'Goldnine' Peach

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'Goldnine' is the third non-melting flesh, clingstone peach [*Prunus persica* (L.) Batsch] released from the Univ. of Arkansas peach breeding program. Previous releases were 'Allgold' and 'Goldilocks' (Moore et al., 1984).

'Goldnine' is an early, clingstone processing peach that has reliable production, excellent flower bud hardiness, later than average bloom date, above average resistance to bacterial spot [caused by *Xanthomonas campestris* pv. *pruni* (Smith) Dye], and good processing attributes. It is being released as an early to mid-season processing peach for cultivation primarily in northern regions of the United States with cooler summers than the deep South and for potential use as a fresh-market cultivar in areas desiring a non-melting flesh, clingstone peach for the fresh market (Mexico).

'Goldnine', which was officially named in 2000, has been marketed by commercial nurseries in the United States and Mexico as 'Arkansas 9', 'Ark. 9', or 'A-9'. In a census of peach cultivars planted in Michigan in 1997, 'A-9' was planted on 99 ha (Bill Shane, personal communication), with increased plantings anticipated, and 'Goldnine' was used for processing. In 1999, 'A-9' was one of the more commonly planted peaches in the highlands near Casas Grandes, Chihuahua, Mexico, with 30 ha in production for the fresh market (Jaime Martinez, personal communication).

Origin

'Goldnine' resulted from a cross of NJ 554367 × G17-5E made in 1963 by Catherine Bailey and L.F. Hough of Rutgers Univ., New Brunswick, N.J. (Fig. 1). The original seedling trees of this cross were planted at the Univ. of Arkansas Fruit Substation, Clarksville, in 1964, and the original tree was selected in 1966 by J.N.M. and R.C.R. and tested thereafter as 'Ark. 9'.

The primary testing of 'Goldnine' was at

the Fruit Substation, Clarksville, Ark. [west-central Arkansas, lat. 35°31'58"N and long. 93°24'412"W; U.S. Dept. of Agriculture (USDA) hardiness zone 7a; soil type Linker fine sandy loam (Typic Hapludults)], with testing also at the Southwest Arkansas Research and Extension Center, Hope [southwest Arkansas, lat. 33°42'30" and long. 93°33'0"; USDA hardiness zone 8a, soil type Bowie fine sandy loam (Fragic Palendults)]. Additional evaluation plantings were established in southwest Michigan and Princeton, Ky. In all Arkansas testing, trees were trained to an open-center system and pruned annually, spaced 5.5 m between trees, fertilized annually with either complete or nitrogen fertilizers, irrigated as needed, and pests managed using a pest management program typical for commercial orchards of the area, including the applications of fungicides and insecticides. Fruit were thinned each year that a crop was present to a distance of 12 cm between fruit prior to pit hardening but after shuck split.

Trials consisting of two-tree observational plots were maintained at Clarksville and data were collected from these trees or the original tree from 1966 through 1999. Data are reported here only for a maximum of 9 years for any data point. Comparison cultivars also planted at this site included 'Babygold 5',

'Babygold 7', 'Allgold', and 'Goldilocks'. Field observations included bloom date, bloom intensity, and fruit maturity date. Fruit maturity date was estimated for first commercial harvest. Fruit ratings were taken for size, shape, firmness, skin color, flesh color, finish, and flavor. Trees were rated for vigor, crop, health, and bacterial spot susceptibility. The rating scale for these variables was 1 to 10 with a rating of 10 most desirable, with the exception of vigor, in which a rating of 10 indicated excessive vigor. A rating of 7 to 8 would be most desirable for vigor in this rating scale. Additionally, a five-fruit sample was collected from 'Goldnine' for 9 years (1988, 1990–95, 1997–98) and average fruit weight, fruit size, color (using a model CR200 chroma meter, Minolta, Ramsey, N.J.), firmness (using a model FT327 fruit pressure tester with an 11-mm-diameter probe; McCormick Fruit Tree Co., Yakima, Wash.), and soluble solids (using a bench refractometer) were determined. In some years all variables were not measured and this is noted in the text. A replicated trial at Hope was established in 1992 and data were collected for yield and fruit weight in 1995 and 1997 (crops were lost or damaged by spring frosts in 1994 and 1996). Four single-tree replications arranged in a randomized complete-block design were utilized in this planting and data were analyzed separately for each year. Data from the replicated trial at Hope were analyzed by analysis of variance and means separated by least significant difference (LSD) (SAS Institute, 1989).

