

reliable answers. Reliable answers can come only after very extensive trials over a fairly long period of time.

LITERATURE CITED

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MODERATOR DUGAN: Our final speaker this afternoon is Mr. Robert DeWilde who will talk about production and breeding of lilacs.

PRODUCTION AND BREEDING OF LILACS

ROBERT C. DEWILDE

Perkins - deWilde Nurseries, Inc.
Shiloh, New Jersey

INTRODUCTION

The common lilac *Syringa vulgaris* has been grown in gardens of the world for centuries. The first botanical description was written by a French naturalist in the year 1554. During the seventeenth century, English gardens were enriched with this shrub from seed collected in the lilac's native habitat of Rumania, Bulgaria, and Greece. The lilac was one of the first ornamentals brought to America by the early settlers. The beauty of lilacs has been expressed in poems and songs and is strongly associated with home, family, and memories of spring. There is little doubt that nurserymen can find the production of lilacs and the introduction of superior varieties quite rewarding.

PRODUCTION

Lilacs may be propagated in any of five general methods: seed, cuttings, layers, budding, and grafting. When considering the method of production for lilacs or any plant, the commercial objective is to produce the largest percentage of quality salable plants, true to name, in the shortest period of time. One important prerequisite for quality lilacs is that the salable plants be actively supported by their own root system.

Beginning then with seeds, the varieties of *S. vulgaris* will not reproduce the seed parent true to name since they hybridize rather freely. Only the true species grown in isolation can be relied upon to reproduce the parent plant.

Layering of stock plants can be done in late autumn. The time required to root the layered branch is approximately eighteen months. Two additional years are generally required for development of the severed layer into a saleable plant. The tremendous number of stock plants necessary for even a small com-

mercial operation usually relegates this method to amateur interest.

Production of lilacs from cuttings can be accomplished by taking very young soft growth when the newly developed shoots are no more than four inches in length. A sharp knife is used to sever the soft cutting at the point where the new wood emerges from the old. Cuttings should be collected in a polyethylene bag to prevent moisture loss. As with all soft cuttings the time between taking the cutting and its insertion in the bench should be as short as possible. With the use of a fog or intermittent mist system, rooting of good percentage should occur in three to six weeks. Rooted plants are potted, hardened off, and planted in field rows the following spring. This method of production is satisfactory in most respects, but we have found some limitations. Exact timing is required to obtain the very soft cuttings since the rooting percentage falls off rapidly as the new shoot matures. Varietal differences in the time of shoot emergence, rate of growth, and even slight variations in stock plant location require that a constant daily vigilance be maintained over a three week period to obtain the required amount of cuttings. Our propagation requirement was for the production of over a hundred thousand lilacs consisting of about thirty standard varieties and test trials for a number of new introductions. This presented a monumental task since other plant material must also be collected for soft wood propagation at this time of year. Finally, the production time required is four to five years from the time of taking the cutting until the majority of the plants are eighteen inches or better.

Budding of lilacs is carried out in late summer. The understocks most commonly used are seedlings of *S. vulgaris* and oval-leaved privet, *Ligustrum ovalifolium*. Seedlings of *S. vulgaris* provide the most compatible stock, but there is no doubt that the identification problem involved with the "suckering nuisance" of the common lilac has caused most American nurserymen to use privet. Generally the standard "T"-bud method is used. The bud is placed at the lowest point on the stem of the privet, usually several inches below the normal cultivated soil level. The privet top is cut off the following spring. The bud takes its strength from the understock and may grow as much as four feet in one year. By using two or four buds "salable" plants can be produced in one year. The budded lilac has no roots of its own and since privet is not a truly compatible root stock, a natural deterioration begins as antagonism between stock and scion occurs. Unless the budded lilac can be made to produce its own roots the plant will be short lived. Success depends upon deep planting of the lilac stem and subsequent development of adventitious roots along the stem. It is my hypothesis that initiation of the rooting process occurs only when low oxygen conditions within the phloem parenchyma of the lilac stem induce the production of auxin. Auxin initiates growth activity,

