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## **RUMEN CONTENTS OF WHITE-TAILED DEER: COMPARING LOCAL WITH REGIONAL SAMPLES**

by

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### **ABSTRACT**

The rumen contents of 384 white-tailed deer (*Odocoileus virginianus*) collected seasonally from the Savannah River Project in South Carolina were compared with 184 rumen samples collected from six widely scattered areas throughout the Southeastern Coastal Plain. The two sets of rumina differed significantly in the volume of hardened woody twigs and fungi in the spring, dry leaves and fungi in the fall, and succulent twigs in the winter. The decision to collect local samples or rely on regionwide completed studies will depend on the intensity of management and the feasibility of collecting local information. If data on broad plant categories and plant parts such as green leaves, twigs, and fruits are sufficient for management purposes, regionwide studies can be helpful. If the manager needs data on consumption of individual plant species by deer in his area, local sampling is advisable.

### **INTRODUCTION**

A major difficulty in determining food habits of white-tailed deer by rumen analysis is obtaining an adequate number of samples, especially from a local area. Consequently, managers in local areas must frequently rely on regional data such as Harlow and Hooper's (1971). It is essential, however, to determine whether regional findings are applicable to local areas.

In the present study, we compared data collected by Harlow and Hooper (1971) from six locations throughout the Southeastern Coastal Plain with data collected from the U. S. Atomic Energy Commission's Savannah River Plant in South Carolina.

### **SAMPLING AREAS**

Major forest types within the Southeastern Coastal Plain (CP) include the longleaf-slash pine, the loblolly-shortleaf pine, and the oak-gum-cypress types (USDA, Forest Service 1969). Braun (1967) described 13 forest communities contained within these

<sup>1</sup>When this study was conducted Crawford was affiliated with the Southeastern Forest Experiment Station.

three major forest types. This regional diversity of plants offers white-tailed deer a wide variety of forages for consumption. Representative samples were collected from the major forest types in the regional study (Harlow and Hooper 1971).

The Savannah River Plant (SRP) is composed of upland and swamp habitats located in parts of Aiken, Barnwell, and Allendale Counties in the Upper Coastal Plain of South Carolina. Most of the plant communities found on the CP also occur in the SRP. Upland habitats are slightly rolling with an overstory of oaks: turkey (*Quercus laevis*), blackjack (*Q. marilandica*), bluejack (*Q. incana*), sand post (*Q. stellata* var. *margaretta*), southern red (*Q. falcata*), and willow (*Q. phellos*); also included are loblolly pine (*Pinus taeda*), sweetgum (*Liquidambar styraciflua*), and common persimmon (*Diospyros virginiana*). Abundant understory species are Japanese honeysuckle (*Lonicera japonica*), blueberry (*Vaccinium* spp.), azalea (*Rhododendron* spp.), sassafras (*Sassafras albidum*), large gallberry (*Ilex coriacea*), plum (*Prunus* spp.), sumac (*Rhus* spp.), hawthorn (*Crataegus* spp.), chinaberry (*Melia azedarach*), and common pricklypear (*Opuntia vulgaris*). Swamp habitat (commonly termed bottomland hardwoods) includes a wide variety of wet sites dominated by swamp chestnut oak (*Q. michauxii*), swamp white oak (*Q. bicolor*), cherrybark oak (*Q. falcata* var. *pagodaefolia*), sweetgum, blackgum (*Nyssa sylvatica*), yellow-poplar (*Liriodendron tulipifera*), red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*), American sycamore (*Platanus occidentalis*), black willow (*Salix nigra*), and eastern cottonwood (*Populus deltoides*). Areas inundated for significant parts of the year are dominated by bald cypress (*Taxodium distichum*) and water tupelo (*Nyssa aquatica*). Common understory plants include Alabama supplejack (*Berchemia scandens*), redbay (*Persea borbonia*), sweetbay (*Magnolia virginiana*), yellow jessamine (*Gelsemium sempervirens*), Virginia sweetspire (*Itea virginica*), southern bayberry (*Myrica cerifera*), dwarf palmetto (*Sabal minor*), baccharis (*Baccharis* spp.), and willow (*Salix* spp.). Because of the similarities between the habitats in the two areas, the variation in plants and plant parts within and between local habitats in the SRP is similar to that found within and between the study locations throughout the CP. Although the ratio of upland to swamp habitats will differ from area to area, influencing presence and relative abundance of plant species, it would have little influence upon the availability of the major plant parts and categories such as green leaves, twigs, fruits, grasses and sedges, forbs, etc., which are major components of most plant communities. Species breakdown on forages eaten by deer within the CP are given by Harlow and Hooper (1971).

