FRIDAY MORNING SESSION
December 5, 1958

The meeting was called to order at nine-five o'clock by President Steavenson.

PRESIDENT STEAVENSON: The meeting will please come to order. We are anxious to do right by our Vice President and Program Chairman this morning and get started approximately on time. We have a very interestting topic for discussion this morning, to be supervised by our long-time member and friend, Ray Halward, of the Royal Botanical Gardens, Hamilton, Ontario The panel discussion is on the propagation of *Prunus*. Ray Halward.

Mr. Ray Halward assumed the chair

MODERATOR HALWARD: Thank you, Hugh. We are going to have a very interesting session this morning on the genus, *Prunus,* one which hasn't been too widely covered at previous meetings and one of our most important groups of ornamentals.

Our first speaker this morning, Richard Hampton, gained his formal education at Iowa State College. He is now serving at the Irrigation Experiment Station at Prosser, Washington. He is to talk today on "Propagation of Virus-Free Stone Fruit Varieties and Understocks."

Dr. Hampton presented his paper on the propagation of virus-free stone fruits (Applause)

PROPAGATION OF VIRUS-FREE STONE FRUIT VARIETIES AND UNDERSTOCKS

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INTRODUCTION

Investigation of stone-fruit virus diseases began in the early 1880's with the work of Edwin F Smith with peach-yellows Only five stone-fruit virus diseases, all affecting peach, had been described prior to 1930. Milestones in the development of the present knowledge include the discoveries that certain peach viruses could be eliminated from budwood by heat treatment (7,9), that certain virus diseases which are masked in sweet cherry could be detected by use of index hosts (6, 11) and that some viruses are seed transmitted (1, 2, 3) Much work must yet be done in the following phases of research with these viruses. host ranges, symptomology, in-host behavior, means of natural transmission, their chemical composition and their control by heat treatment, host resistance and chemotherapy.

In the United States, approximately fifty stone-fruit virus diseases have been described. Since the complete host range of many of these viruses is not known, the number affecting each *Prunus* species has not been established. Some are found in specific areas, e g. albino of cherry in the vicinity of Medford, Oregon, while others are found in more gen-

eral areas of the United States, e.g. phony peach in the Southeast, peach yellows and little peach in the Northeast and peach rosette in the South. Necrotic ringspot has been reported widely in the United States as well as other countries. The terminology of known viruses is not yet universally standardized and differences of stone-fruit virus strains and in host varieties in the various continents interfere with such standardization.

The effects of various stone-fruit viruses on growth and/or yield of clones of *P. cerasus* and *P. avium* have been measured by workers in Missouri (14, 15, 16), Oregon (12, 13), Pennsylvania (10) and Wisconsin (17) as well as in England (18). The seriousness of their effects have varied from slight to intense among viruses and among host species and clones used in the investigations.

Occasionally some virus-host combinations may result in death of the host in 1-3 years e.g. virus gummosis in apricot, Lambert mottle in Lambert cherry, albino in sweet cherry and necrotic ring spot in the Shirofungen variety of *P. serrulata* Other virus-host combinations may result in definite and characteristic symptoms with perhaps reduced yield and vigor but without direct death of the host, e.g. twisted leaf in Bing cherry, mottle leaf in Bing and Royal Ann, rugose mosaic, rasp leaf and rusty mottle in most sweet cherry varieties, and apricot ring pox in certain apricot varieties. Certain virus-host combinations may result in few obvious symptoms but may be demonstrated to reduce vigor and/or yield, e.g. necrotic ring spot in most varieties of sweet cherry and Montmorency sour cherry and sour cherry yellows, sour cherry bark splitter and sour cherry mid-leaf necrosis in Montmorency (13).

The detection of "masked" viruses is accomplished primarily by the use of virus-sensitive "index" plants. For instance, necrotic ring spot may be detected by placing the juice of macerated leaves from a suspect tree into cucumber or by placing buds from a suspect tree onto trees of Montmorency sour cherry, Shirofugen, or seedlings of *P tomentosa,* since these plants react to this virus.

Natural tree-to-tree spread of stone-fruit viruses has been observed and recorded (19). This could account for virus spread in scion and seed-source blocks All stone fruit viruses are bud and graft transmitted. The necrotic ring spot virus is transmitted through the seeds of Mazzard (2) and peach (3), while both ring spot and sour cherry yellows are transmitted through the seeds of Mahaleb and Montmorency (1) These points should stress the importance of propagation from approved, indexed scion and understock sources.

