which become juicy and fragile and orange in color. These are considered a great delicacy and are eaten, steamed, in the sauce of the rijsttafel. Finally, so Ochse says, the light blue flowers and flower buds are made into a kind of sauce called "petjel," or they may be used for coloring certain foods, such as palm-cabbage for instance.

According to Burkill’s Dictionary of Economic Products of the Malay Peninsula, p. 1819, this bean is a native of Africa but its introduction into the Malayan region took place before the time of Rumphius who lived in the seventeenth century. Burkill says that in Burma its roots are eaten raw, as are those of Pachyrhizus, the Yam-Bean, but in other countries these are little used. An analysis of the beans shows them to contain an oil similar to that of the soy bean, which suggests their possible use as a salad oil.

But it is as a table delicacy that I am now describing the Goa Bean, hoping to attract the attention of some amateurs in South Florida who will experiment in its cultivation and use. Perhaps after another quarter of a century has passed some grower will be making his living out of this bean, and who knows but what he will have hybridized it with some of the other five species said to occur in Africa.

In the mean time, let us experiment further with what we already have.

NOTES ON SOME NEWER HARD-DRYING VEGETABLE OILS: FROM ALEURITES TRISPERMA BLANCO AND GARCIA NUTANS ROHR

S. J. LYNCH
Sub-Tropical Experiment Station, Homestead

War conditions that restrict the imports of many essential basic materials have focused attention on the need for domestically-produced, hard-drying vegetable oils. These oils, typified by tung oil and Japan wood-oil, are essential in manufacturing certain paints, varnishes and inlaid linoleums. They are important in paint and varnish manufacture because these materials are far more rapid drying than linseed oil and have the further advantage of producing a really waterproof coat. Varnishes made from tung-oil do not turn white even on long exposure to water.

At the 1937 meeting at Ocala, Dr. H. S. Wolfe (4) brought to your attention two relatives of the tung-oil tree, the Candle-nut (Aleurites moluccana Willd.) and Soft Lumbang (A. trisperma Blanco), both native to the tropics. The candlenut produces an oil very similar to linseed oil; whereas, the soft lumbang oil is very similar to tung oil in properties and, hence, more valuable. Also the meat of the candlenut is encased in a thick hard shell; whereas, the soft lumbang has a soft thin shell, lending itself well to pressing.

The Sub-Tropical Experiment Station has been interested in the possibilities of growing soft lumbang in South Florida. Two trees of this species, known as the Bow and Nixon trees after original property owners, were found growing in the Homestead area. They originated from one of the
Lynch — Notes on Some Newer Hard-Drying Vegetables Oils; from Aleurites trisperma Blanco and Garcia nutans Rohr

Fig. 1. Aleurites trisperma, four years from seed, at the Sub-Tropical Experiment Station.
Fig. 2. Mixed inflorescence of *Aleurites trisperma*. Lower left blossoms on left branch are pistillate, while the two blossoms on the opposite side of the branch are staminate.
several introductions made by the U.S. Department of Agriculture in 1916 and 1917. Two other trees were found at Palm Beach that could well be from the same introductions. In the fall of 1934 a small planting of A. trisperma seedlings from seed of the Bow tree was made at the Station. A. trisperma seedlings from seed of the Bow tree gathered in 1935, was set out at the Station in April 1936. The trees made excellent growth and in 1939, at the age of four years from seed, were about 8 feet tall with single trunk and typical flat broad tops (Fig. 1). They bloomed for the first time with a light scattered bloom in the spring of 1939, but no crop resulted. The freeze of January 28, 29 and 30, 1940, when a minimum of 28.5°F was experienced, caused a general defoliation of the trees and a loss of much of the young terminal wood which produces the bloom panicles. Only a slight bloom ap-

TABLE 1. Seed Variations in 18 Seedlings of Aleurites trisperma (2).

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<tr>
<th>Sample</th>
<th>Average wt. of seeds in grams</th>
<th>Shell %</th>
<th>Kernel %</th>
<th>Oil in kernel %</th>
<th>Oil in seed %</th>
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<th>Iodine value Wijs 1 hour</th>
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* The seeds were in poor condition; dark-colored oil of poor quality was obtained.

These small plants were killed in the freeze of December 11 and 12 of that year when the temperature dropped to 26° F. The Bow and Nixon trees were only slightly damaged by this temperature and fruit matured on them in the fall of 1935.

