

EFFECTS OF DEER BROWSING ON SOYBEAN PLANTS, CRAB ORCHARD NATIONAL WILDLIFE REFUGE

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ABSTRACT.—Randomly selected soybean plants were marked to establish utilization by white-tailed deer. Seventy-four percent of the tagged plants were browsed at least once during the growing season. The reduction in the production of seed of clipped plants averaged 48 percent per plant; the total damage to the soybean crop was 39 percent. Solutions to the problem include reduction of the deer population and/or application of repellents to field borders.

cause extensive damage to crops, especially soybeans which represent one of the two (corn) most important cash crops on the Crab Orchard National Wildlife Refuge. The increasing deer herd prompted an investigation of the deer population in relationship to the habitats afforded by the refuge. This paper reports a study of deer depredation on soybeans. Appreciation is expressed to refuge personnel and leasee farmers for cooperation which made this study possible.

TECHNIQUES

Since the establishment of the Crab Orchard National Wildlife Refuge, the United States Bureau of Sport Fisheries and Wildlife has developed an intensified agricultural program to provide fall and winter foods for wintering Canada geese. Concurrent with the development of this area as a winter home for geese the population of white-tailed deer has increased rapidly. Farmers, who lease lands in the refuge for intertilled cropping, make repeated claims that deer

Five fields dispersed throughout the refuge were used as a basis for determining the extent of deer utilization of row-planted soybeans. These fields encompassed 42 acres and ranged in size from 6.5 to 11.0 acres. Two of the fields were situated in bottomland and the remainder in upland.

A browse survey was used to determine the extent and nature of the clipping. Nine hundred and forty-one soybean plants were tagged during June

TABLE 1.—Number of Clipped and Unclipped Soybean Plants and Seed Production,
Crab Orchard National Wildlife Refuge, 1964.

Field	Number of Plants and Weight of Seeds (gm)							
	Clipped Before Plants Tagged		Clipped Between First and Second Check		Clipped Twice Prior to Both Checks		Not Clipped	
	Number of plants	Average weight	Number of plants	Average weight	Number of plants	Average weight	Number of plants	Average weight
1.....	51	3.9	16	3.3	10	3.0	34	5.7
2.....	56	6.5	19	8.7	38	7.4	57	9.7
3.....	15	6.2	6	8.1	6	6.0	30	6.2
4.....	26	1.9	2	1.9	10	1.2	19	3.3
5.....	116	2.2	27	1.5	191	1.1	10	2.1
Total.....	264	3.6	70	4.4	255	2.3	150	6.5

and early July, 1963. A three-inch piece of yellow and red plastic, engineers' tape was stapled around each plant just above the cotyledons; this prevented the tags from being covered by cultivation and enabled easy identification. It is not believed that the tags affected selectivity of plants for browsing by deer. Plants were tagged in groups of 1-3 at intervals of 30 paces; every 20th row across each field was tagged in this manner.

Marked plants were checked for early and late-season clipping. The early survey was made when the plant was approximately 5-6 inches above the ground. The check for late clipping was made prior to the soybean harvest. When the soybeans were mature (September) each tagged plant was harvested and the seeds dried and weighed to determine the difference in production of clipped and unclipped plants. A total of 739 tagged plants were available for these analyses; 202 plants were lost due to various causes but largely as the result of ground hog activities.

The advantages of this browse survey method are expediency and lack of expense. Plastic markers are inexpensive and may be quickly fastened by utilizing a stapler; whereas, exclosures are expensive and time consuming to erect and locate. In addition, tagged plants need not be tended and may be cultivated concurrently with the rest of the field.

RESULTS AND ANALYSIS

The average weight of seeds from unclipped soybean plants (6.5 gm/plant) was almost double (Table 1) that of plants clipped early in their growth (3.6 gm/plant). Plants which were clipped prior to the initial check suffered more than plants which were clipped when the plants were more mature (4.4 gm/plant). Plants recorded as browsed at both times when checked produced the least amount of seed (2.3 gm/plant).

Individual fields varied considerably from the average. For example, in Field #3, the average production of plants clipped prior to either of the checks was higher than the average for unclipped plants (Table 1). Weeds were the cause of this deviation; in some areas, pigweed, horseweed, and jimsonweed shielded the plants from browsing by deer. However, these soybean plants were long, slender and yielded few productive pods. These data indicate that a serious weed problem may be more

harmful to the soybean crop than deer browsing.

Deer beds were common in grass-infested areas of fields; two areas approximately 25 feet in diameter had been used so heavily that the surface soil was dusty. Actual damage resulting from trampling by deer was limited. Observations of tracks revealed that the deer usually followed the rows and dead furrows while feeding.

Browsing by deer was heaviest during the first 3 weeks of soybean growth; the plants were probably more palatable at this time. However, the size of the plant may have been important. Larger plants had more leaves; this possibly reduced the number of individual plants on which deer fed.

Early clipping usually involved the loss of the terminal bud. The plant responded by developing two lateral shoots which were inferior in seed production to the main stalk of a normal plant. Later in the season, only a leaf or two was eaten, which was not as critical to subsequent plant growth and production.

The data obtained from this investigation indicates that white-tailed deer are a serious threat to the soybean crop and thus to the income of the farmers. Seventy-four percent of the marked plants were clipped at least once during the summer. Seeds from these plants averaged 3.1 grams/plant compared to 6.5 grams/unharmed plant. The results of this study revealed that the total soybean crop production was reduced 39 percent by feeding activities of deer.

The most obvious solution to the problem of deer depredation would be partial removal of the deer herd. The application of deer repellents may also be considered. Chemicals such as Goodrite Z.I.P. and Diamond-L could be applied along edges of fields when the plants were 2 to 3 inches in height; field edges were most severely damaged by feeding deer. The effect of deer browsing was found to be 25 percent greater in the outer 20 rows than for the remainder of a field. Observations revealed that deer began feeding along the edge and then moved toward the center. If the outer rows were treated with a repellent, the deer might leave without browsing. Provided these chemicals were effective, this method would allow the soybean plants to pass through the initial critical period of growth. Subsequent applications could be applied as necessary.

Manuscript received April 9, 1964