

SOFT MAST PRODUCTION IN YOUNG LOBLOLLY PLANTATIONS

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Abstract: Soft mast production was measured on loblolly pine (*Pinus taeda*) plantations, ages 1 to 9 years, in Kemper County, Mississippi. A fertilized 6-year-old plantation, site prepared by bedding, had the largest number (6) of soft mast producers. Blackberry (*Rubus argutus*) production accounted for 91 percent of the total soft mast yield. Blackberry and total soft mast production (93 kg/ha) was significantly greater ($P < 0.05$) on a 5-year-old bedded plantation than on all other plantations. Total fruit yield was greater on 6- and 7-year-old fertilized than on non-fertilized plantations.

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Southern forests are expected to produce not only a majority of the nation's soft roundwood but also an abundance of wildlife. To meet demands for wood and fiber, the pine-hardwood forest type is being converted to intensively managed pine plantations (Hurst and Warren 1980). Young plantations represent early successional stages and produce a variety of food for wildlife (Johnson and Landers 1978). Soft mast (fruit) is desirable for many species (Martin et al. 1951). This paper presents information on soft mast production on different age pine plantations established by two types of site preparation.

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METHODS

Loblolly pine plantations in the Interior Flatwoods region of east central Mississippi (Kemper County) were studied. The flatwoods are nearly level, mostly forested, and have poorly drained, acid soils. The plantations have soils in the Wilcox series, with the major soils being Savannah, Prentiss, Mayhew, Wilcox, Longview, Falkner and Adaton. A fragipan is frequently present at a depth of 46-76 cm in Savannah and Prentiss soils. The climate is mild with 296 frost-free days and rainfall averages 144 cm per year (Pettry 1977).

The treatments studied were plantation age, site preparation, fertilization and herbicide application. Two site preparations, bedded and tree-crushed and burned (TCB), were studied. Bedding consisted of shearing all residual (unmerchantable) plant material to ground level, raking the material into windrows which were burned, and then plowing the area to form beds. Beds were about 30.5 cm high and 2.44 m apart. TCB consisted of crushing all residual plant material with either a 34-ton or a 60-ton LeTourneau tree-crusher, allowing the material to dry, and broadcast burning the area in late summer or early fall. Fertilizing consisted of a single application of urea, 371 kg/ha (equivalent of 169 kg/ha of nitrogen) by helicopter in December. Herbicide (2-4-5-T) at the rate of 0.91 kg/ha was applied by helicopter in May.

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A total of 17 plantations varying from 32-259 ha in size was sampled. Seven plantations (ages 1-3, 5-7, 9) site prepared by bedding and 3 plantations (ages 3-5) site prepared by TCB were used. Three other plantations (ages 6, 7, 9) site prepared by bedding and 2 plantations (ages 6, 7) site prepared by TCB were fertilized in December, 1978, and were sampled. In addition, 2 plantations site prepared by TCB that had received an herbicide application in May 1977 (one at age 4 and the other at age 5) were sampled at age 6 and 7.

Four transects (sample units) were used in plantations 64.8 ha or larger, and 2 transects were used in plantations less than 64.8 ha in size. A soft mast production sample consisted of the mean of the 4 or 2 transects. A transect was 1.8 m wide and 15.2 m long and was U-shaped. The corners of the transects were marked and the centerline was flagged. Transects were randomly placed in a plantation and were at least 20.1 m from the edge. The same transects were used throughout the study (Campo 1980).

Soft mast production was sampled every 2 weeks from May-October, 1979. All ripe (mature) fruit on the transect was collected by hand, refrigerated, dried at 40°C in a forced-draft oven for a minimum of 72 hrs, and weighed. Monthly and annual fruit yields were calculated for each species. No adjustments were made for fruit eaten by animals during the study period.

The sampling scheme was proportional allocation relative to plantation size. A two-way analysis of variance (age and treatment) was used to determine significantly different means (g/transect line) at $P < 0.05$. Scheffe's Test was used to separate significant means (Snedecor and Cochran 1975).

