the concept, not whether we use 26 lbs/day or 17.6 lbs/day as the standard unit of measurement. The concept of a standard unit of measure must prevail, and we should all strive to conform to the new standard. The sooner we drop the connection of animal-unit with a particular animal, the better we will understand the concept of a standard unit of measure and how we can apply it to grazing management.

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Locoweed Effects on a Calf Crop

Michael H. Ralphs, David Graham, Lynn F. James, and Kip E. Panter

Locoweed causes neurologic disturbances and emaciation in livestock, but its most devastating economic impact results from damage to reproduction (James et al. 1981). Swainsonine, the toxic alakloid in locoweed, occurs in very low levels (.01–.2% of dry weight) in *Astragalus* and *Oxytropis* species. Swainsonine inhibits an essential enzyme in glycoprotein metabolism resulting in unmetabolizable hybrid sugar molecules that build up in vacuoles in cells and physically retard the cell function (Broquist 1985). Eventually, the organs and systems of the body lose their function, resulting in the many different clinical signs of poisoning.

The developing fetus is particularly susceptible to locoweed. Locoweed fed to pregnant ewes decreased fetal heart rate, caused cardiac irregularity, and decreased the strength of heart contractions (Panter et al. 1987). The weakened heart, in combination with right-heart failure, contributed to fluid accumulation in the anionic sack and placenta (hydrops amnii or allantois, commonly known as waterbelly). In other instances, the fetus dies and is aborted (James et al. 1967). Skeletal deformities of the limbs and spine have also been observed (James et al. 1967) and may be due to reduced fetal movement in ewes consuming locoweed (Panter et al. 1992).

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Astorga (1993) found lambs born to ewes fed locoweed were developmentally impaired. They were slow to get up following birth, lacked the nursing instinct, and would not seek their mothers. Without assistance, all lambs from locoed ewes would have perished. Other research also reported small, weak offspring with low survivability (Balls and James 1973, James 1971).

Swainsonine, is excreted in the mothers milk (Molyneux et al. 1985), so offspring that survive birth may become intoxicated later. Calves, lambs, and even cats fed milk from cows that consumed locoweed, developed lesions of locoweed poisoning (James and Hartley 1977).

Locoweed also reduces fertility in both the male and female. It decreased spermatogenesis in rams and caused a complete loss of libido (Panter et al. 1989, James and Van Kampen 1971); and suppressed estrus and conception rates in ewes (Balls and James 1973).

Overall, the pre- and post-natal survival of offspring can be seriously jeopardized by the mother consuming locoweed. The purpose of this paper is to describe an incidence of reproductive failure that occurred during a locoweed grazing study (Ralphs et al. 1992). It illustrates the potential effect locoweed can have on a calf crop.

Cattle Grazing Study

The study was conducted in western Union County in northeastern New Mexico. Sixteen mature cows (Hereford, Angus, Charolais, and their crosses, 800 to 1,100 lb)

were purchased from a ranch with a history of locoweed problems. White locoweed *(Oxytropis sericea)* was the predominate locoweed species on this ranch. The cows were split into two groups and transported to two locations to evaluate their consumption of two locoweed species.

The first site was 5 mi north of Capulin, N.M., and consisted of a combination of abandoned farmland that had been reseeded, and native range among volcanic basalt rock outcroppings. The pasture size was 75 ac. Major warm-season vegetation consisted of blue grama, sideoats grama, and little bluestem. Western wheatgrass was the dominant cool-season grass. White locoweed was the dominant forb, with other warm-season forbs becoming abundant in the early summer.

The other study site was near Gladstone, N.M. The study site was a 120 ac field that had been farmed until 1963 then seeded to blue grama, sideoats grama, and yellow sweet clover. Squirreltail and purple three-awn had come back naturally. A population outbreak of woolly locoweed *(Astragalus mollissimus)* occurred throughout this area in the fall of 1988, and a dense infestation remained in the spring of 1991.

The cows at both study sites were gentled and diets quantified by bite count. Diets were sampled during 5 grazing periods at Gladstone and 3 periods at Capulin, and are summarized in Table 1. The influence of locoweed on reproduction and calf crop are described in this paper. Details of specific sites, study design and locoweed consumption are described by Ralphs et al. (1993).

Table 1. Locoweed species, grazing periods and locoweeds consumed (Ralphs et al. 1993).

Location/species	Locoweed growth stage	Grazing Period	Loco in diet
			% of bites
Gladstone	Vegetative	1 March 28–April 1	0
Woolly locoweed	Vegetative	2 April 17–26 (Grazing pressure trial)	41
	Bud	3 April 27–May 5	23
	Flower	4 May 8–26	31
	Pod	5 May 31–June 23	5
Capulin	Vegetative	1 April 10–29	14
White locoweed	Flower	2 May 8–26	11
	Pod	3 May 30–June 23	1

Locoweed Consumption

Cattle rejected woolly locoweed at Gladstone at the beginning of the study even though it was the only green forage available among the dry grasses (Table 1). Gladstone cattle were then restricted to a small 16-ac pasture for 10 days where high grazing pressure and limited feed forced them to start grazing woolly locoweed (41% of bites). When the cows returned to the larger pasture of unlimited feed, they continued eating woolly locoweed for 23% of bites. Capulin cattle consumed white locoweed for an average of 14% of bites at the beginning of the study. When warm-season grasses became available in June and locoweed matured, cattle ceased grazing both locoweed species.

