Poisonous Plants: Aliphatic Nitro-containing *Astragalus*

Lynn F. James

The poisonous *Astragalus* spp. can be divided into 3 principal groups: (1) the locoweeds, (2) those that accumulate selenium, and (3) those that synthesize aliphatic nitro compounds. This discussion will be limited to those plants which have the aliphatic nitro compounds as their toxin. They form an important group of plants poisonous to grazing livestock

Description and Distribution

Species of this group of *Astragalus* can be found on ranges from western Canada, through parts of the United States, and parts of northern Mexico. At least 263 taxa of the North Amrican *Astragalus* contain the aliphatic nitro compounds which are toxic to livestock. Examples of these species include Emory milkvetch *(Astragalus emoryanus)*, in western Texas, New Mexico, Arizona, and Mexico; *A. tetrapterus* in Utah, Arizona, Nevada and southeastern Oregon; *A. pterocarpus* in central Nevada; *A. miser* var. *oblongifolius* and *A. hylophylus* in Utah, Colorado, Idaho, Montana, and Wyoming; and *A. canadensis* in most of the 48 contiguous states in the United States and western Canada. Williams and Barnaby have listed these plants in detail (Williams, M.C. and R.C. Barnaby, Brittonia 29:310-326, 1977.)

Species of *Astragalus* are mostly perennial, stemmed, or stemless herbs. Leaves are alternate and pinnately compound. The flower is leguminous. The fruit is a legume pod that varies in size and shape with the species and contains one to many kidney-shaped seeds.

Many of these plants will grow only in years when there are favorable moisture conditions.

Toxic Principle

This group of plants synthesizes glycosides that are metabolized to 3 nitro-1-propanol (3-NPOH) or 3-nitropropionic acid (3-NPA) in the rumen of cattle and sheep. The 3-NPOH is absorbed much more rapidly from the gastrointestinal tract than is 3-NPA, so it is much more toxic. Ruminants are more susceptible to these aliphatic nitro compounds than nonruminants because of their ability to convert these plant glycosides to the toxic forms, 3-NPOH and 3-NPA. However, horses are susceptible to poisoning by these plants, also. As the plants mature, dry, and lose their green color, the concentration of these glycosides decreases and they lose their toxicity.

Cattle and sheep may be poisoned acutely or chronically depending on the rate at which they graze these plants. Acute poisoning results when animals graze too much of these plants in a short period of time. Acute poisoning is characterized by general body weakness, labored, noisy respiration, and loss of motor control, especially in the hindquarters. Acutely affected animals may collapse and die soon after ingesting the plant.

Astragalus miser *var.* oblongifolius. *(Wasatch milkvetch)*

Chronic intoxication occurs when these *Astragalus* plants are grazed slowly over a longer period of time. The signs of poisoning include a rough hair coat, labored respiration, and general body weakness beginning in the hindquarters. There may be knuckling of the fetlocks, goose stepping and knocking together of the hindfeet when walking which produces a clicking sound. The animal may salivate excessively and develop diarrhea or constipation. Chronically affected animals may collapse and die when forced to move rapidly. Lactating cows are more commonly affected than nonlactating cows. Less severely affected cattle recover slowly while severely affected ones may eventually die. Sheep show more respirator involvement and less neuromuscular involvement than cattle.

Conditions of Poisoning

Poisoning of livestock by the nitro-containing *Astragalus* is usually chronic in nature; therefore, animals that become intoxicated probably have been grazing these plants for some period. Any system of grazing that encourages livestock to graze these toxic *Astragalus* contributes to the problem. This does not mean that animals must be forced to graze these plants, as some of this group of plants are quite palatable. Poisoning often occurs when plants of this group are green and available and other forages are in short supply.

Prevention

There is no adequate treatment for animals poisoned on these plants. Prevention lies in devising grazing strategies that minimize the length of time livestock are permitted to

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graze on these plants. Since most livestock intoxications by these plants are of a chronic nature, the plants can be grazed for short priods of time without damage being done. Those responsible for grazing livestock in areas infested with these *Astragalus* plants should be aware if their animals are eating milkvetch so that action can be taken before animals grazing these plants are poisoned.