REGISTRATION OF SCION AND SEED-SOURCE TREES AND NURSERY STOCK CERTIFICATION

Stone fruit certification programs have been or are being established in California, Michigan, Minnesota, New York, Oregon, Washington and other states. This certification will be based on trueness to variety and freedom from known virus diseases. The basic approaches in obtaining these objectives are similar in many cases and ultimately must involve establishment of blocks of registered scion- and seed- source trees which are maintained under a program of systematic indexing for viruses. Once blocks of supposedly virus-free trees are established, it is neces-

sary to continue indexing procedures and to remove those trees which are later found to be infected. Outlines for certification and scion-source utilization are shown in Figures 1 and 2.

Figure 1.—General outline for nursery stock certification.

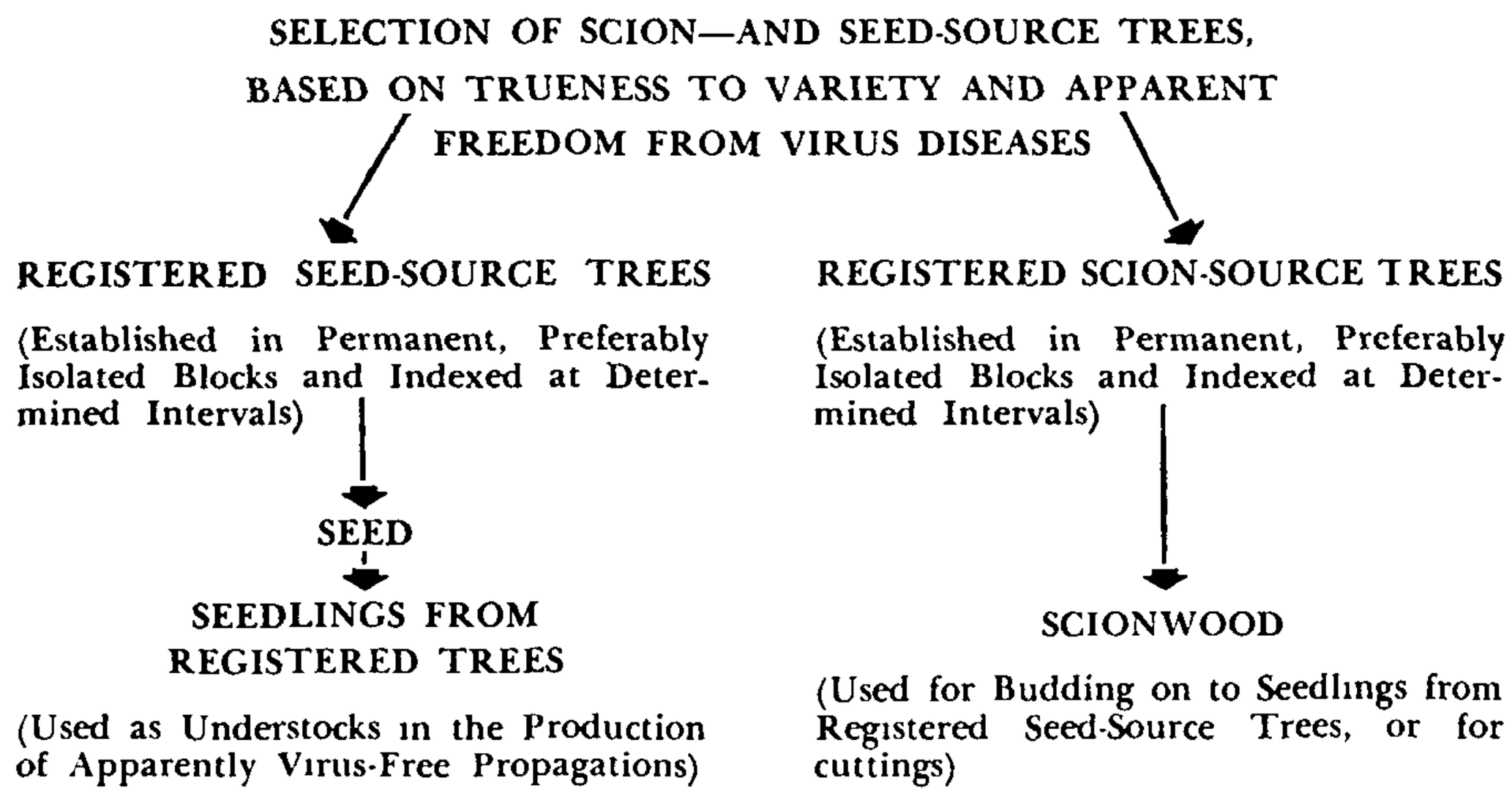
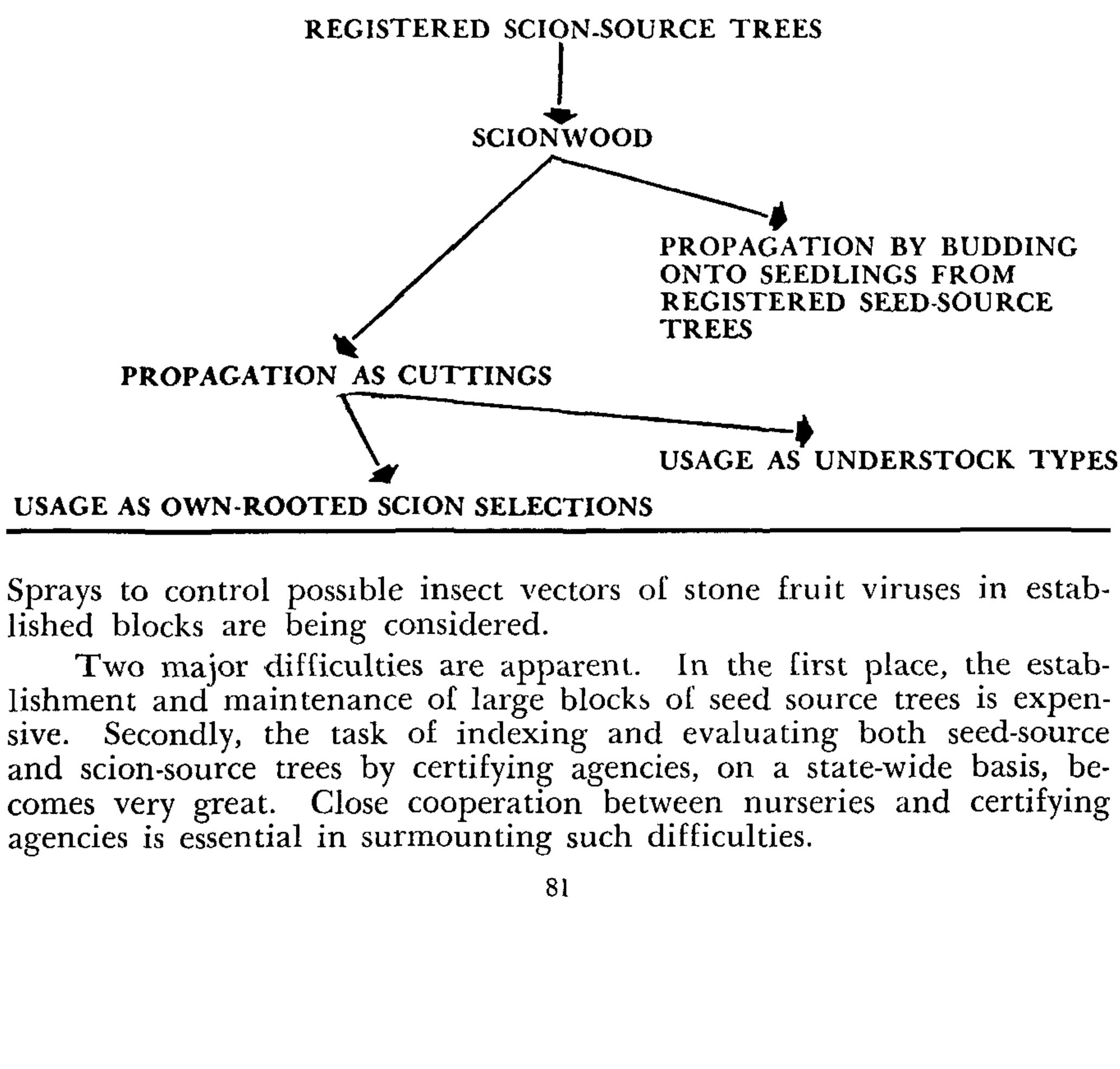


Figure 2.—Utilization of registered scion-source trees.



Sprays to control possible insect vectors of stone fruit viruses in established blocks are being considered.

Two major difficulties are apparent. In the first place, the establishment and maintenance of large blocks of seed source trees is expensive. Secondly, the task of indexing and evaluating both seed-source and scion-source trees by certifying agencies, on a state-wide basis, becomes very great. Close cooperation between nurseries and certifying agencies is essential in surmounting such difficulties.