and if the proper chemical "cofactors" are present in the stem, root meristems and adventitious roots are formed. The swollen below ground portion of the stem which is often typical of budded lilacs is an example of auxin induced growth where the "cofactors" in the stem are lacking, or are acting as inhibitors to root formation. When the lilac is planted deep enough to provide the low oxygen requirement to initiate the rooting process of the stem, a logical question is: What have we done to the oxygen requirements of the privet roots? Roots require oxygen for their respiratory activities. Without oxygen, stored sugars in the roots cannot be utilized to provide the energy necessary for root growth and the uptake of essential elements from the soil. When the roots are poorly aerated growth of the plant is usually restricted. At best, the time required for the production of sufficient adventitious roots to support the lilac plant is two years. During this period adverse conditions often cause death. The percentage of budded lilacs which fail to obtain their own roots will naturally vary with the variety, soil type, and general treatment given the plants by the nurserymen and the buyer. It is my opinion that a majority of budded lilacs do not perform well in amateur gardens and that the number that fail to produce their own roots and subsequently are short lived is much greater than nurserymen are willing to believe. Budding does serve a useful purpose on our nursery for rapidly increasing the required wood of new or desirable varieties for our grafting operation.

Grafting is accomplished by uniting three to four inch length lilac scions onto privet understocks. An important feature of the grafting operation is that the work is done in January when the nursery schedule is generally light. We at Perkins-deWilde Nurseries use this method of propagation. A detailed examination of our production program follows.

If we pick up the cycle for the production of privet understock at this time of year, we will find the one-year-old privet plants tied in bundles healed in sphagnum moss in a cold cellar. During the month of December, when weather conditions are adverse and inside work is required for steady employees, the privet is graded and understocks of pencil thickness with good root systems are selected for grafting. The privet tops are cut off and the branches are saved for making hard wood cuttings. The privet is cleaned of all roots except those at the basal portion. The basal roots are trimmed back to two inches and the heavy roots are removed. The root stock consisting of basal roots and a five inch stem is examined for "eyes" or "buds" which might give rise to suckers at a later date. The stem is disbudded of these "eyes," thus greatly reducing the possibility of suckering. Understocks are tied in bundles of twenty-five, dipped in a fungicide solution, packed in boxes of sphagnum moss, and stored in a cold cellar until required for grafting. The privet tops are sorted and the strong wood is selected for hard wood cuttings. A cutting seven inches in length is made and

all but the top two or three sets of buds are removed. The disbudding is necessary to produce an understock that will be free from excessive side branching at the point where the graft will be made the following year. The cuttings are tied in bundles of fifty, dipped in a fungicide solution, packed in boxes of sphagnum moss, and stored in a cold cellar until early spring. In the spring the ground is prepared; a narrow trench about five inches deep is made and the cuttings are stuck about two inches apart on the row and in field rows three feet apart. The cuttings root in the field and grow through the summer until late fall. In November the rows of privet are mechanically root pruned, the plants are lifted bare root, tied in bundles, and placed in a cold cellar, thus completing the cycle for the production of understock.

Lilac scions are gathered from stock plants as needed for grafting during the month of January. Scions may be pre-cut and stored in a cold cellar. Storage is easily accomplished by wrapping the scions in "no-rot" burlap, dipping them in a fungicide solution, and placing the bundles in moist sphagnum moss.

The mechanics of making the side graft which we use are fairly easy, although practice is required to develop efficiency movement and ease of hand. The grafting knife must be drawn straight across and parallel to the privet stem, insuring a flat, level, and straight cut. When the same type of cut is made on the lilac scion, the stock and scion are easily united, providing even cambium contact on at least one side of the graft. A rubber grafting strip is used to hold the union in place. Waxing the graft union may be beneficial, but our percentage of successful grafts has not reflected this and the waxing operation has been eliminated.

The finished graft is planted directly into a cold frame type greenhouse where the temperature remains cool, but is kept above the freezing point. The soil into which the graft is planted is an ordinary mixture of sand, soil, and peat with fertilizer added and the pH adjusted to 6.5. The graft is planted below the graft union so that only the top buds of the lilac scion are visible. Callus tissue is rapidly formed on the graft union and also at the base of the lilac scion.

