Horticultural Aspects of Jojoba

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Jojoba (pronounced "hohoba") is the common name of a desert shrub indigenous over a large area of the arid southwestern part of the United States. Its botanical name is *Simmondsia chinensis,* Link (Schneid). The brown nut-like fruits contain about 50% liquid wax with unique and valuable chemical qualities (4). This substance is easily hydrogenated to a hard, white, crystalline wax, which has many uses including substitution for some of the hard waxes now imported. Exhaustive studies by research chemists indicate that if cultural methods can be worked out, there may be a market for the product which can be produced on thousands of acres of foothill lands with rainfall from 10 to 18 inches (3). Where rainfall is less than 10 inches some irrigation may be needed for profitable yields. Mature plants endure temperatures as low as 15 degrees F. Young plants are more tender although there is considerable variation in cold hardiness among seedlings.

Oil refiners are interested in this wax but they need sufficient volume for trial runs before deciding on a price to farmers. Before this can happen some progress must be made in domesticating this intriguing desert shrub. With this in view two small plantings have been made in connection with a carob demonstration orchard (1) located near Vista which is supported as a public service by the benefaction of Dr. Walter Rittenhouse. Since its inception, the writer has been in charge of the project. The following is a preliminary report of progress to date.

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In their native state jojoba shrubs are spreading and are seldom over eight feet in height, usually with multiple trunks from the ground. They may live over 100 years (3). The plant is dioecious, and no hermaphrodites have so far been noted. The species thrives in interior desert heat and also along the cool and foggy Pacific coast.

Flowers appear during fall and winter but usually remain dormant until spring. Like many other plants, jojoba produces a great many more flowers than can be sustained to maturity. They blight in various stages of development, the final crop depending largely on the supply of available soil moisture. So far, no insect pests or diseases have been noted. There is a tendency toward alternate bearing. The commercial future of jojoba requires horticultural research and development of cultural methods before growers can be expected to invest in the culture of this crop.

The Vista Plantations

In May 1953, fourteen seedlings were planted six by six feet apart at the lower end of the dry-farmed carob demonstration orchard near Vista. The first winter two failed to survive a temperature of 23 degrees F. Of the twelve survivors, five are females and seven males. No irrigating has ever been done. The spot was heavily infested with perennial morning-glory or bindweed. After planting, the ground has not been cultivated. Weeds have been hoed out occasionally by hand. The average recorded rainfall at this farm for eight years is 11.60 inches. The plants were slow

to start growth, but responded strongly to the unusually heavy rains of 1957–1958.

The 1959 crop at six years from planting was harvested, mostly from the ground, between August 15th and September 15th, weighed and counted.

Yield in 1959

Plant Location	No. of Fruits	Total Weight	No. per Pound
Row 1 No. 1	1004	3 lbs. 2 oz.	320
1 No. 2	2064	3 lbs. 9 oz.	532
1 No. 3	249	0 lbs. 12 oz.	325
2 No. 3	292	0 lbs. 9.5 oz.	525
3 No. 1	920	1 lb. 8 oz.	480

Fruits from different plants varied in size, shape, color, markings and percentage of doubles or twins. The female plants vary in size and habit of growth. It is evident that careful selection among seedlings and perhaps asexual propagation is needed for optimum yields and control of sex. A start on this has been made. It happens that plant 1 row 1 is outstanding in precosity, yield and good erect habit of growth. It has been propagated by rooting cuttings and given the provisional name "Vista".

Jojoba plot No. 2 was selected some 250 yards from plot No. 1, where some irrigation water is available from a domestic hydrant. Twenty-eight rooted cuttings of the Vista clone were planted in June 1959. They were watered occasionally by portable sprinklers until the fall rains. They have made excellent growth and after eighteen months began to bloom and set fruit in December, 1960. At this time all male plants in the area were completely dormant with no pollen available. While many of the sets blighted in various stages of development, about 50 fruits developed to maturity. The season of 1960–61 was exceptionally dry with recorded rainfall of only 5.9 inches at the plot. The original plant of Vista in plot No. 1 matured its first fruits at four years from planting. It appears that some irrigation, to compensate for lack of rainfall, will result in better growth and earlier bearing than is usual with plants under feral conditions. This desert shrub responds splendidly to cultural care.

