

LITERATURE CITED

1. Furuta, T 1966. Personal Communications
2. Ticknor, R L. and A N Roberts 1963. Nursery Performance of Selected Garden Rose Rootstocks. Proc. Inter Plant Prop Soc 13: 205-208.
3. Ticknor, R L, A. N Roberts, and D. B White. 1964 Selecting Rose Rootstocks by Performance Oreg Orn Digest 8(2) · 1-3.

MODERATOR SHUGERT: Thank you very much Bob for a very interesting and thorough paper. The next paper will also be presented by a member of the Western Region. The paper is on the "Morphology of Arizona Cypress on Hetz Juniper." It has been written by Dr. Fred Widmoyer and Dr. Darrell Sullivan. The paper will be presented by Darrell Sullivan.

MORPHOLOGY OF ARIZONA CYPRESS ON HETZ JUNIPER

FRED B. WIDMOYER AND DARRELL T. SULLIVAN

*New Mexico State University
Las Cruces, New Mexico*

For the past several years there has been an increase in the number of papers discussing the relationships of stocks and scions of ornamental plants. The basic phenomena occurring during the re-establishment of grafts were presented at the 12th Annual Meeting (Widmoyer, 1962). Snyder (1963) pointed out that the major areas of propagation research of ornamental plants are concentrated on the rooting of cuttings and germination of seeds. Budding and grafting have received the major attention for fruit crops. As a result of continued research and experience, the use of vegetatively propagated rootstocks has become standard practice (Fletcher, 1964). Most propagators recognize the value of graftage over seedage or cuttings as a technique, as well as the associated disadvantages.

In selecting a stock for any plant, choice is limited to those which have a close botanical relationship. Generally, seedlings of the species are chosen as the scion. Grafts between genera are not unusual, but as a general rule, are limited to relatively few plants. Some ornamental plants which may serve as examples are: *Syringa* (lilac) on *Ligustrum vulgare* (privet); *Cotoneaster* on *Crataegus* (hawthorne); *Chaenomeles* (flowering quince) on *Sorbus* (mountain ash); and *Pyrus* (pear) and *Malus* (apple) on *Crataegus oxyacantha*. Notice particularly the absence of the narrow-leaved evergreens.

Several years ago the cutting-graft procedure was described. This technique was especially valuable when the potted stocks were not on hand at the proper season. To be of the greatest use, the stock-scion must form a quick union. The stock must root readily. The stocks need to be slightly larger than for cuttings to facilitate handling. Healing of the wound is necessary for a successful graft. This process is accomplished by the action, principally, of the cambium layer. Any other

cell capable of regeneration, such as phloem, xylem, or ray parenchyma, may assist in the union.

Examination of this diagrammatic section of the *Rosa* and *Chaenomeles* stem reviews the anatomy of a woody stem. In grafting, the vascular system of the stem is of the most interest. Externally is the phloem and internally, the xylem. The cambium layer is a continuous layer between the vascular bundles and the rays. The cambium is a meristematic layer which, by cell division, produces alternately, potential phloem and xylem cells. Young phloem cells are more likely than xylem to retain, or revert to, a meristematic condition.

The xylem has both tracheids and vessels in these genera. The gymnosperm has only tracheids and also resin ducts in the phloem and xylem. The resin may be beneficial in grafting by preventing drying or helping translocate growth material. It may be detrimental as a mechanical barrier between stock and scion.

The pith is generally of limited size in the evergreen, as compared to deciduous plants. The parenchyma cells, which make up the pith, perform storage functions.

The potential development of a graft union of evergreens is shown in the photomicrographs using *Cupressus arizonica* on *Juniperus scopulorum* (Blue Heaven). The Arizona cypress has a rather narrow climatic range across the Southern United States. Most are produced by seedage, which are not uniform as ornamentals or Christmas trees. Cuttings produce satisfactory trees, but are costly to produce, and are not usually available. In recent years selected clones have been grafted on seedling stocks. Numerous losses have been attributed to root rot and other problems. The root system is shallow, and plants are uprooted by winds. *Thuja* has been used experimentally as a rootstock to adapt the plant to higher moisture and salinity areas.

Hetz juniper and *Thuja* offered several desirable attributes — easily rooted and well adapted to heavy, dry soils, long-lived and easily transplanted when compared to *Cupressus*. Side grafts were used in October, November, and January of 1965.

Although propagators and researchers constantly stress the importance of 'closeness of fit', microscopically wide separations are generally observed. In any graft union, several phenomena probably occur simultaneously. Proliferation of the parenchyma cells produces a functional callus. Both stock and scion may produce new cells by division of any cell capable of division. Wound necrotic tissue may be surrounded by increasing cell numbers. They are compressed into the graft interface by new cells from both stock and scion, frequently appearing as islands in the union.

Differentiation of certain parenchyma cells will become, or revert to, cambial cells, completing the cambium of both stock and scion. In the early growth of a graft, undulating

growth can be attributed to this regeneration. This cambial layer begins to produce xylem cells toward the pith and phloem cells toward the outside. Cells in a graft do not 'rearrange' themselves, but are the result of new cells being produced which differentiate into new functional units. This results in a successful graft union. None of the grafts using *Thuja* survived. Cell proliferation did not occur at the graft interface, nor did the stocks root under the conditions used.

LITERATURE CITED

- Fletcher, W. E. 1964 *Peach bud-graft union on Prunus besseyi* Proc International Plant Prop 14 265-271
- Snyder, William E. 1963 *The role of research in plant propagation* Proc. International Plant Prop 13 153-158
- Widmoyer, Fred B. 1962 *Anatomical aspects of budding and grafting* Proc. International Plant Prop 12.132-135

MODERATOR SHUGERT: Before we get into our question period I would like to make one comment about nomenclature. I heard the term or the name *Juniperous scopulorum* (Blue Haven) is in fact (Blue Heaven). This clone was introduced to the trade by Plumfield Nurseries in Nebraska in about 1926 or 1927.

KEN REISCH: I would like to ask Dr. Ticknor if he has seen any problems or a decline with Dr. Huey understock?

BOB TICKNOR: We have not seen any decline; the plants continue living but they are not very vigorous and there is a low bloom production.

MARTIN VAN HOF: I noticed in Dr. Sullivan's slides that the scion was growing faster than the understock. These grafts were only two years old. Now in the future will it not develop that the difference in growth rates between the scion and the stock will be such that they will easily break off at the union?

DR. SULLIVAN: I do not believe the differences in growth rates is as great as you have indicated. However, we will have to wait for several years before we can be sure.

DICK STADTHER: Dr. Ticknor, did you use any of the Ames varieties for your understock trials? I was thinking of varieties 4 and 5 and was wondering how you propagated them.

BOB TICKNOR: We did not use those varieties. The D 1 that we used was from Ames and in the past couple of years we've had one or two others that have gone through the screening trials at the Texas Rose Foundation. We placed some of them in the growers' fields because we could not incorporate them into our trials and from our observations they were not good as far as the nursery stock was concerned. We had about four of them but I don't remember at this time what the numbers were.

MODERATOR SHUGERT: At this time I would like to turn the program over to Dr. Stu Nelson for the business meeting.

PRESIDENT NELSON: Ladies and gentlemen I believe we should give a real show of our appreciation to Ralph Shugert for a terrific program. Combined with a large number of firsts I believe we have had one of the best programs ever here in Mobile. Thank you very much, Ralph, for a job well done.

[Editor's note: The minutes of the business meeting appear at the beginning of the 'Business and Technical Sessions' of the Eastern Region.]