RESULTS

Total soft mast production averaged 0.60 kg/ha on bedded plantations at ages 1 and 2, and increased to about 12 kg/ha at age 3. Production was significantly higher ($P < 0.05$) on a 5-year-old bedded plantation (93 kg/ha) than on all other ages (Table 1). Production declined greatly at age 6 and continued to decline at ages 7 and 9.

A 6-year-old bedded and fertilized plantation had a total mast production of 20 kg/ha, which was higher, but not significantly different ($P < 0.05$) than an unfertilized-bedded 6-year-old plantation (4.5 kg/ha). A 7-year-old bedded and fertilized plantation had significantly ($P < 0.05$) more total mast production than an unfertilized plantation.

Total soft mast production on a 3-year-old TCB plantation was about 15 kg/ha, which was not significantly different from a bedded 3-year-old plantation. Production increased to 17 kg/ha on a 4-year-old TCB plantation then declined to about 4 kg/ha on a 5-year-old plantation.

A TCB and fertilized plantation, age 6, had about the same (21 kg/ha) production as the bedded and fertilized plantation at age 6. However, the bedded and fertilized 7-year-old plantation had significantly ($P < 0.05$) more total production than the TCB and fertilized at age 7. The TCB plantations that had been sprayed (2-4-5-T) at age 4 and 5 had about the same total production at age 6 and 7 as bedded 6- and 7-year-old plantations that had not been sprayed.

Blackberry (*Rubus argutus*) was the principal fruit producer on all plantations, accounting for 91 percent of the total production. On bedded plantations blackberry production was zero at age 1, 0.11 kg/ha at age 2, 11 kg/ha at age 3, and very high (86 kg/ha) at age 5 (Table 2).

Fourteen species produced mature fruit on the transects and fruit was available from early June through January (Table 3). Dewberry (*Rubus trivialis*) was the first species to ripen. Blackberry fruit was available from June through August, with peak production from 20 June - 2 July.

Table 1. Total soft mast yield (kg/ha), mean oven-dry weight, from bedded and tree-crushed and burned loblolly pine plantations, ages 1-9 years, Kemper County, Mississippi (June - October 1979).

Age	Bedded	Bedded and fertilized ¹	Tree-crushed and burned ²	Tree-crushed and burned and fertilized ¹
1	1.09 A ³	---	---	---
2	0.12 A	---	---	---
3	11.58 Aa	---	14.96 ABa	---
4	---	---	17.35 Ba	---
5	93.40 Bb	---	4.19 Aa	---
6	4.46 Aa	20.33 ABa	4.03 Aa	21.06 Aa
7	2.79 Aa	45.89 Ab	1.19 Aa	6.03 Ba
9	0.45 Aa	3.10 Ba	---	---

¹Fertilized in December 1978, by helicopter, with 371 kg/ha of urea.

²Six- and 7-year-old plantations were sprayed with 2-4-5-T (0.91 kg/ha), in May 1977, when the plantations were 4- and 5-years old.

³Significantly different ($P < .05$) between ages if not followed by the same capital letter; and between treatments if not followed by the same small letter.

Table 2. Blackberry fruit yield (kg/ha), mean oven-dry weight, from bedded and tree-crushed and burned loblolly pine plantations, ages 3-9, Kemper County, Mississippi (June-July 1979).

Age	Bedded	Bedded and fertilized ¹	Tree-crushed and burned ²	Tree-crushed and burned and fertilized ¹
3	10.94 Aa ³	---	14.90 ABa	---
4	---	---	17.32 Ba	---
5	85.80 Bb	---	2.78 Aa	---
6	4.34 Aa	16.94 ABa	1.55 Aa	21.05 Ba
7	2.29 Aa	45.51 Ab	0.60 Aa	6.03 Aa
9	0.38 Aa	0.01 Ba	---	---

¹Fertilized in December 1978, by helicopter, with 371 kg/ha of urea.

