Cattle Utilization and Chemical Content of Winged Elm Browse[1]

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Highlight

Cattle browsed winged elm twigs most intensively during May 1 to late July, when the browse was succulent and higher in crude protein content. As the growing season progressed, upward trends were observed in percent dry matter, ether extract and crude fiber, while downward trends were observed in percent moisture, protein and nitrogen-free extract.

Winged elm *(Ulmus alata)* occurs throughout southeastern United States from eastern Kansas, Oklahoma and Texas to the coast of North and South Carolina and parts of Florida (Brush 1918; Shipman, 1959). In the central states, including Oklahoma, it occurs as a sub-dominant species in the post oak-blackjack oak *(Quercus stellata - Q marilandica)* forest type described by Duck and Fletcher (1943). The major cattle forage in Oklahoma is grass, however, cattle and deer utilize winged elm and other browse species.

Kingery (1963) listed elm as one of the principle browse plants of the Wichita Mountains Wildlife Refuge and Dwyer (1961) stated that cattle in northern Oklahoma often browsed American elm *(Ulmus americana)* intensely, keeping some plants in a shrubby form. According to Halls et al. (1957) browse constituted up to 16 percent of the cattle diet in the Georgia Coastal Plain. This indicates that browse can be an important forage in the diet of cattle.

There are varying opinions as to the importance of winged elm as a browse plant. Whitetail deer *(Odocoileus virginianus)* browse winged elm heavily, according to Van Dersal (1938). Carlile (1963)[2] stated that winged elm was in the top three browse species preferred by whitetail deer in Oklahoma. Halls (1963)[3] listed the elm low to medium as a deer browse in the Texas-Louisiana-Tennessee area. The difference in the ratings or degree of utilization may have been due to variation in locale, other available forage and other factors.

While some very general information is available on winged elm browse, there are no specific data on degree of utilization by cattle, chemical composition or seasonal variations of either. The purpose of this study was to obtain more specific information on the degree to which winged elm was utilized by cattle in southeastern Oklahoma and the chemical composition of the young winged elm twigs sampled periodically during the growing season.

Methods and Materials

An area in the blackjack-post oak forest type was selected for

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[2] *Personal communication from F. Carlile, deer range specialist, Warner, Oklahoma. 1963.*

[3] *Personal communication from L. K. Halls, Range Conservationist, Southern Forest Experiment Station, Nacogdoches, Texas. 1963.*

the study. The area, in southeastern Oklahoma, had been aerially sprayed with 2,4,5-T to control oak species. Winged elm remained abundant on the area due to its resistance to the herbicide. Most of the elms were very shrubby because of previous heavy browsing (Figure 1). Plants less than 36 inches tall often had trunks as much as 1.5 inches in diameter due to the heavy browsing.

Twig Utilization.—Winged elm plants ranging from 18 to 48 inches in height were randomly selected throughout the grazing area. The following two treatments were applied to the selected plants in a randomized complete-block design replicated 20 times. Each elm represented one replication.

1. Twenty winged elm plants were protected from cattle browsing by cylindrical woven wire cages placed around the plants and attached to reinforcing rods which were driven into the soil. The current season's twig length was determined periodically from three randomly tagged branches on each elm. Metal tags were used to identify the branches and were placed so a minimum of 10 growing twigs occurred between the tag and branch tip. Periodic measurements were made of all growing twigs occurring between the tag and the branch tip. Individual twigs were measured from the point of the current season's growth to the twig tip.

2. Twenty winged elm plants were left unprotected from cattle browsing and were tagged for identification. Twig measurements were made as in treatment 1. The percentage twig utilization was calculated as follows:

$$\frac{TC - TU \times 100}{TC}$$

Where TC = twig length from caged elms and TU = twig length from uncaged elms. Because the apical meristem was destroyed by terminal browsing, the assumption was made that the difference in twig length of caged and uncaged elms was due only to browsing and not to a difference in twig growth.

FIGURE 1. Suckling calves browsing on shrubby winged elm.

Chemical Analyses. — Twenty winged-elm plants protected from browsing by cylindrical woven wire cages were used for chemical analyses. Hand-collected samples were taken from each elm and a composite sample prepared. The twigs were clipped to include only the current season's twig and leaf growth. An attempt was made to simulate cattle browsing. At least 50 grams, oven-dry weight, were collected at each sampling date. Each sample was chemically analyzed in duplicate and an average value obtained. Analytical procedures were the same as those listed and discussed by Webster, et al. (1963).

Results and Discussion

Twig Utilization. — The cattle stocking rate was two animal units per acre during grazing. However, grazing was deferred for short periods in late May and July. Numerous grass species produced most of the forage on the area.

Whitetail deer were present in the general study area, but their presence was not evident at the study plots.