Processing evaluations were conducted in 1988, 1994, and 1995 by the Dept. of Food Science, Univ. of Arkansas, from ≈20-kg samples collected at Clarksville and delivered to Fayetteville. For all processing samples, fruit were peeled, pitted, and blanched in live

Fig. 1. Pedigree of 'Goldnine' peach. NJ = New Jersey and G17-5E is a California-developed cling selection, but records do not indicate the meaning of "G" or "DIX."

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steam for 5 min and then packed in a 0.5-L glass jar, which was exhausted for 10 min, sealed, and cooked for 25 min in boiling water. Soluble solids were measured with a bench refractometer from a blended, filtered sample. Titratable acidity and pH were measured on a 10-g blended sample diluted in 50 mL of deionized water, and titration utilized 0.1 N NaOH and was taken to a pH of 8.2. These measurements were obtained for both fresh fruit (represented as the fresh-slice data in Table 1), and processing samples (represented in the canned slices and canned puree data in Table 1). Processed sample color was determined by a Gardner Color Difference Meter (Colorguard System 1000 Colorimeter; Gardner/Neotec Instrument Division of Pacific Scientific Co., Silver Spring, Md.) that was standardized with a plaque (L = 93.5, a = 1.4, and b = 3.2). Sensory evaluations were also conducted on processed samples by a trained panel of 10 to 15 evaluators. These evaluations were done 3 to 4 months following processing of the fruit, and panelists rated the samples for color and flavor.

Description and performance

Average 10% bloom date at Clarksville for 'Goldnine' was 18 Mar., 1 d later than 'Goldilocks' and 'Babygold 5', and 3 d later than that for 'Allgold' and 'Babygold 7' (Table 2). Average full bloom date for 'Goldnine' was later than all comparison cultivars by 2 to 3 d (Table 2). Intensity of bloom ratings averaged over 9 years for 'Goldnine', a reflection of the amount of bloom, exceeded those for 'Allgold', 'Goldilocks', 'Babygold 5', and 'Babygold 7' (data not shown). Flowers of 'Goldnine' are showy and self-fertile. Leaf glands are reniform. Tree vigor was rated slightly lower than that for 'Allgold' and 'Goldilocks' (Table 2), although this difference was minimal and would not affect canopy management decisions. Crop load ratings conducted at fruit maturity were generally similar to the test cultivars (Table 3). Consistent cropping was achieved in all years of fruiting except when frosts near bloom eliminated the crop. Ratings for tree health for 'Goldnine' were between those for 'Allgold' and 'Goldilocks' (Table 3). 'Goldnine' was comparable with 'Allgold' in bacterial spot resistance, and less susceptible to this disease than were 'Goldilocks' and 'Babygold 5' (data not shown). In some years a limited number of bacterial spot lesions were seen on leaves of 'Goldnine' but defoliation was not a concern. Bacterial spot lesions were rarely seen on fruit and, when seen, were very minimal. No other disease problems have been seen on 'Goldnine', although a commercial fungicide program was used to control brown rot [caused by *Monilinia fructicola* (G. Wint.) Honey]. Peach scab (caused by *Cladosporium carpophilum* Thuem.) was observed on the fruit of 'Goldnine' 1 year at Hope, but was judged to be no more severe than on other cultivars in the planting.

