Nursery propagation of mangos at the present time is a varied procedure and employs many different techniques such as eye budding, side veneer grafting and inarching. The degree of success with any one method has been directly dependent on the one doing the work as much as with the method. With the appearance of new varieties of mangos, the scarcity of graftwood has been the limiting factor for growing quickly any large quantity of trees of a new variety. The general method used is the side veneer graft on one year old stock, utilizing a terminal cion for each tree. Consequently tree costs have been kept high and this in many instances has been a controlling factor in setting out increased acreage of budded mangos. In the last few years, some trees of good quality have been coming on the market selling for about half the cost of conventionally grown trees. These have been propagated by eye or chip budding and were grown in one year from seed instead of the two to three years required by most nursery methods.

Popenoe * states that shield budding is the method employed by nurserymen in Florida for growing mangos. This is on stock roughly a year old. However, he discusses the low percentage of take and concludes the paragraph with the statement that "at present (1919) there are only a few propagators in the United States who can produce budded mango trees economically and in quantity." So the eye budding of mangos is not new. But, although it was recommended some 30 years ago, the growers realized that much work was needed to make eye budding a general method of mango propagation for the so-called "common-man."

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Several individual problems present themselves in making the eye budding of mangos successful. They can be listed briefly as follows: Selection and preparation of budwood, age and condition of stock and season of the year.

With preliminary work on about 1500 stocks at the University of Miami Experimental Farm during this summer, a few of these problems have been partially answered.

It was found necessary to either prepare the budwood or else by chance to find a few sticks with swelling buds. The budwood is prepared by choosing terminals that have hardened or are in the last stages of pink stem, from \( \frac{3}{4} \) to \( \frac{3}{8} \) inch in diameter (larger wood gives too large a shield). Cut off the leaf petioles to about \( \frac{3}{8} \) inch, leaving only 2 or 3 leaves at the terminal. If the tree is in good growing condition, the bud eyes will be swelled, ready for use in 2 to 3 weeks. If the trees are hard, an application of a high nitrogen fertilizer is advisable. Each terminal will give 5 to 8 buds and a tip which can be sidegrafted.

The preparation of mango seeds for stock plants is important. The husk is removed by cutting along one suture, being careful not to injure the seed. The hulled seed is placed in a sprouting media such as peat, sawdust or other friable material, with the convex edge upward and about one-half inch below the surface. The seeds should be replanted in pots, tubes, or in the nursery row, as soon as they show viability by putting out a short (one inch or less) root or plumule growth. This immediate replanting assures the establishment of the plant for the early budding procedure.

The age of the stock is very important on two counts. First, if it is used in the succulent red stage (Fig. 1), which is 2 or 3 weeks old, the bud mortality rate is very low. Second, within four (4) to six (6) weeks from budding the eyes will spring. The high percentage of union is no doubt due to the stock tissue being partially undifferentiated and there is a broader cambial or growing area. The springing of the eyes may be due in part to the heavy and steady supply of food from the cotyledons. The type of bud used on this age stock is a chip bud with a long (1\% to 2") shield (Fig 2). The front of the shield below the eye is cut off through the bark, leaving exposed the cambial area. The cion is in-
inserted like a side graft into a deep slanting cut into the stock extending horizontally about one-third through the stem and about 2 in. deep. A small piece of 20 gauge vinylite 2 inches wide and long enough to wrap around the stem 1½ times is wrapped to hold the bud and the vinylite snugly in place (Fig. 3). The film allows the carbon dioxide to diffuse out but retains the moisture next the bud, thus facilitating union of the tissues. Regular watering and an application of starter solution or an application of a mild fertilizer to the plant at this time is a good practice. In two weeks the rubber band and vinylite may be removed and it can be determined if a union has been made. After another week the stock can be cut back to two or three leaves and a final pruning-back of the stock to the upper edge of the bud may be made when the bud sprout is 3 to 4 inches long (Fig. 5). It may be added, that the cion tips from each bud stick mentioned above can be side grafted into these succulent stocks with the same success as the bud eyes. In most cases these tips will spring with more vigor than the bud eyes.

Mango stocks over 4 weeks old have stems on which the bark is green with a well defined cambium and a cortical region showing signs of woodiness. The first flush of leaves have lost their reddish color and are maturing (Fig. 1). At this stage, a slightly different type of bud is used from the foregoing and the stock preparation does not have as deep an incision (Fig. 4). Also, the chip of the bark and wood is removed from the stock by a downward 45 degree cut at the joint which will be the bottom of the exposed cambial area. A typical chip bud is cut of a size and shape to fit the prepared stock. The bottom edge of the shield is cut with a 45° slant to match that on the stock. The bud is placed in position, covered with vinylite and wrapped with a rubber band as in (Fig. 3).

In three weeks time, the rubber band and vinylite is removed to show whether the bud union has formed. Procedure for a rapid springing of the buds on this older stock has given erratic results. Very likely these buds will all sprout within a few months but this defeats the purpose of growing a tree ready for field planting within a year from seed. No definite recommendations are available at this writing. Further work is in progress at the University of Miami both in nursery practice and anatomical studies on this phase of the problem.

The season for budding is directly correlated with the availability of seed. If the crop is early, budding may be started correspondingly early and continue through the summer as long as the seeds are available. This means an average season of about three months for propagation by the above discussed methods.

Summary

Budding of mangos has been shown to be quite feasible if the stocks are used in the red succulent stage (one to three weeks from sprouting).

A modified chip bud has proven successful on the young stock.

The preparation of budwood is apparently essential and the use of gas-permeable film is advisable.

Budding stocks after the red color has disappeared from the stem has proven successful as to making bud unions. There is as yet no definite method for forcing a rapid sprouting of the bud-eye on this older stock.

The season for budding is dependent on the availability of seed.