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MILO IN THE DIET OF WHITE-TAILED DEER FROM SOUTHERN ILLINOIS

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ABSTRACT

In a study of fall food habits of white-tailed deer on Crab Orchard National Wildlife Refuge, milo was the second most important food after honeysuckle, occurring in over two-thirds of all rumens sampled and making up one-third of the volume. As milo consumption increased, consumption of other foods decreased. Also, fewer different items were found when milo consumption was relatively high. Milo consumption declined over the one-month interval between collection periods. Several possible reasons are cited for the decline. Although milo was apparently more available than corn, its importance was believed to be primarily a result of preference, rather than mere availability.

INTRODUCTION

Food habits of white-tailed deer (*Odocoileus virginianus*) have been well documented; however, there is a lack of information on the use of milo (*Sorghum bicolor*) as a food item. The management program on Crab Orchard National Wildlife Refuge (CONWR) involves leaving about one-third of the milo and corn (*Zea mays*) crops unharvested as winter food for Canada geese (*Branta canadensis*) (unpubl. data, CONWR). In 1974 this amounted to around 120 ha (18,000 bushels) of milo and 216 ha (23,400 bushels) of corn. These grain crops and any waste residues after harvest are also available to a large refuge deer herd in the fall and early winter. This paper represents a portion of a study to determine fall food habits of the CONWR deer.

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MATERIALS AND METHODS

The study area, a portion of CONWR, was opened to a special hunt coinciding with the 1974 split deer season in Illinois. A 4,280-ha area south of Crab Orchard Lake was hunted during 15-17 November and a 2,040-ha area north of the Lake was hunted during 13-15 December.

Rumen samples provided by successful hunters were frozen until analyzed. After thawing, each sample was subdivided by washing it through a series of four screens with 2-, 4-, 8- and 16-per inch meshes to permit the analysis of particles of similar size. The point technique (Chamrad and Box 1964) was used in the analysis of all samples. Plant identification keys and reference collections aided in the identification of plant parts. Each food item was recorded by percent frequency (i.e., whether or not it occurred in a sample) and percent volume (as determined by the point technique). Importance values were determined by multiplying percent frequency by percent volume.

The sex, age, field dressed body weight and antler beam diameter (where appropriate) were recorded for each harvested deer and the location of each kill was plotted on aerial photographs of the Refuge. A weekly 17-mile automobile census was used to determine relative population levels on the study area [Cooperative Wildlife Research Laboratory (CWRL) records]. Data were averaged for a 6-month period preceding each hunt. Agricultural practices on the study area were determined from land use records at CONWR and through a survey of aerial photographs.

RESULTS AND DISCUSSION

Contents of 173 rumen samples were analyzed to determine diet. To evaluate diets of deer of different sex and age, data for 112 (14 in each of the 0.5, 1.5, 2.5, and 3.5+ year sex-age classes) deer harvested on the south area were compared with data from 56 (7 per age class) harvested from the north side.

Deer on CONWR had a relatively simple diet during the fall (Table 1). Forty-five plant items were identified in addition to eight categories of unknowns. The top five foods accounted for over 85 percent of the mean volume of all samples. Honeysuckle (*Lonicera japonica*) and milo were the two primary foods, rating far above all others in importance values (Table 1).

TABLE 1. Percent volume, percent frequency, and importance values for the foods occurring in 173 rumens taken from CONWR deer during November and December, 1974.

	Plant	Part(s) Eaten	$\bar{X}$ % Vol.	$\bar{X}$ % Freq.	Importance Value
1)	*Lonicera japonica*	leaves, stems	30.39	98.3	2,987.3
2)	*Sorghum bicolor*	seed heads	33.14	68.2	2,260.1
3)	Gramineae and Cyperaceae	blades	4.74	82.1	389.2
4)	*Zea mays*	grain, cobs, silk, stalks	11.08	34.1	377.8
5)	*Plantago* spp.	leaves	1.31	26.0	34.1
6)	*Gleditsia triacanthos*	seed pods	1.19	19.7	23.4
7)	*Rhus glabra*	fruiting heads	0.70	25.4	17.8
8)	*Prunus serotina*	leaves	0.82	19.7	16.2
9)	*Diospyros virginiana*	fruit	0.60	20.8	12.5
10)	*Rosa* spp.	leaves, fruit	0.61	20.2	12.3
11)	*Pinus* spp.	needles	0.83	13.9	11.5
12)	*Smilax* spp.	leaves	0.62	17.3	10.7
13)	*Rubus* spp.	leaves	0.20	10.4	2.1
14)	*Acer* spp.	leaves	0.35	10.4	3.6
15)	*Trifolium* spp.	leaves	0.25	9.8	2.5
16)	*Symphoricarpos orbiculatus*	fruit	0.19	7.5	1.4
17)	*Lespedeza stipulacea*	leaves	0.25	5.2	1.4
18)	*Quercus* spp.	acorns	0.39	2.9	1.1
19)	*Vitis cinerea*	fruit, leaves	0.46	4.6	0.7
20)	*Polystichum acrosticoides*	fronds	0.13	3.5	0.5
21)	*Glycine max*	seed pods	0.13	1.2	0.2
22)	*Daucus carota*	leaves	tr.	4.6	--
23)	*Allium vineale*	aerial parts	tr.	2.9	--
24)	*Ulmus* spp.	leaves	tr.	1.1	--
25)	*Juniperus virginiana*	needles	tr.	2.3	--
26)	*Lespedeza cuneata*	leaves	tr.	2.9	--
27)	*Cornus florida*	leaves, seeds	tr.	1.7	--
28)	*Antennaria plantaginifolia*	leaves	tr.	0.6	--
29)	*Melilotus* sp.	leaves	tr.	2.3	--

