

INTEGRATED TOXIC PLANT MANAGEMENT HANDBOOK

**Livestock
Poisoning
Plants of the
Trans-Pecos
Region of
Texas**



Integrated Toxic Plant Management

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Integrated Pest Management (IPM) is a balanced, tactical approach to pest control. It involves taking action to prevent pest outbreak, when possible, and to prevent excessive damage caused by pests. IPM combines several control practices including biological control, cultural practices, mechanical control methods, monitoring of pest populations, and careful use of pesticides. The goal of IPM is to achieve economical and effective pest control with the least risk to the environment.

Integrated Toxic Plant Management (ITPM) is an application of IPM. Integrated Toxic Plant Management involves identifying toxic plants, understanding the symptoms of poisoning in livestock, recognizing problem areas, and formulating a management strategy for minimizing livestock losses. Management strategies include using good range and livestock management practices, recognizing when plant control is necessary, knowing what kind of control is best, and planning for follow-up management to reduce reinfestation by targeted plants. Following is a general view of Integrated Toxic Plant Management strategies. Control strategies for specific plants can be found on each plant's page in this handbook.

Understanding the factors affecting poisoning.

Most poisonous plants kill animals only if eaten in relatively large amounts over a short time period. Therefore, dose usually determines whether poisoning occurs. Since livestock normally eat a variety of plants, rangelands in good condition that provide a variety of forages are generally safer than ranges in poor condition.

Some toxic plants are not equally toxic to all species of livestock. For example, western bitterweed is toxic to sheep but usually not to cattle or goats. Other plants may be more toxic to animals in certain physiological stages. Broom snakeweed may cause abortion in pregnant livestock, and rayless goldenrod can poison suckling calves and lambs via the milk even before the dams show signs of poisoning.

Season of the year and environmental conditions within the season also influence the threat poisonous plants pose to livestock. During drought, many of the more palatable range plants wither or are unavailable, while many toxic plants remain green longer and/or respond to moisture sooner. As a result, these toxic plants may become more palatable to livestock.

Know the plants that may poison your livestock.

Knowing how to recognize toxic plants and the symptoms they cause is the first step in preventing poisonings. Some toxic plants are not present every year. Pictures and descriptions, such as those in this handbook, may be helpful references.

Use good grazing management practices.

Good grazing management practices can be the key to success. By following these guidelines for grazing management, you can reduce or avoid livestock losses.

- In areas infested with toxic plants, decrease grazing pressure by reducing the number of animals per area of land. This allows the animals to selectively graze around toxic plants.
- Avoid grazing pastures infested with toxic plants when environmental conditions are extreme. Small rain showers during drought and excessively rainy periods can cause toxic weeds both to sprout rapidly and to become abnormally abundant. Many toxic plants are more drought-resistant than desirable forage species, and may be the only source of “green” forage available for a period of time.
- Avoid grazing pastures infested with toxic plants until adequate forage from desirable plants is available. Several toxic plants are among the first to “green-up” in spring and may remain green longer in the fall. Use these pastures during the correct time of year when other forage is available.
- Use the proper stocking rate for the pasture. If preferred forages are over-grazed, livestock seek out the remaining forage, which may be toxic plants. This is a particular problem with highly intensive grazing systems.
- Maintain a few “toxic plant-free” pastures that can be used when other pastures are unsafe. Toxic plant control methods may be needed to create such pastures, but often they already exist and all that is required is the re-designing of fencelines.

Use good livestock management practices.

Here are some suggestions for good livestock management.

- Hungry animals should never be kept on, driven through, bedded in, or released into areas known to have toxic plants. Hungry animals tend to be much less selective of forages and to consume large quantities of toxic plants in a short time.
- Graze infested areas with the proper livestock species—that is, the species that will be least affected by the plants present.
- Feed adequate amounts of protein, energy, minerals or vitamins when needed. Deficiencies may cause livestock to ingest more toxic plants. In general, supplemental feeding is most important during winter and early spring when forage quality is lower. West Texas rangelands are typically deficient in phosphorus. Deficiencies in phosphorus or Vitamin A may cause abnormal appetites and increased consumption of toxic plants.
- When possible, use animals that are native to the area being grazed. New animals coming in from other areas graze less selectively until they “learn” the new vegetation. The potential for livestock poisonings is much higher for non-native animals than for native animals.

Select the proper kind of control method when needed.

When toxic plants become a dominant part of a pasture's vegetation, control measures may become necessary. If toxicity problems occur only seasonally, it may be smart to concentrate on controlling plants in a few pastures. The following control options can be used individually or in combinations.

