

'ROHDE RED VALENCIA,' AN ORANGE SELECTION WITH IMPROVED JUICE COLOR

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Abstract. The 'Rohde Red Valencia' is a selection found near Sebring, Florida and was named after its discoverer, the late Paul Rohde, Sr. of Winter Haven. At least 3 blocks of these trees were planted near Haines City between 15 and 20 years ago. The trees, budded on rough lemon rootstock, have large canopies and bear excellent crops of medium to large sized fruit. The fruit appears to be typical of 'Valencia' in appearance, time of maturity, and flavor; but the juice color is much deeper orange than that from known types of this cultivar.

In recent years, there has been an increasing interest in the color of orange juice because of its importance for establishing USDA grades. The purpose of this paper is to describe a "Valencia" selection having deep orange flesh which is attractive to market as fresh fruit and valuable for its juice to blend with that of other varieties that have pale color.

Origin. Probably the largest plantings of the 'Rohde Red Valencia' have been made by Mr. Julian Johnston of Winter Haven. When contacted, Mr. Johnston indicated that the budwood was obtained from a neighbor, the late Mr. Paul Rohde, Sr. Mr. Rohde's son, Mr. Paul Rohde, Jr., was then interviewed and the following letter describes the source of the budwood:

Paul E. Rohde, Jr.
365 Avenue G S.E.
Winter Haven, Fla. 33880
March 30, 1973

Dr. Ivan Stewart
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Subject: Origin of budwood of a late 'Valencia' type orange with interior red color similar to the 'Honey' tangerine.

The original budwood for the above type orange was discovered in a Sebring, Florida area grove back in 1955 by my father, Paul E. Rohde, Sr., while working as a fruit buyer for a local citrus packinghouse. At that time, my father had a small nursery next to my present home at 365 Avenue G S.E., Winter Haven, Fla. With the help, I believe, of Julian Johnston, Sr., the budwood from the couple of trees from Sebring was budded to, I believe, sour orange seedlings (I am not sure of the rootstock), from which came the present couple of trees in my yard and my neighbor's yard, as well as some trees in my groves. Also, some of this type orange trees were planted in Mr. Johnston's grove, which has since been sold to a member of the Haines City Citrus Growers Assn. I, Paul E. Rohde, Jr., give the University of Florida permission to use this type of orange budwood from the trees in the yard at my home, as well as the trees in my grove.

Yours truly,
Paul E. Rohde, Jr.

The location of the original tree in Sebring is unknown. However, Mr. Paul Rohde, Jr., has trees growing in his backyard that are believed to be on the original nursery site. As indicated in his letter, these trees are probably on sour orange rootstock. The trees are small for their age, but the fruit is characteristic of the red type. Replants of this mutant in the Rohde groves also appeared to be on sour orange rootstock, and they are also small. The trees grow large on rough lemon rootstock. The cause of the stunting on sour orange rootstock was not determined.

Pigmentation. If the 'Rohde Red Valencia' is to be useful as a source of juice color, it is important to know the pigments that contribute to the color. For example, the xanthophylls cryptoxanthin and violaxanthin are important carotenoids in most orange juices. However, in red grapefruit, lycopene is the main pigment, and in blood oranges, it is anthocyanin. Both of the latter 2 pigments have been troublesome to process and can give the juice a brown muddy appearance.

A preliminary separation of the carotenoids by high pressure liquid chromatography suggested that the main difference between the red juice and that from a common type 'Valencia' was due to cryptoxanthin. The carotenoids were then extracted from a suitable amount of 'Rohde Red Valencia' juice and the pigments separated on an

open chromatography column. The crystalline material from the main red band had the same spectra and chromatographic properties as known samples of cryptoxanthin, which is the orange pigment that gives the deep color to 'Honey' and 'Dancy' tangerine juice. Samples taken in early April indicated a total cryptoxanthin content of 152 $\mu\text{g}/100$ ml of juice from 'Rohde Red Valencia' fruit and 90 $\mu\text{g}/100$ ml from standard 'Valencia' juice. Since cryptoxanthin is a vitamin A precursor and remains fairly stable during processing, this makes it a highly desirable pigment for color in citrus juice.

Color measurements were made on the juice using a Hunterlab Model D-45 Citrus Colorimeter. Samples were taken at approximately weekly intervals from January to May during 1974 and 1975. The color values are expressed as ECS (equivalent color score) (1). As expected, in both years, the ECS values were consistently higher for the juice from the 'Rohde Red Valencia' than from a common 'Valencia' strain (Fig. 1).

Fruit quality. Fruit samples were taken from 7 typical 'Rohde Red Valencia' trees on rough lemon rootstock and from a common 'Valencia' strain in an adjoining grove, and fruit quality determinations were made on 3 different dates (Table 1). For the 'Rohde Red Valencia' the juice volume and ratios were significantly higher than in the common 'Valencia' and the soluble solids and acid values were significantly lower. There was no significant difference between the number of seeds or vitamin C content. Maturity data as compiled by the Florida Crop and Livestock Reporting Service also showed that 'Rohde

Red Valencia' juice was lower in acids and soluble solids than the averages for sampled 'Valencia' blocks.