Winter bud hardiness is very good for 'Goldnine' and is probably at least part of the

Table 1. Quality analyses of processing peach cultivars grown at the Univ. of Arkansas Fruit Substation, Clarksville.

Characteristic	Cultivar			
	Goldnine	Allgold	Goldilocks	Babygold 5
<i>Fresh slices^c</i>				
Soluble solids (%)	11.3	11.4	12.1	13.5
pH	3.73	3.62	3.86	3.83
Titratable acidity ^d	5.40	5.30	4.10	4.80
CDM ^a -L	56.3	65.7	60.3	62.4
CDM-a	19.3	12.3	20.0	15.8
CDM-b	30.6	35.1	34.1	34.7
<i>Canned slices^c</i>				
Soluble solids (%)	13.7	13.4	15.5	14.6
pH	3.67	3.75	3.86	3.77
Titratable acidity	4.70	4.00	3.60	4.50
CDM-L	67.5	68.8	66.0	69.3
CDM-a	9.8	10.9	13.5	10.0
CDM-b	36.8	38.6	37.3	37.8
<i>Canned puree^w</i>				
Soluble solids (%)	13.6	15.0	14.4	---
pH	3.60	3.79	3.93	---
Titratable acidity	5.20	4.70	3.10	---
CDM-L	46.1	46.0	50.5	---
CDM-a	11.7	11.3	14.3	---
CDM-b	26.6	27.0	29.1	---

^aMeans for 3 years: 1984, 1986, 1994.

^dTitratable acidity as malic acid in g·L⁻¹.

^cCDM = Color difference meter; the lower the L value, the darker the sample; the higher the a value, the redder the sample; the higher the b value, the more yellow the sample.

^wSingle-year data: 1986.

Table 2. Bloom and harvest dates and fruit characteristics of processing peach cultivars, Univ. of Arkansas Fruit Substation, Clarksville.

Cultivar	Bloom date ^c		Harvest date ^d	Fruit wt ^e (g)	Fruit firmness ^a (kg)	Soluble solids (%) ^w
	10%	full				
Goldnine	18 Mar.	26 Mar.	11 July	187	4.8	12.7
Allgold	15 Mar.	23 Mar.	1 July	204	3.3	12.1
Goldilocks	17 Mar.	24 Mar.	18 July	147	5.2	12.6
Babygold 5	17 Mar.	24 Mar.	21 July	153	5.8	14.0
Babygold 7	15 Mar.	23 Mar.	30 July	170	6.6	13.3

^aMeans for 9 years: 1988, 1990–95, 1997–98.

^dMeans for 8 years: 1988, 1990–91, 1993–95, 1997–98.

^eMeans for 5 years: 1991, 1993–94, 1997–98; determined by a fruit pressure tester with an 11-mm-diameter on fresh, unpeeled samples.

^wMeans for 7 years: 1990–91, 1993–95, 1997–98.

basis for its reliable cropping. Following –22 °C on 24 and 25 Dec. 1989 at Clarksville, percent flower bud survival for 'Goldnine' was 76% vs. 10% for 'Allgold' and 24% for 'Goldilocks'. In that same time period, data from Kentucky indicated that 'Goldnine' had 38% flower bud survival following exposure to –26 °C vs. 2% survival for 'Redhaven' and 14% for 'Reliance' (Brown and Strang, 1990). Chilling requirement of 'Goldnine' has not been determined, but is probably near 750 h below 7 °C based on observations of budbreak and bloom in comparative plantings with test cultivars of known chill requirement. In Chihuahua, Mexico, in 1999, 'Goldnine' fruited well with an estimated chilling of 500 h below 7 °C. Budbreak of 'Babygold 5' and 'Babygold 7' was reduced because of lack of adequate chilling (Jaime Martinez, personal communication).

