‘Golden Hills’ Pistachio

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Abstract. ‘Golden Hills’ is a new female pistachio (*Pistacia vera* L.) cultivar released by the California Agricultural Experiment Station in 2005. The nuts mature uniformly and are harvested 2–4 weeks earlier than ‘Kerman’. In-shell nut yields in the first 4 years are equal to those of ‘Kerman’, but the percentage of edible split nuts is higher. ‘Golden Hills’ flowers earlier than ‘Kerman’ and has not demonstrated symptoms of insufficient chilling in Kern Co. or in Madera Co., Calif. It appears to be a good early maturing cultivar, with uniform harvest period and little navel orangeworm infestation.

The cross that produced ‘Golden Hills’ was made in 1990, and the original seedling was planted at a research plot provided by Paramount Farming Company in 1991 near Bakersfield, Calif. The *Pistacia vera* seedling parents, female ‘2-35’ × male ‘ES#2’, were created at the former Plant Introduction Garden at Chico, Calif. (J. Crane and J. Maranto, personal communication). ‘2-35’ was evaluated by Julian Crane (Crane 1977, Crane 1988; Crane and Iwakiri, 1983).

‘Golden Hills’, evaluated under its seedling designation B22-31, first produced a crop in 1994 and was evaluated annually from 1994 to 1999. Production characteristics were evaluated in replicated trials on commercial rootstocks from 2002 through 2005. Nut yields were compared with ‘Kerman’, the only cultivar with significant acreage (99%) in Calif., at two locations: Kern Co. and Madera Co., Calif. The Kern Co. test used ‘PG1’ rootstock with two replicates of 10 trees each, planted and field-budded in 1997. They first flowered in 2001. Performance data were obtained in 2002, 2003, 2004, and 2005. The Madera Co. test used budded ‘PG1’ and ‘UCB1’ rootstock with two replicates of five trees for each rootstock, planted in 1999 from nursery-budded trees. ‘Golden Hills’ flowered and fruited in 2003. Performance data were collected in 2004 and 2005. ‘Golden Hills’ was released 20 June 2005. U.S. plant patent PP17158 was issued on 17 Oct. 2006.

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Description

All of the color references are to the Royal Horticultural Society Color Chart (Royal Horticultural Society, 1986) and are designated as RHS. Yield data were obtained from commercial processing of nut harvests for ‘Golden Hills’ and ‘Kerman’. Nut dimensions and weights were evaluated from 50 nut samples by year, location, and rootstock. Nut volumes were computed as volume = $(\pi/6) \times (\text{length} \times \text{width} \times \text{height})$. Comparisons are made to ‘Kerman’ pistachio, the primary cultivar in California. General linear models analyses of variance (ANOVA) were performed with MINITAB ver. 14.20 (Minitab, State College, Pa.).

Tree

Tree structure. ‘Golden Hills’ has tree structure and branching habit typical for *P. vera*. Branch angles are broad, ranging from 80 to 90 degrees for both scaffold and lateral branches. Distribution of scaffold and lateral branches are a function of pruning and training activities which are practiced intensively during the first 3 years of growth. The crown is generally spherical. ‘Golden Hills’ displays more and smaller scaffold branches than ‘Kerman’ under the standard vase pruning system.

Tree vigor. Grafted trees are about 3 m tall at 7 years with a spread equal to the height. Trunk diameters range from 10 to 15 cm. Trunk cross-sectional areas of ‘Golden Hills’ were 121% greater than for ‘Kerman’ and were significantly different by ANOVA ($P < 0.01$).

Bark. Bark color is similar to ‘Kerman’, between RHS 202C and 202D.

Lenticels. Many more compound lenticel structures are found on ‘Golden Hills’ trunks than on ‘Kerman’. ‘Golden Hills’ lenticels are more corky in appearance than ‘Kerman’

lenticels and are more closely spaced, forming horizontal lines. Lenticel counts were done on either 16- or 20-cm² patches from five trees. The mean number of lenticels per cm² for ‘Golden Hills’ (23.4) and ‘Kerman’ (19) were not significantly different by ANOVA. The variance in the number of lenticels within a given area is much higher for ‘Golden Hills’ than for ‘Kerman’ (6.7 vs. 1.0).