During the month of October the lilacs are dug from the cold frame and planted in field rows. At planting time ninety percent of the grafts will have started to produce adventitious roots from the callus tissue formed at the base of the lilac scion. In October one year later the privet nurse stock will have deteriorated and in most cases the lilac will be supported entirely by its own roots. At this time the lilac stem is cut back to two inches above the ground. The following spring strong shoots break from the base of the stem. In the fall, a little less than three years after grafting, eighty percent of the plants should be in well branched grades of eighteen to twenty-four inches and two to three feet. The privet stock which has fulfilled its purpose as a temporary nurse stock will have completely died

away, resulting in quality salable lilacs actively supported by their own root system.

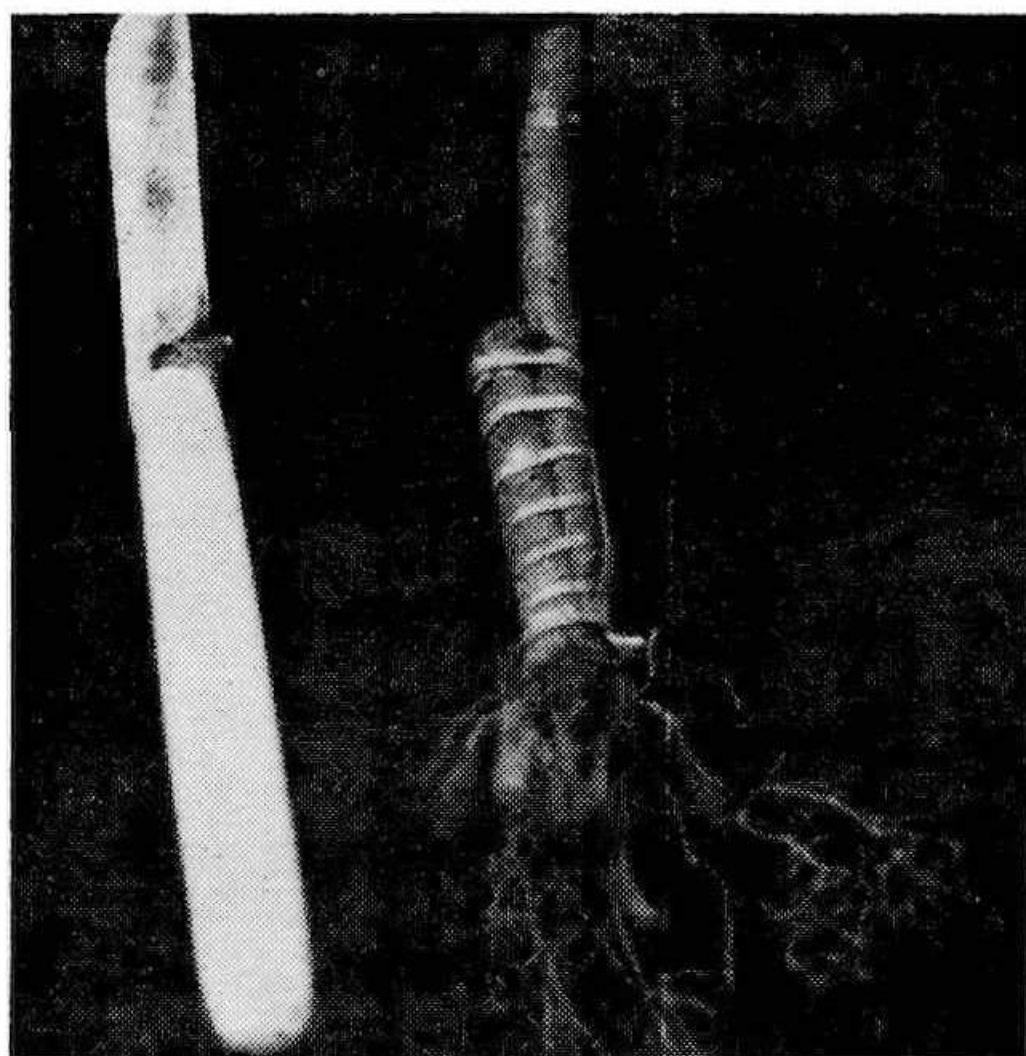


Figure 1. A newly made graft.