UTILIZATION OF REGISTERED SCION AND SEED-SOURCE TREES

Once virus-free trees are established, production of virus-free seeds and seedlings and propagation of virus-free clones becomes possible. Where propagation is by budding, virus-freedom is highly important in both the understock and the scion. *Prunus* species and varieties which lend themselves to propagation by cuttings enable the propagator to eliminate the use of the understock, and consequently virus freedom in the clone is of prime importance.

CONSIDERATIONS FOR PROPAGATION BY CUTTINGS

Unfortunately, under most conditions propagation survival is lower as either soft- or hardwood cuttings than as budded seedlings, and also the quantity of budwood required is greater. It is not uncommon to achieve 100% rooting in softwood cuttings from certain clones of *P. mahaleb*. However, unless carry-over conditions are unusually well controlled, field establishment of a high percentage of these propagations becomes difficult The principle obstacle in producing finished cuttings of those species in which rooting can be induced has proven to be survival following rooting Permitting softwood cuttings to go into dormancy normally, without transplanting until completion of dormancy, seems to result in better survival

Optimum conditions for rooted cuttings during dormancy appear to be the following· 1) temperatures between 35 and 40° F. to reduce respiration, and relative humidity above 80% to reduce water loss, 2) moisture percentage in the rooting medium which is high enough to prevent drying out of roots and low enough to prevent rotting by bacteria and fungi. Transferral immediately after rooting appears to damage newly formed roots and increase probability for damage by these organisms. Moreover, the possibility of such damage increases when the plants are dormant as opposed to actively growing.

One promising approach involves the manipulation of cuttings so that rooting can be induced immediately following dormancy and so that root branching and differentiation can precede the following dormant period This has been accomplished at East Malling in England (4, 5, 8) by taking cuttings in September before leaf fall, treating with root inducing hormone and planting in cold frames. Callus formation occurs prior to dormancy. Root-formation and development occurs the following spring and summer Then in the succeeding fall when the propagations go into dormancy, root development and branching is well grounded. Plants of this type are better suited to handling and transplanting, with less root injury and less damage by micro-organisms during dormancy. Mariana, *Prunus cerasifera gigantea*, in California and St. Julian, variety of *P. cerasifera*, in Oregon and British Columbia, are commercially propagated as cuttings by methods partially based on this principle.

PURPOSES AND LIMITATIONS OF PROPAGATION BY CUTTINGS

Purposes of propagation by cuttings fall into two general categories: 1) clonal maintenance and 2) quantity clonal increase. Fulfillment of

the former is usually quite successful, except in the very difficult-to-root *Prunus* species and varieties, since low survival is not especially disrupting. However, in the case of the latter purpose, in which large numbers of finished rooted propagations are required, high percentage survival becomes important. It is here that exacting procedures and controls are often necessary. For the average nurseryman, propagation by cuttings of any random species and variety of *Prunus* for the purpose of quantity increase may not be practical, at least until relatively inexpensive and successful measures have come into use. The most feasible method of propagation of the majority of *Prunus* species and varieties seems to be budding of selected and indexed scion sources on seedlings from apparently virus-free seed source trees. However, in research studies involving uniform understocks and self-rooted scion selections, and in large-scale nursery operations, a premium is placed on high percentage survival in large numbers of rooted cuttings. Results obtained in these realms may eventually lead to methods suited to general commercial practices.

DISCUSSION AND SUMMARY

At least fifty stone fruit virus diseases have been described in the United States. All these viruses are graft and bud transmitted and some are known to be seed transmitted. Perhaps the most important control measure is avoidance of the use of virus infected scions and understocks in the nursery. Propagation of clones by cuttings offers the advantages of clonal increase of understocks and of eliminating scion-rootstock incompatability Virus transmission to scions through seedlings originating from contaminated seed-source trees is also avoided. At the same time this method offers the disadvantage of requiring special, well controlled and more expensive production measures.

Except for a few extremely-difficult-to-root *Prunus* species which require precise and expensive manipulation, at least small percentages of finished clonal propagations from cuttings can be produced. The standard budding procedure, supported by the use of scions and understocks free of known viruses, appears at present to constitute the most practical means of stone-fruit-variety propagation.

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MODERATOR HALWARD: I think we will dispense with the question and answer period. If we have any time at the end of the program we will work them in at that time.

Our next speaker this morning will discuss the "Propagation of *Prunus* Species and Varieties." This topic will be presented by Mr. W. A Cumming of the Experimental Station, Morden, Manitoba, where he has been for some three years. Previously he worked at the Plant Protection Division of the Federal Government and has done some work with Dr. Skinner. I now give you Mr. Cumming.

Mr. Cumming presented his talk an "Propagation of *Prunus* Species and Varieties" (Applause)