- **Prescribed burning** does little damage to herbaceous **perennial** plants and is usually not a good method of controlling toxic plants. The herbaceous fuel needed to sustain a fire is usually limited in west Texas. However, fire may be useful where **annual** toxic plants occur in small areas. For example, cocklebur may be burned out of low areas such as dry stock water tanks. In these cases, artificial fires such as propane burners may be needed to burn down the vegetation. Fire also may be used to suppress woody toxic plants such as mesquite.
- **Mechanical control** methods such as chaining, railing, root plowing or grubbing may control some woody toxic plants such as whitebrush, oak and mesquite. However, herbaceous toxic plants such as western bitterweed and twin-leaf senna may become more abundant when soil is disturbed. Shredding or mowing can be useful in controlling some herbaceous, annual toxic plants where the terrain allows.
- **Biological control** methods use living organisms to feed upon toxic plants. This can be particularly effective when the plant is toxic to one species of livestock and not to another, because the non-affected species can be used to control the plant. Many insects also are being evaluated, and some are available for controlling a few plants. Perennial snakeweed has been shown to have numerous insect enemies, as have the locoweeds (these insects are currently unavailable for commercial use).
- **Chemical control** is often the most economical and effective method. Toxic plants, depending upon their growth habits and susceptibility to herbicides, may be controlled with individual plant treatments, ground or aerial broadcast application, or a combination of methods. It is important to remember that once plants are treated with herbicides and begin to wilt, livestock are much more likely to eat them. Some plants become more toxic after herbicide treatment. Livestock should not be grazed on treated pastures until affected plants have completely dried up. Herbicides and rates for controlling specific plants can be found in B-1466, "Chemical Weed and Brush Control Suggestions for Rangeland," available from the Texas Agricultural Extension Service.

The authors wish to acknowledge Darrell Ueckert, John Reagor and Chris Allison for assistance in preparing this material.

Funding for this project was provided by the Texas Agricultural Extension Service IPM mini-grant #IPM-M-13.

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African Rue *(Peganum harmala)*

Description

African rue is a member of the caltrop family. The plant is a bright green, succulent, perennial herb. African rue is bushy, many branched, and about 1 foot tall when fully grown. Leaves are alternate, without hairs, and divided into narrow segments. Flowers consist of five white petals. The fruit is a two-, three- or four-celled, many-seeded capsule.

Distribution and Habitat

African rue is native to the deserts of Africa and southern Asia. It was first recognized in the United States on a section of land near Deming, New Mexico, in 1935, and has since spread onto dry rangelands in Arizona and western Texas.

Toxic Agent

African rue has been found to contain at least four poisonous alkaloids, and to be toxic to cattle, sheep, guinea pigs and probably horses. The seed of the plant is the most toxic, with a lethal dose of 0.15 percent of the body weight, as determined by guinea pigs. Young leaves are somewhat less toxic, with a lethal dose of approximately 1.0 percent of the animal's weight. Dry leaves apparently lack toxicity.

Symptoms

The signs of chronic poisoning include:

- loss of appetite
- listlessness
- weakness of the hind legs
- knuckling of the fetlock joints

Under acute conditions, the following symptoms occur:

- stiffness
- trembling
- incoordination
- frequent urination

The temperature of poisoned animals is usually subnormal. There is excessive salivation and the lower jaw and muzzle may be wet. Acute poisoning usually is caused by consumption of the seeds.

Integrated Toxic Plant Management

African rue is extremely unpalatable to livestock. Consumption generally occurs only if animals are starved or suffering from severe mineral deficiencies. If poisoning occurs, it is usually in spring and summer. Pastures infested with African rue should be avoided during these times if possible. There is some evidence that cattle that have consumed large amounts of mesquite beans may be more likely to graze African rue. This plant is generally found only on disturbed areas (road sides, oil field locations, etc.). It spreads to new areas on the undercarriages of automobiles or highway equipment, so vehicles entering a pasture from an infested area should be washed first. If livestock are known to be grazing young leaves or seeds of African rue they should be removed from the area. Chronic poisoning cases generally recover if given good quality feed and water. Chemical control treatments available for African rue tend to be expensive and should be targeted to problem areas such as roadsides, livestock pens and traps, and around oil field sites.



Desert Baileya *(Baileya multiradiata)*

Description

Desert bailey is an annual or weak perennial herb of the sunflower family. This plant grows to a height of 1 to 1.5 feet. Flowers are yellow, with showy heads on long stalks arising from a leafy base. Leaves are alternately arranged along the stem, entire to pinnately divided, and covered with woolly hairs. Desert bailey flowers from spring to late fall

Distribution and Habitat

Desert bailey is generally confined to desert regions from Texas to southern California and south into Mexico. The plant is most often found on sandy and gravelly soils and dry plains and mesas up to 5,000 feet in elevation. It is also common on disturbed areas such as roadsides.