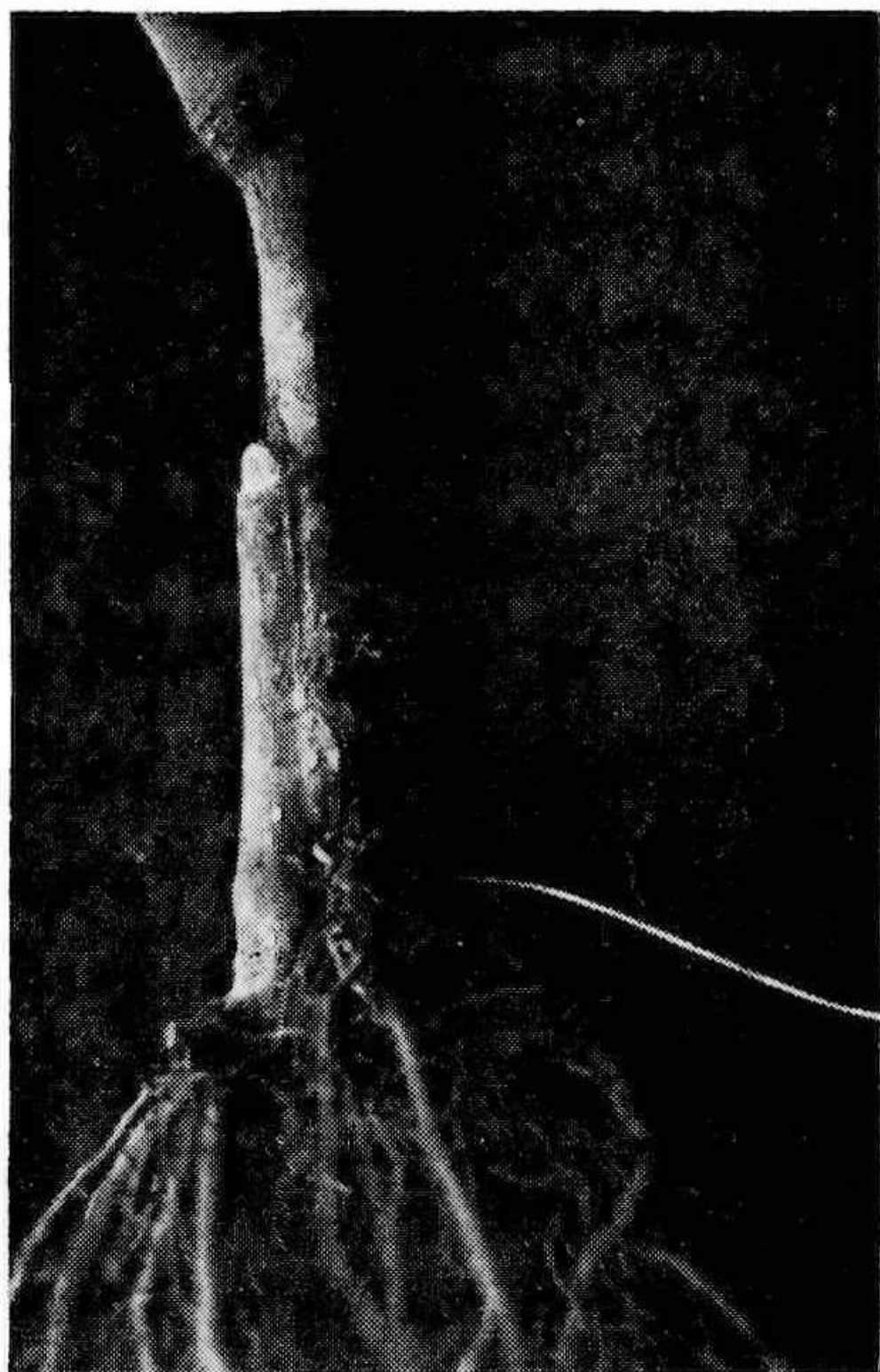


Figure 2. Graft after union formation and growth.

