Round Table on Azalea Propagation

SATURDAY MORNING SESSION

December 4, 1954

The session convened at 9:35 o'clock, President Chadwick calling the meeting to order.

PRESIDENT CHADWICK: As I mentioned yesterday, this program has been made up primarily on the basis of returns from surveys that were sent out previously to formulate the program.

One of the main topics requested for discussion this year was azalea propagation.

I think we are fortunate this morning in having Dr. Skinner as the moderator of this panel on azaleas. I think all of you know Dr. Skinner. He has appeared on our programs here previously. Dr. Skinner is director of the National Arboretum at Washington, D. C., and it gives me pleasure to introduce Dr. Skinner this morning.

MODERATOR SKINNER: Thank you, Dr. Chadwick.

Following a customary pattern, the first discussion is intended as a survey of some of the general problems as far as azaleas are concerned. The meeting will then be turned over to the much better speakers who follow, to give you the real details and the real meat of this morning program in azaleas. References cited in the first talk will be found later in the Proceedings.

Dr. Skinner presented his paper, entitled: "Fundamentals of Azalea Propagation." (Applause)

FUNDAMENTALS OF AZALEA PROPAGATION

HENRY T. SKINNER

U. S. National Arboretum, Washington 25, D. C.

A recognition of the principal differences between the classes of azaleas in cultivation here and abroad is prerequisite to a consideration of propagation methods. Morphological and physiological differences between members of these classes are so pronounced as to necessitate quite separate appraisal from the propagation standpoint.

The Kinds of Azaleas

By the system of classification employed by Wilson and Rehder in the *Monograph of Azalea* (29) these plants are of course still botanically maintained as Rhododendrons. Within Rhododendron the azalea subgenus *Anthodendron* is divided in four sections of which the two largest are Number I and IV. The first, *Tsutsutsi,* contains the semi-evergreen "Indian" and "Japanese" types with which we are very familiar. Flowers in this section have stamens variable in number to 10. The fourth section, *Pentanthera,* with stamens in fives, contains the deciduous azaleas including our natives, as well as *R. molle, japonicum, luteum* and the Ghent and Mollis hybrids.

By the English horticultural classification as employed in *The Species of Rhododendron* (12) of the Royal Horticultural Society, and the *Azalea Handbook* of the American Horticultural Society (18), azaleas become the series azalea of the genus *Rhododendron* and this series is broken into six subseries including *Canadense* (*R. canadense, albrechti, vaseyi,* etc.), *Luteum* (including the principal deciduous types), *Nipponicum,* with one species, *Obtusum* (including *R. yedoense, obtusum,* and many other species, the Kurume and Belgian hybrids, etc.), *Schlippenbachii* (including *R. schlippenbachii, quinquefolium, weyrichii,* etc.), and *Tashiroi,* with but one species.

From the cytological standpoint such azaleas as have so far been investigated by Sax (20) or by Ammal et al (1) seem to possess a reasonably uniform diploid chromosome content of 2n=26. The single exception so far discovered is *R. calendulaceum* which may be a tetraploid with a count of 52 chromosomes, implying a measure of possible difficulty to be expected in the employment of *R. calendulaceum* as a parent in hybridizing. Incompatibilities may be evidenced in seed set or in seed germination. Yet we also know that this tetraploid is capable of setting fertile seed when pollinated by certain diploids and can only assume that unreduced gametes in the pollen of related diploid azaleas may be of quite frequent occurrence.

In the present stage of azalea culture in this country the members of four of the subseries just mentioned are cultivated only as species which have undergone very little selection or very minor hybridization. Our mass of garden hybrids fall only into two series, *Obtusum* with its Kurumes, Gables, Glenn Dales, Indian and Forcing azaleas, and *Luteum* with its confusion of Ghent, Mollis, "Kosterianum", "Rustica flora plena", Exbury, Knap Hill and occidentalis hybrids. It is these two subseries which pose the major problems from the propagation standpoint. The nature of these problems may perhaps best be understood by now turning to a consideration of a few requirements for a successful commercial azalea.

Commercial Requirements

To an azalea specialist I suspect that any true species is worthy of cultivation either on its own merits or as a demonstration of his skill in procurement and in rearing it to the flowering stage. In hybrids he realizes that there is available (at a price) a confusing array of the good to mediocre and consequently he wants the best—the best in flower size, color and plant. A suburban home owner is much more easily satisfied so long as there is plenty of color and the bugs are not too bad. He will take pretty much what the trade has to offer—if the price is right.

