QUALITY OF SOME WINTER DEER FORAGES IN THE ARKANSAS OZARKS[1]

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Abstract: Green herbage comprised most of the stomach contents of 10 white-tailed deer (*Odocoileus virginianus*) killed in two Arkansas Ozark enclosures in March 1967. Analyses of freshly gathered forages showed that herbage was more digestible and contained more protein than browse. Acorns formed a relatively small portion of the total food ingested, because the mast crop was small the preceding fall.

In March 1967, five deer were killed in each of two enclosures, one containing 600 acres and the other 675 acres, on the Sylamore Experimental Forest in the Arkansas Ozarks. The stomach contents of each deer were examined and the foods eaten were identified. At the same time, a series of forages were collected for chemical analyses. The 10 most preferred forages eaten by deer were analyzed for crude protein and nonnutritive residues.

METHODS

Rumen and reticulum contents of each deer were washed through a 0.25-inch sieve and sorted for identification. Weights of forage species or species groups are expressed as percentages of the total dry matter recovered.

Information on forage and mast availability was collected in March 1967 by techniques reported previously (Segelquist and Green 1968). Forages for chemical analyses included only that portion of plants within a height zone of 5 feet. Each species or species group was comprised of several plants collected from five areas within each enclosure and five areas outside of the enclosures to represent average quality. Green leaves and stems were collected from cool-season grasses, sedges, and forbs. The terminal inch of twig tips was collected from deciduous browse species, and the terminal inch and attached leaves were collected from evergreen browse. All samples were oven-dried at 45 C and ground to 1 mm.

Crude protein was determined by standard AOAC procedures (Horwitz 1960). Nonnutritive analyses were determined by the methods of Van Soest and Moore (1966). In these analyses, dry matter was divided into cell and cell-wall contents (CWC). The CWC were further separated into acid-detergent fiber (ADF) and acid-detergent soluble fractions.

At the time of collection, buds on some deciduous browse species had begun to swell in response to the unseasonably warm weather in early March. As a consequence of this growth, cell contents and crude protein values may have been higher than in midwinter.

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RESULTS

Food Preference and Availability

Forage—leaves, stems, and twigs of herbage and browse—made up 84 percent of the food eaten by deer. Herbage as used in this paper consists of forbs, grasses, and sedges; browse is considered to be the current annual leaf and twig growth of shrubs, trees, and woody vines (Huss 1964). Acorns, probably the most highly preferred winter food of deer in the Ozarks (Korschgen 1962), contributed only 16 percent of the total food eaten by deer in our study. Mast yields in the fall of 1966 were below average. To compare forage preference with forage availability, the amounts of various classes of vegetation eaten were expressed as percentages of total forage consumed rather than as percentages of total food (forage plus acorns) eaten.

In spite of its scarcity, green forage contributed more to the diet of the deer than other vegetation. Green herbage constituted 41 percent of the total forage ingested: grasses and sedges 33 percent and forbs 8 percent. These items made up only eight percent of the available forage in the habitat. Eastern red cedar (*Juniperus virginiana*), the only evergreen browse eaten, made up eight percent of the forage eaten but only three percent of the total available.

In contrast, deciduous browse twigs comprised about 69 percent of the forage available but only 30 percent of that eaten. Eleven percent of the forage eaten was red maple (*Acer rubrum*) and 4 percent flowering dogwood (*Cornus florida*). Lowbush blueberry (*Vaccinium vacillans*) and common deerberry (*V. stamineum*) accounted for 4 percent. Twigs of ash (*Fraxinus* spp.), plum (*Prunus* spp.), and serviceberry (*Amelanchier canadensis*) accounted for about 1 percent of the total eaten. Unidentified twigs made up 10 percent.

Dead leaves of deciduous browse species, which were not measured as part of the available forage, constituted 8 percent of the forage eaten. The remaining 13 percent was unidentified fibrous plant material.

Chemical Analyses of Forages

Cell contents consist of sugars, soluble carbohydrates, starch, pectin, protein and nonprotein nitrogen, and other soluble materials. These nutrients are almost totally digested by deer (Short and Reagor 1970) and by cattle and sheep (Van Soest and Moore 1966) and thus are good indicators of forage quality. In the present study, the cell contents of forbs were higher than those of other classes of forages, and the cell contents of eastern red cedar were higher than those of deciduous browse species (Table 1).

Grasses and sedges had low cell contents, but their CWC contained more hemicellulose than other forages. The hemicellulose in grasses was relatively well digested by ruminants, whereas the other component of cell walls, ADF or lignocellulose, was more difficult to digest (Van Soest 1966). ADF was lowest in forbs and highest in deciduous browse twigs and dead leaves.

Short and Reagor (1970) demonstrated that the ratio of ADF to CWC was inversely related to digestibility, by deer, of the CWC of woody twigs. In our study, the ADF : CWC ratios for browse and forbs were high, indicating poor cell-wall digestibility, but the CWC were higher in browse than in forbs. Grasses and sedges had a low ADF : CWC ratio. Thus, their abundant cell-wall constituents were probably more digestible than those of either forbs or browse.

Proteins are essential for animal maintenance, growth, and reproduction (Morrison 1957:159, 168, 185). The average protein content for deciduous browse twigs was

Table 1. Chemical analyses of 10 Ozark winter forages.

Forage	Percentage Composition				Ratio of ADF:CWC
	Crude Protein	Cell Contents	Cell-Wall Contents (CWC)		
			Hemicellulose	Lignocellulose (ADF)	
Forbs	15.4	74	2	24	.92
Grasses	16.7	43	27	30	.53
Sedges	9.6	34	29	37	.56
Eastern red cedar	8.0	67	5	28	.85
Flowering dogwood	7.2	63	4	33	.89
Red maple	7.5	58	3	39	.93
Lowbush blueberry	7.0	53	5	42	.89
Ash	6.5	45	12	43	.78
Common deerberry	7.0	46	9	45	.83
Dead oak leaves	7.3	53	1	46	.98

only slightly over seven percent, which is near the minimum required for maintenance by deer (French et al. 1955). The average values of protein content of deciduous twigs may have been even lower prior to the unusual period of early spring growth. The protein content of eastern red cedar was higher than the average for deciduous species. Crude protein values were over 15 percent in both forbs and grasses—more than twice the minimum required for maintenance and higher than in any of the browse species examined.

Crude protein and cell contents were about the same in dead oak leaves as in deciduous browse twigs. However, the quantity of hemicellulose in dead leaves was very small, and the ADF:CWC ratio was extremely high, suggesting poor digestibility of CWC.

DISCUSSION

Because forbs were high in crude protein and in easily digestible cell contents, they probably provided the best winter forage for deer. Cool-season grasses with their high protein concentrations were also good winter food. The limited supply of highly nutritious green herbage was selected over the more abundant deciduous browse.

The deciduous and evergreen browse species were of limited quality. All browse species eaten by deer had low cell contents and high ADF:CWC ratios, indicating poor digestibility (Short and Reagor 1970). Protein values were also low. Forage quality of dead oak leaves was as low as that of deciduous browse twigs.

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