work which is already being conducted in this and related fields by such organizations as the Subtropical Experiment Station, the Bureau of Plant Industry of the United States Department of Agriculture, and other state, federal, and private institutions. The field of research in tropical horticulture is endless.

There are many problems which confront us due to the numerous fruits and vegetables which are adaptable to this area and the vast difference of this region to those of any other in the United States. We shall not solve all of the problems we now see in the many years ahead and with each year there will be new problems appearing constantly. We do hope, however, that we can take our stand along side the other research groups and have a large share in the building of new industries and in creating better living for this fruitful area.

NOTES ON THE PROPAGATION OF THE SYMPODIAL OR CLUMP TYPE OF BAMBOOS

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The Bamboos botanically reputed to be the oldest living grasses of our world flora play a major role in the plant life and economy of the Orient, India, Asia and parts of Latin America. It is estimated at present that there are in the neighborhood of one thousand described species and varieties of Bamboo. (5).

The flowering and fruiting of Bamboos is a somewhat rare phenomena in most species of these grasses. In many species accurate data on flowering and fruiting periods are not available. Records of other species indicate that it is common to have intervals of thirty, fifty or seventy years or more transpire between one blooming period and the succeeding flowering period.

Altho a small number of the known bamboo species have been introduced into Florida they have nevertheless been extremely slow in coming into the prominence they deserve in the Florida landscape.

In South Florida one sees a scattered specimen or group of specimens of several different species of bamboos attesting to the adaptability of a number of these majestic grasses to our soil and climatic conditions.

The largest collection of exotic bamboos to be seen in Florida is located at the U. S. Plant Introduction Garden, Coconut Grove, Florida, of the U. S. D. A. These introduced bamboos have proven to be among the best wind resistent exotics ever grown in Florida.

The rare flowering and fruiting habit of bamboos requires that vegetative propagation be resorted to for the production of these bamboos.

It might be of interest to mention here that wide variation in vegetative character and habit has been noted in several species of bamboos grown from seedlings. Such seedling variation can be ready noticed by inspection of *Bambusa tulda* Roxb. and *Dendrocalamus strictus* Nees. grown in Florida that were raised from imported seed.

Of three separate seed introductions of *Bambusa tulda* introduced by the Bureau of Plant Industry and at present being grown in Puerto Rico B. P. I. No. 22002 introduced by Dr. David Fairchild in 1907 from India is of exceptional economic importance and

extremely ornamental while the other seedling strains are considerably inferior both from an economical and ornamental standpoint. *B. tulda* No. 22002 has erect straight culms that are over 50 feet tall with internodes that are up to two feet in length while the other strains have culms that rarely exceed thirty feet in length and these normally check at the nodes during growth, also, the internodes are short being usually about a foot in length and the culms are consistently crooked.

In general bamboos can be classified as belonging to either of two types: (5)

1. The type usually native to the temperate zone having an indeterminate rhizome character (*Monopodial*) which form the running bamboos, as contrasted with

2. The type usually native to a tropical or semitropical habitat having a determinate rhizome character (*Sympodial*), which produce plants having a clump habit.

As far as the Monopodial or running type bamboos are concerned there is not any major problem in the vegetative propagation of these plants. Quantities of sections of rhizomes can be easily procured from which new plantings can be readily established. (3)

However the situation has been relatively difficult when attempting to propagate quantities of the Sympodial or clump type bamboos using rhizome material, for it requires the removal of a whole culm or more for each piece of propagating material.

A number of vegetative propagation methods have been and are being used for the propagation of the Sympodial or clump type Bamboos, (1) which are far from satisfactory as they are extremely laborious and costly in both time and money.

Attempts at rooting culm cuttings of several nodes in length or a number of desirable species have yielded extremely low percentage of takes. Such cuttings are usually extremely bulky and pose a real problem when transportation of any distance is involved.

Of the various methods of propagation that have been used namely, culm stumps (offsets), two-node cuttings, air layering, and buried whole culms, the first and last have been favored as being the most efficient yet these have decided limitations.

As in the culm cutting method we encounter in the culm stump method a serious limitation in the transporation of the bulky propagating material of the larger species where the average culm stump or offset often weighs as much as twenty pounds and usually takes one man-day of labor to dig and prepare five such offsets. In addition when this method is employed only one plant can be obtained from each culm. In the buried-whole-culm method the labor costs are even higher than that encountered when propagating by the culm stump method and it is most impractical for use where transportation over any distance is required. The proponents of this method of propagation state that it is favoured because more than one plant can be obtained from each culm. However, observations made where this method was being employed indicated that this additional increase in production was not always obtained.

During 1943 while the author was engaged as Horticulturist at the Federal Experiment Station at Mayaguez, Puerto Rico, Dr. F. A. McClure, then Research Associate of the Smithsonian Institute, Washington, D. C., and the foremost American authority on Bamboos, visited the Experiment Station. Dr. McClure stated that he had successfully propagated *Sinocalamus Oldhamii* (Munro) McClure while in the Orient from basal side branch cuttings.