## METHODS

The 183 samples originally collected from the SRP in the regional study by Harlow and Hooper (1971) were combined with an additional 201 samples from the same local area; these 384 samples were then compared with the 184 samples originally collected from six other locations in the CP from northwest Florida to coastal Maryland (Fig. 1). Processing of rumina was similar for all areas. Rumen contents were identified macroscopically and their volumes measured by water displacement.

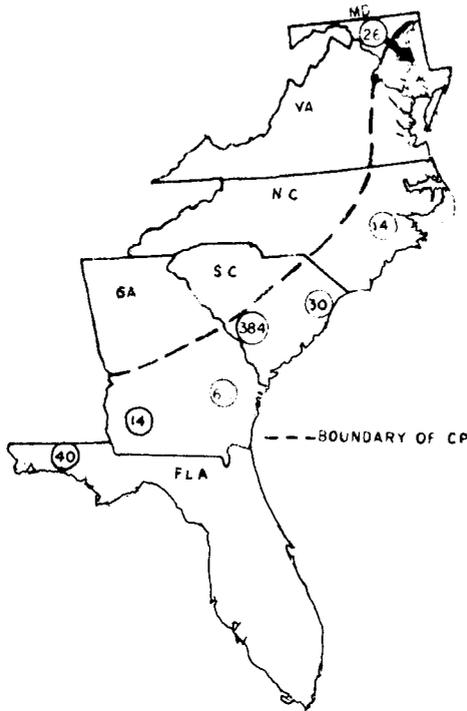


Figure 1. Number and location of rumen samples from white-tailed deer collected in the Southeastern Coastal Plain (CP). In South Carolina, 384 samples were collected from the Savannah River Plant (SRP).

Student's t-test for unequal observations was used to compare the CP and SRP areas in the mean volumes of the major food items in the deer rumina. Because we were trying to enhance finding any possible difference between local and regional areas in mean volume of plants eaten by deer, we tested at both the .10 and .05 significance levels.

## RESULTS AND DISCUSSION

### *Spring Season*

During the spring, the fruits of oak, chinaberry, pricklypear, pine, and maple were abundant in deer rumina from the SRP (24.9 percent) but, with the exception of a small volume of acorns (5.3 percent), were absent in rumen samples from other areas in the CP. The greater number of fruits in rumina from the SRP was caused in part by the larger sample from this local area. The greater the number of samples taken, the greater the number of plants that appeared in the analysis, up to a point. Furthermore, fleshy fruits, which appear mainly in the spring, decay and disappear more rapidly than the more persistent, hard-bodied fruits. Probably, because the sample size was small in comparison with the variation in sampling, there was no significant difference between the two sets of rumina in mean volumes of fruit (Table 1).