²Six- and 7-year-old plantations were sprayed with 2-4-5-T (0.91 kg/ha), in May 1977, when the plantations were 4- and 5-years-old.

³Significantly different ($P < .05$) between ages if not followed by the same capital letter; and between treatments if not followed by the same small letter.

Table 3. Species of soft mast producers, period of availability, and peak production (kg/ha) by plantation treatment and age, Kemper County, Mississippi.

Species	Mature fruit available	Peak production	Site preparation ¹	Age (yrs)
blackberry (<i>Rubus argutus</i>)	6 June - 6 Aug	85.82	BD	5
dewberry (<i>R. trivialis</i>)	6 June - 20 June	1.09	BD	1
pokeberry (<i>Phytolacca americana</i>)	18 July - 8 Sept	0.32	BD	3
wild rose (<i>Rosa carolina</i>)	18 July - Oct	0.30	TCB	5
Elliott's huckleberry (<i>Vaccinium elliotii</i>)	15 June - 2 July	0.01	BD	4
tree-huckleberry (<i>V. arboreum</i>)	9 Aug	0.07	BDF	6
elderberry (<i>Sambucus canadensis</i>)	6 Aug - Sept	7.19	BD	5
smooth sumac (<i>Rhus glabra</i>)	6 Aug - Dec	0.16	BD	5
winged sumac (<i>R. copallina</i>)	6 Aug - Dec	3.07	BDF	9
honeysuckle (<i>Lonicera japonica</i>)	Oct - Jan	3.11	BDF	6
swamp dogwood (<i>Cornus stricta</i>)	Oct	0.01	BDF	6
greenbrier (<i>Smilax rotundifolia</i>)	Oct	0.02	BDF	6
persimmon (<i>Diospyros virginiana</i>)	Sept	1.10	TCB	5
French mulberry (<i>Callicarpa americana</i>)	Oct	0.15	TCB	6

¹Site preparation: BD - bedded, TCB - tree-crushed and burned, F - fertilized.

DISCUSSION

Trends in fruit production on pine plantations are important to the forest-wildlife manager. Mast production on bedded plantations was very low at ages 1 and 2, peaked at age 5, and declined markedly at age 6. The decline continued through age 9. Canopy closure occurs at about age 6 on bedded plantations in Kemper County. As a result, blackberry production would be expected to decline since the species is not shade tolerant and competition with pine and hardwood trees would be limiting. Fertilizing the bedded plantations increased total mast production and temporarily reversed the downward trend in fruit production.

Spraying pine plantations at the peak of blackberry production, age 4 or 5, probably decreased mast production the year of spraying because blackberry plants and other potential mast producers decrease in abundance after herbicide application (Easley 1977). Two years after spraying, at age 6 and 7, mast production was so low that there was no difference between sprayed and not sprayed.

At age 3 there was no difference in total or blackberry fruit production between bedded and TCB plantations. Both site preparations greatly disturb the soil with bedding being the most intensive preparation. In east Texas the highest fruit production was found on plantations that had the least soil disturbance (cut and burn) (Stransky and Richardson 1977, Stransky and Halls 1980).

Burned windrows in bedded plantations were not sampled as separate units, but soft mast production on windrows would have greatly exceeded any other treatment. Dense, luxuriant stands of elderberry (*Sambucus canadensis*), blackberry, sumac (*Rhus* spp.), and pokeberry (*Phytolacca americana*) were present on windrows age 1-4. Windrows made up an average of 7.8 percent of the total acreage in bedded plantations in Kemper County (Johnson 1974).

Fruit production by shade intolerant species can be expected to decline at canopy closure, but production by shade tolerant species (*Vaccinium*, *Crataegus*, *Prunus*) might increase as the plants mature. In fact, ripe fruit of dogwood (*Cornus florida*) and deciduous holly (*Ilex decidua*) was found on 6- and 7-year-old plantations. Fruit production should increase after the plantations have been precommercially and/or commercially thinned.

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