# COMPARING GRAFTING TECHNIQUES FOR BLACK WALNUT

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The increasing demand for black walnut timber in recent years has caused interest in planting black walnut. A source of superior seed is needed to obtain the best growth and quality possible from these plantings. Techniques are needed to insure that selected clones can be propagated in seed orchards for the production of the required seed. In addition, high quality black walnut is rapidly being cut, and the gene pool drastically narrowed. Therefore, there is great interest in preserving superior selections by grafting before they are cut.

The object of this study was to compare five different propagation techniques in an effort to determine which methods were suitable for use in the establishment of black walnut seed orchards.

## MATERIALS AND METHODS

Scion was collected by shooting branches from the selected phenotypes between March 13 and March 26, 1968. As soon as the scion was collected in the field it was placed in polyethylene bags and packed in moist sphagnum moss. Once in the laboratory the cut ends of the scion were dipped in Paraffin to prevent drying. The scion with some moist moss was ten sealed in polyethylene bags and stored at a temperature of 340 to 36 F. Scion was stored until June without having any deleterious effects.

Care should be taken during storage to insure that the scion is not too wet or dry. Hartmann and Kester (1.961) stressed that the moss should be barely moist because the scion is more liable to be damaged by being too wet, due to fungal development,than by being too dry. When the scion is being stored for a prolonged period, it should be checked occasionally for moisture loss.

Sitton (1931) and McKay (1966) stressed the use of large caliper scionwood (3/8 to 5/8 **in.)** for best results in grafting. Whenever possible scionwood of this size was collected. However, on may selections it was impossible to obtain wood of this diameter. Scionwood 1/4 inch in diameter was used for grafting without encountering undue loss. The basal portion of the current years growth or 2-year-old wood produce the best scion. It **was** preferred to make the graft union on the 2-year-old wood and have the buds present from the first-year wood.

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Tops of the root stocks were severed 10 to 14 days before grafting. This allowed ample time for the stocks to bleed and thus reduce graft failure due to **sap** flaw. At the time of grafting, the stocks were cut off again to expose live wood.

After the scion or bud was in place, it was wrapped with a rubber strip (1/4 in. x 8 in.) and painted with paraffin. The paraffin covered the entire piece of scion and all cut surfaces and thus, helped to prevent the scion from drying out before callusing and union had occurred.

Adventitious shoots which developed below the graft point were removed every few days to force growth on the graft. On some grafts the buds did not begin growth until after these adventitious shoots were removed.

Grafts should be staked for support during the first two years to reduce strain placed upon the graft union by the action of the wind.

Grafting methods used were as follows: bark inlay, cleft grafting, whip grafting, T-budding, and patch budding. Propagation techniques with the exception of patch budding were performed between April 9 and May 21, 1968, while patch budding was done on August 28, 1968.

After active growth of the stock had started, the bark inlay was performed as follows:

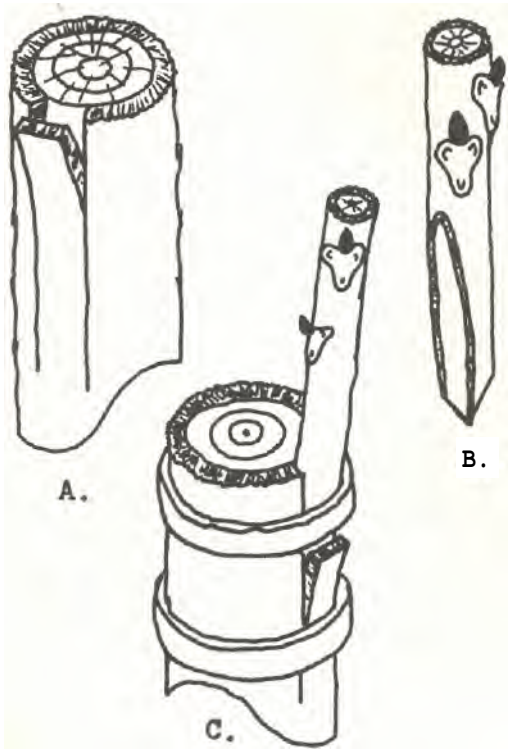


Fig. 1 - Bark Inlay Graft
A, Stock; B, Prepared Scion;
C, Completed Graft.

