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PROPAGATION OF SOUTHERN RED OAK AND WATER OAK BY ROOTED CUTTINGS

Abstract.—Southern **red oak and water oak, needed in studies of fusiform rust of southern pines, were propagated from cuttings of rooted stump sprouts and mature tree branches placed in outdoor propagation beds in June. Root strike and root development were increased when cuttings with basal wounds were treated with both the hormone IBA and the fungicide folpet. Cuttings from water oak rooted better than those from southern red oak.**

Most efforts at vegetative propagation of oaks have been so unsuccessful that the genus *Quercus* has been relegated to the "extremely difficult" class of plants to be propagated by cuttings. Skinner,[1] in his review of oak propagation, mentions only one report on the propaga tion of 20-year-old English oak (*Q. robur* L.) and concludes that cuttings from other than juvenile stock plants are not likely to root. This paper reports success in propagating southern oaks by rooted stump sprout and branch cuttings.

The development of clonal lines of various oak species has been a limiting factor in many research projects where genetically pure lines are essential. Clonal lines are necessary in present studies of the pathogenic variability of *Cronartium fusiforme* Hedgc. & Hunt ex Cumm., which causes fusiform rust on southern pines. Tests were initiated in 1965 to determine if clonal lines of several oak species could be obtained by rooting of cuttings subjected to various treatments. These exploratory studies revealed that stump sprout cuttings from water oak (Q. *nigra* L.) were relatively easy to root, with 60 to 80 percent success obtained for several clones of this species. Willow oak (Q. *phellos* L.) , laurel oak (*Q. laurifolia* Michx.), and bluejack oak (Q. *incana* Bartr.) could all be rooted, but with a much lower percentage of root strikes.

[1]Skinner, **H. T. Propagation of oaks. Amer. Nurseryman 98 (10) : 12, 63-69. 1953.**

Materials and Methods

In 1967, a study was established using combinations of various treatments which showed promise in the earlier tests on water oak and on southern red oak (Q. *falcata* Michx. var. *falcata*) . Two stumps and two trees of each species were selected for sources of cuttings. All material was from vigorous, first-flush growth. Branch cuttings were obtained from the center portion of the crowns of dominant or codominant trees. Water oak trees were 18 and 22 years old, and the southern red oaks were 26 and 32 years old. Water oak stumps were estimated to be 40 to 45 years old with sprouts beginning their second growing season. Southern red oak stumps were estimated to be 35 to 40 years old with sprouts in their fourth growing season. The cuttings were collected June 7 and 8 near Athens, Georgia. At this time the first flush of current year's growth had mature leaves and the wood had hardened-off. One hundred and sixty cuttings, 1/4 to 3/8 inches in diameter and 6 to 8 inches long, were collected from each of the eight sources.

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Cuttings were treated and placed in propagation beds on the day of collection. The following treatments were applied:

IBA-basal ends of cuttings moistened and then dipped in 0.8 percent indole-3-butyric acid in talc; excess powder removed.

folpet[2]—30 min. total immersion of cuttings in suspension of 1 tbsp. folpet 50 percent WP in 1 gal. water.

IBA + folpet-30 min. total immersion in folpet suspension followed by dip in 0.8 percent IBA; excess powder removed.

Check-30 min. total immersion in water.

Immediately prior to treatment each cutting was wounded by making two longitudinal cuts about 1 inch long on opposite sides at the base. This wounding resulted in removal of two narrow strips of the phloem, cambium, and outer xylem. Only the apical three or four leaves were retained on each cutting. The leaves retained on southern red oak were cut approximately in half across the longitudinal axis in order to reduce transpiration and subsequent water loss. Forty cuttings from each source received each treatment and were set 1 to 2 inches deep in randomized rows of 10 each in outdoor mist propagation beds.

The rooting medium consisted of a 1: 1 mixture of milled pine bark and washed river sand. In earlier studies, this medium was found to be superior to sand-peat or sand-perlite because of its increased water holding capacity and lower bulk density. Sides of the beds were enclosed with clear plastic sheeting to reduce mist-blow and drying but permit full light. An intermittent mist system, at an initial misting interval of 5 seconds every 2 minutes, operated during the daylight hours the first 5 weeks. The misting interval was readjusted to 5 seconds every 3-1/3 minutes during the daytime for the remainder of the study. September 28 the cuttings were lifted from the beds and root strike was evaluated.

[2]N- (trichloromethylthio) phthalimide.

Results and Discussion

The percentages of root strike obtained in this study are given in table 1. The results with water oak confirm results from earlier tests on this species: cuttings from stump sprouts rooted better than those from branches. With southern red oak cuttings, however, cuttings from branches rooted better.

The effect of treatments indicated that root strike was increased in both species where the combination of hormone plus fungicide was applied. This appeared to be a synergistic effect, since the combination induced more rooting, except in water oak branch cuttings, than did either the hormone or fungicide alone. Water oak cuttings produced greater root strike than did southern red oak. It was encouraging that as much as 25 percent of southern red oak branch cuttings rooted in this study. *This is the first known report of successful vegetative propagation of this species.* Table 1 also shows there were differences in rooting ability between individual trees used as sources of propagules.