Another planting of 18 trees, from seed of Bow tree gathered in 1935, was set out at the Station in April 1936. The trees made excellent growth and in 1939, at the age of four years from seed, were about 8 feet tall with single trunk and typical flat broad tops (Fig. 1). They bloomed for the first time with a light scattered bloom in the spring of 1939, but no crop resulted. The freeze of January 28, 29 and 30, 1940, when a minimum of 28.5°F was experienced, caused a general defoliation of the trees and a loss of much of the young terminal wood which produces the bloom panicles. Only a slight bloom ap-
peared in April and no crop resulted. The trees were starting to put out bloom panicles in the spring of 1941 when a low temperature of 26.5° F. on March 2 killed the bloom and eliminated any crop for that year. Injury to the terminal twigs resulted in a very poor growth during the summer. The bloom period in 1942 extended from mid-March through April, during which time the weather was mostly fair and warm with only an occasional shower.

A study of the inflorescences on the 18 trees, now 7 years from seed and blooming for the third year, gave several interesting indications. The subterminal panicles are racemose, while the secondary axes are cy-mose. All the trees are monoecious and on individual trees purely staminate, purely pistillate and mixed panicles are found. Panicles bearing both staminate and pistillate flowers (Fig. 2) are most common. There are enough pistillate flowers present on each tree so that if 5 percent set fruit, a heavy crop would result. Apparently ample pollen is produced by the staminate flowers present. The percent pistillate flowers varied from 6 to 65 on various trees, with an average of 30% for all the trees. A very light crop matured in 1942 and no crop records were taken. The Bow tree had a good bloom but also set no crop. The Nixon tree with a good bloom set a light crop of nuts in 1942.

Grove heaters offered ample protection for the Station A. trisperma trees when the temperature dropped to 26° F. on the night of February 15, 1943. The trees bloomed profusely in March and April and the first crop was harvested during August and September. The yield of shelled nuts varied from 1 to 5 lbs per tree with an average yield of 3.2 lbs. per tree. The Nixon tree produced 55½ lbs. of shelled nuts in 1943. (A bushel volume of shelled A. trisperma nuts weights about 32 lbs.)

The Station trees at the present time are 15 feet tall with a like spread, planted at a spacing of 15 by 20 feet. They receive a grower-type fertilizer three times a year, about the same rate as citrus trees of the same age. Cultivation consists of mowing the cover of Natal grass, sandspurs and other small ground cover several times during the year.

Four A. trisperma of the same seed lot have been growing on the Station East Glade farm since 1936. The soil is marl and, although very little flooding occurs, the soil is very wet during the summer and early fall months. These trees, planted 10 feet west of a Casuarina lepidophloia windbreak, have made 15 to 18 feet of vertical growth with but a 10 to 12 feet spread. The foliage is more sparse than the pineland grown trees. The bloom has been light on these trees and only an occasional “pod” of seed has matured.

Approximately 140 trees of A. trisperma have been distributed to various cooperators in South Florida during the past seven years. Results from the response of these trees to the various soil types and locations should prove of interest.

Analytical Studies

The Scientific Section of the National Paint, Varnish and Lacquer Association, Inc., takes a very active interest in any work toward the production of hard-drying oils in this country. Dr. Mark V. Westgate of the Scientific Section carried out a series of analyses with A. trisperma seed of the 1943 crop from 18 different trees of the planting on the Station ground. The purpose was to obtain data to aid in choosing seed trees for future plantings. These analyses, showing the variations between seedlings, are listed in Table 1.

An arbitrary method of rating the samples was used so as to select the seedlings that would produce large seeds containing a high percentage of kernels, which in turn would yield a high percentage of quality oil characterized by a high refractive index and a high iodine value. The combination of these characters, with the heavy fruiting possibilities as more crops are recorded, will act as a guide in choosing seed trees.
A new super-hard quick-drying oil was brought to the attention of the National Paint, Varnish and Lacquer Association, Inc., in the spring of 1943. The Scientific Section received some nuts from Mexico of a tree native to Tropical America, known as *Garcia nutans*. The shell of the nut was very thin, brittle and easily removed. The oil, which was easily expressed, was very pale and resembled in appearance American tung oil. The nut contained 80% kernel and the kernel yielded in the neighborhood of 55% oil, approximately that of the tung kernel. Botanical literature gives very little information of a horticultural nature regarding the plant, other than it is a small tree with monoecious flowers producing 2- to 3-seeded capsules. The grayish-brown, mottled, round, shiny seed is ½ inch in diameter. Gardner and Westgate (1) examined the oil for its chemical and physical properties and found that this oil was comparable or superior to American tung oil in all of the salient features pertaining to paint and varnish manufacture and use. Westgate (3) reported further that additional tests of a control nature showed that the oil of *Garcia nutans* continued to compare favorably or be superior to American tung oil in drying in thin films or in making varnishes. Comparative varnishes were made with these two oils, and it was again found that *Garcia nutans* oil conferred much more body in the same cooking time than did tung oil. This was true even when 50% of either of these oils in a varnish was replaced by heavy bodied soybean oil. Some comparative properties of *Aleurites trisperma* oil (expressed from seed of the Nixon tree), *A. fordi* oil and *Garcia nutans* oil are given in Table 2 from Westgate (3).