Dr. Howard Gentry, U. S. Department of Agriculture plant explorer, made collections of seed from wild plants in Arizona, Baja California and southern California. Seeds from each wild plant were germinated separately and assigned serial numbers. Ninety small seedlings, 18 from each of the five most promising wild plants, were donated for inclusion in plot No. 2. These were planted December 17, 1959. Because of the exceptionally dry season they were watered occasionally. These plants have made fine growth and are much more erect in habit than the rooted Vista plants, which tend to sprawl over the ground. Most of these seedlings initiated bloom in August 1961. The males will furnish pollen for the Vista females in adjoining rows.

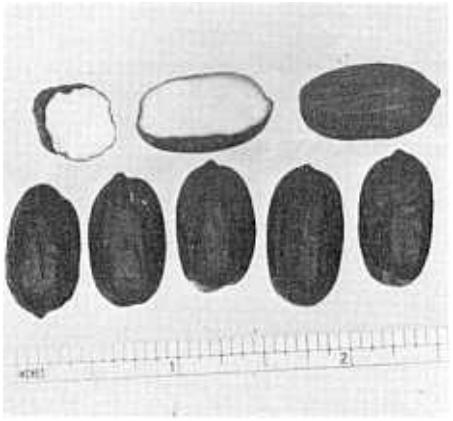

Fig. 1. **Fruits of the Vista clone of the jojoba.**

Fruits of these forty or more female seedlings will be evaluated in the hope of finding clones even better than Vista. We will look for ease of rooting, precocity, yield, regularity of crop, size of fruits, percentage of twins or doubles and percentage of wax.

Jojoba cuttings are not easy to root. Cuttings are taken from new growth in mid-summer, treated with a root-inducing chemical and set in a suitable medium such as vermiculite. They must be kept in a saturated atmosphere for six to eight weeks. The roots are very fragile and transplanting to small tar paper containers requires great care. They should be grown to six or eight inch size before planting in field.

Jojoba responds so well to cultural care that it may be found more economical to plant a selected seedling strain instead of rooted cuttings. Male plants can be detected so early that a large percentage of them could be removed before they crowd the females. The bush habit of jojoba must be changed by pruning. Lowest branches should be at least twenty inches from the ground to facilitate mechanical harvesting which is made necessary by the high cost of labor.

This work with jojoba has been carried on as a public service for farmers with meager or no irrigating water in areas of low rainfall. There are at present no facilities or funds available for technical research. If plant scientists anywhere may be interested in the use of the plant materials maintained at Vista, they will be welcomed.

References

1. Coit, J. E. Carob or St. John's Bread. Econ. Bot. 5(1):82–96. 1951.
2. Dougherty, P. M., Sineath, H. H., and Wastler, T. A. Industrial Raw Materials of Plant Origin, IV. A. Survey of *Simmondsia chinensis* (Jojoba). Georgia Inst. Tech. Eng. Expt. Sta. Bull. 17: 1–36. 1953.
3. Gentry, H. S. The Natural History of Jojoba *(Simmondsia chinensis)* and Its Cultural Aspects. Econ. Bot. 12(3):261–294. 1958.
4. Mirov, N. T. Simmondsia or Jojoba—A Problem in Economic Botany. Econ. Bot. 6(1):41–47. 1952.

Changes in Cherry List

Dr. H. W. Fogle, senior author of the cherry variety source list published in Volume 16 Number 1 of Fruit Varieties and Horticultural Digest has submitted the following changes:

(1) **Hatif Burlat**—page 6, column 1, item 9—is now officially Early Burlat, and should be listed as follows: **Early Burlat** (Hatif Burlat, Bigarreau Hatif de Burlat) P.I. 125106., Ore., USDA (Ch), Wash (P); P.I. 127378: Cal., N.Y.*, USDA (Ch); P.I. 162449: Ore., USDA (Ch), Wash. (P). (Delete Hatif Burlat and Bigarreau Precoce de Burlat.)

(2) **Bigarreau de St. Charmez**—page 4, column 1, item 29 and Bigarreau Moreau, page 4, column 2, item 3 should both be listed as follows: **Moreau** (Bigarreau Moreau, Bigarreau de St. Charmez, Souvenir de Charmes, Bigarreau Sandrin): N.Y., Ore., Wash. (M); P.I. 104295: Cal., USDA (Ch), Wash. (P); P.I. 125567: USDA (Ch), Wash. (P); P.I. 125697: Cal., USDA (Ch). (Delete Bigarreau de St. Charmez and Bigarreau Moreau.)