Nurserymen, by and large, meet quantity demands by offering standard selections which sell, and which can be produced with minimum labor, at a minimum cost. Demand for species such as *R. kaempferi* or *schlippenbachii* can be readily met because they can be raised from seed and seedling production is relatively cheap and rapid. Seed procurement is about the only problem. Most semi-evergreen "Japanese" azaleas of the *Obtusum* subseries will remain with us in quantity because cuttings of the majority root with comparative ease. These rooted cuttings develop rapidly, flower early and produce a plant which approaches the ideal for the roadside trade. The need here has little to do with improvement of propagation techniques. It is concerned with selection of the *best* to propagate from the confusing multitudes of collectors' list-

ings and with additional breeding, still needed, for increased hardiness or adaptability.

We are now left with the deciduous azaleas of subseries *Luteum,* and with these we are confronted with very real propagation problems. To be sure the species of this subsection remain straightforward so long as we can locate reliable seed of *R. alabamense, cumberlandense, prunifolium, speciosum* or *austrinum.* But what of the Ghent, Mollis and related hybrids which do not breed true from seed? Probably all of them can be propagated by cuttings but so far scarcely on a commercially profitable basis. Because they are difficult we find that in Holland they are grafted, in England layered, and in America they are imported. Only one or two nurserymen in this country have done a little with cuttings and there are few, as at Andorra Nurseries, who have seriously attempted layering. Layering seems a little too slow, although I have long been convinced that some enterprising American propagator could make money at it if he really tried.

Among the 200-300 names in Ghent and Mollis hybrids now growing at the National Arboretum are at least a few excellent azaleas worthy of a place in any garden whose owner may welcome a color break from the Kurumes. Some of the good ones have been in this country for 50 years or more. Fortunately they can still be imported but there also exists a real challenge to azalea propagators to work out a reproduction system which will place this class of azaleas more on a par in availability with the Japanese types. The ultimate solution may of course rest with the plant breeder. Certainly some of our native azaleas, such as *R. viscosum* and *arborescens* can be rooted with reasonable success from cuttings, while *R. atlanticum* and perhaps *alabamense* or the stoloniferous *nudiflorum* selections will reproduce from root cuttings or layers. It would seem a logical step to utilize such tendencies in producing improved Ghent hybrids lacking the propagation difficulties of our present stocks. In view of the extreme importance of the propagation factor as a regulator of the dissemination and horticultural use of *any* garden plant it certainly behooves our future breeders to keep more of a weather eye on this problem than many have done in the past. So much for the azalea problem in general. Let us now turn to a review of major accomplishments along propagation lines.

Propagation by Seeds

Seeds provide an easy and relatively rapid means of reproducing azalea species or hybrids where seedling variation is not important. Normal pollination is through the agency of insects and natural cross pollination between adjacent individuals is the rule rather than the exception. While self fertilization is possible on occasion, it has been pointed out by Bowers (2) that self-incompatibility is common. Interbreeding is usually, though not always, possible between members of the same section or subseries but difficult to impossible between sections.

Seed is usually gathered in fall at the time of browning of the capsules following the first frosts. However Creech (5) has found the embryos to be fully developed and capable of germination in seed of several species when gathered, dried at 100 degrees F. for 24 hrs. and sown as early as August 18. The seed is light. That of *R. catawbiense* runs about 5,000,000 seeds to the pound (30). For most azaleas this figure would be even higher. The seed has

no apparent dormancy problems, but loses vitality fairly rapidly in open storage—a loss which may run from 50 to 100% within 12 months. Sealed, cool temperature storage will greatly reduce these losses. When cleaned by removal of dust and debris it may be sown at any time from fall to early spring, many propagators preferring December to January or February in heated greenhouses or mid-April when heat is not provided.

