turns above an initial research cost of $823,877. (Total funds allocated to the research from 1976 to 1984 were $537,661. Since society was deprived of the use of these funds for other purposes, compound interest at the rate of 12 percent was charged through 1984. The costs do not reflect the efforts of the UC Extension personnel or the collaborators who cooperated in developing the presence-absence monitoring system [see Zalom *et al.*, *California Agriculture* May-June 1984]. UC Cooperative Extension costs for education and implementation during 1984-85 are also excluded.)

The returns result in benefit-cost ratios of 15, 26, and 35, respectively, which translate into an annual return of 280 to 370 percent on the initial research investment. If the program is used longer than five years, additional benefits to the initial research investment will accrue, although costs for ongoing education and adaptation will continue.

A program like this has much to recommend it, since it is not expected to increase crop yields. Therefore, in the short run, the cost-saving benefits accrue to the growers directly and totally.

The integrated mite management program is unique in that it incorporates, as a component, a laboratory-selected predator. An additional unique feature is the fact that a large portion of the development costs can be documented to determine the economic justification of the endeavor.

By June 1985, an informal survey of pest control advisors and UC Cooperative Extension personnel suggested that nearly 25 percent of the growers with spider mite problems had already adopted the program. In 1984 and 1985, at least 12,000 acres of almonds received releases of the laboratory-selected strain of *M. occidentalis*. Cost savings expected from the first increment of adoption have therefore already been achieved. The outlook is that, by 1987, up to 60 to 70 percent of growers with spider mite problems will have adopted the program, and the projected industry cost savings will be reality.

J. C. Headley is Professor, Department of Agricultural Economics, University of Missouri, Columbia, and Marjorie A. Hoy is Professor and Entomologist, Department of Entomological Sciences, University of California, Berkeley. *The authors thank Walter Bentley, Daniel Cahn, Darryl Castro, Lonnie Hendricks, Clif Kitayma, D. Lee, Wilbur Reil, Barry Wilk, and Frank Zalom for information. William W. Barnett, Area Specialist, UC/IPM, Fresno County, and Robert Curtis, Almond Board of California, provided valuable advice. This project has been supported in part by funds from the Almond Board of California; UC/IPM Project; Experiment Station Project 3522-H; Western Regional Project-84; and the California Department of Food and Agriculture. Information on the integrated mite management program is available in UC/IPM Publ. 1, 1984, "Managing Mites in Almonds, An Integrated Approach," from the Integrated Pest Management Implementation Group, University of California, Davis, CA 95616.*

'Melogold', a new pummelo-grapefruit hybrid

Robert K. Soost □ James W. Cameron

The second offspring of a pummelo-grapefruit cross — 'Melogold' — is now being released. In 1958, an essentially acidless pummelo, CRC 2240 (*Citrus grandis* Osbeck), which imparts low acidity to its progeny, was crossed as seed parent with a seedy, white tetraploid (having twice the normal number of chromosomes) grapefruit (*C. paradisi* Macf.). The small population from this cross consisted of one tetraploid and six triploids (having 1½ times the normal number of chromosomes), which were field-planted in 1962. Two of the triploids had particularly favorable characteristics and were propagated for further testing. One of these was released in 1980 as 'Oroblanco' (*California Agriculture*, November-December 1980). The second, 6C26,18, is the cultivar 'Melogold'.

Observations have been made and data collected at Riverside (intermediate, interior climate) since 1967. Additional test trees were planted at the University of California Lindcove Field Station at Exeter (also intermediate, interior), the UC South Coast Field Station at Irvine (cool, humid area), and the U.S. Date and Citrus Station, Indio (hot desert climate). Some fruit has been available for testing at these locations since 1975.

'Melogold' appears to be best adapted to the inland citrus areas of California. At Lindcove, the season of production is from early November through February, just slightly earlier than 'Oroblanco'. At Riverside, maturity is from early December into March. 'Melogold' is suitable as a breakfast or salad fruit.

Description

In general characteristics, 'Melogold' resembles the present white-fleshed grapefruit cultivars but is more pummelo-like than 'Oroblanco'. Fruit are larger than 'Marsh' grapefruit and 'Oroblanco' at all test locations. Weight at Riverside from 1967 through 1975 averaged 470 grams (17 ounces) for 'Melogold', 360 grams (13 ounces) for 'Oroblanco', and 280 grams (10 ounces) for 'Marsh'. At Lindcove, from 1975 through 1983 with younger trees, fruit weight averaged 700 grams (25 ounces), 520 grams (18 ounces), and 450 grams (16 ounces), respectively, for the three cultivars.