Fruit of 'Goldnine' mature on average 10 d after 'Allgold', 7 d before 'Goldilocks', and 10 and 19 d before 'Babygold 5' and 'Babygold 7', respectively (Table 2). Yield data, collected at Hope for 1995 and 1997, indicated

that 'Goldnine' had significantly higher yields than did 'Babygold 5' and 'Babygold 7' in 1997 and statistically similar yields in 1995 (Table 4). Fruit size ratings were similar to those for 'Goldilocks' and 'Babygold 5', but less than those for 'Allgold' and 'Babygold 7' (Table 2). Average fruit weight for 'Goldnine' over 8 years was 187 g and exceeded that of all comparison cultivars except 'Allgold' at Clarksville (Table 2). Fruit weight at Hope for 'Goldnine' was less than for 'Babygold 5' and 'Babygold 7', although crop loads for 'Goldnine' were heavier than for either of these comparison cultivars (Table 3). 'Goldnine' fruit averaged 6.1 cm in length and 7.1 cm in diameter in measurements taken over 9 years. Fruit shape, skin color, and finish ratings were generally similar among 'Goldnine' and the other cultivars evaluated (Table 3). The skin usually had ≈40% blush with some red striping when grown in Arkansas. Skin ground color (background color) had 7-year average values of 71.7 for L (the lower the L value, the darker the sample), 11.1 for a (the higher the a value, the redder the sample),

Table 3. Subjective evaluations (based on a 1–10 scale, with a rating of <6 considered unacceptable) of fruit and tree characteristics for processing peach cultivars. Data are means of 7 (1991–95, 1997–98) years and ratings are from the Univ. of Arkansas Fruit Substation, Clarksville.

Characteristic	Cultivar				
	Goldnine	Allgold	Goldilocks	Babygold 5	Babygold 7
	<i>Fruit</i>				
Size ^z	7.8	9.0	7.7	7.7	8.8
Shape ^y	7.7	7.6	7.7	7.6	6.4
Firmness ^x	8.7	7.8	8.1	7.7	8.6
Skin ^w	7.5	8.1	8.0	7.3	7.6
Flesh ^v	6.2	7.6	7.1	6.4	6.4
Finish ^u	7.7	8.0	7.7	6.7	7.4
Flavor ^t	7.5	7.4	7.6	7.3	6.8
	<i>Tree</i>				
Vigor ^s	7.8	8.3	8.1	---	---
Crop ^r	8.7	8.6	8.3	---	---
Health ^q	8.2	9.0	7.4	---	---

^z10 = very large fruit.

^y10 = round or mostly round or uniform and free of bulging suture and blossom-end tip.

^xBased on hand pressure applied to whole, unpeeled fruit with 10 = very firm fruit.

^wPreferred is a light, bright red-over-orange ground color with 10 = full expression of these colors.

^vPreferred is uniform orange color with no trace of red pigment with 10 = no red in flesh and uniform orange color.

^uPreferred is bright finish free of any blemish or skin cracks or inconsistencies with 10 = free of all surface blemishes or skin cracks.

^tRatings based on fresh samples; higher values indicate good sweetness and expression of peach flavor with little astringency or other undesirable flavor components.

^sRatings based on good shoot growth, but not overly vegetative; optimum is a rating of 7 to 8 with a rating of 10 considered excessive.

^r10 = full crop; 9 = 90% crop, etc.

^q10 = no disease or health concerns. The most important disease involved in this rating is bacterial spot, and a higher rating indicates a lower occurrence of this disease. Non-disease factors could involve poor health due to mineral deficiencies or insect damage.

