SOUTHERN FOREST EXPERIMENT STATION

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SWEETGUM SEED PRODUCTION ON SOILS IN CENTRAL MISSISSIPPI

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During 1965 and 1966, sweetgum trees on Delta sites produced more seed than trees on loess and Coastal Plain sites. Speed and completeness of germination were about the same for seed from the three sites.

Interest in culture of sweetgum *(Liquidambar styraciflua* L.) is increasing so rapidly that seed orchards and seed production areas are being established. The study reported here was designed to determine which of three common sites in Mississippi—Delta, loess, or Coastal Plain alluvium—is best for seed production. Fruitfulness of trees, number of full seed per fruit, germinative capacity, and germinative energy of the seeds were correlated with various tree and site characteristics.

PROCEDURE

Twenty dominant and codominant seed-bearing trees between 12 and 24 inches d.b.h. were selected on each of the three sites, Delta, deep loess, and Coastal Plain alluvium, in central Mississippi during June 1965. Plots were near 33° N. latitude (fig. 1). The 60 sample trees were permanently marked, and seeds were collected from them in the summer and fall of 1965 and 1966.

Each year, three or four limbs were shot down from the upper two-thirds of each tree's crown. Productivity for a tree was defined as the percentage of fruit-bearing twigs in a random sample of 30 twigs from the removed limbs. The average number of full seeds per fruit was determined by cutting seeds extracted from 10 fruits from each tree; seeds with a firm white endosperm were considered full.

Seed quality was measured in standard laboratory germinators. After a 30-day moist stratification at 35° to 40° F., six replications of 50 seed per tree were germinated for 15 days at 85° F., a relative humidity of nearly 100 percent, and 100 foot-candles of light for 2 hours per day. Counts were made daily, and the germinated seeds were discarded. Germinative capacity (completeness) was calculated as the percentage of sound seed germinated at the end of 15 days. Germinative energy (speed) was calculated as the largest quotient obtained when the cumulative percentage of germination for each day of the test was divided by the number of days since the test began, after the method of Czabator *(3)*.

Regressions were computed to determine the influence of 10 variables on productivity and quality:

(1) Diameter at breast height
(2) Five-year radial growth
(3) Tree age

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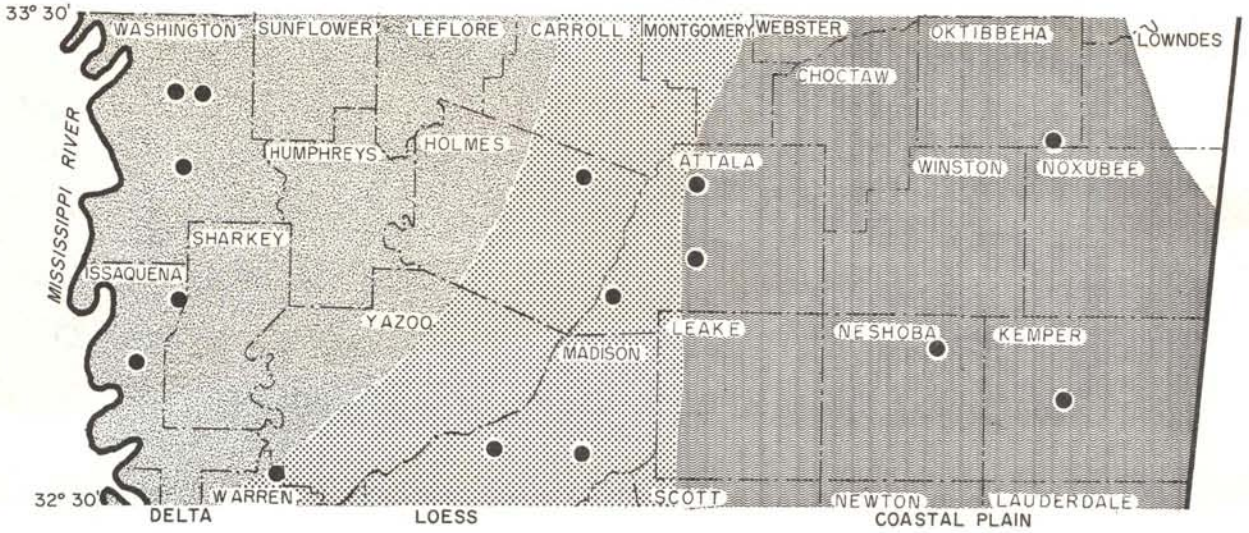

Figure 1.—*Five plots (large dots) were located on each of the three major soil areas in central Mississippi.*

(4) Current year's twig growth
(5) Previous year's twig growth
(6) Site index—by method of Broadfoot and Krinard *(2)*
(7) Crown surface area
(8) Fruit diameter
(9) Fruit weight
(10) Number of epicormic branches.

RESULTS AND DISCUSSION

Fruit production was significantly greater on trees on the Delta site than on the other two sites (table 1). The difference in fruitfulness was slight in 1965, but in 1966 trees on Delta soil were twice as prolific as those on other sites. Loess and Coastal Plain sites were about equally productive.

Fruits from Delta trees contained more than twice as many full seeds as fruits from trees on the other areas (table 1). The 2-year average of 52 full seeds per fruit from Delta trees is considerably above the seven or eight seeds per fruit given in the Woody-Plant Seed Manual *(4)*, but it is about the same as an 8-year average of 58 for various collections near Stoneville *(1)*.

Table 1.—*Seed production and quality*

Site and year	Relative fruitfulness	Full seed per fruit	Germinative capacity	Germinative energy
	Percent	*Number*	*Percent*	
Delta				
1965	58.8	58	97	20.0
1966	58.8	45	94	20.0
Average	58.8	52	96	20.0
Loess				
1965	52.9	21	95	18.9
1966	26.3	19	91	16.9
Average	39.6	20	93	17.9
Coastal Plain				
1965	42.2	22	94	20.8
1966	14.4	12	91	17.6
Average	28.6	17	92	19.2

Sound seeds from all sources germinated about equally well (table 1). Germinative capacity ranged from 79 to 100 percent; germinative energy varied between 11.4 and 24.2. Seed quality was slightly better in 1965 than in 1966, but the difference was too small to be of practical importance.

Not surprisingly, fruit diameter and weight were positively correlated with seed production and quality. Conditions which favored good seed set and development also favored growth of the fruit heads.

Most of the tree and site variables studied were very weakly correlated with seed production and quality; none could safely be used to select good seed trees or seed orchard sites.

Although the reasons were not evident, it appears that, in central Mississippi, the Delta is best suited for sweetgum seed production.

LITERATURE CITED

1. Bonner, F. T.
1967. Handling hardwood seed. Southeast. Area Forest Nurserymen's Conf. Proc. 1966: 163-170. U. S. Dep. Agr. Forest Serv. Southeast. Area, State and Priv. Forest.

2. Broadfoot, W. M., and Krinard, R. M.
1959. Guide for evaluating sweetgum sites. U. S. Dep. Agr. Forest Serv. Southern Forest Exp. Sta. Occas. Pap. 176, 8 pp.

3. Czabator, F. J.
1962. Germination value: an index combining speed and completeness of pine seed germination. Forest Sci. 8: 386-396.

4. USDA Forest Service.
1948. Woody-plant seed manual. U.S. Dep. Agr. Misc. Pub. 654, 416 pp.