Carob Varieties

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For more than one hundred years seedling trees of the carob, sometimes called St. John's Bread, *Ceratonia siliqua,* L., have been grown for shade and ornament on streets and avenues throughout southern and central California, and also in southern Arizona, at elevations below 2500 feet.

This evergreen, glossy-leaved tree attains a height of fifteen to twenty-five feet. The fruit is an indehiscent, leguminous pod, four to ten inches long, and a quarter to half-an-inch thick. When mature, it is chocolate brown in color with four to ten small, very hard seeds embedded in thick flesh. Individual trees bear either male, female, hermaphrodite or perfect flowers; hence, not all trees are fruitful. The fruit has a very high sugar content, and is therefore highly susceptible to rain damage. For this reason commercial production is restricted to areas relatively rain-free during the harvest period. Southern and central California and southern Arizona meet this climatic requirement.

Since ancient times this tree has been extensively grown in countries bordering the Mediterranean Sea, where superior seedlings have long been propagated by conventional budding.

In Europe, until recently, the chief uses of carob have been for livestock feed and industrial alcohol, a relatively small amount being reserved for human consumption. Within recent years, research chemists have developed a number of new uses which has resulted in increased demand and some new plantings. Until recently there has been little interest in carob culture in the United States because of our surplus grains and other livestock feeds. However, there is now an active demand by local mills for a more dependable supply of good quality carob, from trees budded to good varieties, with pods containing from 45 to 55 percent sugar. As yet there is very little commercial production of such quality in California. Imports from the Old World in 1959 amounted to 11,981,675 pounds valued at ports of export at $2,690,854.00.

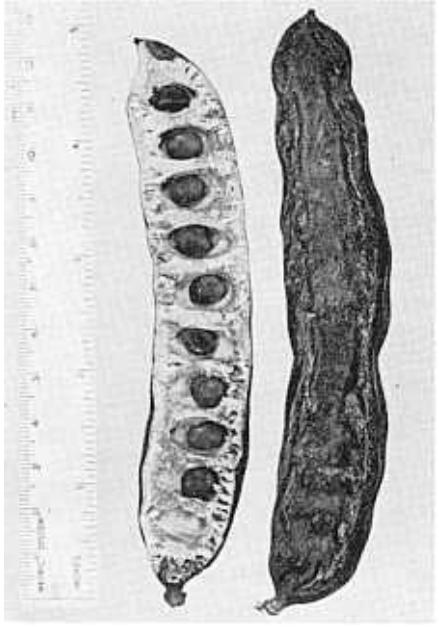
In 1949, Dr. Walter Rittenhouse, a retired physician of San Diego, recognized the similarity of climate between Mediterranean countries, and southern California and concluded that it is time for commercial carob culture here on non-irrigated foothill lands. This would conserve our soils by preventing erosion and at the same time provide more profit per acre than is usual with grains or dry pasture. Dr. Rittenhouse provided a trust fund, the interest from which supports a demonstration carob orchard for variety tests and research near Vista in northern San Diego county. The objective of the project is to work out such horticultural problems as economic propagation, cultural methods, harvesting, and, most important, the testing of many varieties both, foreign and domestic, to find those best suited to the local environment. From its inception to the present time, the writer has had personal management of this project.

Varieties

In 1954 the writer spent the harvest season for carobs in most of the Mediterranean countries where this im-

portant crop is grown, making a study of both production and utilization. Innumerable varieties were found and, with a few exceptions, the nomenclature was in great confusion. Some variety studies have been made in Cyprus while it was under British control, in Israel, and to a small extent at the Italian Experiment station in Sicily and at the Experiment Station at Dubrovnic, Yugoslavia.

With the cooperation of the United States Department of Agriculture and the University of California at Los Angeles, twenty-three European varieties have been introduced and established in California during the past ten years. These have come from Portugal, Spain, Italy, Yugoslavia, Greece, Cyprus, Crete, Israel, Tunis and Algeria. Thirteen varieties from Europe were in bearing in 1960, and several of these are very promising. Others may be discounted because of late maturity and susceptibility to damage from early fall rains.



Pods of the carob variety Bolser, a promising domestic selection.