There appeared to be some effect of treatment on root development after root strike in both species. Although data were not recorded on relative root development, it was evident that root systems developing from treatments not including IBA were in general more poorly developed and less vigorous in their rate of growth. Root systems were generally considered good in both species, but feeder root development was more pronounced on water oak than on southern red oak. More callus tissue and root origins were associated with the area of wounding than with unwounded areas. Based on previous root-

Table I.-Rooting of oak species as influenced by cutting source and treatment

Treatment	Water oak						Southern red oak					
	Sprout			Branch			Sprout			Branch		
	Source 1	Source 2	Avg.	Source 1	Source 2	Avg.	Source 1	Source 2	Avg.	Source 1	Source 2	Avg.
	Percent rooting											
IBA	38	48	43	28	25	26	0	3	1	0	5	3
Folpet	8	33	20	0	3	1	0	0	0	0	0	0
IBA + folpet	60	68	64	18	23	21	10	3	6	13	25	19
Check	8	33	20	0	0	0	0	0	0	0	0	0

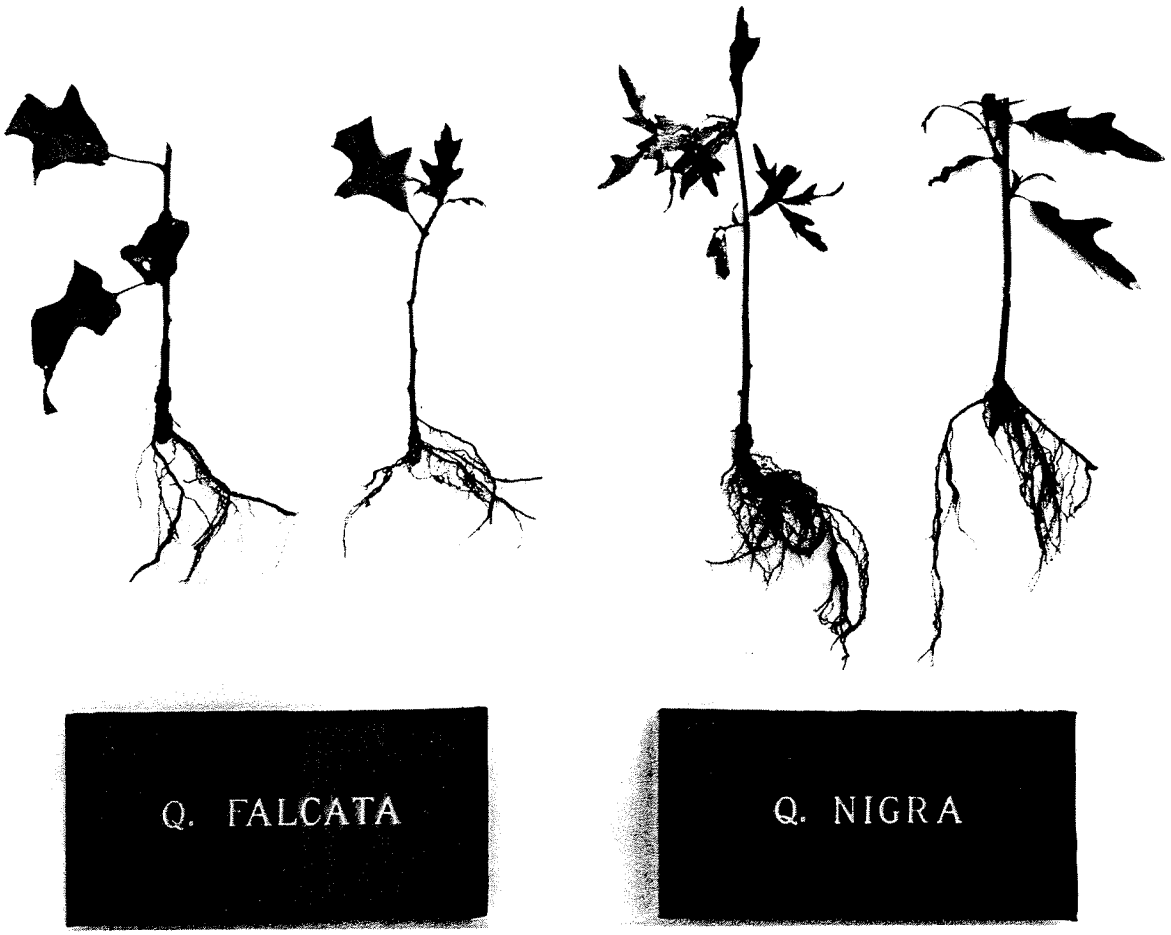

Figure 1.—Typical root systems obtained from rooted cuttings of southern red oak and water oak.

ing success with water oak stump sprout cuttings, it is believed that abnormally low night temperatures in the Athens area during the summer of 1967 may have retarded root strike and development in this study. Typical root systems obtained are shown in figure 1.

The diameter and age of the wood to be used as cuttings are of great importance in successful rooting of oaks. Root strike is improved when large (1/4 inch or larger) diameter cuttings are taken from the first flush after it hardens-off and just prior to second flush bud-break. Survival after rooting is also increased where larger cuttings are used. Earlier overwintering tests with potted, rooted, water oak cuttings in shadehouses have shown that 80 to 90 percent survival can be expected from the large cuttings.

These data indicate that clones of southern red oak and water oak can be propagated vegetatively from cuttings with some degree of success. Other *Quercus* species may respond in a similar manner to these or modifications of these treatments. Destruction of the tree is one disadvantage of the stump sprout method for obtaining cuttings. Further studies of various species are being planned, emphasizing the propagation of branch material or branch sprouts obtained by crown pruning.

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