HORTSCIENCE 35(2):314–315. 2000.

'Lewis' Hazelnut

Shawn A. Mehlenbacher[1], Anita N. Azarenko, David C. Smith, and Rebecca McCluskey

Department of Horticulture, 4017 Agricultural and Life Sciences Building, Oregon State University, Corvallis, OR 97331

Additional index words. Corylus avellana, filbert, *Anisogramma anomala,* eastern filbert blight, nut breeding

'Lewis' is a new hazelnut (*Corylus avellana* L.) cultivar for the kernel market. It was released by the Oregon Agricultural Experiment Station in Jan. 1997. Compared with 'Barcelona', Oregon's leading cultivar, 'Lewis' has a higher yield efficiency, smaller nuts, higher percent kernel, earlier maturity, and greater quantitative resistance to eastern filbert blight, caused by *Anisogramma anomala* (Peck) E. Müller. 'Lewis' is the second cultivar released by the Oregon State Univ. (OSU) hazelnut breeding program.

Origin

'Lewis', tested as OSU 243.002, was selected from a progeny of 428 seedlings resulting from a cross of OSU 17.028 x 'Willamette' made in 1981 by Maxine M. Thompson. 'Willamette' was released in 1990 (Mehlenbacher et al., 1991). OSU 17.028 resulted from a cross of 'Barcelona' x 'Tombul Ghiaghli'. 'Tombul Ghiaghli' was imported from Greece and was described by Raptopolous and Kantartzis (1961). The original 'Lewis' tree first set a crop of nuts in 1985. The original tree performed well in subsequent years and was propagated by tie-off layerage. The rooted layers were lined out in a nursery row the following season, and then used to plant replicated trials in Spring 1990 and 1991, in which 'Barcelona', 'Willamette', and 'Casina' were included as control cultivars. 'Lewis' has been evaluated annually in Corvallis since that time. The name was chosen to honor Meriwether Lewis of the Lewis and Clark Expedition, whose Corps of Discovery spent the winter of 1805–06 near Astoria, Ore.

Description

Trees of 'Lewis' are ≈75% to 80% of the size of 'Barcelona'. They have an upright-spreading growth habit and thus should be easy to manage in a commercial orchard. The first harvest in the replicated yield trials confirmed the precocity observed on the original seedling. Cumulative yields of whole nuts of 'Lewis' and 'Barcelona' did not differ significantly in the 1990 planting, but 'Lewis' slightly out-yielded 'Barcelona' in the 1991 planting (Table 1). Nut yield efficiency, which adjusts yield for differences in tree size, was significantly higher for 'Lewis' than for 'Barcelona' in both plantings, as 'Lewis' is a smaller tree.

'Lewis' nuts are borne in clusters of three to five in husks ≈20% longer than the nuts. The nuts fall free of the husk at maturity and are ready to be harvested mechanically ≈5 d earlier than those of 'Barcelona'. This earlier maturity, which becomes apparent after the second crop year, is a significant improvement over 'Barcelona'. Thus, in most years, harvest of 'Lewis' can be completed before the start of the rainy season in the Willamette Valley. The free-husking trait represents an improvement over its parent 'Willamette'.

'Lewis' nuts are similar in size and appearance to 'Willamette' and are attractive (Fig. 1). Raw kernels have little fiber on the pellicle. When lightly roasted (150 °C for 15 min) and rubbed, about half of the pellicle is removed. Thus, blanching scores for 'Lewis' are similar to or slightly better than for 'Barcelona'. Kernel flavor and texture have been rated as very good by several researchers and growers. Nuts of 'Lewis' are smaller than those of 'Barcelona' (an average of 2.9 g for 'Lewis' vs. 3.8 g for 'Barcelona' in the first trial). Percent kernel, the ratio of kernel weight to nut weight, averaged 50% for the original seedling tree and

Table 1. Nut yield, trunk cross-sectional area, and yield efficiency of 'Lewis' and control cultivars of hazelnut planted in 1990 and 1991.

Cultivar	No. trees	Yield per tree (kg) 1992	1993	1994	1995	1996	1997	Total	TCA[z]	YE[y]
				Planted 1990						
Willamette	10	0.30	2.27	3.85	9.09	6.01	---	21.51	79	0.273
T. di Giffoni	5	0.65	1.84	3.39	5.75	5.80	---	17.43	67	0.259
Lewis	5	0.42	2.35	3.44	6.34	5.99	---	18.55	81	0.228
Barcelona	10	0.34	2.64	3.07	6.95	6.00	---	18.99	105	0.181
Casina	10	0.18	1.85	2.81	7.51	2.87	---	15.22	94	0.165
$LSD_{0.05}$		0.24	0.86	0.98	1.15	1.48	---	3.63	19	0.034
				Planted 1991						
Lewis	8	---	0.75	3.40	4.98	6.67	8.76	24.5	88.3	0.28
Willamette	8	---	0.54	2.72	6.66	4.07	9.80	23.8	85.9	0.28
Barcelona	8	---	0.47	2.61	4.89	4.61	8.81	21.4	114.5	0.19
Casina	8	---	0.32	1.81	5.71	3.31	9.67	20.8	120.0	0.17
$MSD_{0.05}$[x]			0.23	0.55	0.67	0.79	0.84	2.0	13.8	0.03

[z]Trunk cross-sectional area (cm^2).
[y]Yield efficiency = Total yield/TCA in $kg \cdot cm^{-2}$.
[x]Means separation by Waller-Duncan k-ratio *t* test, k-ratio = 100.

Fig. 1. Nuts and kernels of 'Lewis' and of 'Barcelona' hazelnut. Scale in centimeters.