1. Preparation of the Stock (Fig. 1A)
   a. Vertical, parallel cuts (1 to 2 inches long) were made through the bark of the stock. The distance between these cuts was equal to the width of the scion.
2. Preparation of the Scion (Fig. 1B)
   A sloping cut (1 to 2 inches long) was made on one side.
   A second cut (1/2 inches long) was made on the opposite side.
3. Completion of the Graft (Fig. 1C)
   Bark was peeled from the stock and the **scion** inserted in the slot.
   The top 2/3 of the bark flap was removed.
   The scion was tied in place with a rubber strip.
   The grafted stub and scion were waxed.
   Occasionally checks were made to replace the rubber strips as they deteriorated.
   Adventitious shoots were removed from the stock as they developed.

Before active growth of the root stock had started, the cleft graft was performed as follows:

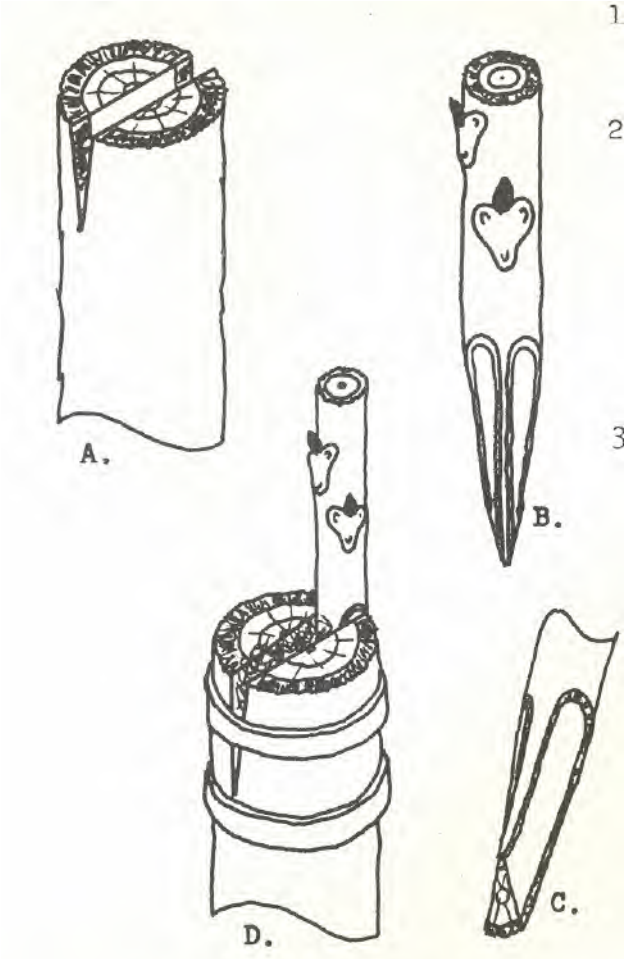


Fig. 2 - Cleft Graft.
A, Stock; B, Side View of Scion; C, End View of Scion; D, Completed Graft.

1. **Preparation** of the Stock (Fig. 2A)
   a. The stock was split for a length of 2 to 3 inches.
2. Preparation of the Scion (Fig. 2B and C)
   a. A sloping cut (1 to 2 inches long) was made on one side.
   b. A second sloping cut the same length was made on the opposite side in a manner that formed a wedge, which is slightly thicker on the outer edge of the scion than it is on the inner edge.
3. **Completion of** the Graft (Fig. 2D)
   a. The split in the stock was held open by a wedge.
   b. Insert the scion in the stock with the thicker edge to the outside of the stock. The cambiums of the stock and scion must align.
   c. The wedge was withdrawn.
   d. The stock was wrapped with a rubber strip and soft paper was placed in the remaining portion of the cleft.
   e. The grafted stub and scion were waxed.
   f. Occasional checks were made to replace rubber strips as they deteriorated.
   g. The adventitious shoots were removed from the stock as they developed.