Production. Six trees were randomly selected in 1975 for yields. The highest yield per tree was 13.75 boxes, and the lowest, 9 boxes, with an average of 11. Although yields have been taken for only 1 year, observations would indicate that the 'Rohde Red Valencia' trees on rough lemon rootstock are consistently good bearers.

Budwood testing program. In 1969, Lake Pierce Nursery, Inc. submitted 10 'Rohde Red Valencia' trees as source tree candidates in the Citrus Budwood Registration Program. These 8-year-old trees were growing in the Green Swamp and were part of a grove belonging to Bowen Brothers, Inc. Virus indexing of these trees showed identical virus patterns, positive for xyloporosis and exocortis, and negative for tristeza and psorosis. Yearly examination of the candidate trees made while virus indexing was in process resulted in the elimination of 5 trees because of the occurrence of foot rot, atypical fruit color, and excessive fruit chimeras and bud variations. In October 1974, 5 trees were registered as free of psorosis and accepted as parent trees in the Citrus Budwood Registration Program. In order to eventually obtain virus free budwood, seed from fruit of the candidate trees were planted in 1970. A second group of seedlings were produced by controlled pollination of the 1973 bloom. Both groups of seedlings are now growing in the Budwood Registration Program, Foundation Grove, Dundee. The presence of exocortis and xyloporosis virus in the budwood now available greatly limits the rootstock that can be used for the 'Rohde Red Valencia.'

Conclusions

The 'Rohde Red Valencia' is a selection with significantly improved juice color. It has performed satisfactorily in commercial plantings on rough lemon rootstock. This selection appears to have considerable potential where better juice color is desired. Its tendency for low acidity, high ratio, and high color score appears particularly suitable for blending with early season juices to provide a more uniform product.

The advantage of this selection should encourage grower evaluation of plantings on rough lemon from currently available budwood. Additional rootstocks should be considered when virus-free budwood is available.

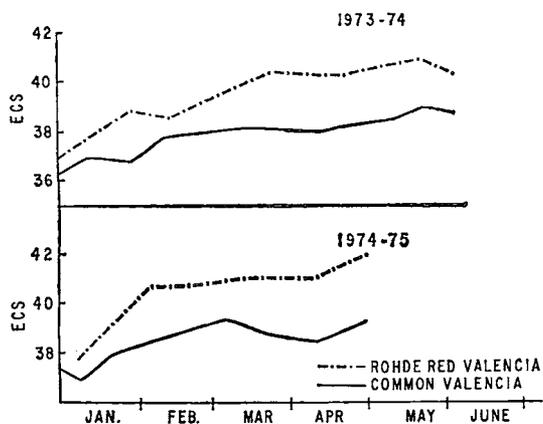


Fig. 1. Comparison of color readings of juice from 'Rohde Red Valencia' and from a common 'Valencia' strain. Values are expressed as ECS (equivalent color scores).

Table 1. Fruit quality of 'Rohde Red Valencia' compared with a standard 'Valencia' and samples from groves reported by the Florida Crop and Livestock Reporting Service.

		Sample dates, 1974			
		4-10	4-23	5-8	Average
Seeds (number/fruit)	Standard	4	5	6.2	5.1
	Rohde Red	3.3	3.8	3.1	3.4 ^y
Juice (ml/fruit)	Standard	72	80	89	80
	Rohde Red	87	101	100	96 ^z
Soluble solids (per cent)	Standard	12.6	12.9	13.0	12.8
	Rohde Red	12.2	12.4	12.3	12.3 ^z
	FCLRS ^x	12.5	12.7	12.8	12.7
Acid (per cent)	Standard	1.17	1.12	1.03	1.11
	Rohde Red	1.06	0.95	0.90	0.96 ^z
	FCLRS	1.12	1.11	1.04	1.09
Ratio	Standard	10.77	11.52	12.62	11.6
	Rohde Red	11.62	13.01	13.79	12.8 ^z
	FCLRS	11.34	11.63	12.60	11.9
Vitamin C (g/100 ml)	Standard	43.68	49.14	46.41	46.4
	Rohde Red	44.22	43.91	43.23	43.8 ^y

^zSignificantly different at the 5% level between the 'Rohde Red Valencia' and standard 'Valencia.'

^yNot significantly different.

^xMaturity test results from Florida Crop and Livestock Reporting Service sample groves, sampled April 1, April 15, and May 1, 1974.

Literature Cited

1. Huggart, R. L., F. W. Wenzel, and F. G. Martin. 1969. Equivalent color scores for Florida frozen concentrate orange juice. *Proc. Fla. State Hort. Soc.* 82:200-205.