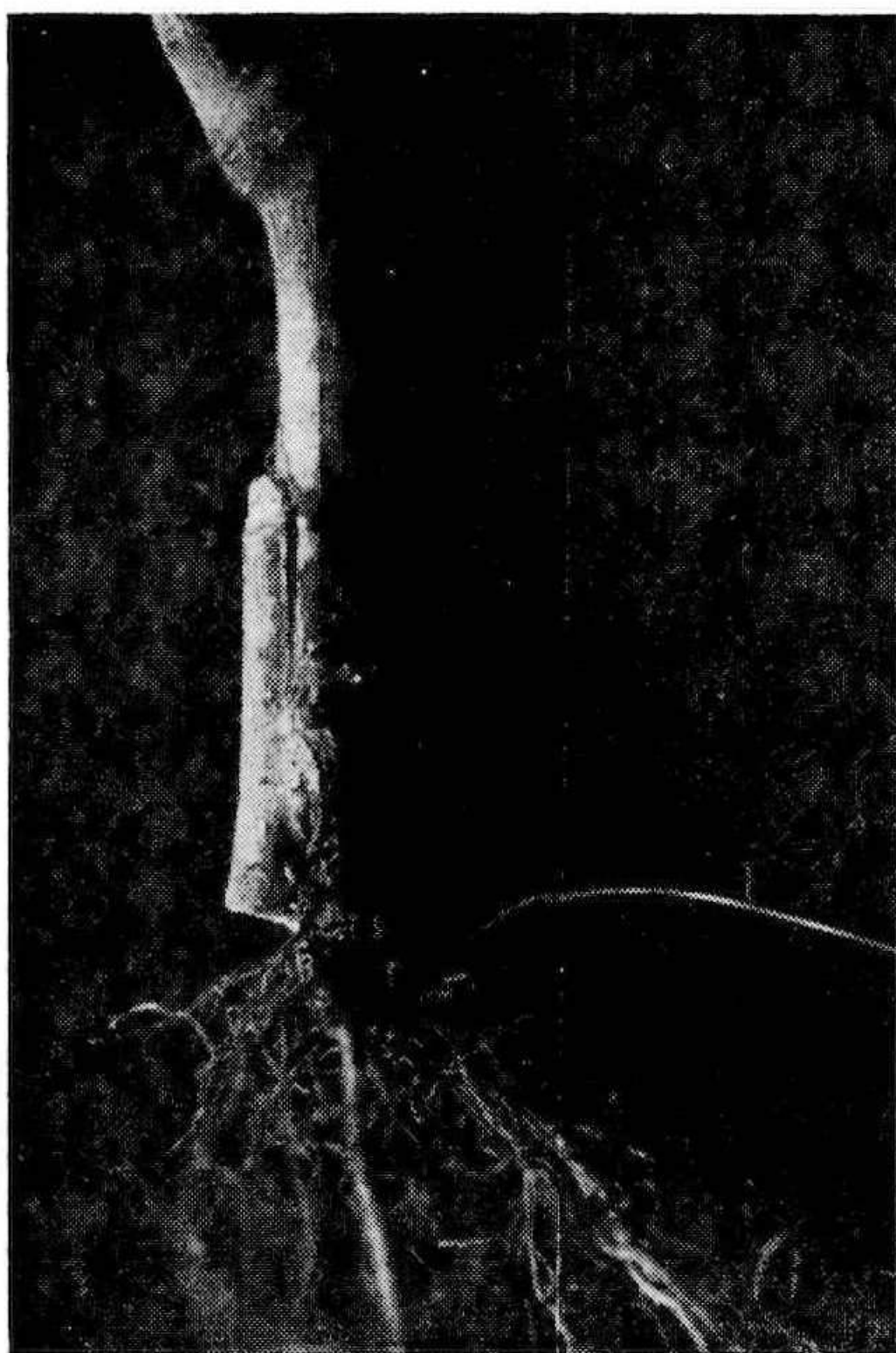


Figure 3. Understock root system removed.

