Effects of Browse Rejuvenation on Selected Blood Serum Characteristics of White-tailed Deer

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ABSTRACT

The effects of roller chopping brush annually during summer on blood serum characteristics of white-tailed deer (*Odocoileus virginianus* Raf.) were determined from 1985-1988. Blood Ca of deer from the roller-chopped area was higher than that of deer from the control area in fall 1987 and winter 1988 but was lower in winter 1987. Blood P was greater in the roller-chopped area in winter 1986 and winter 1987. Values for other blood characteristics were similar between the roller-chopped area and control area. Blood serum characteristics did not provide conclusive evidence of differences in nutritional status of deer in the two areas.

KEYWORDS: *Acacia berlandieri*, *Acacia rigidula*, blackbrush, brush management, guajillo, *Odocoileus virginianus*, shrubs

Mechanical top growth removal of brush stimulates regrowth which is temporarily higher in crude protein and phosphorus than mature browse (Powell and Box, 1966; Everitt, 1983; Fulbright et al., 1992; Reynolds et al., 1992) and is more accessible to white-tailed deer (*Odocoileus virginianus* Raf.) because of plant height reduction (Everitt, 1983). Everitt (1983) recommended shredding brush in July to temporarily improve white-tailed deer nutrition by providing nutritious sprouts during the late summer and early fall.

Nutritional quality of white-tailed deer diets in south Texas is greatest in spring, late fall, and winter and lowest in late summer and early fall when forbs become scarce. During this period of low forb availability deer become primarily browsers of woody material with lower digestible energy content (Everitt and Drawe, 1974; Meyer et al., 1984; Varner and Blankenship, 1987). Annual availability of nutritious brush resprouts during late summer and early fall should lessen this seasonal fluctuation in nutritional quality of white-tailed deer diets. Thus, we predicted that annually roller chopping a guajillo- (*Acacia berlandieri* Benth.) and blackbrush-acacia- (*A. rigidula* Benth.) community during the summer would result in improved nutritional status of white-tailed deer.

Blood serum characteristic values are commonly used as indices of condition in

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cervids (Kie, 1988). Our objective was to determine the effects of annually roller chopping 20% of a 1,000 acre area on blood total serum protein (TSP), albumin, globulin, calcium (Ca), phosphorus (P), glucose, creatinine, total bilirubin, alkaline phosphatase, and creatinine phosphatase.

MATERIALS AND METHODS

The study was conducted on the 12,000 acre Esperanza Ranch in Duval County, Texas. Climate, soils, and vegetation of the ranch are described in Fulbright et al. (1992). Parallel strips of brush 130 feet wide and 0.75 - 1.1 miles long were roller chopped in a 1,000 acre study area using a 20-foot-wide (about 60,000 lbs.) roller chopper pulled by a crawler tractor in a pattern of alternating roller-chopped and nontreated strips during the summers of 1985-1988. A new strip was roller chopped each year adjacent to each strip roller chopped the previous year. About 20% of the area was roller chopped annually. Our goal was to produce browse regrowth each year while maintaining adequate brush for cover.

An area of similar size, soils, and vegetation about 1.5 miles distant was utilized as a control. Licht (1987) reported that white-tailed deer on the Edwards Plateau of central Texas rarely travel farther than 1.25 miles from the center of their home range, and home range sizes average only 0.4 miles^2 for does and 1.6 miles^2 for bucks. Ellisor (1969) and Inglis et al., (1986) reported home ranges of deer on the Rio Grande Plains in Dimmit County, Texas, to be 0.9 miles^2 and 0.7 miles^2, respectively. Home range sizes of female deer appear less variable than those of males (Inglis et al. 1986). Thus, samples from treated and untreated areas were considered independent of each other.

Three to 6 female white-tailed deer from the control area and 4-6 in the roller-chopped area were shot with high-powered rifles during winter 1986-1988 and fall 1985-1987. Blood samples were collected by cardiac puncture using a heparinized syringe for serum separation. Samples were then centrifuged and the serum was extracted and sent to the Texas A&M Veterinary Medical Diagnostic Laboratory, College Station. Samples were analyzed to determine TSP, albumin, globulin, Ca, P, glucose, creatinine, total bilirubin, alkaline phosphatase, and creatinine phosphatase.

Data were analyzed with analysis of variance (ANOVA) for a completely randomized design with a factorial arrangement of treatments (6 seasons X 2 treatments) (Steel and Torrie, 1980). Orthogonal contrasts were used to compare ($P \leq 0.05$) treatment means for each date when the season X sampling date interaction was significant ($P \leq 0.05$) (Steel and Torrie, 1980). The experiment was not replicated because of the expense of the treatments. Statistical inference is valid when treatments are not replicated, but inferences pertain only to specific sites (Steel and Torrie, 1980; Hurlbert, 1984).