Selected Readings

James, L.F., W.J. Hartley, M.C. Williams, and K.R. Van Kampen. 1980. Field and experimental studies in cattle and sheep poisoned by nitro-bearing *Astragalus* or their toxins. Amer. J. Vet. Res. 41:377-382.

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Conservation Helps a Dry Creek Flow Again

Mark E. Moseley

A West Texas creek dry for decades started flowing again, and the residents of nearby San Angelo can thank ranchers and their conservation work in a 74,000-acre watershed. In the early 1960's landowners on 5 ranches, covering about half the watershed, began rootplowing, reseeding, treedozing, aerial spraying, and chaining. The ranchers received technical assistance and cost-sharing for this work through the Great Plains Conservation Program. The program is administered through local Soil and Water Conservation Districts in selected Great Plains counties by USDA's Soil Conservation Service. These ranchers did not start out to prove anything—it just happened.

West Rocky Creek flowed yearlong until the drought of 1918-1919, when it became an intermittent stream. By 1935, springs feeding the creek had been dried up by mesquite and other invading woody plants.

Located in the Edwards Plateau region, West Rocky Creek is a tributary of the Middle Concho about 20 miles west of San Angelo. Average annual precipitation is about 18 inches. Shallow soils formed over limestone and caliche are characteristic of the plateau regions, and early day travelers described the rough, rolling hills as barren. The only timber was along the draws and the need for firewood was a real concern to these pioneers.

Before the area was settled, prairie fires were common—set naturally by thunderstorms and also by Indians. Early travelers reported seeing prairie fires that would burn for miles prior to being extinguished by either a lack of fuel or by rainfall. Fires suppressed the brush. As the early pioneers began to fence the rangeland, several things triggered. Their apparent lack of understanding about grazing management depleted the cover of prairie grass such as sideoats grama, the state grass of Texas. In pristine condition, most of the watershed supported a plant cover averaging 2,000 pounds of production per acre—mostly grasses.

Settling of the land stopped the wildlife for 2 reasons —1— they fought the wildfires and —2— there was no longer enough grass to burn. This lack of ground cover allowed erosion to take place and held little water on the land. Not only did the reduced ground cover short circuit the aquifer recharge cycle but it provided a favorable environment for the establishment of brush plants. The brush first encroached the deeper soils and then gradually moved up the draws to the hillsides. The watershed now would support only about 500 pounds per acre of protective grasses.

Mesquite was the main brush problem. With its extensive root system it can draw water from far below the 5-foot depth that is generally the limit for native grasses such as sideoats grama, buffalograss, curly mesquite, and tobosa. Its thirst for water is much greater than that of the native grasses. In fact, it takes about 1,725 pounds of water to grow a pound of mesquite, but only 705 pounds of water to grow a pound of sideoats grama. It is interesting to note that scientists estimate that 38% of the rainfall in Texas is used up by noneconomic plants. This equates to about 138 million acre feet per year. (Johnston 1957).

In 1964, following the accelerated range conservation program, one of the 5 ranchers noticed that a spring—dry since 1935—had started flowing again. By replacing the water-hungry brush with a good grass cover, more rainfall soaked into the aquifer, recharging the dormant springs. By 1970, springs had begun flowing on all 5 ranches. West Rocky Creek, which now flows at a rate of 475 to 4,000 gallons per minute is not big by most standards but its sparkling waters are a welcome sight in this part of Texas. All the conservation work was done in a manner that would benefit whitetailed deer and turkey—a valuable hunting resource.

The role of sound grazing management cannot be overlooked. The ongoing grazing management on each ranch enhances the cover of grasses on the watershed. The soils now, under good grazing management, are producing an estimated 2,000 - 2,500 pounds of forage per acre—still mostly grasses.

This grass cover retards the reinvasion of brush and helps hold water and soil on the land. The turf decreases the sediment load in surface water supplies. Sediments reduce water quality and the storage capacity of reservoirs and streams. Although the brush succession is retarded, these ranchers periodically must do maintenance brush work just to keep things in the desired balance.

Even though the rangeland improvements have reduced erosion in the watershed and increased forage production for the ranchers' livestock, the story of the West Rocky Creek may be more important to the 70,000 residents of San

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