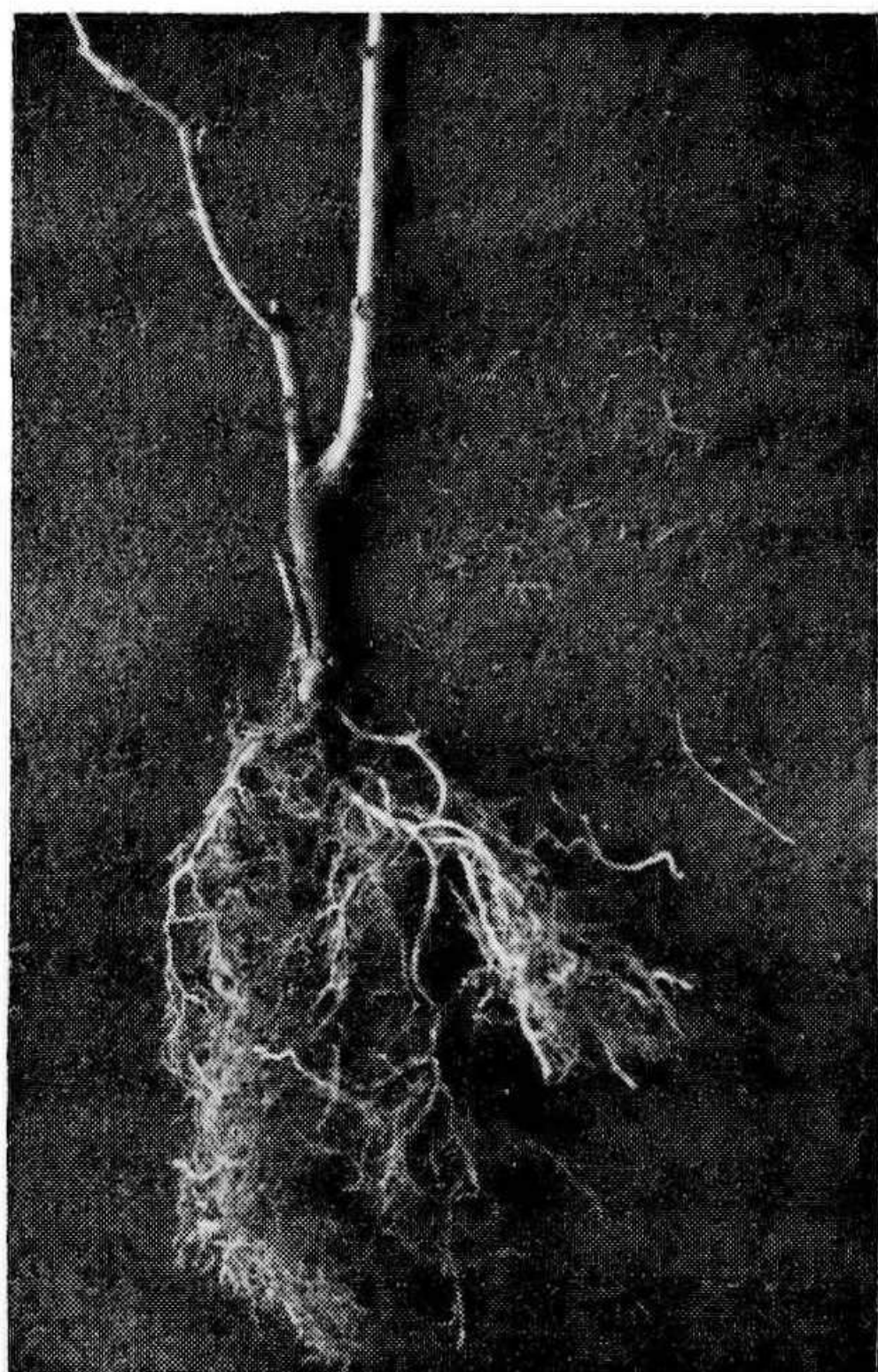


Figure 4. Scion on own roots with only a remnant of understock.