Toxic Agent

The toxic agent is an unknown water-soluble compound. All parts of a green or dried plant are poisonous, with the flowers and seed heads being more toxic than the leaves. Sheep, goats and rabbits are susceptible experimentally to desert bailey poisoning, although under range conditions poisoning has been limited to sheep. Feeding trials suggest 16 to 65 pounds of either dry or green desert bailey will be lethal to a full-grown sheep.

Symptoms

The first symptom in sheep is a frothy green salivation, followed by extreme weakness, rapid heart beat and trembling of the limbs. Under range conditions, poisoned animals may trail the flock with a stiff gait and show marked weakness. Other symptoms include:

- trembling and loss of appetite
- standing with arched back
- lying down and refusing to move when approached

Integrated Toxic Plant Management

The first management strategy to consider is to graze problem areas only with cattle. Sheep and goats should be removed from infested pastures as soon as poisoning is noticed. Animals should then be furnished with supplemental feed and good quality water and kept quiet. Sheep poisoned by desert baileya may refuse to eat for a few days, but most will regain their appetite and a large percentage will recover. Losses from desert baileya generally occur when other feed is short or sheep are trailed or driven through dense stands. Since the flowers and seed heads are fairly palatable to sheep, these animals cannot be grazed in pastures containing dense stands of desert baileya. Sheep losses from this plant in Presidio county were between \$50,000 and \$100,00 annually in 1958 and 1959. Chemical and mechanical controls tend to be impractical. Losses can best be minimized through good livestock management.



Bitterweed

(Hymenoxys odorata)

Description

Bitterweed is an erect, annual, composite plant that grows to a height of 2 feet. Stems are purplish near the base and the leaves are alternate, entire to pinnately divided, glandular, and usually woolly on the underside. The bright yellow flower heads occur at the tips of the long stems. This plant has a bitter taste and aromatic odor.

Distribution and Habitat

Bitterweed is common in arid areas of the southern great plains from southwest Kansas and central Texas to southern California and into Mexico. It is most commonly found where soil disturbance or overgrazing has occurred. This plant is often confused with *Helenium tenuifolium*, which is also called bitterweed or bitter sneezeweed.

Toxic Agent

Bitterweed is toxic to sheep, and under conditions of starvation, sheep that eat bitterweed may develop a liking for it. Because it is extremely unpalatable, it has not been reported to produce natural cases of poisoning in cattle, horses or goats. The toxic agent is a sesquiterpene lactone (hymenoxon). This material appears to be cumulative in nature, with a lethal dose consisting of 1 percent of an animal's weight of green plant material, whether ingested at one time or over a period of several months. The considerable variation in minimum lethal dose between individual animals is not dependent on the nutritional history of the animal. Bitterweed slowly increases in toxicity with maturity, and becomes much more toxic under drought conditions.

Symptoms

Signs of acute bitterweed poisoning are:

- loss of appetite
- cessation of rumination
- depression
- indications of abdominal pain and bloating

A green salivary discharge is a typical range symptom. Loss of weight is the most common sign of chronic bitterweed poisoning. These symptoms typically are not immediate. Symptoms may appear a month or more after initial consumption of the plant.

Integrated Toxic Plant Management

There is no medical treatment for bitterweed poisoning. Poisoned animals should be moved to clean pastures or fed alfalfa or a suitable diet in a feedlot for 7 days before being returned to rangeland. If animals have grazed bitterweed only in small quantities for a short period of time, slow recovery is possible. Prevention of bitterweed poisoning can best be accomplished by following a well-planned range management program that prevents overgrazing of range by livestock, and that also includes a proper supplemental feeding program. Sheep losses can be minimized by simultaneously grazing a mixture of cattle, sheep and goats. When areas become highly infested with bitterweed, chemical treatment can be applied with aerial or ground broadcast methods. Localized populations of bitterweed can be treated with targeted ground applications, but severe infestations may require aerial application. Herbicide treatments for western bitterweed include broadcast and individual plant sprays of 2,4-D, Weedmaster[®], Banvel[®] and Grazon P+D[®]. Follow any chemical treatment with proper range and livestock management programs. Proper stocking rates are essential to any management program for bitterweed.



Perennial Broomweed, Broom Snakeweed *(Gutierrezia microcephala and G. sarothrae)*

Description

Two species of perennial broomweed are found in west Texas. For all practical purposes, the two species look and affect livestock the same. Perennial broomweed is a perennial half-shrub that grows to a height of 1 to 2 feet. The plant is many branched and quite resinous. The leaves are linear in shape, smooth on the margins, and alternately arranged on the stem. The flowers are yellow and occur in small heads at the tips of the numerous branches.

