icate, greenish white flowers have a spicy, clove-like aroma. The fruits are about three inches long, hanging in loose groups on long slender stems. They are divided into three parts longitudinally, with definite seams along which they split when mature to expose three shiny black seeds embedded in creamy edible arils. The name "vegetable brains" is given to the akee fruit due to the resemblance of its arils or meats to the brains of small animals.

Harvested when the fruit begins to split, the fruit is opened and the meats separated from the seeds and from any membrances which may be present. The meats should be firm, and free from soft or moldy spots. Akee is best prepared for the table by pan-broiling, as one would prepare mushrooms, in hot butter.

The stories of the poisonous qualities of the akee are grossly exaggerated. According to J. J. Bowrey, analytical chemist to the government of Jamaica, the edible part of the akee fruit is quite safe to eat as long as it is ripe, fresh, firm, bright in color and free from decay or mold.

Although the akee is tropical in origin, it will stand moderate frost. The chief difficulty in growing it is its dislike of high alkalinity. However, when its growth requirements are better understood, I'm sure it will become increasingly popular with gardeners in southern Florida. —Condensed from *Horticulture*, February, 1952

The Carob in California

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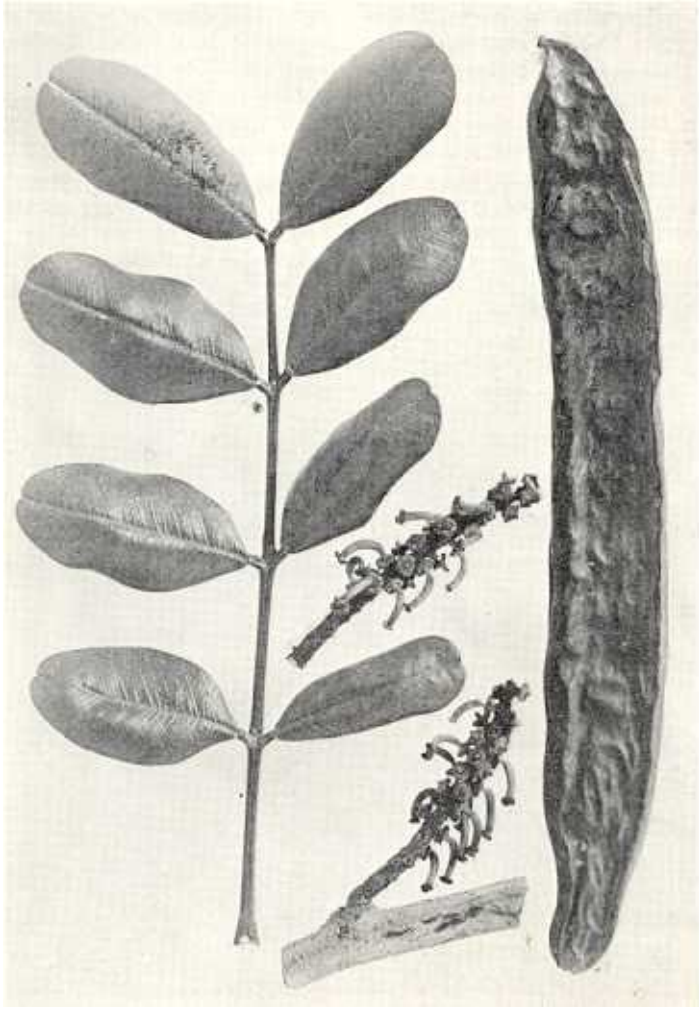
The carob, *Ceratonia siliqua*, a pod-bearing tree of the legume family, has been grown in California for many years. While the plant will tolerate considerable drought and heat, it is truly a hardy subtropical and will withstand only 18 to 20 degrees F. without serious injury. The development of an extensive root system provides considerable adaptation to drought conditions; hence the tree frequently will survive where other species perish from lack of soil moisture. Adequate commercial production of satisfactory crops is obtained in the Mediterranean region when 12 to 15 acre inches of water are available, although the tree

Remnant of abandoned 800 acre carob orchard near Riverside, California.

itself will survive on 3 to 4 acre inches per year. Because of the tolerance to these adverse conditions of soil and climate, the potentialities of the carob as a dry-farmed tree crop on otherwise marginal acreage in California have long been contemplated.

