light green in color. There are two reddish spots on the fore wings, and they are bordered by a reddish fringe. The antenna is white above and dusty below. On the upper surface of the abdomen several round white tufts of scales are present. This insect may become a serious problem on lychee in some areas of the State.

**OTHER INSECTS ON LYCHEE**

- Spirea aphid (*Aphis spiraecola* Patch)
- Citrus root weevil (*Pachnaeus litus* Germ.)
- Lepidopterous larva (*Homosetia* sp.)
- Cotton square borer (*Strymon melinus* Hbn.)
- Bella moth (*Utethesia bella* Linn.)
- Io moth (*Automeris* sp., may be *lilith* Strkr.)


**PROPAGATION OF GUAVAS BY GRAFTAGE**

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The vegetative propagation of the guava, *Psidium guajava* L., by reliable and inexpensive methods has taken on more importance in recent years with the advent of many improved varieties of sweet guavas that show promise for processing and for fresh fruit sales.

The majority of the larger plantings in Florida in past years has been seedling varieties of the common acid type guava used in jelly making. The variations in fruit encountered by the use of seedlings in these plantings were not considered of too great importance. However, modern day horticultural practices with tree crops requires uniform clones or varieties. This is especially so if the product is to be sold in the fresh fruit markets. Vegetative methods of propagation by either cuttings, air layering or graftage are commonly employed for increasing plants of a desirable variety.

Up to the present time, air layering has been the only reliable method of vegetative propagation of the guava (8). This method, however, does not allow for the production of a large number of plants from a limited source of plant material. Methods such as budding, grafting, and stem cuttings utilize the least number of buds to the greatest advantage in the increasing of plants. Varying degrees of success have been encountered using these methods for the propagation of the guava. Air layering has an advantage over budding and grafting because, being on its own root, the suckering problem is minimized. However, suckers arise on other plants propagated by budding or grafting but most growers are able to keep this under control until the new top becomes dominant, thus depressing sucker growth to a negligible degree.

Root and stem cuttings have been used to a limited extent in guava propagation. The use of stem cuttings may prove to be a workable method under specialized environmental conditions such as exist in water mist propagation beds (2).

Other investigators state that the propagation of guavas by budding and grafting has been unpredictable and could not be used as a dependable method. They indicate that the type of scion giving some success was obtained from budwood that had lost its green color, and that grafting done in winter and early spring months gave the best results (4, 5, 9). Trials using scions as suggested, also
proved undependable at the University of Miami.

Work on the propagation of guavas at the University of Miami Experimental Farm was started in the spring of 1950. Various techniques of eye budding and grafting were tried. Although some success was obtained by certain methods used, results for the most part were discouraging. Great difficulty was found in selecting scions containing buds in the proper stage when budwood was used of the maturity suggested by other investigators. Inconsistent springing of buds was also encountered. Various hormone treatments on the cut surfaces of the stock and scion gave no apparent success. Girdling of limbs to be used as graftwood gave no higher “takes” than ungirdled limbs.

The method used to determine suitable scions was to select budwood sticks containing a number of buds and, numbering each scion, graft by several methods to determine which area of the budwood stick gave scions from which “takes” were possible. In several instances, all scions used from the more mature, brown colored area of the budwood stick failed to “take” and all those in the green, quadrangular stage of maturity were alive. The maturity of the scion in later trials again proved to be the difference between success and failure under varying nursery conditions and varying size of stocks. A type of scion cut and wrapping procedure has now been developed which gives “takes” in the 90% bracket. A large number of trees grafted by this method have been distributed to nurseries in Florida. The season in Florida during which the most rapid springing of buds has taken place has been from March through September, which is also the time when budwood is most available.

The following recommendations are suggested for nursery propagation of guavas by graftage:

**Stocks:** Seedlings of a vigorous variety of guava should be grown in seedbeds or 3 inch clay pots and later transferred to No. 10 cans or to felt paper tubes of comparable size. If nursery plants are to be field grown, it is advisable to move them from containers to the field rather than from a seedbed, thus insuring more rapid recovery from the transplanting operation. If possible, the better plan is to grow the plants in containers and thus eliminate root pruning and the problem of root suckers arising from the cut rootlets. The seedlings from the Red Indian variety of guava have furnished excellent rootstocks.

Guava seedlings grow rapidly when frequent water and fertilizer applications have been made. The seedlings are considered to be of workable size when they are ½” to ¾” in diameter, or about the size of a lead pencil, usually reaching this caliper in about 6 or 7 months. It may be necessary to spray the seedlings with a nutritional spray containing copper, manganese, and zinc, before graftage is attempted, if these elements have not been adequately furnished by fertilizing. Insecticides for scale insects and leaf tiers, (1) are required at times.