TABLE 1. Continued.

	Plant	Part(s) Eaten	$\bar{X}$ % Vol.	$\bar{X}$ % Freq.	Importance Value
30)	*Ambrosia artemisiifolia*	leaves	tr.	1.2	--
31)	*Malus pumila*	leaves	tr.	0.6	--
32)	*Glecoma hederacea*	leaves	tr.	0.6	--
33)	*Ipomoea* sp.	flower	tr.	0.6	--
34)	*Passiflora incarnata*	fruit, seed	tr.	1.7	--
35)	*Polygonum pennsylvanicum*	seed	tr.	1.2	--
36)	*Cuscuta* sp.	leaves	tr.	0.6	--
37)	*Oxalis* sp.	leaves	tr.	0.6	--
38)	*Euphorbia serpens*	leaves	tr.	0.6	--
39)	*Parthenocissus quinquefolia*	leaves	tr.	0.6	--
40)	*Quercus* spp.	leaves	tr.	0.6	--
41)	*Ulmus americana*	leaves	tr.	0.6	--
42)	*Liriodendron tulipifera*	leaves	tr.	0.6	--
43)	*Fraxinus* sp.	seed	tr.	0.6	--
44)	*Achillea millefolium*	leaves	tr.	0.6	--
	UNKNOWNS:				
1)	Woody spp.	leaves	7.35	83.8	615.9
2)	Woody spp.	stems	0.84	40.5	34.0
3)	Herbaceous spp.	leaves	1.49	60.7	90.4
4)	Herbaceous spp.	stems	1.11	38.7	43.0
5)	--	fragments	0.14	8.1	1.1
6)	--	seeds	tr.	0.6	--
7)	Woody spp.	fruit (nuts)	tr.	0.6	--
8)	Herbaceous spp.	fruit	tr.	1.2	--

Various authors have noted the importance of honeysuckle in the diet of deer (Thorsland 1966, Nixon et al. 1970, Segelquist et al. 1971, Sheldon and Causey 1974), and have reported that deer use most of the other items found in CONWR deer rumens; however, little information has been published on milo in the diet of deer.

TABLE 2. Significant correlations* between percent milo consumption (by volume) and percent consumption of other foods, based on 173 rumen samples from deer harvested from CONWR in 1974.

	Correlation Coefficient
% milo with % honeysuckle	- 0.5996
% milo with % corn	- 0.3589
% milo with % grasses and sedges	- 0.2265
% milo with % woody leaves	- 0.3002
% milo with number of different food items	- 0.3391

*α = 0.01.

Milo has only recently come into widespread use as a grain crop in southern Illinois (Martin and Leonard 1967). According to Crampton and Harris (1969) it is a nutritionally well-balanced food, averaging 12.4 percent protein, 4,389 kcal/kg energy, and 0.33 percent phosphorus. These levels are considered moderate to high in these required nutrients for deer (Urness 1973). In the present study negative correlations (not all significant) were noted between percent milo consumption by volume and percent consumption of the other foods considered, and variety of items consumed per sample (Table 2). When consumption of milo increased, consumption of other foods decreased, suggesting that deer could get most of their nutrients from milo. Comparing dressed body weights and antler characteristics of CONWR deer (Table 3) with those for deer from other parts of southern Illinois (Richie 1970), it appears that milo in conjunction with the other foods consumed is supportive of good herd condition. Richie (1970) noted that both male and female fawns and yearling males averaged slightly heavier ($\bar{X}_{mf}$ = 61 lbs, $\bar{X}_{ff}$ = 53 lbs, $\bar{X}_{ym}$ = 112 lbs) than those in the present study. However, weights of other sex and age classes were virtually identical to those in the present study.

TABLE 3. Mean field dressed body weights and antler beam diameters of deer harvested from CONWR in 1974.