and 59.9 for b (the higher the b value, the more yellow the sample), while skin over color values were 40.1 for L, 36.7 for a, and 24.2 for b. Fruit firmness for ‘Goldnine’ was higher than for ‘Allgold’ in ratings and objective testing (Tables 2 and 3). Flesh color ratings were less desirable for ‘Goldnine’ than for ‘Allgold’ or ‘Goldilocks’, but near those for ‘Babygold 5’ and ‘Babygold 7’. This reduced rating is due to the commonly seen red color in the flesh for ‘Goldnine’ in Arkansas. This red color was usually found not only around the pit of the fruit but also in the flesh, and the intensity of the red varied with year. ‘Goldnine’ was judged to have excess red in the flesh in some years in Arkansas trials and was not released prior to this time because of this limitation. However, less red pigment in the flesh was observed in cooler environments such as those found in southwest Michigan (Todd DeKryger, Gerber Products Co., personal communication). Flavor ratings were good for ‘Goldnine’, generally comparable to those of the other Arkansas cultivars and ‘Babygold 5’ but higher than for ‘Babygold 7’ (Table 3). Soluble solids content of orchard samples was near that of the other Arkansas cultivars but was exceeded slightly by

‘Babygold 5’ and ‘Babygold 7’ (Table 2). In most years no split pits were observed in ‘Goldnine’, and in years when this did occur the incidence was as low or lower than in other processing peach cultivars (data not shown).

Quality analyses indicated that ‘Goldnine’ had good processed quality. Soluble solids, pH, and titratable acidity values were generally comparable among the cultivars evaluated whether these variables were measured on fresh, canned, or pureed samples (Table 1).

Minor differences were seen among L values, indicating lightness of samples, and the ‘Goldnine’ value for fresh slices was lower than that of ‘Allgold’, and to a lesser extent lower than that of ‘Babygold 5’ and ‘Babygold 7’, possibly reflecting some darkness in the sample due to the red pigment in the flesh of ‘Goldnine’. However, processed samples indicated that ‘Goldnine’ did not have darker values than other cultivars. Since red pigment in the flesh can lead to browning in a processed product (and presumably to a darker value), the lack of a lower L value in processed samples is a positive finding. For the fresh-slice a values, ‘Goldnine’ was higher than ‘Allgold’ (in which no red is observed in the flesh), which indicates that the red is probably

Table 4. Yield and fruit weight in 1995 and 1997 of processing peach cultivars grown at the Southwest Research and Extension Center, Hope, Ark.^z

Cultivar	Yield (kg/tree)	Avg fruit wt (g)
1995		
Goldnine	54.5 a ^y	176 b
Babygold 5	50.8 a	189 ab
Babygold 7	43.3 a	208 a
1997		
Goldnine	107.7 a	149 b
Babygold 5	51.1 b	247 a
Babygold 7	68.6 b	---

^zPlanting established in 1992.

^yMean separation within columns and years by LSD ($P \leq 0.05$).

being measured by the color difference meter. ‘Goldnine’ was more similar to ‘Babygold 5’ and ‘Goldilocks’ in fresh-slice a value, which was expected, since some red often occurs in the flesh of these two cultivars. Interestingly, the higher a value for ‘Goldnine’ was not observed in the canned slices or canned puree (Table 1). This may indicate that the red pigment in the flesh does not contribute to red color in the processed product. In sensory evaluations on pureed samples, averaged over 4 years, flavor of ‘Goldnine’ rated near that of ‘Goldilocks’ and ‘Allgold’, and higher than that of ‘Babygold 5’ (data not shown). Sensory values for color desirability were higher for ‘Goldnine’ than for ‘Goldilocks’ and ‘Babygold 5’ (data not shown).

The outstanding characteristics of ‘Goldnine’ are its reliable production, excellent flower bud hardness, later than average bloom date, above average bacterial spot resistance, and good processing attributes. ‘Goldnine’ is recommended for trial where other eastern, North American–developed processing clingstone peaches are grown.

Availability

‘Goldnine’ is available from commercial nurseries under this name or as ‘Arkansas 9’, ‘A-9’, or ‘Ark. 9’. A limited amount of budwood is available for research and evaluation purposes; requests can be sent to J.R.C., 316 Plant Science, Dept. of Horticulture, Univ. of Arkansas, Fayetteville, AR 72701.

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