Distribution and Habitat

Perennial broomweed is wide-spread on dry ranges and deserts from California to Texas, south to Mexico, and north to Idaho. Extreme infestations reduce forage production but may not indicate overgrazed ranges because broomweed populations naturally fluctuate. However, overgrazing does accelerate the growth and propagation of perennial broomweed.

Toxic Agent

Perennial broomweed is poisonous to cattle, sheep, goats and swine. The toxic agent is a saponin but the plant is also capable of accumulating selenium when it grows on soils high in selenium. Perennial broomweed is most toxic at earlier stages of growth, usually in late winter or early spring. It is much more toxic on sandy soils, and relatively non-toxic when growing on clay soils. As little as 20 pounds of fresh broomweed consumed in 7 days causes abortion in cattle. Ten to 20 percent of the body weight consumed in 2 weeks has caused death in cattle, sheep and goats.

Symptoms

Chronic poisoning usually results in:

- abortion
- stillbirth
- retained placenta
- weak offspring

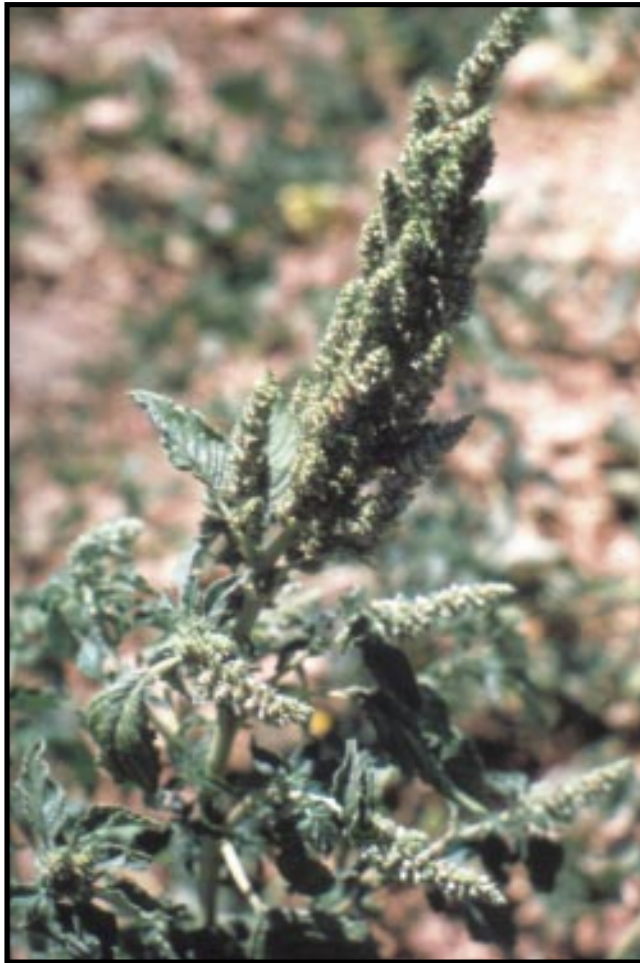
Acute poisoning generally produces different symptoms:

- periodic, thick nasal discharge
- crusting and sloughing of the skin of the muzzle
- oral ulcers
- loss of appetite
- loss of weight
- listlessness
- rough hair coat
- occasionally, dark brown or reddish urine

Animals urinate frequently and twist as if urination causes pain. Diarrhea, observed in early stages, changes to constipation and large amounts of mucous is found in the foul-smelling feces. Pregnant cows often have periodic vulvar swellings and an earlier-than-normal udder development.

Integrated Toxic Plant Management

Since perennial broomweed is much more toxic on sandy soils, these areas should not be grazed by gestating livestock during periods of maximum broomweed growth (late winter and early spring). Perennial broomweed is generally not palatable at other times of the year. Proper range management practices that improve range condition will help limit broomweed availability to livestock. Proper mineral supplementation helps prevent the development of abnormal appetite. This plant is relatively economical to control with herbicides. Chemical control is cost effective when populations are dense enough to reduce forage production. Herbicide treatments for perennial broomweed include aerial or ground broadcast applications of Escort® at .0625 ounce a.i./acre in the spring when weeds are less than 4 inches high. Tordon 22K® also may be used during and after full flower stage in the fall at 1/4 to 1/2 pound a.i./acre. Follow chemical treatments with proper range and livestock management programs to reduce reinfestation. Several insects have promise as biological control agents. Research continues with a snakeweed-eating grasshopper, leafhoppers, and a root-boring beetle. However, these control organisms are not yet practical to use.



Carelessweed, Pigweed *(Amaranthus spp.)*

Description

Carelessweeds are annual weedy herbs that belong to the amaranth family. Texas has 23 recorded species. The growth forms of the various species vary from prostrate to branching upright. Most species, especially in early growth, are palatable to domestic animals and are relished by swine; hence, the name "pigweed" often is used.

