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Cattle Toxicity from Woolly Locoweed (*Astragalus mollissimus*): A Case Study in Central New Mexico

Abstract

Livestock toxicity resulting from poisonous plants poses a significant challenge for ranchers, particularly concerning locoweeds (*Astragalus spp. or Oxytropis spp.*). This study investigated a case of cattle poisoning in central New Mexico, where clinical signs were consistent with locoweed toxicity. Rangeland conditions were hot and dry following earlier spring rains, promoting advantageous environmental conditions for a locoweed outbreak. Analysis of Woolly locoweed (*Astragalus mollissimus*) and animal samples from the ranch confirmed the presence of swainsonine, a key toxin in locoweeds. It can be concluded that the likely cause of cattle losses was locoweed toxicity, highlighting the need for proactive management strategies when environmental conditions are conducive to increases in locoweed populations.

Keywords

Astragalus mollissimus, swainsonine, locoweed, cattle

INTRODUCTION

Livestock toxicity resulting from the ingestion of poisonous plants is one of the many hazards ranchers face across western rangelands. In New Mexico alone, there are over 3000 different plant species, with at least 270 of them reported as poisonous to livestock (Fox *et al*., 2010). Among these, locoweeds (*Astragalus spp. or Oxytropis spp.*) are notably one of the most problematic species in the state. Swainsonine, an indolizidine alkaloid, is the primary toxin associated with locoweed poisoning, although other *Astragalus* species can accumulate or contain high levels of selenium or nitro-toxins (Cook et al., 2009; Allison *et al*., 2016). All parts of the plant are toxic, whether green or dry, posing risks to horses, humans, and all classes of livestock. Locoweeds are often greener in the spring when other forages are still dormant or slow to grow. Spring precipitation stimulates locoweed growth, necessitating more intensive livestock management to limit or avoid ingestion (Cook *et al*., 2009). Signs of poisoning include incoordination, visual impairment, depression, unpredictable behavior, emaciation, and death. While there is no specific treatment, early detection allows for isolation and feeding of hayed forage, which aids in recovery. Recovery may take 1-2 weeks or more (Panter *et al*., 1999).

BACKGROUND

A cattle ranch located northwest of Corona, New Mexico, with approximately 180 head of cows and 36 heifers, serves as the focus of this case study. The animals were introduced to the pasture in mid-April of 2023. Emergence of clinical signs among the cattle were first observed in late May. These signs closely resembled those documented for locoweed poisoning (Cook *et al*., 2009), encompassing fetlock buckling (Figure 1), loss of animal condition, uncharacteristic gait or wide stance (Figure 2), trembling, loss of coordination (evidenced by attempts to drink water from four inches above water line), hair loss, blindness and death. Attempts were made to isolate sick animals and provide them with hay; nevertheless, a total of 21 cows and 4 heifers died, while 32 heifers failed to recover, resulting in their culling (Rancher, personal communication).

The ranch received a sufficient amount of rain in late March, triggering some plants in the pasture to green up. This was followed by dry, higher-than-normal temperatures through mid-May. The 40-year average annual precipitation is 13.7 inches (347 mm) with 2023 precipitation averaging 10.7 inches (270 mm; PRISM, 2024). Average annual forage production is 850 to 1570 lbs per acre (Soil Survey Staff, 2024). The majority of the pasture is deep sand savanna, penistaja sandy, and witt loamy ecological sites. Primary plant composition consisted of one-seed juniper (*Juniperus monosperma*), broom snakeweed (*Gutierrezia sarothrae*),