	Age (Years)	Mean Field Dressed Body Weight (lbs)	Mean Antler Beam Diameter (mm)
Males	0.5	54.2	--
	1.5	101.3	17.5
	2.5	138.0	27.0
	3.5+	163.1	33.3
Females	0.5	48.9	
	1.5	83.9	
	2.5	93.9	
	3.5+	97.6	

TABLE 4. Percent volume, percent frequency, and importance values for the four principal foods in 114 and 59 deer rumen samples collected during the November (south) and December (north) CONWR hunts, respectively, in 1974.

	November Hunt			December Hunt		
Plant	$\bar{X}$ % Vol.	$\bar{X}$ % Freq.	Imp. Value	$\bar{X}$ % Vol.	$\bar{X}$ % Freq.	Imp. Value
Sorghum bicolor	43.47	85.1	3,699.3	13.2	35.6	469.9
Lonicera japonica	24.25	96.5	2,340.1	42.2	100.0	4,220.0
Gramineae and Cyperaceae	5.15	83.3	429.0	4.0	79.7	318.8
Zea mays	4.47	14.9	66.6	23.9	71.2	1,701.7

A decline in milo consumption was noted between the first (south) and second (north) hunts, coinciding with an increase in honeysuckle and corn consumption (Table 4). Milo acreage on the south area made up 6.5 percent of the land use, while accounting for only 3.5 percent of the land use on the north side (Table 5). This partially explained the substantial drop in milo consumption between the two areas. The dramatic decrease in milo consumption and increase in corn consumption between the November and December hunts suggested that deer tended to turn to corn only after the supply of milo had diminished.

The rapid deterioration of milo when exposed to weather (DeVos and Mosby 1971) may partially account for its decline in consumption over the one-month interval between the hunts. Other possible explanations for the decline include a shift in preference from milo to corn, greater availability of corn or other more preferred foods on the north area, or greater competition for corn on the south where the average number of deer seen per mile was substantially higher than on the north area. Less milo may have been available on the north area as a result of the time differential and due to the geese, which tend to feed first in the center of open fields and move toward the edges (Bell and Klimstra 1970) where they compete more directly with the deer for food. While it is probable that milo grown near woody cover received heavier utilization by deer there was no evidence that a greater proportion of milo than corn was situated near woods on either of the study areas.

TABLE 5. Deer data, acreage, and land uses along the study areas on CONWR.

	$\bar{X}$ deer seen per mile*	$\bar{X}$ deer killed per mile	Total area (ha)	Percentage in each land use type				
				Pasture	Milo	Corn	Hay & Clover	Woody & other cover
South area	20.3	90.1	504	7.6	6.5	8.2	6.7	71.0
North area	6.9	34.8	291	10.5	3.5	14.6	10.3	61.1
Total	14.0	64.1	795	8.6	5.4	10.4	7.9	67.7

*Based on CWRL census data collected prior to the harvest.

Honeysuckle and corn consumption showed weak negative correlations with mean number of deer seen per mile ($r = -0.194$, $\alpha = 0.05$, and $r = -0.255$, $\alpha = 0.01$, respectively), whereas milo consumption and mean number of deer seen per mile were positively correlated (not statistically significant) (Table 5). Thus, as numbers of deer increased, corn and honeysuckle consumption decreased, whereas milo consumption was apparently not affected by deer numbers. It seemed likely that deer were attracted to the milo, as the percentage of land in milo (5.4 percent) was about half that in corn (10.4 percent) yet the consumption by percent volume of milo was almost three times that of corn (Table 1). By percent frequency it was about twice that of corn. More deer were observed in areas where milo was abundant. Milo was apparently more easily obtainable than corn, as there was little difference in the consumption of milo among the different age classes except for fawns, which generally showed the lowest consumption of corn and higher consumption of milo (Table 6).

Evaluation of pre- and post-hunt censuses indicated a pre-hunt density of one deer per 2.3 ha on the study area (CWRL records). This is an extremely high density, as one deer per 32 acres (12.8 ha) has been reported as an average density (Hosley 1956). Apparently the abundance and availability of agricultural crops serve to buffer the impact of deer on native vegetation and effectively raise the carrying capacity of the area.

TABLE 6. Percent volume of milo and corn consumed by animals representing selected age classes of deer harvested from CONWR in 1974.

	MALES Age (Years)				FEMALES Age (Years)			
	0.5	1.5	2.5	3.5+	0.5	1.5	2.5	3.5+
November								
Milo	55.2	47.4	48.8	38.1	43.1	35.4	41.9	38.7
Corn	--	1.5	16.1	0.9	2.9	4.4	6.1	5.2
December								
Milo	1.4	7.9	10.5	6.4	22.7	11.4	30.4	11.3
Corn	13.1	25.6	59.1	43.5	9.4	14.7	9.7	9.8

While corn and milo are heavily used by deer on CONWR, it is not suggested that the level of utilization be considered an index of deer density, as variation in crop yields from one year to the next or planting patterns might affect the use deer make of grain. The degree of utilization of these grain crops however, should be of substantial concern in any management program for CONWR deer because it is extremely unlikely that the native plants could support such a high deer density.

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