CUTTING DATE EFFECTS ON YIELD AND QUALITY OF UNIMPROVED KUDZU (PUERARIA LOBATA (WILLD.) OHWI.)

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ABSTRACT

Kudzu (*Pueraria lobata* (Willd.) Ohwi.), a vigorous, perennial warm-season legume, is considered a weed in the southern United States. It is tolerant of drought and low soil fertility and has potential as a low-input forage for livestock production. A field experiment tested effects of cutting date on yield and nutritive value of an unimproved stand of kudzu (10-15 yr old) in central Georgia. Yield measurements were made in June, July, September, and November, 1994, with forage samples taken to determine quality parameters. Soil fertility was unaffected by cutting treatment. Whole plant and leaf dry matter (DM) production and crude protein (CP) were similar for the 3 summer harvests and lower ($P<0.05$) in a final harvest taken after a killing frost. Whole plant and stem in vitro dry matter disappearance (IVDMD) declined throughout the growing season, while leaf IVDMD remained the same (546-579 kg/ha) up until first frost. Kudzu has potential as a low-input forage for livestock in its zone of adaptation.

KEYWORDS

Kudzu, yield, nutritive value, protein bank, drought feed

INTRODUCTION

Kudzu, a leguminous warm-season perennial vine, is growing on approximately 3 million ha in the southeastern United States (Everest *et al.*, 1978), mostly as a volunteer species. Because of a climbing growth habit and large leaves, kudzu can dominate most other vegetation and can become a pest species if left undisturbed. Once valued as a forage crop, kudzu is now classified as a common weed in the south. Kudzu is adapted to a wide range in soil fertility and acidity. Though slow to establish, mature kudzu stands are very tolerant of drought, with a large, deep root system (Everest *et al.*, 1978). Kudzu may have potential as a low-input forage crop, particularly for use as supplemental feed during periods of drought, or in late summer or autumn when quality of warm-season grasses is reduced.

A field study was designed to investigate the effect of cutting date and frequency on yield and quality of an unimproved stand of kudzu.

METHODS

Experimental plots (15.25 x 30.5 m) were laid out near Fort Valley, Georgia (32½ 33' N, 83½ 54' W), on a well-established stand of kudzu (10-15 years) that had no fertilizer, herbicide, or pesticide inputs for the life of the stand. Soil in the plot area was an Orangeburg loamy fine sand (Fine loamy, siliceous, thermic Typic Paleudult). Experimental plots were laid out in May 1994, and cutting treatments (single harvests on June 3, July 25, September 14, and November 2) were randomly assigned to plots in 4 blocks. Final cutting (November 2) was made after a killing frost.

At each harvest, yield measurements were taken at 5 locations within each plot by cutting and weighing all plant material in a randomly placed 2 x 2-m quadrat. Cuttings were made with a gas-powered hedge trimmer. Starting with the July harvest, there was a distinct layer of dead leaves and vines in the stand, so separate yield measurements were made on live and dead material. Grab samples were taken from live cut material for analysis of whole plant tissue and leaf and stem separations. Soil samples were taken at first cutting date and at the end of the growing season to monitor soil nutrient status. Leaf and stem separations were done by hand. All whole plant, leaf, and stem samples were dried at 50½ C for 48 hours and ground to 1-mm particle size. Ground samples were analyzed for DM (AOAC, 1984), Ca, Mg and P content (Watkins *et al.*, 1987), CP (Jones *et al.*, 1990), and IVDMD (Windham and Akin, 1983). Soil samples were analyzed for pH, available P, K, Ca, and Mg, and organic matter by the University of Georgia Cooperative Extension Service Soil Testing Laboratory, Athens, Georgia.

Yield, forage quality, and soil data were analyzed as a randomized block design (SAS, 1988). When the F-test was significant, means were separated using Duncan's multiple range test (SAS, 1988). For soil analysis data, nutrient levels at the end of the growing season were statistically compared with pre-trial levels.

RESULTS AND DISCUSSION

There was no effect of cutting treatment on soil fertility in the kudzu plots, but nutrient levels were lower ($P<.05$) at the end of the growing season than at the beginning. Averaged across all plots, pretrial available soil nutrient concentrations were 21, 113, 1671 and 198 kg/ha, while season-ending levels were 13, 88, 917 and 112 kg/ha for P, K, Ca and Mg, respectively. Soil pH(6.6) and organic matter content (1.3%) did not change during the season and were not affected by cutting treatment.