Distribution and Habitat

Carelessweed is abundant throughout most of the U.S. on disturbed sites, especially barnyards with rich, moist soils. It is also a common weed in croplands.

Toxic Agent

The toxic agent is thought to be potassium nitrate, although the classical symptom of nitrate poisoning (brown blood) is not always present. All ruminants are susceptible to nitrate poisoning. Carelessweeds can accumulate nitrates from the soil to toxic levels. Environmental factors often influence nitrate accumulation. For example, nitrate poisoning is more likely to occur if the plant is growing in soils high in nitrogen, especially during drought. Plants containing more than 1.5 percent nitrates are dangerous, and nitrate consumption in amounts as little as 0.05 percent of an animal's weight may be lethal. The plant is also known to cause bloat.

Symptoms

With acute nitrate poisoning, animals are often found dead with no previous history of illness. Less acute nitrate poisoning can be identified by the following symptoms, in the order of their appearance:

- weakness
- unsteady gait
- collapse
- shallow and rapid breathing
- rapid pulse
- coma
- death

Unpigmented parts of the body, such as the whites of the eyes, the tongue, and lips, often have a blue-brown discoloration, while the blood may be chocolate-brown in color.

Integrated Toxic Plant Management

Carelessweed is relished by livestock, particularly during the early stages of growth. It is usually the most dangerous during drought, but poisonings have occurred at all growth stages and under a variety of conditions. The nitrate content of carelessweeds is significantly higher in the morning than in the afternoon. Livestock should be kept off infested pastures during the early stages of the plant's growth and following periods of sudden temperature change. This plant may remain dangerous as a component of hay or silage. Cattle are most often poisoned when they are placed in a pen that contains many carelessweed plants, so herbicide or mechanical treatments should focus on these areas. Immediately after herbicide treatment both the nitrate content and palatability of the plant may increase; thus, livestock should not be allowed access until the plants have completely dried up.



Cocklebur **(*Xanthium spp.*)**

Description

Cockleburs are coarse, rough, annual weeds with alternate, toothed, or lobed leaves. There are separate male and female flowers on the same plant, although both are inconspicuous. The male flowers occur in dense clusters on the ends of the stems, while the female flowers occur in the leaf axils. The conspicuous cocklebur fruits are covered with many spines and have two compartments, each containing a seed. There are six species of cocklebur in Texas.

Distribution and Habitat

This plant is found throughout most of the U.S. In west Texas, it is most common around water holes, playas, arroyos, and disturbed roadsides.

Toxic Agent

All classes of livestock may be poisoned by cockleburs. The poison was once thought to be hydroquinone, but has now been identified as carboxyatractyloside, a glycoside causing hypoglycemia. The toxic substance is contained in the seeds. While livestock will generally not eat the seed, problems can occur when cattle are fed whole cottonseed or hay contaminated with cocklebur. The toxic agent is present in the seedling and remains through the cotyledon stage. The concentration of the toxin drops rapidly as soon as the first true leaves appear. A toxic dose of seedlings is approximately 0.75 to 1.5 percent of the animal's weight. Cocklebur seedlings retain their toxicity even when dead and dry.

Symptoms

Symptoms generally occur 12 to 48 hours after ingestion of cocklebur seedlings. These symptoms include:

- general weakness
- depression
- unsteady gait
- rapid, labored breathing with a weak, rapid pulse
- subnormal body temperature with nausea and vomiting

Once animals are down, they go into convulsions, making running motions with their legs or showing a marked curvature of the neck. Death usually occurs a few hours to 3 days after the first symptoms appear.

Integrated Toxic Plant Management

Poisoned animals should be kept warm and given large amounts of fatty substances. Cream, milk and lard can be given by mouth. Linseed oil should be administered through a stomach tube to avoid producing inhalation pneumonia. Heart and respiratory stimulants are also recommended. Poisoning is always associated with ingestion of seedlings in the cotyledonary stage of growth. Extra precautions should be taken at this time. In west Texas, cocklebur is usually restricted to draws and other low lying areas that receive extra moisture. Herbicides can be used to control the plant in these areas. Cocklebur can be controlled by aerial application of 2,4-D low volatile ester or amine at 1.0 pound a.i./acre (1 quart of 4-pound/gallon product) before plants flower. Or, mix 4 pounds (1 gallon of 4-pounds/gallon product) of 2,4-D low volatile ester or amine with 1 to 2 quarts of surfactant and water to make 100 gallons of mixture for individual plant treatments. Follow any chemical treatment with proper range and livestock management programs. Any means of mechanical control will help reduce the population of this annual plant. Concentrations of small seedlings also may be burned with a hand-held propane burner.