RESULTS AND DISCUSSION

Blood serum characteristic values were similar ($P > 0.05$) between the roller-chopped and control areas except for blood Ca and P. The sampling date X treatment interaction was significant for blood Ca ($P = 0.02$) and P ($P = 0.05$).

Blood Ca of deer from the roller-chopped area was higher than that of deer from the control area in fall 1987 and winter 1988 but was lower in winter 1987 (Table 1). LeResche et al. (1974) stated that depressed blood Ca may indicate range deterioration in certain instances. Blood P was greater in the roller-chopped area in winter 1986 and winter 1987. Decreased inorganic P may result from dietary deficiencies (LeResche et al., 1974).

Total serum protein, albumin, globulin, albumin/globulin ratio, creatinine, total bilirubin, alkaline phosphatase, and creatinine phosphatase varied significantly ($\underline{P} < 0.05$) among sampling dates. Kie et al. (1983) reported that serum creatinine, albumin, and alkaline phosphatase differed with month of collection. In their study, glucose, TSP, and bilirubin did not vary with month of collection.

Blood characteristic values did not provide conclusive evidence of differences in nutritional status of deer in the roller-chopped and control areas. The few blood values that differed between the 2 areas, except for blood Ca in winter 1987, tended to indicate better nutritional status in the roller-chopped area. Lack of differences in blood values may have resulted in part from low sensitivity of blood values to differences in nutritional status, from differences in deer density between the 2 areas, and from similaries in diet composition between the two areas. Kie et al. (1983) concluded that postmortem blood chemistry is of limited value in assessing physical condition in field situations because they found highly significant differences in body weights and fat reserves between deer from a low density and deer from a high-density herd, but few differences in blood values. Body weights and fat reserves of deer in our study were similar in the roller-chopped and control areas, except in fall 1987 when the kidney fat index was higher for deer in the control area (Fulbright et al., in press).

Deer density increased during the study in the roller-chopped area and was higher in the roller-chopped area than in the control area during 1985-1987 (Bozzo et al., 1992). Greater deer density in the roller-chopped area may have resulted in depletion of high-quality forages, thus masking differences in blood characteristics between deer in the two areas.

Browse and forb composition of deer diets was similar in the control and roller-chopped areas on all sampling dates except fall 1986 (Fulbright et al., in press). During fall 1986, browse comprised a greater percentage of deer diets in the control area than in the treated area, whereas forbs comprised more of deer diets in the treated area than in the control area. Our results should be interpreted cautiously because the experiment was not replicated. Although we attempted to select areas that were similar in soils and plant composition, differences in blood serum characteristics between the 2 areas may have resulted in part from inherent differences between the sites rather than from treatment effects.

Table 1. Albumin (Alb), albumin/globulin ratio (AG), alkaline phosphatase (AP), calcium (Ca), creatinine (Creat), globulin (Glo), glucose (Gluc), phosphorus (P), total bilirubin (TB), and total serum protein (TSP), of deer collected from a control (Con) and roller chopped (Trt) area in fall 1985-1987 and winter 1986-1988, Duval County, Texas.

Blood	Fall 1985		Winter 1986		Fall 1986		Winter 1987		Fall 1987		Winter 1988	
Charac.	Con	Trt	Con	Trt	Con	Trt	Con	Trt	Con	Trt	Con	Trt
Deer sampled	3	4	4	4	5	5	5	5	5	6	6	6
Alb (g dL^{-1})	3.1	3.3	3.3	3.7	2.7	2.4	3.9	3.9	2.6	2.5	2.5	2.8
AG	1.1	1.2	1.1	1.3	0.8	0.7	1.3	1.4	0.7	0.7	0.5	0.7
AP (Units L^{-1})	146.7	153.3	60.8	65.5	181.6	231.4	57.0	89.0	33.0	67.5	21.5	43.5
Ca (mg dL^{-1})	7.9	8.8	8.6	8.5	10.1	9.6	9.3	8.2*	9.2	9.7*	8.8	9.4*
Creat (mg dL^{-1})	1.2	1.2	1.3	1.4	1.7	1.4	1.6	1.4	1.3	1.2	1.4	1.6
Glo (g dL^{-1})	3.0	2.8	2.9	2.9	3.2	3.5	3.2	2.8	3.6	3.6	4.5	3.9
Gluc (mg dL^{-1})	90.0	144.2	133.3	118.8	131.8	137.0	126.0	119.0	216.8	127.7	83.5	152.5
P (mg dL^{-1})	14.2	10.4	8.9	13.5*	14.7	10.5	10.6	12.6*	7.9	10.7	8.2	9.2
TB (mg dL^{-1})	0.5	0.5	0.5	0.6	1.5	0.6	0.1	0.1	0.2	0.1	0.1	0.1
TSP (mg dL^{-1})	6.1	6.1	6.2	6.6	5.8	5.9	7.2	6.7	6.2	6.1	6.9	6.7

* Significantly different ($P < 0.05$) according to orthogonal contrasts comparing the two treatments for each date.

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