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**A STUDY ON THE ESTABLISHMENT OF MANGO ORCHARD WITH
WEDGE GRAFT ON "IN SITU" GROWN MANGO SEEDLINGS
IN DRY REGIONS OF THE GUJARAT STATE**

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The establishment of an orchard of mango, using simple approach graft is a bit difficult in the areas of the middle and north Gujarat and in Saurashtra, even in good soils. This is because the top root and secondary roots of the grafts have been cut off while lifting the stock from the soil into the earthen pots or any other containers. Moreover, the new roots which develop into the container coil within the container as there is no space for their horizontal development, ultimately making the plants have the pot-bound root system. Although simple approach grafting gives nearly 100 per cent success in securing the union, the establishment of such grafts in the field becomes very difficult even with irrigation facilities. This is mainly because such grafts are usually available for planting in the field, only during the middle or later part of the monsoon season. Such grafts transplanted into the field fail to establish due to the warm weather of October–November. Grafts that survive overwinter without developing much roots. Regular irrigation and proper shade help the grafts to put up new roots and shoots during the spring and summer. However, it is difficult to maintain the required moisture near the rootzone as the growers irrigate the grafts small basins or rings around the planted grafts. This is not the case in Southern districts of the Gujarat State where the atmospheric humidity and retentions of soil moisture are very high. However, the pot-bound conditions of the grafts make them difficult to establish as many of them die off. Only about 40 per cent of the grafts remain alive in the north and middle Gujarat areas.

Every year thousands of grafts are planted in the field since last two decades but only very few orchards have come up in good soils, having better retention of soil moisture and humid atmosphere.

The propagation of mango by cuttage and layerage have been tried by many workers with mixed results (6, 8, 12, 13). Other methods of vegetative propagation

are tried by many workers with different methods of budding and grafting by using the detached scion wood (2, 3, 5, 8, 11, 14). Although the propagation of mango by any method of budding is cheaper, easier, quicker and better for commercial practice, it is restricted to the nurseries only. Transplanting of budded plants and their establishment in the fields remain low as those for simple approach nursery grafts; while budding "*in situ*" is restricted only to some areas of states having ideal conditions (4). Recently, Veneer grafting, has given encouraging results at many places (1, 7, 10). Similarly, the bench grafting by splice, whip-and-tongue and wedge methods on one to two week old sprouted seedlings have given very promising results for propagating in the nursery conditions at several places (3, 6, 8, 9).

In all the methods stated above for preparing the grafts either by splice, whip-and-tongue or wedge methods of bench graftings the better success restricted to only humid and moderately warm conditions. However, securing the perfect union between stock and scion and obtaining a good graft is only one aspect of vegetative propagation: Establishing the graft in the field successfully and economically is another aspect, especially in the sandy or sandy-loam soils having the semi-arid climate.

During the recent years another problem has arisen in the Gujarat State. As the prices of forest timber have gone very high, the country mango trees are used as timber wood resulting in low production of mango fruits. With a simultaneous increase in the population, the demand for this national fruit has gone high alongwith the prices. It is interesting to note that the apples produced in the temperate regions of the country and the mango produced locally are available approximately at the same rates in Gujarat during their seasons. Realizing this difficulty of establishment of the grafted mango in the fields, a technique was conceived and tried on the mango stock plants in the nursery fields of Gujarat Agricultural University, Anand Campus and also on the country mango plants growing in the head land of the surrounding cultivators' fields.

MATERIALS AND METHODS

Many persons in past might have tried the detached methods of grafting known to us in case of mango, but no recorded information is reported for the dry and warmer climatic regions of the Gujarat State.

In this technique, the method used for grafting is known to all the horticulturists. It is a detached method of wedge grafting of mango plants "*in situ*".

This grafting can also be done successfully by other detached methods—splice, whip-and-tongue and saddle graftings. But wedge grafting being simple and convenient to work with and tie the polythene strip, without the help of others, was considered better for this work.

By modifying the whole technique of detached method of grafting in three different phases, the percentage of success has increased considerably even in dry warm areas. Three important phases are (1) Selection of a site on the stock for grafting (2) selection of scion wood (3) Preparation of graft.

(1) *Selection of a site on the stock for grafting* : The stock of any "in situ" sown and grown mango seedling 1 to 2 years old and 45 to 90 cm. high is most ideal for grafting. However, 2 weeks to 5 year old plants having 25 cm. to 2 m. height of stock can also be grafted (grafting on 2 weeks old seedling in controlled condition gives good union; but they fail to establish in the open fields due to late rains, therefore, if grafting is to be carried out in the same year it should be done only at the site of second vegetative flush put up by the seedlings). On tall plants having two to four branches, successful grafts can be made with a little care.

Grafting on such stocks is to be done, only on the stem of the terminal fresh growth having bronze coloured leaves and stem which has been put up by it, during the last week of July to first week of September. Keeping 7 to 10 cm. of the lower stem portion of the fresh growth, the remaining top portion of the fresh growth is decapitated and the top of the stem is splitted vertically to about 3 to 3.5 cm. in length forming a 'V' shape by a sharp knife or a razor blade.