Many germinating media have been recommended: from woodsoil and sand as recommended by Morrison (17) to peat and peatmoss mixtures, sawdust and shredded sphagnum. Advocacy of the last by Stoutemyer et al (11), (24) marked a significant step forward in overcoming usual earlier losses from damping-off fungi. Seed containers may be covered by glass plates or set on open benches in the greenhouse .Morrison et al (18) recommend a night temperature of 55 degrees F. and day temperature of 72 degrees F. for germination. Dr. de Vos has secured excellent results at the National Arboretum this fall by sowing under polyethylene tents or placing seed flats in polyethelene-covered frames on Sept. 9. No further watering was required until the covers were removed during the cotyledon stage. Second and third leaves are now being formed. In unpublished studies at Cornell (1937) Skinner found pure culture germination on agar, using a Knudson's solution containing sucrose, to be a practical method of securing maximum germination from small lots of valued seed. The method has recently been described in detail by Bowers (4). Seedlings are customarily transplanted to prepared soil mixtures for growing on, though the use of sphagnum moss and nutrient solutions has been recommended by Stoutemyer et al (25). Methods of handling both seeds and seedlings were excellently described by Wells (27) in 1949.

Propagation by Layering

While layering is a reasonably effective means of reproducing any azalea or rhododendron, it finds commercial use only for the deciduous hybrid azaleas which do not root readily from cuttings and from which seed would be useless. The physiology of root formation, as in cuttings or layers, was discussed by Mahlstede and Chadwick at last year's meeting. Curtis (7), in 1920, was among the first to prove the effect of ringing in interrupting the downward transport of sugars which gave the clue to the similar effects of wounding or bending, as employed in layering, upon phloem translocation and the formation of root initials. Water and oxygen, as needed for root development, are provided by the moist peat-sand medium in which the layer is embedded.

Layering of azaleas as practiced by the English nurserymen, who use it most, differs from procedures for the evergreen rhododendrons as described by Bowers (2), Wells (27) and others in that with rhododendrons new stock plants are required for each batch of layers, while with azaleas a field of the established stock plants may be maintained in continuous layer production for very many years. Some of the English beds have been used for 50 years or longer. As described by Hanger (9) the system is briefly as follows: Healthy own-rooted azalea plants are set out at 4 x 4 ft. spacing in clean, well prepared peat-sand soil. When well established, these stock plants are cut off at ground level in spring. Vigorous new shoots are layered in a circle about the stock plants the spring following, the shoots being bent upwards, but not notched, and covered with 4 inches of soil, without pegging. With good care,

the layers can be removed the second year, leaving the stock plant again pruned back to the base. This process is repeated indefinitely and continuous annual production can be secured by arranging a rotation so that layers from one-third of the stock plants mature each season. With feeding and good management production increases during successive years. In this country a sizeable shade house provides the most suitable conditions for an operation of this sort.

Air layering with use of polyethylene film, as described by Wyman (31), Creech (6) and others works very well with azaleas. But while it may be a convenient method for use of the amateur its commercial advantage over the older system awaits demonstration.

Propagation by Grafting

Grafting is sometimes used for two classes of azaleas: (1) for "Indian" or Belgian forcing azaleas which are suitably displayed on short standards and (2) for Ghent and Mollis hybrids, particularly as they are propagated in Holland.

In group 1 a tip graft involving young wood is usually employed, as described by Mallinson (15), Bowers (2) and others, the understock being *R. mucronatum* (*ledifolia alba*) or the clone 'Concinna' of *R. phoeniceum.*

Group 2, the Ghent and Mollis hybrids, are handled by the usual veneer grafting of potted understocks of the Pontic azalea, *R. luteum.* It is this class of grafted azaleas, particularly the Mollis hybrids, that have been chiefly criticized as exhibiting poorer performance in this country than own-root plants. Bowers (3) in particular noted pathological conditions which he classified as a probable graft effect. Unfortunately this is a field in which detailed information is lacking. *R. luteum* certainly needs checking as a desirable understock. Regardless of its compatibility with all clons of Ghent and Mollis hybrids, it is certainly a very variable species from different seed sources; some individuals succeed well in our eastern states while others remain indefinitely stunted. Until one is sure of uniformly desirable understocks, grafting may be expected to remain subject to recurring criticism of this sort.

Propagation by Cuttings

For a review of the physiological principles applying to propagation by softwood cuttings, including those of azaleas, I refer you to Dr. Mahlstede's paper delivered before this society last year. I need only enlarge upon a few additional points of particular application as they apply to the two classes of semi-evergreen and deciduous azaleas.