Periodic differences were noted in the amount of twig growth utilized. Percent twig utilization increased from 6.5 percent on May 3 to 33 percent on July 23 (Table 1). No change in utilization was noted from July 23 to September 23. The September 23 value may have been affected by a fire which destroyed some of the elms in the study.

The degree of twig utilization by cattle appeared to be related to crude protein and moisture content (Table 1). Crude protein and moisture percentage declined from 13.6 to 7.4 and 65.6 to 39.0, respectively, from May 3 to September 23. When crude protein and moisture content reached their lowest levels, utilization of winged elm was curtailed. Lignin content varied only slightly and did not appear to be an important factor affecting browse utilization (Table 2).

Results of the study show that winged elm is browsed relatively heavy by cattle and if small winged elm plants are present, they may be heavily utilized under intense grazing practices. Cattle make the most use of small elm plants within easy grazing reach. Heavy browsing would aid in control of small winged elm by limiting plant growth and reproduction. Control of small winged elm by browsing would be desirable in areas where the elm limits more

Table 1. Percent twig utilization by cattle and proximate analyses of winged elm twigs (percent dry weight), 1963.

Component	Date of Sampling				Avg.
	May 3	May 30	July 23	Sept. 23[1]	
Twig Utilization	6.5	20.0	33.0	33.0	—
Proximate Analyses					
Moisture	65.6	60.0	45.8	39.0	52.6
Dry Matter	34.4	40.0	54.2	61.0	47.4
Ash	5.2	7.0	6.6	6.8	6.4
Ether extract	1.3	1.6	6.1	7.4	4.1
Crude fiber	16.6	20.7	22.3	22.9	20.6
Crude protein	13.6	10.6	8.8	7.4	10.1
Nitrogen-free extract	63.3	60.1	56.2	55.5	58.8

[1]Composite of 8 field samples, remaining 12 were destroyed by fire.

Table 2. Other chemical analyses of winged elm twigs (Dry weight percentages), 1963.

Component	Date of Sampling				Avg.
	May 3	May 30	July 23	Sept. 23[1]	
Lignin	15.0	17.6	15.6	13.3	15.4
Sugars					
Reducing	1.2	0.7	0.9	0.8	0.9
Sucrose	2.6	1.8	2.6	2.4	2.3
Total	3.8	2.5	3.5	3.2	3.2
Acid Hydrolysis					
Strong	21.2	22.2	18.6	19.4	20.4
Mild	4.1	4.3	4.3	4.3	4.3
Alcohol soluble solids	26.5	23.1	26.3	29.0	26.2
Alcohol soluble nitrogen	2.3	1.5	1.7	2.0	1.9
Alcohol soluble ash	1.7	1.3	1.1	0.7	1.2

[1]Composite of 8 field samples, remaining 12 were destroyed by fire.

desirable forage production.

The degree of winged elm utilization may be affected by grazing intensity, deferment grazing schedule and the destruction of the twig apical meristem. Due to this, the utilization values were not as exact as might be desired. However, an indication of the degree of utilization by cattle was obtained.

Chemical Analyses. — Variations in chemical content were observed at different sampling dates (Tables 1 and 2). Downward trends were observed in percent moisture, protein and nitrogen-free extract as the season progressed from May 3 to September 23. Average seasonal composition of these components was 52.6, 10.1 and 58.8 percent, respectively. Upward trends were observed in dry matter, ether extract and crude fiber during the same period. Average seasonal composition of these components was 47.4, 4.1 and 20.6, respectively. Little to no change was observed in ash content reported in Table 1 or any component reported in Table 2.

Crude fiber was lower and crude protein, nitrogen-free extract and ether extract were higher in the winged elm samples than would be expected for actively growing bluestem grass when compared on a dry matter basis (Morrison, 1959).

Summary and Conclusions

This study was conducted to determine the degree to which cattle browse winged elm twigs and to determine the chemical content of the browse forage. Seasonal differences were noted in the determinations.

Seasonal differences were found in the degree to which cattle browsed winged elm. The more intense browsing was done between the first of May and the last of July, when the browse was more succulent and had higher protein content.

Downward trends were observed in percent moisture, protein and nitrogen-free extract as the growing season progressed; seasonal averages were 52.6, 10.1 and 58.8 percent, respectively. Upward trends were observed in dry matter, ether extract and crude fiber as the growing season progressed; seasonal averages were 47.4, 4.1 and 20.6 percent, respectively. Little or no change was noted in any other chemical component.

The degree of twig utilization by cattle appeared to be positively related to protein and moisture content.

By comparing winged elm browse and actively growing bluestem grass, it was noted that the crude protein, nitrogen-free extract and ether extract were higher in the elm samples.

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