(2) *Selection of scion wood* : A healthy and vigorously growing mango tree of a desired variety, free from diseases and malformation is selected for scion wood. One to two weeks prior to the date of grafting, a terminal shoot at least 3 to 6 months old and of about 0.5 cm. thick stem, having enlarged terminal bud is selected. Defoliation upto 25 cm of the terminal growth is done, keeping about 6 mm petioles attached to the stem. This is not separated till it is required for grafting. On the day of grafting, twigs (scion wood) which were defoliated one or two weeks before, are collected from the tree and wrapped in moist cloth and kept in polythene bags till the operation of grafting on stock is carried out.

(3) *Preparation of the graft* : As mentioned previously, grafting with

selected scion is done by wedge method of grafting on the stock, during the last week of July to first week of September.

The stem of the new growth is decapitated leaving 7 to 10 cm. of stem and discarding the top along with leaves. The top is then splitted by a sharp knife or a razor blade to a length of about 3 to 3.5 cm. (Fig. 1). The scion having the same thickness as that of the splitted stem is selected from the lot previously collected. If the scion is more in length it should be reduced to 10 to 13 cm. Hence, the lower end of the scion twig is mended to 2.5 to 3 cm. as wedge by removing the bark and little wood from two opposite sides, taking care to retain some bark on the remaining two sides. The wedge of the scion so prepared is inserted into the "V" shaped slit of the stock and secured firmly with 1.2 cm. wide and 45 cm long, 200 gauge, white transparent polythene strip. Immediately after this operation of grafting, all the leaves on the stock plant below the grafted portion are removed. The stock appears naked without any leaves.

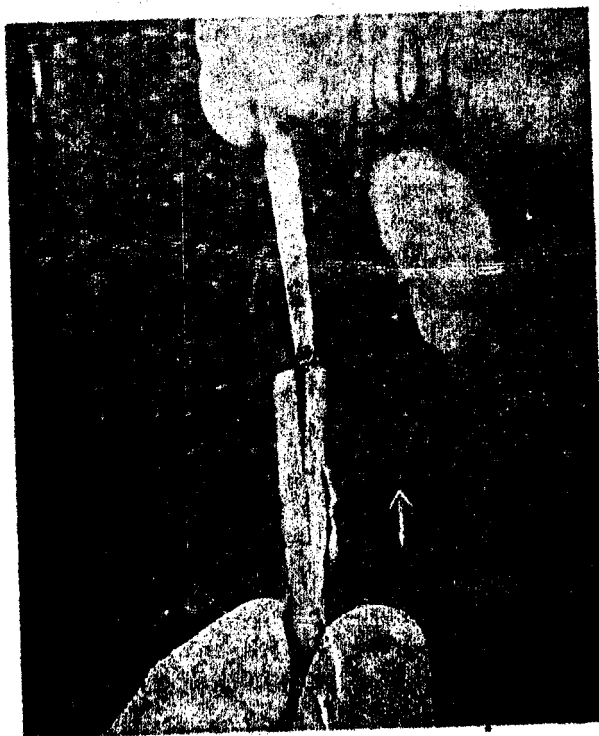


Fig. 1. Wedged Scion and Splitted Stock.

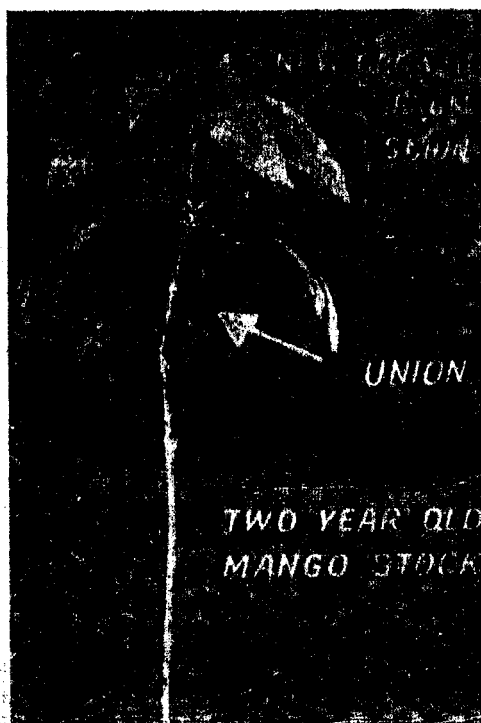


Fig. 2. Sprouting of the Scion Wood on the Grafted Mango Stock.

In August 1972, a filler trial of grafting was done on 68 one-year old and 30 to 45 cm. high 'situ' grown mango stock plants by the method described earlier. Out of these, 66 grafts were successful resulting in 97 per cent success. The scions used were from Rajapuri variety of mango and they grew vigorously giving very good growth of 40 to 60 cm during the period of ten months. In view of this encouraging result, 211 'Situ' grown mango 2 years old stock plants and 90 to 180 cm high in the nursery of the campus and 50 mango stocks growing naturally in the head land of cultivators' fields were grafted with the Rajapuri scions by the method described above during August 1973. Observations were made in the month of December 1973 for the successful union and sprouting of the scions (Fig. 2).