BREEDING OF LILACS

In America there have been two general types of lilac breeding: the first of which comprises straight selection of progenies raised from open pollinated seed, or from more or less random crossing of good varieties with the object of looking for a "winner." It is easy to disparage this technique, but it has given us a large number of our present day lilac varieties. The second method of breeding is possible only after the first has produced a range of varieties reasonably suited to local conditions. It comprises a more positive approach of choosing the best of the available varieties to work with, finding out their faults and deliberately building the required characteristics into them or into similar varieties. Although there is a great challenge to develop new hybrid groups through species crosses, it was decided to direct the main effort of our breeding program to the established *S. vulgaris* group with the hope of obtaining improvement in the following areas: extension of the season of bloom; selection of compact and shapely growth habits with consideration for possible dwarf varieties; obtain mildew resistance; increase flower substance to withstand spring rains; obtain clearer and darker colors particularly pinker pinks and redder reds; increase the size of flower spikes with emphasis on the double flowered varieties; obtain flowers with less color fade; and finally to increase the desirable lilac fragrance. Naturally, there is always a hope for a new color break or other novelty features that will provide a new breeding line. With the help of Dr. John C. Wister of the Arthur Hoyt Scott Horticulture Foundation of Swarthmore College and Mr. Alfred Fordham of the Arnold Arboretum, over two hundred and fifty different named lilacs were obtained. This collection was comprised of *S. vulgaris* varieties, their hybrids, and a representative species group with their known hybrids. With the help of Dr. Wister these lilacs were reviewed for their particular characteristics. After gathering as much information as possible, a breeding program was started in the spring of 1959.

The mechanics of making the crosses are relatively simple although tedious. The flowers of the desired female or seed parent are emasculated and the petals are removed before the flower opens. Pollen of the male parent is usually collected from dehiscing anthers in the field early in the morning. Pollen is easily collected and stored in vials for use when the blooming times of the varieties do not overlap. Unfortunately, numerous pollinations of the same cross are necessary to obtain a number of progeny since the maximum number of seeds obtained from any single pollination is two. One or more flower spikes on the seed parent are selected for each cross. Since the individual florets mature first at the top of the spike, these open flowers are cut off together with the lesser developed buds at the base of the spike. As high as fifty flower buds can then be emasculated for pollination from the center of the flower spike.

In order to prevent contamination from foreign pollen a polyethylene bag is placed over the flower spike of the completed cross. Each cross is tagged and recorded with regard to location of the plant and the location of the cross on the plant. When the blooming season is over the protective bags are removed. In the latter part of September the seeds are collected and stratified for eight to ten weeks. The seeds are sown in flats containing an ordinary soil mixture and a top layer of sphagnum moss. The germinated seedlings are transferred to pots and placed in a cold frame. The following fall the seedlings are planted in nursery rows. The crosses made in the spring of 1959 flowered abundantly for the first time in the spring of 1963. Selections from the program were made for further testing. Although there are numerous excellent varieties in the *S. vulgaris* group, it is believed that selective breeding will provide varieties of superior merit.

MODERATOR DUGAN: As the day draws to a close I want to take this opportunity to thank you. You've been a good group. You've asked questions at the right time and you kept your mouths shut the rest of the time. We have come out on time and I want to thank our speakers. They have done a terrific job of presenting their material, stimulating us to go home and cut a bigger swath in the propagating business.

John Roller has a few announcements.

PRESIDENT ROLLER: I would like to make appointments to the following committees. To the resolutions committee, Dick Fillmore, Chairman, Clarence Barbre, and Arie Radder. To the auditing committee, Mr. W. E. Cunningham, and James Ilgenfitz. To the students award committee, Mr. William Flemmer, III.