Whip grafting was performed before the root stock had initiated growth while the T-budding was performed after the bark on the root stock had started to slip, Both techniques were accomplished as described in Hartmann and Kester (1961) with the exception that a callus stimulate (indolebutyric acid and naphthalene acetic acid) was used with the whip grafts.

Patch budding was done on August 28, 1969, using buds that were collected on August 26, from the current years growth. The patches were cut on the root stocks 14 days before the actual budding operation. The procedure described in Hartmann and Kester (1961) was followed.

## RESULTS

The number of grafts performed and the percentage of successful grafts per technique are shown in Table 1.

Table 1. Results of Different Propagation Techniques

| Method | Number Attempted | Number of Successes | Percent of Success |
|---|---|---|---|
| Inlay | 36 | 30 | 83.3% |
| Cleft | 25 | 12 | 48.0 |
| Whip | 37 | 0 | 0 |
| T-Bud | 37 | 0 | 0 |
| Patch Bud | 86 | 0 | 0 |

The cleft graft and bark inlay were used in the spring of 1969 to establish a black walnut seed orchard. There were 209 cleft grafts and 98 bark inlays performed. The preliminary results are 71.8% success for the cleft grafts and 76.8% for the bark inlays.

## DISCUSSION

The bark inlay was the fastest and easiest to perform in addition to having the greatest percentage of takes. Bark inlay has the disadvantage of requiring root stocks that are at least one-inch diameter at the grafting point. If larger stocks are available, more than one scion can be grafted to each stock.

Cleft grafting is both relatively easy and fast and does not require one-inch diameter root stocks. After the scion was in place and wrapped, absorbent paper was placed in the remaining portion of the cleft to absorb excess sap.

On March 18, 1969 three cleft grafts were made using scion that was collected during November, 1968, when a superior selection was cut. These grafts were placed in a growth chamber which was set for a 1 -hour daylight photoneriod with day and night temperatures of 60 and 45 F, respectively. By March 28, the day length had been gradually increased g to 15 hours while the day and night temperatures had been increased to 80 and 65 F, respectively. Relative humidity was maintained between 80 and 100 percent. All three grafts were successful which demonstrates the importance of high humidity and moderate temperatures in callus formation. Growth chamber grafting is of value when a selection is cut before normal scion collection season. However, in this one case scion was successfully stored from November until field grafting in May.

A callus stimulant was used on the whip grafts. The stimulant was carried in an alcohol base, and it is thought that the alcohol killed the cambial cells which could account for the lack of success with whip grafting. Due to the time involved in performing the whip graft and the percentage of takes obtained with other techniques, it is believed that this method is not satisfactory for field use with black walnut.

T-budding is fast and easy but it appears that the bark of even small walnuts is too thick to obtain a good fit around the margins of the bud.

Patch budding has been used by many workers, but the results have been uncertain. By April, 1969, many of the patches had died and fallen off. Apparently, a patch is needed that is free of extra leaf scars. This requires rapid growth of the budwood, and budwood of this type is difficult to collect due to its absence or its position in the crown of the tree, Also, we experienced difficulty in keeping the bud trace with the patch. This could have caused the total mortality which we experienced.

## CONCLUSIONS

The bark inlay technique is the most appropriate method to use when the root stock has sufficient diameter (greater than 1 inch at grafting point). When a smaller-sized root stock (less than 1 inch at grafting point) is used, the cleft graft gives satisfactory results. Either method produces a satisfactory percentage of successes to be used in the establishment of black walnut seed orchards. Whir grafting, T-budding, and patch budding were totally unsuccessful under the conditions of this investigation.

## LITERATURE CITED

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