Live whole plant and leaf DM yields were similar in the June, July, and September harvests but were lower ($P<0.05$) in the cutting made in November, after frost (Table 1). Dry matter yields were similar to or slightly less than reported values for well-fertilized stands of this forage (Sturkie and Grimes, 1939; O'brien and Skelton, 1946). Live stem DM yield was stable for the first 2 harvest dates and lower ($P<0.05$) for the last 2. Total DM production (live + dead) increased throughout the year due to a steady increase in dead material as the season progressed. As dead forage DM has essentially no feeding value, this material would greatly reduce kudzu feed quality if forage is cut for hay or silage after early July. Based on our data, an early June harvest is the best time to cut kudzu for hay or silage since DM yields at this time were similar to later harvests, and there was no dead forage buildup.

Crude protein of kudzu whole plant and leaf DM were stable from June through September, while leaf CP was lower ($P<0.05$) in forage harvested after frost in November (Table 2). Stem CP was stable for the first 2 cuts and then lower ($P<0.05$) in September and November. Whole plant Ca, Mg, and P concentrations were not affected by cutting date, but in leaf tissues, Mg and P were reduced ($P<0.05$) and Ca increased ($P<0.05$) as the growing season progressed. Whole plant IVDMD was lower ($P<.05$) in forage harvested in September than in the June- or July-cut material due to reduced ($P<.05$) stem IVDMD. These differences were probably due to increasing vine thickness and maturity as harvesting was delayed from June to September. Leaf IVDMD remained the same throughout the growing season. Thus, kudzu appears to be well-suited for use as a protein bank for supplemental summer or autumn grazing by livestock. Tropical kudzu (*P. phaseoloides*) is commonly used in this manner to improve livestock performance on tropical grass pastures in Central and South America, particularly in the dry season (Ruiloba, 1990; Lourenco *et al.*, 1992).

Kudzu holds promise as a low-input forage for livestock production in its zone of adaptation. Further research on this forage is needed to define long-term cutting date-soil fertility interactions and effects on yield sustainablility, but in the short term this species can inexpensively provide good quality forage for supplemental drought feed or as a protein bank for summer or autumn grazing.

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Table 1
Cutting date effects on dry matter yield (kg/ha) of unimproved kudzu.

	Plant part				
Cutting date	Whole plant	Leaf	Stem	Dead material	Total live + dead
June 3	4670a[a]	1920ab	2750a	0a	4670a
July 25	4960a	2250a	2740a	2800b	7780b
September 14	4480a	2300a	2190b	5420c	9910c
November 2	3110b	1330b	1780b	6910d	10020c
SE[b]	340	210	160	190	390

[a]Column means followed by the same letter are not significantly different (P<0.05).
[b]Standard error.

Table 2
Cutting date effects on chemical composition and *in vitro* dry matter disappearance of unimproved kudzu.

		Date of cutting				
Item[a]	Plant part	June 3	July 25	Sept 14	Nov 2	SE[b]
		g/kg				
CP	Whole plant	146a[c]	154a	133a	NS[d]	9.3
	Leaf	218a	233a	236a	168b	5.5
	Stem	91a	83a	59b	47b	5.3
Ca	Whole plant	10.8a	11.0a	13.9a	NS	1.00
	Leaf	14.1a	15.3a	19.3b	24.8c	0.89
Mg	Whole plant	2.6a	1.9a	2.1a	NS	0.30
	Leaf	3.2a	2.2b	1.9b	1.7b	0.21
P	Whole plant	1.2a	1.7a	1.2a	NS	0.15
	Leaf	2.0a	2.2ab	1.8b	1.3c	0.08
IVDMD	Whole plant	519a	507a	473b	NS	4.2
	Leaf	569a	577a	576a	546a	10.5
	Stem	512a	462ab	440b	NS	10.1

[a]CP=crude protein; IVDMD=*in vitro* dry matter disappearance.
[b]Standard error.
[c]Row means followed by the same letter are not significantly different (P<0.05).
[d]No sample available for analysis.