Coyotillo *(Karwinskia humboldtiana)*

Description

Coyotillo is a woody shrub or small tree that varies in height from 3 to 20 feet. The most distinctive feature of this plant is the leaves, which are opposite and have single veins that end at the untoothed margin of the leaf.

Distribution and Habitat

Coyotillo grows along arroyos and canyons and on gravelly hills and ridges. It is found from southwest Texas into Mexico and southern California.

Toxic Agent

The actual toxin involved is unknown. This plant is toxic to cattle, sheep, goats, hogs and fowl; cattle are the most susceptible. The "berries" from this plant were known by Indians to produce paralysis in humans. Only 0.05 to 0.3 percent of an animal's weight of seed will produce poisoning. Fifteen to 21 percent of an animal's weight of leaves must be consumed for poisoning to occur. Seeds and leaves produce two different poisoning syndromes. There is usually a lag period of days or weeks between ingesting the seeds and the onset of symptoms.

Symptoms

Symptoms of seed ingestion are:

- weakness and incoordination of hind legs
- dragging motion while walking
- exaggerated high stepping
- jumping or moving backwards
- complete prostration
- death

Symptoms of foliage ingestion are:

- loss of condition
- wasting
- nausea
- progressive weakness
- death

Integrated Toxic Plant Management

No effective medicinal treatment is known for coyotillo poisoning. Few animals paralyzed from eating the seed will recover under range conditions. Animals unfamiliar with coyotillo should not be turned into infested areas when this shrub is in fruit. Proper stocking and good supplemental feed and mineral programs will help reduce the incidence of poisoning.



Tobosagras Ergot **(*Claviceps cinerea*)**

Description

Tobosagras ergot is a toxic fungus that parasitizes the ovary of the developing tobosagras flower. Infection takes place at the time the grass flower opens. The fungus is recognized as a hard, pink or purplish structure which gradually replaces the grass grain. This grain-shaped mass varies in size from the same as, to three or four times larger than, the grain it replaces. At this point, the fungus becomes toxic. The fungus also can infect small grains and other wild grasses such as galleta.

Distribution and Habitat

Tobosagras is found on dry, rocky slopes; dry upland plains and plateaus; and heavy, clay soils. It grows from central Texas west to southern Arizona and south into Mexico.

Toxic Agent

The toxicity of ergot appears to be caused by a variety of alkaloids. Few experiments have been made to determine the exact amount of ergot necessary to produce symptoms in cattle, or the time required for symptoms to appear. In one research trial, gangrenous ergotism was produced in a cow by feeding 100 grams of ergot per day for 11 days (about 0.02 percent of the animal's weight per day). Ergot poisoning in animals other than cattle is relatively rare. Human poisoning from eating infected grain has occurred; in fact, it reached epidemic proportions in Europe in the early 1800s.

Symptoms

Ergotism is divided into two different disease syndromes: acute, usually characterized by nervous signs; and chronic, characterized by gangrene. Signs of nervous ergotism are:

- extreme nervousness
- increased heart rate
- muscular trembling
- frequent urination
- loss of certain senses followed by ataxia, prostration, convulsions and death

Gangrenous ergotism usually affects parts of the body having the poorest blood supply, such as the feet, legs, tail and ears, any or all of which may drop off. Frequently cattle are able to walk without hooves, apparently without pain. Abortion is thought to be a sign of chronic ergotism, although research has failed to produce abortion with ergot.

Integrated Toxic Plant Management

Cattle do not dislike ergot, and when let into a pasture they may eat only grass heads at first, thus obtaining a concentrated amount of ergot. Grazing or mowing to keep down grass head production will help control ergot poisoning. If symptoms do occur, cattle should be moved from the pasture immediately. Animals with gangrene often have to be destroyed for humane reasons. Animals with nervous ergotism usually will recover if removed from the infested pasture, given good feed and water, and not unduly disturbed.



Garboncillo, Rattleweed *(Astragalus wootonii)*

Description

Garboncillo is a much-branched, annual legume with erect, hairy stems that vary from about 3 to 12 inches long. The leaves are composed of 9 to 19 leaflets that are hairy beneath and smooth above. Flowers are pink or purplish to white in color. The most conspicuous part of the plant is the fruit, which is a large, one-celled, inflated pod.

Description and Habitat

Garboncillo is restricted to the Trans-Pecos region in Texas. It is also common in southern New Mexico, eastern Arizona and northern Mexico. Garboncillo is most abundant in valleys that accumulate runoff water from the surrounding hills, as well as in bar ditches, along trails and around earthen tanks.