Table 1. Means and standard deviations (in parentheses) of percent by volume of major food items identified in rumen samples collected each season from the Savannah River Plant (SRP) and from six other areas in the Southeastern Coastal Plain (CP).<sup>a</sup>

Major Food Categories	Springb		Summerb		Fallb		Winterb	
	SRP(59)	CP(33)	SRP(42)	CP(25)	SRP(257)	CP(90)	SRP(26)	CP(32)
Fruit	27.0(34.0)	2.8(4.1)	50.7(34.9)	14.1(26.8)	77.5(71.3)	42.1(41.6)	24.0(23.5)	22.2(38.4)
Green Leaves (Woody Plants)	33.9(46.2)	49.9(41.2)	25.6(26.8)	23.0(12.1)	10.9(18.4)	23.3(23.4)	43.9(53.5)	48.7(54.7)
Dry Leaves (Woody Plants)	0.3(0.2)	0.1(-)	1.4(2.2)	1.9(1.8)	0.8c(2.6)	7.6c(9.5)	0.8(1.4)	3.9(6.5)
Succulent Twigs	5.2(5.3)	5.5(4.4)	2.0(2.5)	3.4(2.9)	4.0(4.1)	1.1(0.9)	12.8d(18.6)	0.4d(0.1)
Hardened Twigs	4.3d(2.5)	1.1d(1.6)	0.0(-)	0.2(-)	0.7(1.2)	5.2(5.7)	2.0(1.6)	4.9(5.4)
Fungi	8.8d(9.5)	0.2d(1.7)	8.3(10.3)	15.8(19.7)	2.4c(5.3)	14.8c(15.9)	2.9(4.0)	3.0(2.8)
Forbs	20.3(27.7)	32.2(26.6)	11.4(12.1)	33.9(17.9)	1.3(2.2)	3.6(3.6)	8.3(10.1)	6.5(7.3)
Grasses and Sedges	0.2(0.4)	8.2(10.0)	0.6(0.5)	7.7(12.8)	2.4(2.4)	2.3(2.5)	5.3(5.0)	10.4(8.9)
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

<sup>a</sup>Percentage breakdowns of volume and occurrence by plant species are available from the senior author on request.

<sup>b</sup>Number of rumen samples is shown in parentheses.

<sup>c</sup>Significant difference in mean values between SRP and CP (P = 0.10).

<sup>d</sup>Significant difference in mean values between SRP and CP (P = 0.05). Possible heterogeneous variance (succulent twigs).

Green leaves from many of the same species of woody plants occurred in both local and regional samples. The leaves of Japanese honeysuckle occurred in greater volume and frequency than those of all other 14 species of plants identified. Green leaves comprised one-third of the total volume of food items in the SRP samples and one-half the total volume in the CP samples, but the two means were not significantly different at the 0.05 level (Table 1).

Legumes were numerous in the rumina from the CP and absent in those from the SRP. However, there was no significant difference between the mean volumes of all forbs in the two sets of rumina (Table 1).

Fungi, an ephemeral food item, were abundant (8.8 percent) in the rumina from the SRP and sparse (0.2 percent) in those from the CP, whereas grasses and sedges were more common in the latter. The mean volume of hardened twigs were significantly greater ( $P \leq 0.05$ ) in the rumina from the SRP than in the CP but differences were not significant for dry leaves or succulent twigs.

### *Summer Season*

During the summer as in the spring, a greater number of species of fruits (33 percent) occurred in rumina from the SRP than in those from the CP. Predominant summer fruits in the SRP samples included plum, grape (*Vitis* spp.), blueberry, chokeberry (*Aronia* spp.), pecan (*Carya* spp.), oak, and pricklypear. In rumina collected from the CP, blueberries occurred in greatest volume and frequency, followed by acorns, palmetto fruits, and hawthorn. Fruit made up 50 percent of the total volume of food items in the SRP samples but only 14 percent of the total volume in the CP samples (Table 1), but the difference was not statistically significant.

The most abundant item in rumina from both areas was again the green leaves of Japanese honeysuckle. Green leaves of many plant species occurred in rumina from both areas, with the SRP samples containing the greatest variety. The volumes of green leaves in the samples from the two areas were not significantly different (Table 1).