Flower

Inflorescences. Female inflorescences are born laterally on 1-year-old wood and rarely from terminal buds. Flowers are borne on panicle inflorescences with 3–9 branches. The panicle is typically 2.5–4 cm long at the beginning of flowering, expanding to 8 cm long after completion of pollination. The panicles are $\approx 2/3$ as wide as they are long when fully expanded. The shape is roughly conical. Flowers become receptive from the base to the tip of the panicle, and receptivity spans a 3-week period, depending on weather conditions during individual seasons. Young inflorescences are pale green RHS 145C (yellow-green group) becoming darker green (RHS 143C) as the panicles mature. Individual flowers are 0.5–1.0 mm long and all are female. Fifty to 200 flowers are typically borne on each inflorescence with a high level of variability among inflorescences. Typical of *P. vera*, the majority of flowers abort before fruit maturation, leaving 10–20 mature fruit per inflorescence.

Flower buds. Ten dormant flower buds, measured on each of five trees, were significantly longer for ‘Golden Hills’ (8.34 mm) than ‘Kerman’ (7.48 mm) by ANOVA ($P < 0.01$).

Flowering date. ‘Golden Hills’ typically flowered 1–2 weeks before ‘Kerman’ (Table 1). ‘Golden Hills’ had regular synchronous bloom, while ‘Kerman’ exhibited an extended and irregular bloom period that resulted in asynchronous nut maturity in 2003.

Leaves

Leaf description. Leaves are deciduous simple compound paripinnate with one or two pairs of oppositely arranged lateral leaflets. Average number of leaflets is three or five. The apices of the leaflet blades are obtuse to cuspidate, and the leaflet base is rounded. Leaflet margins are entire to slightly crenate. Leaflets are oval to ovate. Terminal leaflet appears mucronate in some situations. Leaves are 10–15 cm long. Leaves vary considerably in shape, in general being ovate with cuspidate to rounded tips and rounded base. Margins of leaf blades are entire. Leaf surfaces are glabrous, smooth, and waxy. Leaves range from light green at first emergence to dark green at maturity. Upper and lower leaf surfaces do not differ significantly in color. Scores for older leaves are between RHS 136A and RHS 139A, and for young leaves, between RHS 136A and RHS 139B. Leaflets are typically 4–6 cm wide and

4–7 cm long. The compound leaf is typically 10–15 cm long. There is considerable variation in leaf and leaflet size depending on time of the season, position in the tree, and year.

Fruit

Fruit and nut description. Nuts are drupes arranged in panicle clusters (Fig. 1). Husk color gradually changes from a light green in late June to a bluish pink to cream white with tiny brown spots at maturity [RHS 52D (pink) to 11D (cream)]. The pink color is more intense on the surfaces facing the sun.

Husks (exo-mesocarp) initially adhere tightly to the shell (endocarp), become detached, yet remain intact at harvest. Shells split in midseason, usually 4–6 weeks before harvest but remain enclosed in the husk. Some shells do not split, producing a nut with low economic value. ‘Golden Hills’ produces a processed nut that is very similar to ‘Kerman’ in size and color. Nuts are oval, longer than wide with a somewhat truncate base, and have a slightly cuspidate to rounded tip (Fig. 2). The shell suture is deep, extending from the tip almost to the base, and is symmetrical. ‘Golden Hills’ in-shell nuts are slightly longer than ‘Kerman’ nuts and are more symmetrical (Fig. 2). Shell sutures are more symmetrical, and the in-shell nuts have a less flattened shape than ‘Kerman’ without the longer shell sutures on one side that are typical for ‘Kerman’. Kernels are almost completely covered by a purplish pink (RHS 50G-D to 53B) pellicle and are green (RHS 145C) where the pellicle is absent.

Nut size. Nonsignificant differences were observed from ANOVA for nut weight and volume between ‘Golden Hills’ (1.32 g/nut, 0.66 cm³/nut) and ‘Kerman’ (1.35 g/nut, 0.65 cm³/nut).

Production comparisons

Harvest date. ‘Golden Hills’ can be harvested 2 weeks before ‘Kerman’ (Table 2), permitting more efficient use of equipment and avoiding delayed maturity problems in years with irregular maturation and late harvest.

Yield. Total in-shell nut yields, split edible in-shell nut yields (Table 3), and grower paid yields for ‘Golden Hills’ and ‘Kerman’ were not different at either location. However, percent split edible in-shell nuts for ‘Golden Hills’ was greater ($P < 0.01$) than for ‘Kerman’ at both locations (Table 3). Split edible in-shell nut percentages are expressed as a percentage of the total dry harvested material (excluding leaves, etc).