Toxic Agent

The toxic principle is an alkaloid called swainsonine. Horses are particularly susceptible to garboncillo, although cattle and goats may also develop garboncillo poisoning. It is estimated that symptoms of poisoning are first produced in cattle after they have consumed about 90 percent of their body weight of the plant. As much as 200 to 350 percent of their body weight of the plant, eaten over a period of several months, may be required to kill cattle, sheep and goats. However, about 30 percent of body weight consumption will produce signs in a horse, and about 75 percent may be fatal. Both dry and green garboncillo is toxic. The dead stems remaining following die-back at frost are readily consumed by livestock.

Symptoms

Symptoms develop from the involvement of sensory and motor functions. In cattle they are:

- carrying the head a little lower than normal
- a vacant stare, perhaps due to distorted vision
- trembling of the head and difficulty or inability to eat and drink
- abortion

Swainsonine also may be passed in the milk of cows, possibly explaining the unthriftiness of some suckling calves. Symptoms for sheep are much the same, while goats will develop an ascending paralysis which becomes increasingly severe, eventually involving the forelegs.

In horses, the time between onset of symptoms and death is much shorter than in cattle. The horse will be listless and will not notice ordinary activities, but on being stimulated by some sudden event, will become excessively excited and wild. Other symptoms are similar to those for other species of livestock. Horses with chronic locoism rarely recover and are dangerous for riding because of unpredictable and permanent behavioral changes.

Integrated Toxic Plant Management

Since garboncillo is an annual, mechanical removal of the plant around tanks, along roadways and in other hazardous sites is often effective. Herbicide spot or broadcast applications can be used successfully if benefits outweigh the cost. Individual plant treatments with Grazon P+D[®] (mix 2 gallons with 1 to 2 quarts surfactant and water to make 100 gallons) applied directly to the leaves of the plant may be effective in controlling small problem areas. When a large area is infested, aerial or ground broadcast applications of 0.94 pounds a.i./acre of Grazon P+D[®] (3 pints) have given good results. Proper stocking rates and grazing management practices should follow to reduce reinfestation problems. Sound range management practices such as these ensure the maintenance of good to excellent range condition, and are the best prevention against garboncillo poisoning. As range condition improves, so does plant diversity. When more desirable forage is available animals are much less likely to eat garboncillo. Livestock also should receive proper supplementation of energy, protein, minerals and vitamins.



Inkweed, Thicketleaf Drymary *(Drymaria pachyphylla)*

Description

Inkweed is a glabrous, short-lived annual with semi-pointed leaves that are usually about as wide as they are long. The plant grows close to the ground in a circular pattern 8 to 10 inches in diameter. Small flowers are produced in the axils of the leaves.

Distribution and Habitat

Inkweed grows on sites with sparse vegetation, most commonly on heavy, alkaline, clay soils and in low areas subject to occasional flooding. It is found in western Texas, southern New Mexico, southeastern Arizona, and south into Mexico.

Toxic Agent

Cattle, sheep and goats are known to be poisoned by this plant. The actual toxic agent contained in inkweed is unknown. Both dry and green plants are toxic. Most poisoning occurs on over-grazed ranges and plants are most commonly grazed in the early part of the day while they are turgid. An unusually brief period between the onset of symptoms and death is characteristic of drymary poisoning. Therefore, symptoms are not easily observed under range conditions. Feeding experiments have shown that consuming 0.6 percent of its body weight of the plant will kill a sheep, 0.4 percent a cow and 0.9 percent a goat. Symptoms appeared 18 to 24 hours after ingestion of a toxic dose.

Symptoms

Animals poisoned by inkweed usually die before symptoms are noticed. Death usually occurs less than 2 hours after the first symptoms occur. Symptoms in the order of their occurrence are:

- loss of appetite
- diarrhea
- arched back and "tucked up" abdomen
- coma
- death

Integrated Toxic Plant Management

Inkweed is very unpalatable to all classes of livestock. Poisoning generally occurs only when other forage is limited. Improving range conditions and increasing the diversity of forage will reduce loss of livestock to inkweed. Special caution should be observed during drought years.



Kochia **(*Kochia scoparia*)**

Description

Kochia is an annual forb growing from 2 to 5 feet tall; it begins growth in late spring. The stems of kochia are erect, much-branched and leafy. Leaves are arranged alternately on the stems, which become bright red with age. Interest in the plant as a feed source has been high in recent years because of its crude protein levels of 12 to 25 percent. Kochia can produce the same amount of forage per acre as alfalfa with half the water; hence, the plant is often called "poor man's alfalfa."

Distribution and Habitat

Kochia originated in Eurasia. It was introduced into the U.S. in the early 1900s and is found throughout most of the country. Its appearance was first recorded in Texas during the late 1940s. It occurs mostly on disturbed sites and in old fields.