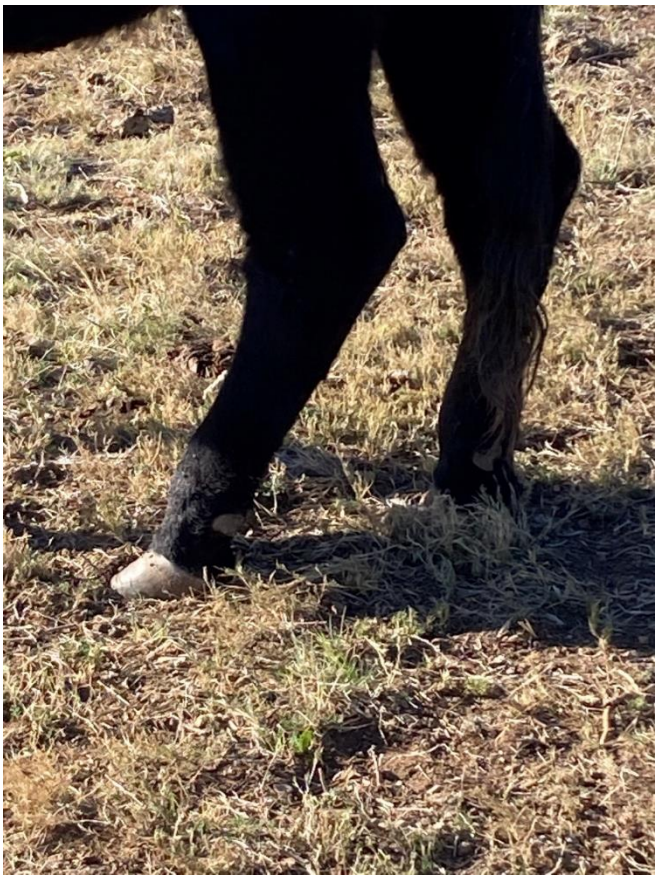

Figure 1. Fetlock buckling of a heifer from ingestion of wooly locoweed (*A. mollisimus*) in New Mexico.

blue and black grama (*Bouteloua gracilis* and *eriopoda*), galleta (*Pleuraphis jamesii*), and little bluestem (*Schizachyrium scoparium*). In New Mexico, supplementation of cattle during the non-growing season is a common practice due to the lack of nutrients in dormant range forages (Ward and Scholljegerdes, 2019). However, no supplementation was provided during the period of cattle symptomology.

ASSESSMENT AND RESULTS

The rancher contacted the USDA Poisonous Plants Research Laboratory (PPRL) in early July of 2023. Following discussions, locoweed was identified as a potential cause of cattle poisonings. Plant material, rumen contents, and a liver sample were subsequently collected by the rancher and submitted to PPRL for analysis. Samples were assessed for swainsonine using methods described by Gardner and Cook

(2011). Swainsonine was detected in all samples (Table 1). Plant samples concentrations were similar to other evaluated *A. mollissimus* collections (Ralphs et al., 2008; Cook *et al*., 2016). The presence of swainsonine in the rumen contents and liver only serve as a qualitative biomarker that a swainsonine-containing plant was being ingested. Quantitative clinical ranges vary with species, breed, and individual animals and are inadequate by themselves to diagnosis swainsonine intoxication.

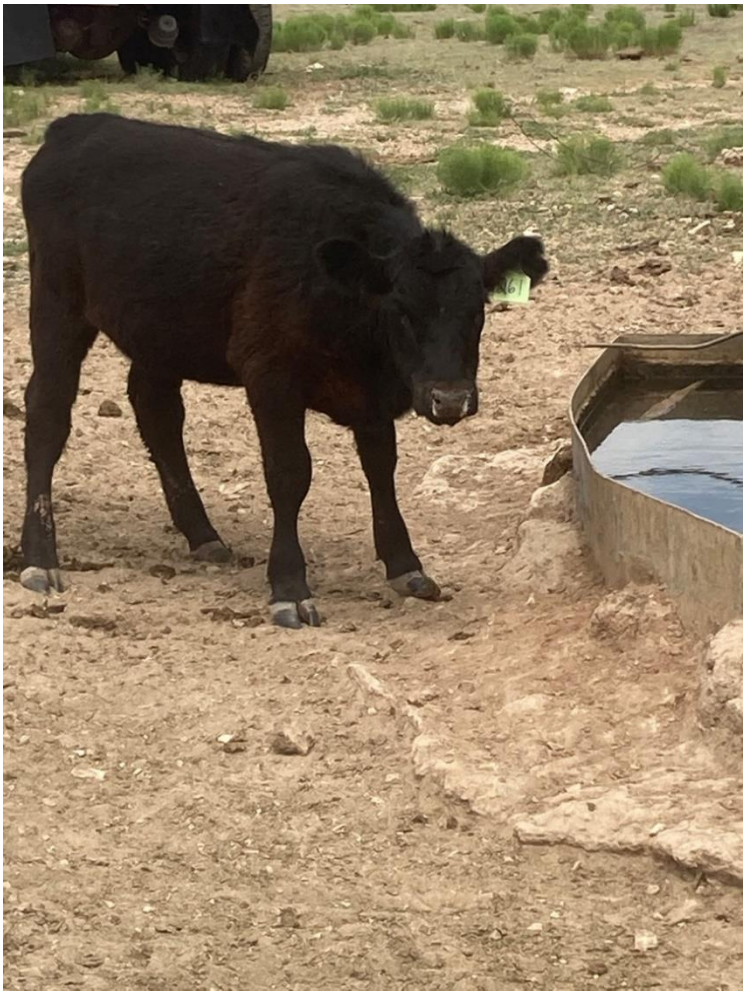

Figure 2. Heifer exhibiting toxicological signs of swainsonine poisoning in New Mexico.