**Graftwood Selection:** Scions are selected from terminal growth flushes when the stem is still green and quadrangular. (See Fig. 1). Axillary buds should be well developed. In many instances both bud eyes (leaves are opposite in guava) will be of the proper development and this bud-stick with opposite eyes may then be split to form two scions. Usually at the time of budding, however, only one of the two bud eyes is of proper development,
and the less desirable eye is trimmed off when the cut is made prior to placing it in contact on the cut of the stock.

In order to get a good supply of budwood from older parent trees, it has been found necessary to prune the parent tree back approximately 1/3 in order to force sprouts that contain a large number of scions with desirable bud eyes. Younger parent plants contain growth flushes that are suitable for scions without this procedure. The forcing of this type of “juvenile” growth furnishes a larger diameter stick of budwood containing more scions than can be found normally on older parent trees.

**Cutting the Stock:** The cut on the stock for receiving the scion is made as in the chip bud or veneer method of grafting. The length of cut will vary, depending on the length of the scion. The slice of tissue removed to expose the cambial region is made by cutting a notch at the lowest point where the scion is to be placed, slanting at approximately 45° inward, and then moving the knife upward 1/2" to 2", and a downward cut made to the notch, thus removing a slice of bark and exposing the area of cambium. (See Fig. 2). A properly made cut will not extend inward further than the woody cylinder. However, it should be made certain that no bark remains on the cambial area where the scion is to be placed.

**Cutting the Scion:** Scions are usually cut into lengths of 1½" to 2" as they are removed from the parent plant. They are then stored in damp spaghnum moss until the graftage is undertaken. Usually only one of the two opposite bud eyes is in the proper stage of develop-
opment for use as a scion. The less desirable
of the bud eyes is then removed by making a
cut parallel with the surface of the scion and
enough stem tissue is removed to expose the
area of cambium. (See Fig. 2). The scion,
1 1/2" in length, will now have one bud eye
which will be located on the upper 1/2" of the
scion. There will be approximately 1/4" of stem
below the eye. In the event that both eyes
should be of proper development on a scion,
the cut can be made by simply splitting the
stem, thus giving two suitable scions.
The graft is wrapped with a vinyl plastic
film strip 3/8" to 1/2" wide and of suitable length
for the stock size used. It is wrapped in a
manner that leaves a small opening at the top
of the wrap through which the bud emerges
(5) (See Fig. 3). After 3 weeks, the stock
can either be lopped over as in citrus budding,
or the top one half of the stock can be re-
moved. This will force more rapid springing
of the bud. Staking and tying is done as on
other nursery trees. After 4 to 6 weeks, the
film is removed. The stub of the stock above
the bud can be pruned back when the scion
has attained 4 to 6 inches of growth. It
should be painted with wax or some other suit-
able tree wound paint. Graftage on stocks from 3/4" (See Fig. 3) up to 4", using the type
of scion described, has been accomplished
successfully.

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NOTES ON LYCHEE GRAFTING

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The propagation of the lychee (Litchi chinensis Sonn.) is best done by air layering or
"Chinese layering" (9). This process has
been modified by Grove very effectively by
the use of a plastic film wrap (3).
Investigation into the propagation of the
lychee by budding and grafting has been un-
tertaken at the University of Miami, primarily
to establish reliable methods to use in rootstock
trials. Established varieties such as Brewster
and other promising varieties may show a de-
cided improvement in bearing habits and tol-
erance to varying soil conditions when grafted
onto rootstocks of certain varieties that may
influence these desirable characteristics.

Within recent years, a number of promising
new seedling varieties from Florida and Ha-
waiti have become available in limited quanti-
ties. The rapid multiplication of new fruit
varieties is universally accomplished by either
budding or grafting methods. The need to
top work inferior varieties is now also appar-
ent in many areas of Florida, and reliable
methods must be developed.
Investigations into the grafting of the lychee
have been carried out in several areas of the
world with varying conclusions. Higgins (4)
has stated that, with the exception of inarch-
ing, the practice of budding or grafting is
seldom applied to the lychee. Realizing the
need for rootstock studies which necessitates
the use of graftage, he says, "Aside from the
advantages of speed and facility in multiplica-
tion, budding and grafting afford the opportu-
nity to use as rootstocks other varieties or
species which may offer as decided advantages
in the case of the litchi as are well known to
exist in the case of many other fruit trees."
Methods of grafting lychees are described
by Higgins (4) using a bark graft. Pope and
Storey (8) tongue grafted one year old.seed-
lings. Cobin (1) reported successful cleft