Fruit shape is comparable to 'Marsh' and 'Oroblanco' with a slight tendency for more stem-end taper. Exterior peel color is slower to develop than in 'Marsh' grapefruit but is comparable late in the season. Exterior peel texture is smooth to slightly pebbled. Average peel thickness is slightly greater than in 'Marsh' but, as a percentage of fruit diameter, is equal to 'Marsh' and thinner than 'Oroblanco'.

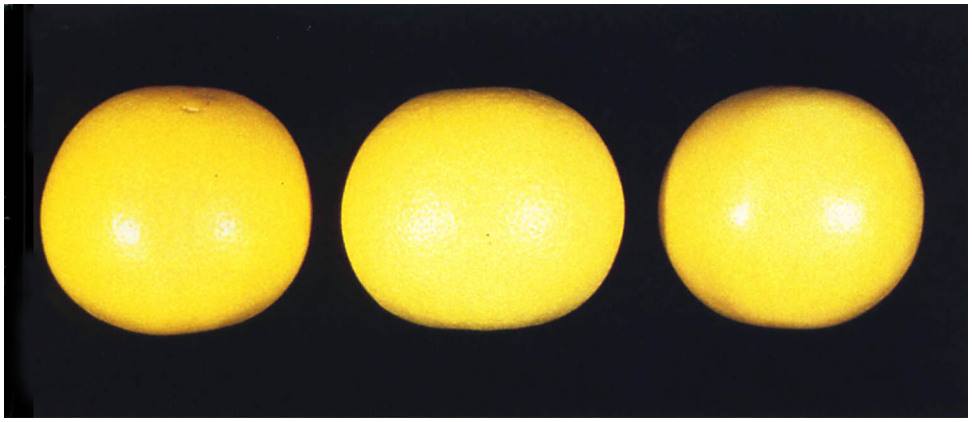
Interior color and texture are the same as in 'Oroblanco'. As with 'Oroblanco', the central core hollow is greater than in 'Marsh' at maturity. The flesh is tender and juicy, separating well from the segment membranes. Percent juice has been equal to 'Marsh' and slightly higher than 'Oroblanco'.

'Melogold' may have a slight bitterness, particularly early and late in the harvest season. In taste tests, 'Melogold' was always preferred by a wide margin over 'Marsh' but usually was a very close second to 'Oroblanco'. In flavor, 'Melogold' differs from both 'Oroblanco' and grapefruit and is more like pummelo.

The total soluble solids, titratable acid, and solids-to-acid ratios of 'Melogold', 'Oroblanco', and 'Marsh', have been recorded since 1967 at Riverside and 1975 at Lindcove (tables 1 and 2). Riverside data for 'Melogold' and 'Oroblanco' through 1976 are from the original seedling trees or the first-budded trees on Troyer citrange (*Citrus sinensis* [L.] Osbeck × *Poncirus trifoliata* [L.] Raf.) rootstock. The slightly lower solids and acids in 1975 through 1978 are from younger trees also on Troyer citrange. All trees in Lindcove are also on Troyer citrange.

In comparison with 'Oroblanco', solids have consistently been slightly lower at Riverside but have sometimes been slightly higher at Lindcove. Acidity has also been consistently slightly lower than that of 'Oroblanco' at Riverside but has fluctuated at Lindcove. As with 'Oroblanco', 'Melogold' had much lower acidity than 'Marsh' did on all sampling dates through the season at all test locations.

In the 1981-82 season at Lindcove (table 2), the low acidity with moderate solids produced a much higher ratio than in 'Marsh' at all sampling dates. Fruit from the Coachella Valley and South Coast Field Station also had low acidity and moderate solids, even early in the season.



Although not evident in these photos, for which fruits were selected for equal size, 'Melogold' fruit (at left) are larger than 'Oroblanco' (center) or 'Marsh'. Under development since 1967, 'Melogold' is suitable as a breakfast or salad fruit.

Fruit from the Coachella Valley have been rather insipid, however, and those from the South Coast Field Station generally have been slightly bitter and lacking in flavor.

