SATURDAY AFTERNOON SESSION

December 7, 1963

The Saturday afternoon session convened at 1:15 p.m., Ralph Shugert, Neosho Nursery, Neosho, Missouri, moderator.

MODERATOR SHUGERT: Our first speaker this afternoon is Mr. Hans Hess, Hess Nureries, Wayne, New Jersey.

HOLLY PROPAGATION AND CULTURE

HANS HESS
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Since all of our plants originally started from seed, this paper on Holly propagation will start with the miraculous and often exasperating little seed.

Berries are collected when ripe in November and December. They will vary in size and shape depending on the species, the largest being about ½ inch in diameter on *Ilex macrocarpa* and also *Ilex opaca* variety Emily, a selection of the late Wilfred Wheeler.

Inside the berry there are generally four individual nut like seeds, which if you carefully remove the pulp, appear as a single stone. The skin and pulp are removed from the seeds by fermenting in water with a small amount of sugar and rubbing over a screen or by using a commercial seed cleaner. The seeds of the various species vary in size in definite relation to the size of the berry. The imperfect seeds which are plentiful in some species are floated off and discarded. A bulletin which describes and illustrates the seeds of thirty some species was written some years ago by Dr. Harold Hume and published by the Holly Society of America.

The seed coat of all *Ilex* species is very hard and the embryo immature at the time the fruit ripens. Stratification is necessary to complete the development of the embryo; we have used both sand and peat moss with equal success. Most species germinate better than 60% the second spring. In the case of *Ilex opaca* only 10 to 20% germination takes place the second spring with 60 to 70 % occuring in the third spring.

We feel that since there is so little germination the second spring it is more practical to make your sowing during the fall, two years after harvest on *Ilex opaca*.

Seed should be gathered in or near your growing area or even at a more northerly location to insure hardiness of the seedlings. First year seedlings of all species should have protective lath shading the first growing season with the addition of salt hay or similar material the first winter. Birds are very fond of Holly seed and will destroy a bed of germinating seedlings

unless a protective wire cover is provided until the plants have true leaves. Normal treatment with red lead or a similar product will not last through the stratification period. Seedlings of *Ilex opaca* are generally four to six inches tall the first year on a well prepared seed bed. The deciduous species such as *Ilex verticillata, Ilex serrata* and the evergreen types like *Ilex crenata* will develop a reasonably well branched root system as a young seedling. *Ilex opaca* on the other hand tends to tap root from the very beginning and seedling grown plants need several transplantings or root pruning to develop a good root system. Cuttings of *Ilex opaca* seem to make a well branched root syetem without as much transplanting. Fruiting of seedling grown *Ilex* species as with all seedling grown plants takes much longer than asexually produced plants. Most of the seedling Hollies cannot be expected to fruit in less than eight to ten years.

So much for Hollies from seed since to-day in large part asexual production of selected clones has replaced seedling production. Plants selected for their growth habit, superior foliage, fruit and its display are the ones currently in demand. The first method used to reproduce these selections was grafting and budding on two or three year seedlings and a few varieties are still grown by this method; however, with the development of automatic misting, virtually all asexual production of hollies is by cuttings. We have found that Hollies can be very easily and quickly rooted under mist in open beds, potted and carried in frost free storage frames for the winter. I must not forget to mention that we use a 20% dilution of Chloromone on these cuttings to speed up the rooting. Turning from propagation to culture of Hollies, let us begin with plant selection. Select only those which are hardy in your area, this pertains to all species which are native in the United States as well as those introductions from other countries. Next, when planting in your nursery or on your customers grounds, select a location with good moisture and drainage and also good air drainage to avoid frost damage to the flowers and foliage.

There is a great difference of opinion regarding the proper fertilizers for Hollies but generally speaking the standard organic fertilizer for broadleaves, plus some dolomitic limestone every three years will do a good job. Feeding of young plants should be made during the winter, so that food is available when growth starts and will not push the plants late in the season, causing kill back. Hollies in general do not have a large number of insect pests, but the well known leaf miner on evergreen species poses the biggest problem and it is actually more unsightly than harmful. The best known and generally used control is a combination spray such as DDT and malathion applied as growth begins in May and repeated again in about seven to ten days. The DDT providing a residual effect and the malathion to prevent a build up of spider mite. Systemics have been found very affective in the control of leaf miner, but because of the hazards it presents, it has not been widely accepted. In conclu-

sion may I say that Hollies are a large group of plants, evergreen and deciduous, having red, black and even yellow fruits, some of them with smooth leaves, some with sharp spines. Their white flowers are generally inconspicuous. They are also dioecious, so be sure to select lots of females for fruit and a few boys to do their job and keep the girls happy.

Although they grow best in a rich well drained soil, they will thrive under a variety of conditions. If you select those hardy to your area, there is hardly a group of plants so well suited to such wide landscape use

MODERATOR SHUGERT: Thank you very much, Hans. The second speaker is Dr. Don F. Wetherell from the Department of Botany, University of Connecticut, Storrs, Connecticut.

GROWING WHOLE PLANTS FROM INDIVIDUAL CELLS

A Possble Propagation Technique for the Future.

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The age old practice of plant propagation has taught us that many of the organs of a mature plant can be separated from the rest of the plant and in a relatively short time will reconstruct the missing parts to reform an intact plant. This capacity for regeneration of parts must mean that at least some of the cells which compose these organs, carry all the information and metabolic tools necessary for the formation of an entire new plant, i.e., they must carry as much inherited information as the zygote which forms as the result of fertilization and which is the starting point for the embryonic plant contained in seeds. We call the possesson of all essential genetic information and metabolic machinery — totipotence. Biologists have long wondered whether such cells could be isolated from the protection of their tissues in the intact organ and still retain not only their ability to grow but also their totipotence. As long ago as the turn of the century intensive efforts were being made by Gottlieb Haberlandt, the famous German botanist and anatomist, to isolate single plant cells and make them grow under artificial conditions[1]. This ultimate refinement of plant propagation has been on the minds of botanists ever since but only very recently have we accumulated enough experience to permit us to test these ideas.

It was not until after the discovery of auxins in the 1930's and the subsequent recognition of their key role in growth and development, that we could carry out the first step, the culture of tissue masses on artificial culture media. Although auxin-dependent tissue cultures have now been common place for 20 years, the successful culture of single freely suspended cells (so called "cell culture") was not achieved until the mid 1950's. The