

Roy M. Nordine, Morton Arboretum.

L. Laking, Royal Botanical Gardens, Hamilton, Ontario.

Fred Galle, Ida Cason Galloway Gardens, Pine Mountain, Georgia

MODERATOR ROLLER: Thank you, Mr. Forster.

Next is Propagation of Oaks from Seed, and we will hear again from Roy Nordine of Morton Arboretum.

PROPAGATION OF OAKS BY SEED

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The genus *Quercus* L. or Oak contains about 275 species and 50 hybrids. 45 species and 30 hybrids are found in North America. They are distributed through the colder and temperate regions of the Northern Hemisphere and southward into the mountains of the tropics. They include evergreen and deciduous trees and shrubs. They are found on nearly all soil types from rich, moist, and sometimes swampy sites and heavy, tight soils to the drier, rocky, sandy, and barren sites.

The oaks are divided into two groups, the white oak group and the black or red oak group. The white oak group is identified by the rounded outer margins of the leaves, while the leaves in the black or red oak group have pointed margins. The two groups are also separated by the ripening of the acorns. Plants in the white oak group ripen the acorn in one year; those in the black or red oak group require two years to ripen. The only known exception is *Quercus agrifolia* (California Live Oak), which, though belonging to the black oak group, ripens the acorns in one year.

The oaks are monoecious. The staminate flowers are borne in slender, pendulous catkins; the pistillate flowers are located in the axils of the young leaves. The flowers are pollinated by the wind, which can carry the pollen for a considerable distance. Oaks hybridize readily, more so when single or scattered trees are among other species belonging to the same large group. There are no known hybrids between plants of the white oak and the black or red oak groups.

The fruit is a one-seeded nut, surrounded at the base or sometimes almost enclosed by a cup-like involucre. The acorns vary widely in size, but all have a hard outer shell that contains an embryo with two large cotyledons.

All the oaks are spring flowering, ripening the acorns in the fall. Among the tree-sized oaks, plants do not become seed-bearing until twenty or more years old. The shrubby oaks can start fruiting when only three or four years old. Seed years through the geographical range of a species may be frequent, while in a local area seed years may be very infrequent, ranging up to ten or more years between good crops. An example of this condition occurred this fall with Northern Red Oak. We had no seed in our extensive woodlands.

but thirty miles away there was an abundant crop. Within the species that range over large areas there are undoubtedly geographical races with adaptability to various soils and with varied susceptibility to frost injury.

Acorns are attacked by about ten species of acorn weevils of two genera, at least three species of moths, and several species of gall wasps. The acorn weevils are a common and destructive insect. One or more eggs are deposited in the acorn in late summer. The larva feeds on the kernel until the acorn reaches the ground; then the larva emerges and disappears into the soil. Damage to the seed may range from slight during years of heavy crops to very severe during years of light crops. Acorns can be treated by holding the nuts in 120 °F water for 30 minutes. This treatment is a common practice in our operations, but the White Oak (*Quercus alba* L.), where a root or radicle is already present, this root has been damaged by the treatment. Acorns can also be treated by fumigation with methyl bromide. The dosage is five pounds per 1000 cubic feet of container space, treated for five hours at a maintained temperature of 62°F. Acorns should be treated for weevils as soon as possible after gathering. At the present time there are several research projects under way dealing with the control of acorn weevils. At present the only suggestions for the control of acorn weevils in the soil before their emergence are the products used to control similar insects. Chlordane used as recommended is very effective; also, Aldrin granules at the rate of five pounds per acre provide good control. A more detailed account of a five-year study of acorn weevils will be found in the December, 1962, issue of THE JOURNAL OF ECONOMIC ENTOMOLOGY, by Prof. C. K. Dorsey of West Virginia University.

Since squirrels and other rodents gather large quantities of acorns, it is necessary to gather the acorns as soon as they fall, particularly those in the white oak group.

A variation exists in the germination between the two oak groups. Acorns in the white oak group are not dormant; germination of the root occurs in the fall. The shoot or top appears the following spring. Several species within the large white oak group, namely White Oak (*Quercus alba*), Chestnut Oak (*Q. montana* Willd.), and Chinquapin Oak (*Q. prinoides*), germinate within a few days after the acorn reaches the ground. Acorns can be stored dry for short periods in storage cellars. However, acorns in the white oak group should be sown as soon as possible in the fall. Acorns from the black oak group remain dormant over the winter and germinate the following spring. The latter can be sown in the fall or stored dry in sealed containers just above freezing, or mixed with a moist medium (sand or peat) and stored at cool temperatures. However, better germination occurs when acorns are mixed in a moist medium and kept at low temperatures for 30 to 90 days prior to spring sowing.

Better seedlings are produced when acorns are sown in rows in moist, well aerated humus-filled soil. Acorns will vary greatly in size, and should be covered accordingly, from one to three inches

deep. Germination is usually high; it will vary according to the damage done by the weevils. Several kinds of rodents can be very destructive following seeding; hardware cloth over the seed beds provides the most effective control.

The only reported disease of small seedlings is collar rot, which kills seedlings in patches. The disease is soil-borne and can be controlled by treating the patches with 1½ fluid ounces of formaldehyde in two pints of water to each square foot of seed bed. This is an old remedy; some of the newer fungicides should also provide a control of this disease. Additional information can be found in the **WOODY PLANT SEED MANUAL**, Miscellaneous Publication No 654, U. S. Department of Agriculture.

MODERATOR ROLLER: Thank you, Roy.

We will go right along with our next topic, which is Vegetative Propagation of the Oaks by William Flemer, III, Princeton Nurseries, Princeton, New Jersey.

THE VEGETATIVE PROPAGATION OF OAKS

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The vegetative propagation of Oaks is one of the little traveled by-ways of plant propagation, infrequently employed and even then for only a very few horticultural varieties. The reason is that the oaks are difficult to propagate either by layering or cuttings and if grafted, which is the most successful method, are so badly stunted by the process that several years' culture are necessary before normal growth is resumed. It is a pity that there are not more successful methods known, for an inexpensive, reliable process would be very valuable for the nursery and forestry professions. Everybody who has grown large blocks of oaks for shade trees has observed the considerable variation which even young trees exhibit. Often standing side by side in the nursery row can be seen crooked, stunted specimens and ones which grow with exceptional speed, form a straight trunk and well furnished head without special attention, and are saleable long before the majority of the other trees in the same block. Similarly vastly superior forest types are to be found in the wild, ones which would be far more profitable as timber trees if they could be inexpensively reproduced. Seed selection from superior parents is always good practice, but since oaks are wind pollinated and highly heterozygous as well, this is of limited value. Another interesting phenomenon is the constant succession of natural hybrids which appear in large seedling populations. Many of these hybrids have real horticultural merit. Outstanding have been a *Q. palustris-coccinea* hybrid with superior fall color and a greatly improved branching habit over the Pin Oak, a *phellos x borealis* hybrid with leaves like the Willow Oak but somewhat larger and with brilliant scarlet fall color, and a number of *phellos x virginiana* hybrids of superior form,