Fungi were well represented in both areas and no significant difference between the two mean volumes was detected (Table 1). Grasses and sedges were also present in greater volume in rumina from the CP, but again the difference between the two volumes was not significant. Among the forbs, legumes were more abundant in the rumina from the CP than in those from the SRP although the difference was not significant.

### *Fall Season*

During the fall, acorns were the major fruit identified in rumen samples from both the local and regional collections. However, a greater volume of acorns (67.5 percent compared to 24.4 percent) occurred in rumina from the SRP, primarily because some of the collection areas in the CP are composed principally of pine-palmetto flatwoods with few oaks. Because of the considerably greater number of rumen samples examined from the SRP, 44 percent more species contributed fruit to these samples and 50 percent more species contributed green leaves, possibly indicating that the number of samples from the CP was too small. All of the plant species found in the regional samples, plus a great many more, occurred in the local samples.

Among the plants contributing green leaves, Japanese honeysuckle was the most abundant in volume and occurred most frequently in rumina from the local area and was second to holly (primarily gallberry) in volume in rumina from the region. The mean volume of green leaves was 23 percent in the CP samples and only 11 percent in the SRP samples, but the differences were not significant (Table 1).

A large volume of unidentified dry leaves occurred in the rumina from the CP, contributing to the significant difference ( $P \leq 0.10$ ) detected between the mean volume of this food item in the two collection areas (Table 1). Volumes of succulent and hardened twigs consumed in both areas were small, and neither item was significantly different in mean volume in the two areas. Although fungi were significantly greater ( $P \leq 0.10$ ) in mean volume in the rumina from the CP, forbs, grasses, and sedges occurred in approximately the same volume in the rumina from both collections.

### Winter Season

Acorns were again an important fruit in the diets of deer from both collections. They ranked first in volume and frequency in the CP samples and second in the SRP samples, where pricklypear ranked first.

Japanese honeysuckle contributed more green leaves than did any other species in both areas. No significant differences were detected in the mean volumes of fruit, green leaves, or dry leaves in the two sets of rumina, although a greater volume of dry leaves was found in the CP samples than in those from the SRP (Table 1).

A significant difference ( $P \leq 0.05$ ) was detected between the mean volumes of succulent twigs in the local and regional samples (Table 1). The volume of honeysuckle twigs was considerably greater in the rumina from the SRP than in those from the CP.

No significant differences were detected in the mean volumes of hardened twigs, fungi, forbs, and grasses and sedges in the rumina from the two collections, although the volume of grasses and sedges was almost twice as great in the regional samples (Table 1). The number of rumina collected and species diversity in winter were about the same in both collections.

### Variation in Foods Consumed

The fruits of pricklypear, plum, blackberry (*Rubus* spp.), and pecan and the green leaves of pricklypear, English ivy (*Hedera helix*), and chokeberry occurred in substantial quantities in the rumina from the SRP, but they were absent from rumina collected in the other areas in the CP.

Thus, in the present study, some differences occurred in the species of plants consumed in different areas. Regional findings based on 184 rumen samples indicated fewer species of plants taken by deer than did local findings based on 384 samples. Regional studies usually do not take a sufficient number of samples in one area to detect the existing variability. Deer wander in what appears to be an unmethodical manner from plant to plant foraging until they find an item they prefer. They then consume a substantial amount of this item. The greater the number of rumina taken the greater the likelihood of detecting this variation in feeding behavior. Smaller samples will tend to show only the relatively few species that comprise the bulk of the diet.

The decision to apply regional findings to local situations depends on the intensity of management desired and the feasibility of collecting local information. If the interest in habitat management for deer is based on broad plant categories such as green leaves, twigs, grasses, etc., then a search of the literature on food habits of deer from regionwide studies can be helpful. However, if the manager wants to be more specific and determine what individual plant species indigenous to his area are consumed by deer, then local sampling is advisable. Our experience with local sampling indicates that in spite of a relatively large sample size considerable variation may be encountered for different plant categories during different seasons (Table 1).

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