1. *Semi-evergreen Azaleas.*

Procedures in the handling of semi-evergreen azalea cuttings have been reviewed by Mallinson (16), Bowers (2) and others. While cuttings are usually made of half-ripened wood in summer, Hitchcock (10) found that many clons could be successfully propagated in any month of the year. Preston and his co-workers (19) have recently shown that succulent cuttings root best from stock plants on a low nitrogen diet while well ripened wood is quite successful from nitrogen-fed parents. More cuttings were produced by plants on the higher nitrogen diet. As to sequence of cutting availability Morrison et al (18) have observed that the first to provide suitable cutting wood are the soft or thin-leaved azaleas such as *R. yedoense*, next the hairy-leaved types

including *R. mucronatum* and *kaempferi,* next the Kurumes and finally those with the relatively hard leaves of *R. indicum.*

As to rooting mixtures, Hitchcock (10) was among the first to advocate a mixture of sand and peat over sand itself, although some of his best rooting was in pure peatmoss at pH 3.7. Several other media have since been used including Styrofoam (8), Vermiculite (23) and mixtures of these with peatmoss and sand. Each propagator tends to have his own preference depending upon his facilities and techniques.

With introduction of the rooting hormones Watkins (26) was among the first to show the improved percentage rooting of three Kurume azaleas by the use of a water solution of indolebutyric acid at 60 mgs./1. Skinner (21) noted similar effects with a fairly wide range of clons and species but the greatest stimulation was usually secured with those which naturally rooted the most easily. As an aid chiefly in increasing the rate of rooting various hormones, usually at intermediate strength and in powder form, are now used by many azalea propagators. Supplemental bottom heat is not essential to rooting but when hormones are used a temperature in the vicinity of plus 70 degrees F. will hasten the rooting process.

Cuttings of semi-evergreen azaleas have been very successfully propagated at the National Arboretum in cold frames under constant mist as has been described by Wells (28) and others. They have also been rooted with a minimum of effort in polyethylene-covered greenhouse benches.

2. *Deciduous Azaleas*

The deciduous azaleas are distinct from the foregoing in being generally described as difficult to root from cuttings, with the few exceptions among our native species noted earlier in this paper. In contrast with the semi-evergreen types, the young shoot growth matures fairly rapidly, becoming quite hard, and deciduous azaleas are somewhat lacking in the ability of Kurume types to produce successive growths without pronounced rest. Ghent and Mollis-type hybrids were seldom produced commercially from cuttings before the advent of growth hormones. At least one nursery in this country is so propagating them at present.

In the first major tests of growth substances with these particular plants Skinner (21), (22) was able to secure reasonably good rooting with all but one of 19 Ghent hybrids, with all but one of 6 Mollis hybrids and with all of 4 deciduous species tested. With few exceptions (*R. roseum* among them) all of these were rooted without hormone treatment but with a hormone in the form of indolebutyric acid in water solution, percentage rooting was generally increased (to 100% in many cases), the quality of root system was improved and the time required for rooting was markedly shortened. An effective acid treatment was usually a soaking of about 10 hrs. in a 90 mgs./L. solution. Best rooting occurred in closed frames in a sand-peat mixture at 70 degrees F. bottom heat in cuttings set the third week in June. Rooted cuttings were potted and gradually hardened to have dormancy broken by normal winter in cool greenhouse. The turn-off of usuable plants was surprisingly good, as were results from a similar experiment at the Morris Arboretum in which rooting was done in subirrigated vermiculite. Knight (13) has observed that while certain of these azaleas can be induced to root they are too hard to overwinter without severe losses. Kraus (14) recently reported on

the highly successful rooting of 3 Mollis hybrids, *R. nudiflorum* and *R. occidentale* taken as cuttings on May 25, treated with Hormodin No. 2 and inserted in a peat-sand mixture in outdoor frames without bottom heat. All cuttings were potted by August 28, developed short shoot growths and overwintered well. Cuttings taken on July 5 rooted poorly; many developed terminal flower buds in the propagating frame and of those rooted only 1% finally grew the second year. Morrison et al (18) have noted that *R. schlippenbachii* roots freely when juvenile cuttings are taken as shoots from the base of old plants. Future work with this class of azalea might well utilize this observation, take cognizance of the important relationship between time of rooting and successful overwintering, and give passing attention to recent advances with constant mist or polyethylene film. Through improvement of cutting or layering techniques the production of own-root deciduous azaleas may yet become a venture of commercial significance in this country.

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MODERATOR SKINNER: I think it is the usual custom to delay questions after the first talk particularly since we started a little bit late.

If this is agreeable, I would like to introduce the next speaker, whose background is found in a family nursery rignt near by, in Willoughby. He was a graduate in landscape architecture at Ohio State and after graduation was active in various phases of landscape contracting. Since 1946, he has