WHAT WE KNOW ABOUT GRAFTING

by

Nov C. Grigsby[1/]
Mississippi Forestry Commission

More forest tree species are currently being propagated by grafting than by any other vegetative means. This is true probably because grafting is the most successful method in use, The inconsistency of results, however, indicates that more research is needed in working out the problems that still exist in the grafting of both pines and hardwoods.

Grafting differs from rooting--the other principle method of asexual propagation--in that the resultant product consists of a portion of two trees, the root of one joined with a scion of another.

Several methods of grafting are made use of in testing superior tree phenotypes, setting up seed orchards, inducing early flowering and other tree improvement work. Among these are budding, cleft, saddle, side, and approach grafts. Basically the principal is the same for all--the fusing together of the cambium, phloem and xylem tissues of the stock and scion to the extent that the two parts become one.

Grafting can be done almost any place where the transpiration of water from the scion stem can be controlled while union is being made, whether in the greenhouse or outside. Of course this can be easily regulated in greenhouses where humidifiers are used. Without humidifiers, use must be made of grafting cases, plastic bags or other containers to keep transpiration dawn in the scion.

Lathhouse and open field grafting may be done when the scions are enclosed in bags and shaded to retard transpiration or when transpiration loss is replaced in the scion by the absorption of water from a container such as a bottle.

Patch budding has been used successfully on hardwoods by Zerger(8) Patch bark grafts have been made on shortleaf pine by Jackson and Zak (3). In this process a specially made tool is used in removing the material from one stem and placing it on another.

[1/] Since this paper was prepared the author has accepted employment with the Southern Forest Experiment Station, Crossett, Arkansas.

Only moderate success has been achieved in cleft-grafting hard tissue in the pines. In using this method, the main stem of the stock plant is severed and the scion is placed in a slit in the stump. There is one notable exception, however. Perry and Wang (6) have had 80 to 90 percent success with this method on potted stock in a lathhouse. The graft is made in the hard tissue near the top of the stock. After being waked, it is covered with a ventilated plastic bag. Mergen (5) developed a method of cleft-grafting the soft tissue of slash pine buds which proved highly successful. A plastic bag was used to cover the grafted tip to slow up transpiration in the scion. This method can be used throughout the growing season with good results in the field as well as in the greenhouse. An additional bag made of paper is used to shade open field grafts while union is being made. More recently soft-tissue grafts have been used successfully on loblolly and shortleaf pines and other species (7).

Side grafts, including veneer grafts have been widely used in slash, loblolly and shortleaf pines (1,5). Good success has been attained on potted stock in the greenhouse where the humidity is kept high. In using this method, the wedge-shaped scion is placed in a slit on the side of the stock and the graft is wrapped with a rubber budding strip. After union is made the stock plant is pruned back to the graft over a period of several weeks. Zobel and Cech (9) have used this type of graft in a lathhouse with good results. The scion and entire grafted portion of the stock was enclosed in a plastic bag.

Moderate success has been attained by Grigsby (2) in side-grafting bare-root loblolly pine stock under controlled greenhouse conditions. The advantage of this method is that the space normally taken up by pots is eliminated.

Wedge and saddle grafts have found little use for grafting hard or dormant scions.

A method that has proven very successful for grafting under field conditions is an approach-type known as the bottle graft. The scion is joined to the stock leaving a protruding base which is placed in a bottle of water. This water is absorbed into the scion, replacing that which is lost in transpiration. After union takes place, the bottle is removed and the end of the scion is clipped at the graft. A principle similiar to this, known as inarching, has been used to graft seedlings into mature trees by Morgan (5), Zobel (9) and others. The roots of the seedling are enclosed in a plastic bag filled with moist peat moss and the seedling is tied to a branch of the tree and grafted in the same manner as a bottle graft. Cech (9) is using this method in reverse (i.e., severing from the tree after union is made and planting) to multiply hard-to-graft clones in seed orchards. After obtaining a potted seedling upon which the desired wood has been grafted, inarching can be done repeatedly on seedling stock already established in the seed orchard.

A novel type of graft known as heteroplastic micrografting has been used by Mergen (4) and others in an effort to induce early flowering in the pines. The stock and scion arc young succulent seedlings in or just past the cotyledon stage.

General Observations

Success or failure of plant grafting is largely a matter of water relationships in the scion stem and later in the scion-stock combination. Transpiration of water from the scion stem is dependent on environmental conditions and on the character of the shoot itself. Full sunlight, high air temperature, and low relative humidity in the air s surrounding the scion all contribute to a high rate of transpiration. Succulent material, as used in soft-tissue grafting, is far more sensitive to conditions of high transpiration than is mature and hardened tissue.

The extent and rapidity of union between stock and scion are also important factors in successful grafting. The greater the area of contact between the two parts, the better the chance of success. Grafting skill has much to do with the outcome of any grafting project.

Grafting to stock established in the field is more desirable than grafting potted material. A root system that has been cramped within a pot doesn't function efficiently immediately after planting in the field.

The age of a tree is of little consequence in grafting provided the tissue is healthy and vigorous. Good results have been attained in grafting scions from trees that are 50 years old and older. Treatments such as fertilizing, watering and pruning may be used to obtain vigorous shoots (7).

It is known that some trees graft more readily than others of the same species.

Careful consideration should be given to the matter of gradually pruning the stock tree after grafting in order to force the scion shoot into dominance.

A strong disadvantage to grafting is that it does not reproduce the genotype of the parent tree in the root system.

It is highly probable that incompatibilities may become evident between stock and scion in some of the grafting we are doing today. This has been experienced in the grafting of fruit trees and ornamentals in the field of horticulture.

In general, most forest tree species can be grafted readily by one method or another when stock and scion are both of the same species. Grafting within a genus appears to be practical as evidenced by recent work (4). However, inter-generic grafting is extremely difficult and only of limited use.

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