about equal to 'Barcelona' for susceptibility of this disease (1).

Big bud mite species, *Phytoptus avellanae* Nal. and *Cecidophyopsis vermiformis* Nal. can seriously reduce yields (10). Vegetative and mixed buds become infested, producing large galls which eventually dry and fall off. Crop loss is related to the amount of pistillate flower drop. 'Ennis' is highly susceptible to these pests, while 'Willamette' is intermediate and 'Barcelona' is resistant (10). The mites can be easily controlled with a single thiodan spray every three years (Mehlenbacher, per. comm.)

Growth and Culture

'Ennis' trees tend to be more twiggy and compact than 'Barcelona' trees, although both have a similar shape. 'Ennis' is slightly slower growing, bears its nuts on shorter growth, and has less tendency toward biennial bearing than does 'Barcelona.'

In recent cultivar evaluation trials 'Ennis' trees had the highest yield efficiency of the nine cultivars tested (8, 9). 'Ennis' has 25% smaller trunk cross-sectional area than 'Barcelona' but produced the highest cumulative yield when compared with cultivars and selections of the Oregon State breeding program (8, 9).

Hazelnut cultivars are completely or partially self-incompatible and dichogamous (10). Potential pollinizers for ëEnnisí include: 'Daviana,' 'Hall's Giant,' 'Jemtegaard #5,' 'Royal,' 'Fitzgerald 20,' and 'Nonpareil.' 'Butler' was released specifically as a pollinizer for 'Ennis,' but sheds pollen too early to be effective. Females of 'Ennis' emerge very late under warm climate conditions such as Reus, Spain. In that climate without suitable late pollinizers, yields are low. 'Ennis' is not an effective pollinizer for other cultivars. 'Ennis' pollen is incompatible on 'Barcelona.'

'Ennis' and the Hazelnut Industry

The Willamette Valley of Oregon produces about 99 % of the United States hazelnut crop. This crop is the third largest in the world. Most of the worldís cultivars have small kernels suitable for processing, but about half of the Oregon crop is sold in-shell, where larger nuts, such as 'Ennis' and 'Barcelona' are preferred. Some markets pay premium prices for giant and jumbo nuts such as those 'Ennis' produces.

'Ennis' is producing well in areas unaffected by EFB. Over the long-term, however, the expanding distribution of EFB will prevent 'Ennis' from leading production in the Pacific Northwestern United States. EFB tolerant cultivars, such as 'Lewis,' 'Clark,' or others yet to come, will dominate hazelnut production where this fungus is present. Hazelnut growing areas where EFB is not present could be suitable for the high yielding, large-sized 'Ennis' nuts suitable for in-shell markets.

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Flower Differentiation and Spur Leaf Area in Almond

Floral initiation and differentiation varied greatly among spurs. Spurs with high total leaf areas had more floral buds, and those buds underwent transition to flowering earlier than buds on spurs with lower total leaf area. Within spurs, there was no gradient in floral development relative to bud position on the spur. Results indicate that spurs function independently with regard to floral development and suggest that within spurs buds may function somewhat independently as well. From Polito et a 2002. J.Hort.Sci. and Biotech: 471-478.