A site visit was conducted later in July to evaluate rangeland conditions and discuss management recommendations. The ranch's dense and dominant *J. monosperma* presented challenges for a large-scale assessment. Conditions in visited areas were dry, with *G. sarothrae* and other small forbs being the predominant green vegetation. Grasses appeared brown and dormant. Woolly locoweed (*A. mollissimus*) was identified and collected during the visit (PPRL Herbarium, voucher #5126).

Table 1. Swainsonine content of three samples taken in central New Mexico.

Sample Type	Swainsonine concentration (%)
Astragalus mollissimus	0.17
Rumen	0.04
Liver	0.0002

Risk of locoweed toxicity is greatest during April and May due to other forages such as warm season grasses being dry and dormant while locoweed is actively growing, attracting animals consistent with the observations reported herein (James et. al., 1969; 1970; Cook *et al*., 2009). It can be concluded that the likely cause of cattle losses was the result of *A. mollissimus* ingestion due to observed toxicity symptoms and detection of swainsonine in the plant, rumen, and liver samples (Table 1). The extent of the ranch's locoweed population remains unknown as a larger pasture-level assessment was not possible. Ranchers should be on high alert for locoweed outbreaks when cool-season rain events are followed by hot, dry temperatures in the spring. For grazing recommendations to prevent locoweed poisoning, refer to Cook *et al*. (2009).

In conclusion, generally, it is quite difficult to conclude that an animal died from ingesting a poisonous plant as it requires multiple lines of corroborative evidence including clinical findings, body condition, and evidence of the plant being consumed. This case report provides clinical findings, field conditions consistent with locoweed poisoning, and evidence of *A. mollissimus* being consumed which led to the conclusion of locoweed being the cause of the cattle losses reported herein.

REFERENCES

Allison, C.D., Turner, J.L., Wenzel, J.C. (2016). Poisonous plants of New Mexico rangelands. *NMSU Coop. Ext. Serv.,* Cir 678.

Cook, D., Gardner, D. R., Lee, S. T., Pfister, J. A., Stonecipher, C. A., & Welsh, S. L. (2016). A swainsonine survey of North American Astragalus and Oxytropis taxa implicated as locoweeds. *Toxicon, 118*, 104-111.

Cook, D., Ralphs, M. H., Welch, K. D., & Stegelmeier, B. L. (2009). Locoweed poisoning in livestock. *Rangelands, 31*(1), 16-21.

Fox, W. E., Allred, K. W., & Roalson, E. H. (2010). A guide to the common locoweeds and milkvetches of New Mexico. *NMSU Coop. Ext. Serv.*, Cir 557.

Gardner, D. R., & Cook, D. (2011). A comparison of alternative sample preparation procedures for the analysis of swainsonine using LC-MS/MS. *Phytochemical Analysis, 22*(2), 124-127.

James, L. F., Van Kampen, K. R., & Johnson, A. E. (1970). Physiopathologic changes in locoweed poisoning of livestock.

James, L. F., Van Kampen, K. R., & Staker, G. R. (1969). Locoweed (Astragalus lentiginosus) poisoning in cattle and horses. Journal of the American Veterinary Medical Association, 155, 525-530.

Panter, K. E., James, L. F., Stegelmeier, B. L., Ralphs, M. H., & Pfister, J. A. (1999). Locoweeds: effects on reproduction in livestock. *Journal of Natural Toxins, 8*(1), 53-62.

PRISM Climate Group, 2024. Oregon State University, https://prism.oregonstate.edu. Accessed 19 April 2024.

Ralphs, M. H., Creamer, R., Baucom, D., Gardner, D. R., Welsh, S. L., Graham, J. D., Hart, C., Cook, D., & Stegelmeier, B. L. (2008). Relationship between the endophyte Embellisia spp. and the toxic alkaloid swainsonine in major locoweed species (Astragalus and Oxytropis). *Journal of Chemical Ecology*, *34*, 32-38.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. http://websoilsurvey.sc.egov.usda.gov/. Accessed 19 April 2024.

Ward, M. A., & Scholljegerdes, E. J. (2019). Protein and Energy Supplementation for Beef Cattle Grazing New Mexico Rangelands. *NMSU Coop. Ext. Serv.*, Cir 564.