Reproductive Problems

Five calves died at or shortly after birth (Table 2). Four of these deaths were attributed to locoweed, for a 25% death loss. Of the calves that survived, four were weak or developmentally impaired to the point that they required assistance to get up and nurse. These calves would have died if assistance had not been rendered.

There was a relationship between the length of time the cows grazed locoweed and the incidence of calf death or impairment. The cows at Gladstone did not consume woolly locoweed during the first grazing period (March 28–April 2). However, during the second period, they were forced to consume high levels of woolly locoweed (41% of bites). Only the last 2 calves born at the end of this period were affected by locoweed (Table 2). The first grazing period on white locoweed at Capulin began on April 10. Average white locoweed consumption was substantially lower (14% of bites) compared to the Gladstone site, but the cows consumed locoweed for a longer period before calving started. Of seven calves born, only one was not affected by locoweed. Three died and three were weak at birth. The remaining cow apparently aborted, but the fetus was never found.

Cows at both locations continued to eat locoweed throughout May (Table 1). They all became depressed, solitary and difficult to drive. Those that had been wild at the beginning of the study became very docile and lethargic. There was no belligerence expressed. The surviving calves were also lethargic. Swainsonine is passed through the milk, so even the calves that were normal at birth became intoxicated.

The cows ceased grazing both species of locoweed during June. The cows and calves were placed on a locoweed-free pasture from July to November and returned to normal behavior and appearance. The average weaning weight of the calves in November was 380 lbs, which is below the average of 480 lb for that area. All cows were bred and were 3–5 months pregnant when checked in mid November.

Eight cows were kept for a continuing study. Four of the cows that were kept had been heavy locoweed eaters (20–30% of bites), and the other four were light eaters (5–14% of bites). All were diagnosed as pregnant and expected to calve in March and April. Three of the heavy loco-eaters died in March. Their calves died in utero and the cows started to abort. The decomposing fetal tissue apparently caused a severe and rapid toxemia, because the cows died within a few hours of the initial signs of abortion. The other heavy loco-eater did not calve; she apparently aborted earlier in the winter. One of the light loco-eaters died during calving in April but the calf was full term and appeared normal.

Table 2. Condition of calves at birth and amount of locoweed in their mothers diet prior to birth.

Birth date	Calf condition at birth	Loco weed in mothers diet
		%
Gladstone-woolly loco		
3-27	OK-cow died from infection of retained placenta	0
4-7	OK-slow to nurse	0
4-12	Died-froze at birth, not related to loco	0
4-19	OK-developed navel disease	0
4-22	OK	42
4-24	OK	42
4-25	Weak—couldn't get up, wouldn't nurse	46
4-30	Died-cow died later from infection resulting from premature birth	54
Capulin-white loco		
4-19	Weak	14
4-19	Died-kidney failure-mother had hydrops from previus loco consumption	0
5-5	Died at birth	26
5-6	Died at birth	25
5-7	Weak-couldn't get up	29
5-7	Weak	5
5-8	OK	8
—	Did not calve, probably aborted	6

Summary
5 calves died—4 from locoweed related causes—25% death loss.
4 calves weak—required assistance—25%
1 cow died from premature birth and subsequent infection.
1 cow didn't calve—presumed aborted

Conclusions

Locoweed had a devastating effect on the reproductive efficiency of cows in this study. There was a 25% death loss of calves at or near the birth, and an additional 25% of the calves born were weak and required assistance. The surviving calves, including those that were born normal, became lethargic and depressed as a result of receiving the locoweed toxin through their mother's milk. Their weaning weights were lower than normal for other cattle in that region. Although all the cows apparently recovered and bred back, there were residual reproductive problems in the four heavy loco-eaters. All four cows aborted and 3 died from complications induced by the abortions.

This magnitude of loss may not be as dramatic in a regular cow herd. Our cattle were confined to locoweed infested sites as part of the study design, whereas larger pastures would contain a mosaic of locoweed infested and non-infested sites. However, this is an example of the potential devastating effects locoweed can have on the productivity of a cow herd.

Locoweed poisoning generally occurs in the spring. The surest means to prevent poisoning is to create or maintain a locoweed-free pasture for spring grazing. Many locoweed species are restricted to certain soils or habitats. Sites with no or light locoweed infestations could be reserved for spring grazing. Locoweed could also be controlled with rangeland herbicides in critical spring pastures.

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