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Effects of Grazing and Burning on Nutritive Quality of Cattail in Playas

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INTRODUCTION

Prescribed burning is commonly used to either control emergent marsh plants or improve their nutritive quality (Linde 1969, McAtee et al. 1979a, Smith et al. 1984). Grazing by livestock has also been known to maintain or improve protein levels in marsh plants (McAtee et al. 1979b). During late winter (January-March), landowners in the Southern High Plains region of Texas often graze livestock and/or burn playas in an attempt to control wetland vegetation. Most burning occurs in cattail (*Typha latifolia* L.) dominated playas because these playas have relatively large fine fuel loads (≥ 1000 g/m²; Smith 1988). Grazing and burning of playas is generally considered to have negative impacts on resident and migratory game species because of the loss of vegetative cover (Guthery and Stormer 1984). However, because playa water levels fluctuate widely (they are mostly dry in spring), water depths are generally not sufficient to cause a subsequent reduction in the production of cattail following burning or grazing and vegetative

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cover loss is short-lived (≤ 4 months). Therefore, the potential positive effects, primarily increased nutritive quality of cattail, may outweigh the short-term negative impacts to wildlife. The objective of this study was to compare the nutritive quality of cattail among burned, grazed, and control (no burning or grazing) playas.

METHODS

The study was conducted in Castro County, Texas, in the High Plains. More than 19,000 playa wetlands occur in the High Plains of Texas (Guthery and Bryant 1982) with most (69%) larger than 4 ha having been modified to concentrate water using trenches, pits, and levees for drainage or irrigation purposes. Playas receive water primarily from precipitation (average annual $\bar{x}$ = 47.5) and irrigation runoff (Bolen 1982). Those playas receiving a constant source of water from rainfall and irrigation are often dominated by cattail (Guthery et al. 1982).

Twelve playas ranging in size from 5-40 ha were selected for study. All were dominated (> 90% coverage of the basin) by cattail. The nutritive quality of cattails from these playas was sampled in April and in May. Two playas were used as a control (no treatment) in April and another playa was added as a control for a total of 3 control playas in May. Four playas were used in the burning treatment. Playas were burned from January through mid-March. The fires consumed > 90% of the above-ground litter. For the livestock grazing treatment 4 playas were used in April and 1 playa was added to this treatment in May for a total of 5. Cattle were grazed in the winter (November-March). Stocking rates were generally high and essentially all standing litter was knocked down to a height of < 0.5 m following grazing.

Four vegetation samples (~ 500g) were collected following treatments, from each playa in April when shoots were 15-40 cm tall and again in May when shoots were approximately 1 m in height. Shoots were sampled at these 2 stages of phenological development because nutritive quality varies by stage of development. Samples were dried to a constant weight at 50 C. The dried samples were ground through a 1 mm screen and analyzed for crude protein (micro-kjeldahl) and ash. Plant cell wall constituents (plant cell wall, cellulose, hemicellulose, lignin, and acid insoluble ash) were determined using neutral and acid detergent techniques (Goering and Van Soest 1970). Potential differences in the plant constituents (dependent variables) among treatments (independent variables) were tested during each sampling period with a factorial analysis of variance. Because the design was not balanced (i.e., different number of playas/treatment) potential differences ($P < 0.05$) among treatments (following a significant F-test) were tested using the least squares means in a least significant difference test.

RESULTS AND DISCUSSION

There were no differences ($P > 0.05$) among treatments in protein content or most other constituents in cattail collected in either sampling period (Table 1). Cellulose was slightly (~ 1%) higher ($F = 6.78$; $P < 0.23$) in cattail from the control playas (LSD; $P < 0.05$) in early spring. In late spring plant cell wall was the only variable that differed ($F = 5.61$; $P < 0.026$) slightly (~ 1%) among treatments being highest (LSD; $P < 0.05$) in the cattail from control playas.

Previous studies have demonstrated an increase in nutritive quality of aquatic plants following burning or grazing (McAtee et al. 1979b, Smith et al. 1984). These treatments possibly did not cause an increase in nutritive quality of cattail in playas possibly because playa wetlands are subjected to more frequent disturbances (e.g., water level fluctuations) than many other wetlands. These frequent disturbances may result in new growth with the nutritive quality of cattail remaining relatively high whether or not it has been grazed or burned.

Protein declined 4 to 5% in 1 month as cattail matured (Table 1). This is typical fo most aquatic plants (Boyd 1978). Similarly, the nutritive quality of cattail as a forage declined rapidly with plant cell wall, lignin, and cellulose increasing from early to late spring. Polisini and Boyd (1972) noted that cell content (1-plant cell wall) was positively correlated with digestibility in nonruminant species (e.g., most herbivorous marsh wildlife species). Fonnesbeck (1976) also noted that cell content was correlated with the digestible energy of feed.

The quality of cattail as a forage for cattle or wildlife declines rapidly and is of most value as a quality forage in

TABLE 1. NUTRIENT LEVELS (% DRY WEIGHT BASIS) OF *TYPHA LATIFOLIA* AS AFFECTED BY BURNING AND GRAZING IN PLAYA WETLANDS.

Chemical Compound	Early Spring[1]			Late Spring		
	Burned $\bar{x}$ (SD)	Grazed $\bar{x}$ (SD)	Control $\bar{x}$ (SD)	Burned $\bar{x}$ (SD)	Grazed $\bar{x}$ (SD)	Control $\bar{x}$ (SD)
Protein	15.0(0.5)	14.3(0.5)	14.1(0.7)	9.8(0.4)	11.0(0.3)	10.4(0.4)
Ash	13.4(0.7)	13.0(0.7)	12.7(1.0)	10.4(0.5)	10.9(0.5)	10.3(0.6)
Plant cell wall[2]	60.6(1.6)	63.4(1.6)	67.1(2.2)	68.2(0.3)	68.4(0.3)	69.7(0.4)
Cellulose[3]	25.9(1.0)	28.2(1.0)	32.5(1.5)	31.7(0.4)	32.0(0.4)	32.9(0.5)
Hemicellulose	21.0(0.6)	21.5(0.6)	19.4(0.9)	17.2(0.9)	17.1(0.8)	16.9(1.0)
Lignin	13.4(1.1)	13.4(1.1)	14.9(1.6)	18.6(0.6)	18.8(0.5)	19.5(0.7)
Acid insoluble ash	0.4(0.1)	0.2(0.1)	0.4(0.1)	0.8(0.1)	0.5(0.1)	0.5(0.1)

[1]Early season samples were collected in April when shoots were 15-40 cm and late season samples were collected in late May when shoot heights were approximately 1 m.
[2]Difference ($P < 0.05$) among treatments in late spring.
[3]Difference ($P < 0.05$) among treatments in early spring.

early spring as is the case for most plant species. Prescribed burning and livestock grazing during winter does little to improve the nutritive quality of cattail.

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