Subsequent observations made in the field on thirty odd species and varieties of introduced Sympodial or clump type bamboos growing at the Federal Experiment Station showed that most of these had a common characteristic in their morphology namely, that at the base of the developed culm side

branches a number of foreshortened nodes are to be found and that root initials are usually present at these nodes. (2)

Over 100 side branches of *Sinocalamus Oldhamii* P. I. No. 76496 were cut with a hack saw flush with the culm. The tops of these side branches were removed leaving from one to three normal nodes above the foreshortened nodal base. These untreated cuttings were placed in a sand propagating bed and within sixty days practically 100% of the cuttings had developed vigorous fibrous root systems with roots measuring up to 18 inches long. During this period side shoots developed from the normal nodes above the sand level. Three months from the time the cuttings were taken basal shoots emerged from below the sand level, these new culms originating from the dormant buds of the foreshortened nodal area of the basal side branch cuttings.

Similar results were obtained with basal side branch cuttings of several other bamboos.

Cuttings of *Bambusa vulgaris* Schad. and the variegated yellow culmed variety, *B. vulgaris* Schrad. var *vittata A.* Riviere and *Gigantochloa verticillata* (Willd.) Munro, were rooted with as much ease as those of *S. Oldhami* the majority of which produced new young culms within sixty days. In some of the cuttings of *G. verticillata* new culms 6 feet tall were produced within ninety days of placing the cuttings in the propagating bed.

In these initial trials rooting was obtained with basal side-branches of a number of other species of sympodial type but with far less success than the above species.

Bambusa textilis McClure a relatively hardy bamboo from southern China produces clumps that have a striking erect habit and the native culms reach a height of 40 feet or more. Under ideal growing conditions the culms of this species do not normally produce side branches much below 15 feet from the base of the culm. The side branches have a number of foreshortened nodes at their base, but the root initials are not well developed as in the above mentioned easily rooted species.

I recently observed a vigorous healthy clump of this species of bamboo at the B. P. I. Introduction Garden at Chapman Field the growth habit and character of the side branches were similar to those observed in Puerto Rico.

A clump of this same *Bambusa textilis* planted at the Fairchild Tropical Garden in 1943 has been under observation for the past few months. This clump is not in good vigour in part attributable to the lack of adequate drainage of the planting site. The interesting feature displayed by this plant is that an abnormal amount of side branches have been produced on almost every culm of the clump and that these side branches are developed on almost every visible node above the ground. The root initials at the base of the side branches are not only well developed, but during the heavy summer rains experienced this season, these root initials in some cases developed into roots measuring an inch or more in length.

It would appear highly probable that thru proper physiological stimulation the root initials found on the culm side branches of all sympodial type bamboos could be made to develop fully.

The side-branch method of propagating several species of sympodial bamboos is the most practical method. Its advantages over other methods are several:

1. Small amount of stock material yield large quantities of propagating material. After removal of a side branch, several dormant buds at the same node may develop into shoots for future propagating material.
2. Both labor and time involved are reduced considerably.
3. Propagating material can be easily transported over long distances.

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WRAPPING AIR-LAYERS WITH RUBBER PLASTIC

By WM. R. GROVE
Lychee Orchards,
Laurel

The lower limbs of some trees and plants occasionally lie on the ground. Under appropriate soil and moisture conditions many of these limbs will strike root and start new plants, especially when the limbs have been scarified.

Many generations ago the Chinese decided to utilize this rooting ability by taking the moist soil up to the limbs, scarifying or removing the bark from a small section of the limb at the point where the new roots were to be formed. The point selected should have been and probably was just below a node.

The soil was doubtless wrapped around the cut and tied in place by using leaves and straw. To keep the soil wet over the period of from three to ten weeks required for the roots to develop to a length of one to three or more inches was doubtless then, as now, the real problem.

In the modern method when the young roots begin to show through the wrapping of moss or dirt, the limb is cut off just back of the new roots, kept in a moist and reasonably dark atmosphere for perhaps two or three weeks, then gradually exposed to more light so that within a few weeks the young tree will stand the full sunlight.

That process, variously known as Chinese air-layering, gootee layering (India) and marcottage, has long been used by nurserymen and others in plant propagation. One of the most serious drawbacks to this method has been the necessity of frequent watering to keep the layered limb alive until suitable new roots could be developed.

While the above process was the one prevailing for many centuries, the introduction of rubber plastics, having the properties of holding water, but permitting the passage of respiratory gases, offered an opportunity to develop a new method of wrapping the layers so that they would produce new roots before the water within the layers had become exhausted or sour. This means that a limb of a lychee, hibiscus and many other varieties of plant life can be girdled or scarified, encircled with sphagnum moss, soil or other rooting material in the usual way, then wrapped in a sheet of the rubber plastic, tied securely, preferably with rubber bands, and then forgotten until adequate roots can be observed through the plastic, when the branch is cut from the tree or shrub, the plastic removed and the newborn tree potted or planted. This eliminates the expense incident to watering the layers.

My first experiments with the plastic wrapping were with what is known as pliofilm but it failed by disintegration before the lychee roots could be formed. I then used Vitafilm which is a heavier plastic with the