Rootstocks. ‘Golden Hills’ was grafted on both ‘UCB1’ and ‘PG1’ rootstocks. The ‘UCB1’ rootstocks used at the Kern Co. plot appear to be off types due to nursery production problems (L. Ferguson, personal communication). All cultivar comparisons at that location appeared to be affected by this problem. Performance of ‘Golden Hills’ on both ‘PG1’ and ‘UCB1’ did not appear to be different at the Madera Co. plot. No graft

Table 1. Peak flowering dates for ‘Golden Hills’ and ‘Kerman’ on PG1 rootstock at the Kern Co. plot and on two rootstocks (PG1 and UCB1) at the Madera Co. plot; Julian days are in parentheses.

Location and cultivar	Score ²		
	3/25/2004 (85)	3/24/2005 (83)	4/21/2006 (111)
Kern Co.			
Golden Hills	3	3.5	3.5
Kerman	1.5	1.75	2.75
Madera Co.			
Golden Hills	2.2	2	
Kerman	1.2	1	

²Flowering code: 0, dormant; 1, green inflorescence; 2, early flowering; 3, mid-flowering; 4, full flower; 5, late flowering; most flowers have set fruit.

Fig. 1. ‘Golden Hills’ fruit on tree at maturity.

Fig. 2. ‘Golden Hills’ and ‘Kerman’ in-shell nuts.

incompatibility has been reported by nurserymen on either rootstock now. ‘Golden Hills’ should perform well on ‘PG1’ rootstock.

Use

The entire California ‘Kerman’ pistachio crop ripens at the same time, so that some of

the crop is harvested before or after optimum harvest due to lack of harvesting resources. ‘Golden Hills’ can be harvested earlier than ‘Kerman’ so that growers can optimize the use of labor and harvest equipment. The earlier harvest provided by ‘Golden Hills’ also has the potential to reduce navel orange-worm (*Amyelois transitella* Walker) damage and associated aflatoxin contamination

Table 2. Harvest dates for 'Golden Hills' and 'Kerman' on 'PG1' rootstock from Kern Co., 2002–2005 (sixth through ninth leaf); Julian days are in parentheses.

Cultivar	Yr			
	2002 ^z	2003 ^z	2004	2005
'Golden Hills'	4 Sept. (247)	3 Sept. (246)	16 Aug. (229)	1 Sept. (244)
'Kerman'	4 Sept. (247)	19 Sept. (262)	21 Sept. (265)	15 Sept. (258)

^z Oil was applied in Feb. 2002 and 2003 to promote earlier bloom in the test plot and surrounding orchard.

Table 3. Split edible in-shell nut yield (kg·ha⁻¹) and percent split edible in-shell nuts at (a) Kern Co. for 4 years on PG1 rootstock and at (b) Madera Co. for 2 years; percent split edible in-shell nuts are expressed as a percentage of the total dry harvested material (excluding leaves, etc).

	Kern Co.					Madera Co.		
	2002	2003	2004	2005	Mean	2004	2005	Mean
Split nut yield								
Golden Hills	308	272	729	541	463	134	99	117
Kerman	249	118	500	687	388	112	129	121
LSD 0.05					105 (<i>P</i> = 0.14)			0 (<i>P</i> = 0.21)
% Split nuts								
Golden Hills	96	73	93	93	89	81	93	87
Kerman	85	60	90	80	79	75	73	74
LSD 0.05					6 (<i>P</i> = 0.006)			7 (<i>P</i> = 0.001)

caused by *Aspergillus flavus* Link. Earlier harvest should also reduce yield losses from *Alternaria alternata* (Fr.) Keissler where that fungus is a problem. Inadequate chilling has resulted in irregular bloom, irregular nut maturity, and a high frequency of nonsplit nuts in 'Kerman' during some years. 'Golden Hills' flowers 1–2 weeks earlier than 'Kerman'

and may require less chilling to produce a synchronized full bloom in the spring based on direct observation and literature correlating bloom, flowering, and leafing date (Chao et al., 2003; Kester et al., 1977). 'Golden Hills' also has a high percentage of split nuts compared with 'Kerman'. This is an important commercial character.

Availability

Propagation wood has been distributed to California pistachio nurseries under license through the UC Davis Technology Transfer Center (patent no. PP17158). Licenses for nursery production of propagation wood may be obtained through the UC Davis Technology Transfer Center (One Shields Ave., University of California, Davis, CA 95616, telephone: +1 (530) 757-3432).

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