Received for publication 6 May 1999. Accepted for publication 4 Aug. 1999. Oregon Agricultural Experiment Station Technical Paper no. 11517. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked *advertisement* solely to indicate this fact.

[1]E-mail: mehlenbs@bcc.orst.edu

48% in the 1990 trial, compared with 43% for 'Barcelona'. These figures are based on well-filled nuts. Commercial handlers who find that field-run 'Barcelona' nuts average 40% kernel can expect 'Lewis' to average ≈45%. 'Lewis' kernels are smaller than those of 'Barcelona' but larger than those of 'Casina'. 'Lewis' kernels are slightly larger than the 13-mm diameter considered ideal by European buyers.

'Lewis' produces fewer blank nuts than 'Barcelona' but more moldy kernels (Table 2). Kernel mold is largely confined to the tip of the kernel where it is attached to the funiculus. Many of these kernels are marketable, as the mold is removed with the pellicle during blanching. Because of the potential for kernel mold, however, planting on sites with a history of this problem is discouraged. When crop load is heavy, the kernels do not fully fill the shells. Nevertheless, most of these kernels are sufficiently plump to be marketable.

'Lewis' has incompatibility alleles S_3 and S_8, both of which are expressed in the stigmas and the pollen. 'Lewis' sets many catkins that start to shed pollen in early-midseason, later than 'Barcelona' but slightly earlier than 'Daviana' and 'Casina'. Female anthesis is early, slightly later than 'Barcelona'. Recommended pollinizers include one-third 'Tonda di Giffoni' for the early bloom and two-thirds 'Hall's Giant' for flowers that emerge later. 'Barcelona' is also a suitable early-shedding pollinizer. Pollen of 'Daviana', 'Butler', 'Jemtegaard #5', VR 20-11, VR 11-27, and VR 23-18 all express S_3 and are thus incompatible on 'Lewis'. Leaf budbreak of 'Lewis' is at about the same time as 'Barcelona', but leaf fall is slightly earlier.

The susceptibility of hazelnut cultivars to eastern filbert blight caused by *Anisogramma anomala* (Peck) E. Müller is quantified by measuring cankers 20–22 months after exposure of potted trees under structures topped with diseased branches. Two such tests have been conducted and have shown 'Lewis' to have a high level of quantitative resistance (Table 3). Observation of small trees planted near an infected orchard has confirmed the resistance of 'Lewis' (R. Birkemeier, personal communication). Although not immune to eastern filbert blight, 'Lewis' has a level of resistance that should allow cultivation where the fungus is present if recommended chemical and cultural control practices are followed. Eastern filbert blight is presently in the northern half of the Willamette Valley. Susceptibility to bacterial blight caused by *Xanthomonas campestris* pv. *corylina* has not been determined, although no trees have been lost to this disease in our trial plots. 'Lewis' has a moderate level of resistance to big bud mite (primarily *Phytoptus avellanae* Nal.). Ratings are intermediate between the highly resistant 'Barcelona' and the intermediate 'Casina'. Thus, chemical control should not be necessary to control this pest.

Layers of 'Lewis' are vigorous and comparable to 'Barcelona' in size. They root easily and abundantly.

Table 2. Frequency of good nuts, and of nut and kernel defects in 'Lewis' and standard hazelnut cultivars in trial planted in 1990.

	Frequency (%)[z]							
Cultivar	Good	Blanks	Brown stain	Poor fill	Shriveled kernels	Moldy kernels	Black tips	Twins
Barcelona	72	7.5	2.5	13.3	1.0	1.0	0.1	3.1
Casina	71	8.6	0.9	16.1	1.1	1.1	1.4	0.2
Lewis	75	2.7	0.2	14.0	1.4	6.2	0.9	0.5
T. di Giffoni	61	9.7	1.4	8.7	1.4	19.4	0.8	0.6
Willamette	66	5.6	0.5	15.4	0.6	11.5	0.7	0.8

[z]Average frequency (1992–96). Number of trees shown in Table 1.

Table 3. Results of exposing potted hazelnut trees to eastern filbert blight.

		No. of trees		Canker
Year[z]	Cultivar	Exposed	Infected	length (cm)[y]
1992	Negret	12	11	6.20
	Butler	12	11	6.00
	Hall's Giant	12	11	5.18
	Barcelona	12	10	4.38
	Lewis	12	9	3.28
	Tonda di Giffoni	9	3	1.46
	$LSD_{0.05}$			2.32
1993	Negret	13	13	14.28
	Daviana	13	13	12.44
	Hall's Giant	23	23	11.16
	Willamette	24	23	11.16
	Barcelona	26	26	9.19
	Tombul Ghiaghli	8	7	6.16
	Lewis	12	12	6.14
	Tonda di Giffoni	11	2	0.29
	$LSD_{0.05}$			2.17

[z]Trees were exposed in Spring 1992 and 1993, respectively, and cankers measured after leaf fall 20–22 months later.

[y]Canker lengths were measured in centimeters and then summed for each tree. A square-root transformation was used to remove the association between mean and variance.

Availability

'Lewis' was released as a public cultivar. It may be propagated without restriction. Trees are currently available from several nurseries. A list of these nurseries and limited quantities of scion wood are available from the senior author.

Literature Cited

Mehlenbacher, S.A., A.N. Miller, M.M. Thompson, H.B. Lagerstedt, and D.C. Smith. 1991. 'Willamette' hazelnut. HortScience 26:1341–1342.

Raptopolous, T.D. and N.A. Kantartzis. 1961. The most important hazelnut cultivars grown in Greece (in Greek). Yrbk. Sch. Agr. For. Aristotelian Univ. Thessalonika 1961:53–78.