Westgate (3) states that a small batch of varnish made with the *A. trisperma* oil took somewhat longer to cook and dry, but was comparable in its resistance to hot and cold water to similar varnishes made from the other two oils.

He further reported “that exploration trips which have been made by qualified observers throughout Mexico and Central America have not indicated that the *Garcia nutans* tree is found in sufficient numbers to justify any enthusiasm regarding the possibility of obtaining annually any substantial amount of seed for crushing purposes.” If a commercial source of this oil is to become available, orderly grove plantings will have to be established. Mexico and Central America are probably best suited to this purpose, although South Florida, South Texas and Southern California may prove suitable.

Some seeds of *Garcia nutans*, which Dr. H. A. Gardner had obtained from Mexico, were sent to the Sub-Tropical Experiment Station last summer. An excellent germination (95%) resulted and the young vigorous trees are now 2½ to 4 feet tall. Some 110 trees are being planted in many sections

| Table 2. Characteristics and Properties of Three Drying Oils. |
|---------------------------------|----------------|----------------|----------------|
|                                | *Aleurites trisperma* | *Aleurites fordi* | *Garcia nutans* |
| Iodine Value (Wijs, 1 hr.)     | 127.7            | 165.0           | 177.9          |
| Refractive Index (25° C.)      | 1.4948           | 1.5170          | 1.5252         |
| Gelation Time (Browne Heat Test, Min.) | Fluid at 30 | 12              | 7 ½            |
| Drying Time (1.5 mil film on glass) | 24             | 18              | 16             |
| Without Drier (Hours)          | 3 ½              | ¾               | ½              |
| Pb and Co Driers Added (Hours)  | Good             | Good            | Excellent      |
| Toughness of Dried Film        | Good             | Good            | Excellent      |
of South Florida. Fifty have been sent to
the Rio Grande Valley of Texas. Five of
the small trees were left exposed in a slat-
house throughout the winter and must have
endured temperatures of as low as 34°
without any sign of injury or apparent cur-
tailment of growth.

These notes on hard drying vegetable oils
are brought to the attention of the Society
not to suggest the thought of planting com-
mercial acreage nor to sound the bell of a
new industry, but instead to publish such
information as is available on the plants
and their products and to bring into focus
a few of the tremendous possibilities in
tropical and subtropical horticulture.

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68-70, 1937.

LYCHEE PROGRESS

WM. R. GROVE, Laurel

At the 1943 meeting of the Krome Me-
memorial Institute Professor G. Weidman
Groff presented an excellent study under
the title "Some Ecological Factors Involved
in Successful Lychee Culture." That pa-
per is well worthy of attention by those in-
terested in the lychee. It cites many his-
torical events having a bearing on the cul-
ture of the trees. It brought the story of
the development of the lychee in Florida up
to the date of the presentation of his pa-
per, May, 1943. It may now be of interest
to note the further development, so far as
known to the writer, up to the present
meeting.

Heretofore discussions of the growing of
the lychee in Florida have of necessity been
based largely upon possibilities and proba-
bilities. Perhaps ninety-nine out of every
hundred of the Americans who ever heard
of the lychee still refer to it as the lychee
nut. There have been several instances
where lychee trees in Florida have been
bearing fruit for several years without the
owner having tasted the fresh fruit or
having any idea what kind of a tree it was.
It is believed that enough plantings have
now been made and sufficient interest arous-
ed to warrant a commercial approach to it
as a fresh fruit. The U. S. D. A. has
plantings at Orlando and Chapman Field
and the Florida Agriculture Experiment
Station at Homestead, but so far as I
know the only private orchard plantings,
aside from my own at Laurel, are those of
Mr. E. L. Wirt, of Babson Park, Mr. E. V.
Fairchild, of West Palm Beach, Mr. John
R. Wilson, of Jupiter, and Mr. George W.
Phillips, of Palm Beach: I have not seen
Mr. Fairchild's trees, nor those of Mr. Wil-
son. Mr. Wirt's young trees, as well as his
older ones, seem to be doing very well.
Mr. Phillips' orchard is just being started.
It is understood that Mr. Arthur M. Hill,
Jr., of Vero Beach, has a lychee planting,
still in nursery style. Judge C. E. Ware, of