Long-term yielding behavior is uncertain. Test trees at Riverside have had moderate to heavy yields with a tendency to alternate. Even with heavy yields, fruit size has been considerably larger than in 'Marsh'. 'Melogold' has been grown only on Troyer citrange and Rough lemon (*C. limon* [L.] Burm. f.) rootstocks. The oldest trees on Troyer were 17 years old when pulled and showed no signs of budunion difficulties or decline. Existing trees on Troyer are now 12 years old. Rough lemon is not recommended because of its adverse effects on fruit quality. Other rootstocks that are compatible with grapefruit may be suitable for 'Melogold'.

Availability

Patent rights have been assigned to the Regents of the University of California. Budwood is available only to nurseries licensed to propagate 'Melogold'.

Robert K. Soost is Professor of Genetics and Geneticist, and James .W Cameron is Professor of Horticulture and Geneticist, Emeritus, Department of Botany and Plant Sciences, University of California, Riverside.

TABLE 1. Total soluble solids, titratable acid, and solids: acid ratios of 'Melogold', 'Oroblanco', and 'Marsh' for 11 years at Riverside, California

	Total soluble solids			Acid			Solids: acid		
Year*	'Melogold'	'Oroblanco'	'Marsh'	'Melogold'	'Oroblanco'	'Marsh'	'Melogold'	'Oroblanco'	'Marsh'
	%	%	%	%	%	%			
1967	13.3	13.2	10.7	1.09	1.22	2.16	12.2	10.8	4.9
1969	13.6	12.9	11.5	0.90	1.20	2.07	15.1	10.8	5.6
1970	11.0	11.4	8.5	1.02	1.26	1.95	10.8	9.0	4.4
1971	13.4	13.8	10.4	1.23	1.61	2.02	10.9	8.6	5.1
1972	12.8	13.5	9.3	0.98	1.06	1.62	13.1	12.7	5.7
1973	13.0	14.0	10.6	1.21	1.40	2.25	10.7	10.0	4.7
1974	10.4	10.8	9.4†	0.90	0.91	1.47†	11.6	11.9	6.4†
1975	11.8	12.3	9.9	1.10	1.24	2.22	10.7	9.9	4.5
1976	8.6	8.7	9.5	0.85	0.92	1.73	10.1	9.4	5.5
1977	8.9	9.8	—	0.87	0.87	—	10.2	11.3	—
1978	10.4	13.1	—	0.77	0.85	—	13.5	15.4	—

* All samples harvested in mid-December, unless otherwise noted. No data collected 1968.
† January 1975 samples.

TABLE 2.Total soluble solids, titratable acid, and solids: acid ratios of 'Melogold', 'Oroblanco', and 'Marsh' for 8 years at Lindcove Field Station, Exeter, California.

	Total soluble solids			Acid			Solids: acid		
Date*	'Melogold'	'Oroblanco'	'Marsh'	'Melogold'	'Oroblanco'	'Marsh'	'Melogold'	'Oroblanco'	'Marsh'
	%	%	%	%	%	%			
Date by year									
1975	10.2	12.2	9.2†	1.14	1.07	1.61†	8.9	11.4	5.7†
1976	10.2	10.7	—	0.99	0.86	—	10.3	12.4	—
1977	11.0	11.7	11.3	0.96	1.05	1.82	11.5	11.1	6.2
1978	10.0	10.4	9.7‡	0.91	0.82	1.63‡	11.0	12.7	5.9‡
1980	10.7	10.8	—	1.05	0.98	—	10.2	11.0	—
1981	11.7	11.0	—	0.84	0.84	—	13.9	13.1	—
1982	11.1	10.4	9.8‡	0.93	0.96	1.47‡	11.9	10.8	6.7‡
1983	11.4	9.8	8.9‡	0.91	0.89	1.44‡	12.5	11.0	6.2‡
1981-82 season									
12-9-81	11.7	11.0	—	0.84	0.84	—	13.9	13.1	—
1-20-82	12.0	11.2	—	0.86	0.84	—	13.9	13.3	—
2-25-82	12.1	11.9	—	0.74	0.76	—	16.3	15.7	—
3-16-82	11.5	11.1	9.8	0.74	0.79	1.5	15.5	14.0	6.5

* All samples harvested in mid-December, unless otherwise noted. No data collected 1979.
† January samples, the year following the listed year.
‡ March samples, the year following the year listed.