RESULTS

Out of 211 stocks grafted in the nursery field of the Anand campus, 208 plants sprouted successfully giving 98.5 per cent success. However, in the cultivators' field 38 plants were observed successfully sprouted from the 50 grafted, giving 76 per cent success. This low percentage of success in cultivators' fields may

be due to the conditions of the mango plants being grown on the head land along with other shrubs. It is of interest to note here that it gives an excellent result only when the grafting is done on the stem of linearly developing terminal new growth having the bronze coloured leaves and stem. Older the new growth, lesser is the percentage of success and hence it should only be done when the new terminal flush is in its linear development having bronze coloured conditions of the leaves and stem.

It is also observed that scion wood selected from a desired cultivar should be defoliated at least one to two weeks before the day of operation. Freshly selected and defoliated shoots just prior to the operation of grafting will not give much success.

After the grafting operation is completed on the stock, all the leaves below grafted portion of stock should be removed. If this is not done the percentage of success will be reduced.

Success of establishment depends on the following points :

(1) The basins of 1.5 m. diameter should be prepared for each 'siti' grown plant from the beginning and a layer of 10 cm. of dried leaves should be placed on the soil in the basins to reduce the loss of water from the soil.

(2) If these plants are in the open fields, they should be protected from the scorching rays and heat of summer by providing shelters all around the plants keeping the central top portion open. For this purpose any suitable dried materials may be used.

(3) The tied polythene strips may be removed after six months and if required they may be retied and should completely be removed after another three months' time.

(4) If needed the grafted plants may be staked by any wooden support as is done in other newly transplanted grafts.

(5) The grafted stock that produces side shoots very frequently should be removed as and when seen, allowing only the scion shoot to grow.

(6) During the summer, regular irrigations may be given if irrigation facilities are available; if not, very few irrigations may be given when leaves show deficit of soil moisture.

SUMMARY

The only way of producing a better quality of desired cultivar of mango, is to produce vegetative propagated mango plants and to establish them in the field economically and successfully. A noticeable percentage of success is obtained in getting the vegetatively propagated plants in the nursery conditions; however a large number of such plants fail to establish themselves in the field. Growing mango seedlings "in situ" in the field through mango stone is easy. An experiment was, therefore taken up for wedge grafting the mango stocks grown "in situ", both in the nursery and cultivators' field. Linearly developing terminal new growth of the stock, having bronze coloured leaves and stem was taken as the site for grafting. Wedge grafting using the scion wood defoliated 1 to 2 weeks before was done, and all the leaves from the stem of the stock were removed after the operation. This has given 91.5 per cent success in nursery grown seedlings and 76 per cent success in the cultivators' field without irrigation. Thus, the most effective and economical method for establishment of mango orchard by wedge grafting on "in situ" grown mango seedlings in dry regions of the Gujarat State has been evolved.

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LITERATURE CITED

1. Ahmad, S. (1964). Propagation of mango by veneer grafting W. *Pakist. J. Agric. Res.*, 2 : 32-34.
2. Bajwa, B. S. and A. Ram, (1946). Budding of mango seedlings *in situ*. A brief resume of work done during the years 1943-45. *Punjab Fruit J.* 10 : 10-3.
3. Bhan, K. C., H. N. Sammaddar, and P. S. Yadav, (1969). Chip budding and stone grafting of mangoes in India. *Trop. Agriculture Trin.* 46 : 247-53.
4. Bhat, S. S. (1946). Nursery practices of mango grafting, *Punjab Fr. J.* 10 : 19.
5. Gandhi, S. R. (1942). Recent advances in horticultural practices. *Poona Agr. Col. Mag.* 34 : 86-99.

6. Garg, M. L. (1954). Mango propagation by means of marcotting or air-layering. *Indian. J. Hort.*, 11 : 147-8.
7. Lynch, S. J. and M. J. Mustard (1955). Mangoes in Florida. Bull. No. 20, Department of Agriculture, Tallahassee, Florida.
8. Madhava Rao, V. N. (1967). Propagation practices, The Mango : A Handbook, I. C. A. R. New Delhi : 32-69.
9. Majumdar, P. K. and D. S. Rathore, (1970). Bench grafting in mango. *Indian Hort.* 14 (2) : 11-12.
10. Mukherjee, S. K. and P. K. Majumdar, (1961). Veneer grafting in mango has its own advantages. *Indian Hort.* 6 (1) : 3-30.
11. Singh, L. and A. A. Khan (1943). Mango budding *in situ*. *Indian. Fmg.* 4 : 199-200.
12. Singh L. B. (1954a). Propagation of mango by airlayering for root stocks. *Proc. Amer. Soc. Hort. Sci.* 63 : 128-30
13. Thakurta, A. G. and B. K. Dutt (1941). Vegetative propagation of mango from gootee (Marcotte) and cuttings by treatment with high concentration of auxin. *Cur. Sci.* 10 : 297.
14. Ulvi. A. M. (1940): Mango budding, *Indian. Fmg.* 5 : 222-5.