With this end in mind, a collection of the best varieties from the Mediterranean area, the native home of this plant, as well as locally selected superior seedlings, has been established in a demonstration orchard near Vista, California. This orchard is a privately endowed and maintained project for public observation. The five-acre tract of land has been planted in regular orchard form. The natural rainfall, which averages 12-15 inches, will provide the only source of moisture. The young trees will be supplied with water by tank wagon until they are established. This enterprise has been contemplated to determine the commercial adaptability and feasibility of the carob under Cali-



Leaf, inflorescence and pod of carob, *Ceratonia siliqua.*

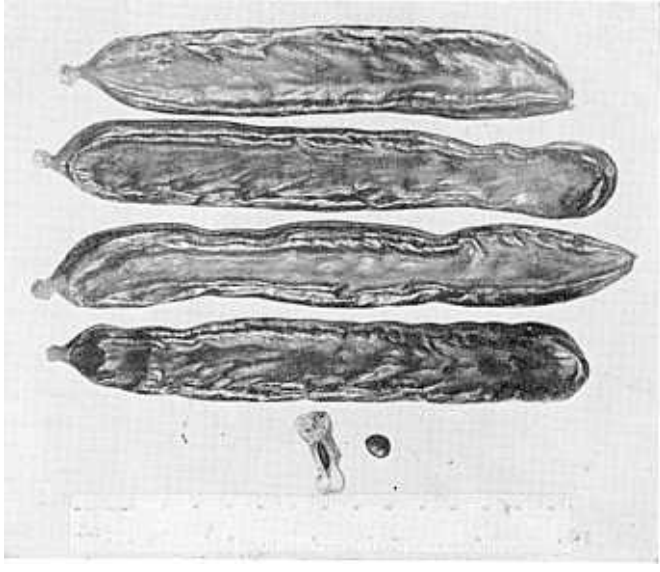
fornia conditions. The project was conceived and organized through the interest of Dr. W. Rittenhouse of San Diego, California, and is under the professional advice of Dr. J. E. Coit, horticulturist, of Vista. The development of the project is being watched with interest by horticulturists, growers and others.

The fruit of the carob is a pod, chocolate brown in color, 4 to 8 or more inches long and ¼ to ½ inch in thickness, enclosing 6 to 12 flat, black, very hard seeds. The fleshy portion of the pod is highly nutritious and consists of 30 to 50 per cent sugar and 4 to 5 per cent protein, in addition to the mineral content of approximately 2-3 per cent. The primary constituents for which the pod is highly desirable are monogalactans and pentosans, organic materials employed for making photographic emulsions, emulsifying agents, plastics, and other by-products.

Carob syrup and flour have attracted some attention in health food stores because of the nutritious aspects of these products. Breakfast foods and candy have been made from the pods. Cattle feeds made from the ground pod and seed have proved highly nutritious. The demand for such products and by-products in Mediterranean countries has practically prevented the export of pods for use in this country. There exists at present a demand in the United States for a considerable quantity of carob pods for processing.

St. John's bread, the carob, is a plant mentioned in the Bible. Since those days when Moses guided the children of Israel, this plant has provided sustenance for man and animal in many countries bordering on the Mediterranean Sea. Even today the carob contributes considerably especially to the diet of animals in those countries. The economy of several areas is built on the carob as a crop plant and on the products and by-products derived therefrom.

The carob has been grown in California for more than three-quarters of a century. Many of the older streets are adorned with these majestic shade trees, which have proved well adapted to the more mild areas. The tree generally is propagated from seed, which has resulted in considerable variation in size and form among the street trees. A few attempts



Pods of Bolser variety carob.

Carob tree utilized as ornamental street tree.

have been made to reproduce selected seedlings, which has resulted in street plantings of excellent uniformity. The flowers in the carob are polygamo-dioecious; that is, the trees bear flowers of either male or female types and occasionally there are trees with perfect flowers. Some selections for parkway plantings have been those of staminate or male trees to avoid the production of the numerous fruit pods which create a problem in street plantings.