Among hundreds of thousands of carob seedlings in bearing on California streets, there are some of value which have already shown their suitability to our climate. Careful search has resulted in the location of a number with outstanding qualities. Some 45 of these have been given temporary names and established in the test orchard. Several already in bearing appear superior in important respects to any imported variety so far introduced and fruited.

Among foreign varieties so far evaluated, the best are Sfax from Tunis, Tylliria from Cyprus, Amele from Italy, and Casuda from Spain. Among domestic varieties deemed acceptable at this time are Sante Fe, Conejo, Bolser, and Molino.

Carob clones vary widely in a great many characters, only some of which are of importance to commercial growers. In evaluating varieties for commercial production in California the following characters are important.

Total sugars. The sugar content of the flesh varies from 37 to 62 per cent. In general, the higher the sugar the better. Any amount over 45 per cent is considered satisfactory.

Season of maturity. In view of the danger of early fall rains, varieties of early maturity are best. Harvest begins in early September and should be completed by November 1st.

Precocity. Some varieties bear commercial crops at five years from budding, while others begin to bear several years later. Most varieties come into bearing earlier where rainfall is adequate, or where light irrigation is practiced in seasons of scant rainfall.

Yield. Heavy yield is of course important, but regular bearing is also to be considered because some kinds are alternate bearers.

Susceptibility to worm infestation. While the carob tree is exceptionally free from insect and disease troubles, the pods of many varieties sometimes become infested with a small scavenger worm *Paramyelois transitella (Walker)* while maturing and before harvest is complete. Newly hatched larvae gain entrance through checks in the skin or cracks in the surface near the stem. This renders the pods unacceptable to the mills which manufacture products for human consumption. Fortunately, several of the better selections are very resistant or possibly immune to the insect.

Ease of harvest. Most varieties are easy to harvest, 90% of the pods falling at one vigorous shake of the tree. A few have firmer attachment, and one kind may have to be picked by hand, a method which is too expensive.

Flavor. Carob is noted for its chocolate-like flavor and is widely used as a substitute for chocolate and cocoa in candy and many other food products. Some varieties have a much more pronounced chocolate flavor than others in which the desired taste is masked by less desirable or even objectionable flavors. Taste tests by numerous individuals indicate that the chocolate flavor is not always correlated with sugar content.

Fiber. Many people like to eat carobs out of hand, discarding the small bony seeds. Any serious amount of coarse fiber left in the mouth is objectionable. When the entire pod without seeds is milled into powder, high fiber content may be preferred for use in certain pharmaceuticals. Among 40 varieties the crude fiber varied from 5.5 to 8.59 percent.

Protein. Among forty varieties the protein content of the flesh varied from 2.2 to 6.63 percent, and is of lesser importance.

Vitamins. No serious technical study of vitamin content has been made, but one commercial analysis indicates moderate amounts of most vitamins and a high niacin content. This analysis reported 1595 calories per pound of powdered flesh.

Sex. No effort has been made to evaluate the imported or domestic male clones as pollinators in the test orchard, except with respect to dates of blooming, which should overlap the flowering dates of desirable females. Hermaphrodites have a special value provided they are self fertile, in that no space in the orchard need be wasted by providing male trees. Fortunately two of our best varieties are fertile hermaphrodites.

At this date, approved varieties are few in number. Additions of new clones are being made each year. Among those which have borne sufficiently for reasonable evaluation are six, technical pomological descriptions for which are to be published later.

Sfax : female; origin—Tunis
Tylliria : female; origin—Cyprus
Casuda : female; origin—Spain
Sante Fe : hermaphrodite; origin—Calif.
Conejo : hermaphrodite; origin—Calif.
Molino : hermaphrodite; origin—Calif.
Bolser : hermaphrodite; origin—Calif.

Budwood of these is being distributed to nurserymen and growers in California and also to many foreign countries, including Israel, Australia, South Africa, Brazil, Argentina, Chile and Mexico.

The Orland strawberry was the most productive variety under trial at the University of Massachusetts in 1960. Unfortunately, the fruit had poor flavor and only fair appearance, and many late berries were misshaped.