Selection of varieties for their fruit quality has been practiced for centuries in the Mediterranean area, but only during the past quarter century have any attempts been made in California to locate specimens of suitable floral and fruit characteristics for possible commercial production. A large commercial planting of about 800 acres was established about 25 years ago near Riverside, but was abandoned when most of the planting was inundated by the construction of a municipally owned storage reservoir on the site. Recently a few small demonstration plots have been established in another California county by growers who perceive a potential demand for the carob fruit and its products.

Some of the seedling selections which have been made in California are listed below.

Bolser—one of the most widely propagated varieties in California. It originated near Rialto, California. The tree is hermaphroditic and bears numerous thick pods, 4-5 inches long, with high sugar content.

White—the original tree still exists in White Park, Riverside.

Santa Fe—the original tree at Santa Fe Springs is still alive. Pods long, to 7 inches, slightly curved.

Grantham—a male type selected as a pollinator because of its abundance of pollen-bearing flowers. This form produces no fruit.

Loma—Selected from a row of budded trees of unknown origin in Santa Barbara.

Coffin—Another fine pod-bearing type from Santa Barbara.

Nichols—A hermaphroditic type bearing exceptionally heavy crops of good sized pods near El Cajon in San Diego County. Pods 5-6 inches long, rather thick.

Fourteen other locally selected seedlings are under test in the Vista planting, but have not yet produced fruits.

Among the varieties imported from the Mediterranean area which are now being tested and observed in California are Tilliria, Feminello, Sykea, Sandalawi, Cyprist, Mekis, Sipanski and Amelo. None of these has produced fruits as yet.

Polyploidy in the Apple

Found Seven Years After Colchicine Treatment

HAIG DERMEN*

In April 1942 six one-year-old apple trees of the varieties Baldwin, Delicious, McIntosh, Stayman and Winesap, were treated with colchicine. The technique used was essentially the same as that recommended for the pear[4]. Although polyploidy was detected in limited areas on some leaves during the first growing period following treatment, no branches were found on any tree where polyploidy could be detected. In the fall of 1942 the plants were taken out of the greenhouse and planted in the orchard.

In 1949, most of the trees bore fruits in moderate number for the first time. On one side of a McIntosh tree certain branches bore large, flattened fruits; of which some were smooth but most were irregular in shape, similar to "giant" fruits and quite typical of diploid-tetraploid periclinal sports of apple[1, 5]. Cytohistological examination of a shoot tip from that region of the tree showed polyploidy in a chimeral form; the epidermis and the outer cortex (about six cells thick) of the stem were diploid and the remaining tissue was tetraploid. In this partial polyploidy the sex tissue in the flower remains normal diploid. Complete tetraploidy may be obtained from such chimeral polyploid material through adventitious budding technique[5, 6].

Internal polyploidy in cranberry[2], peach[3], and pear[4] has been diagnosed with reasonable ease by characteristic changes in their leaves. In the apple this method is less successful because of the irregularities in shape and size of the leaves. Flowering and fruiting of the apple occur on older plants than in cranberry, peach and pear. These older apple trees are tall and the branches badly entangled. The trees were not pruned for fear of cutting off polyploid branches. Failure to recognize polyploidy at early stages of growth makes the problem of pruning difficult. As has been pointed out, changes in size of the flower parts, due to polyploidy, have not been very obvious in other plants mentioned. This is probably the case in the apple also, making visual detection of polyploidy through such small changes in the flower even more difficult.

Polyploidy in the apple can be detected most readily by three fruit criteria (Figure 1): (1) Increase in size (about twice the normal size); (2) flattened shape; (3) irregularity in contour. This is often due to internal diploid-tetraploid periclinal condition in parts of the affected tree. The flattened fruit shape, along with increase in size, has so far been the most useful criterion in the detection of induced or naturally occurring polyploidy in the apple.

The apple is the fourth fruit plant that we have been able to polyploidize by colchi-

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