Toxic Agent

Oxalic acid contained in kochia is toxic to all livestock, but primarily to cattle and sheep. Kochia poisoning involves a mineral imbalance caused when calcium becomes tied up by the oxalates. Calcium levels drop in the blood and cannot be immediately restored even with treatment. The oxalate crystals formed in the blood accumulate in the kidneys and clog the tubules, causing kidney failure. Caution must be used when cattle grazing kochia are allowed access to water containing high amounts of salt. Recent information also suggests that alkaloids may be the primary toxin. In addition, nitrate accumulation is suspected when conditions are favorable.

Symptoms

There are three categories of symptoms. The first is sudden death. The second is polio encephalomalacia (polio), characterized by:

- nervousness or confusion
- incoordination
- blindness
- grinding of teeth
- muscular spasms
- a tendency to lie down

The third is liver damage and photosensitization characterized by:

- jaundice
- progressive central nervous system disfunction

Integrated Toxic Plant Management

Two treatments for poisoning have been used with varying degrees of success. One is an intravenous injection of calcium gluconate, and the other is dicalcium phosphate fed free choice at 25 percent of the usual salt ration. The latter treatment is often used as a preventive measure when cattle or sheep are grazing pastures heavily infested with kochia. Cattle grazing kochia also should be supplemented with high levels of calcium. Some ranchers have had success feeding free choice hay straw to their animals to reduce toxicity problems. It is generally recommended that cattle should not graze kochia for longer than approximately 60 days. Kochia is most toxic during drought and at seed maturation during the fall. Because it is an annual, mechanical or chemical control treatments are effective when desired.



Lechuguilla **(*Agave lecheguilla*)**

Description

Lechuguilla is a member of the same genus (*Agave*) as the century plant. Each plant consists of a crown bearing 20 to 30 thick, fleshy leaves 1 to 1 1/2 inches wide and 12 to 14 inches long. The leaves bend upwards; they have prickles on the margins and terminate in a sharp spine. When a plant is 10 to 15 years old, it flowers once, then dies. The flower stalk produced at this time is 6 to 12 feet tall. New plants are formed from seed or by offsets from the parent plant.

Distribution and Habitat

Lechuguilla is found in western Texas, southern New Mexico, and south into Mexico. It is prominent on dry hills, hillsides and limestone hills, in dry valleys, and in bordering canyons. It is especially abundant in the Trans-Pecos region of Texas.

Toxic Agent

Sheep and goats are poisoned most frequently under range conditions. Cattle are poisoned somewhat less frequently, although this plant can be a serious problem to cattle during periods of extended drought. Horses are not known to be poisoned. Lechuguilla poisoning is thought to be the combined action of two toxins. One is a saponin that causes liver and kidney damage, the other a photodynamic agent that causes photosensitization. In experimental work lechuguilla fed daily to sheep or goats produces symptoms of photosensitization in less than a week, and death from the effects of liver and kidney damage in 1 to 2 weeks.

Symptoms

Under range conditions the first symptoms observed are generally:

- listlessness and lack of effort to keep up with the flock or herd
- progressive decrease in water and food consumption and eventually a complete loss of appetite
- progressive weakness and emaciation
- a short period of coma just before death
- jaundice
- golden yellow to orange skin and mucous membranes
- yellow secretion from the eyes and nostrils
- urine occasionally port wine in color
- photosensitization with swelling of the face and ears

Integrated Toxic Plant Management

When poisoning occurs, animals should be removed from pastures where lechuguilla grows. Animals with symptoms of poisoning should be placed in the shade and given good quality water and feed. Animals with severe jaundice usually die. Since lechuguilla poisoning generally occurs when other more desirable forage is lacking, any range management practice that improves range condition will help decrease losses. Proper mineral supplementation, especially with phosphorous, is also desirable. Plants along trails and in shipping traps should be removed, especially when hungry livestock are being trailed or held for shipping. Lechuguilla is not easily controlled with herbicides. Grubbing does provide good control, but is not practical for large areas.



Woolly Loco, Purple Loco *(Astragalus mollissimus var. mollissimus)*

Description

Woolly loco is a stout, decumbent, many-branched perennial legume. The leaves have 19 to 29 ovate-oblong leaflets which are densely pubescent. The thick, woody root gives rise to stem branches which tend to lie close to the ground. The plant displays a purple to lavender flower.

Distribution and Habitat

Woolly loco is found from southwest South Dakota south to Texas and New Mexico. It is commonly found in upland, mesa and mountain areas, especially the Davis Mountain area of the Trans-Pecos region of Texas. It is often found on blue-grama dominated rangeland.

Toxic Agent

Woolly loco is toxic to cattle, sheep, goats and particularly horses. Signs of locoism have been produced in cattle and sheep after they have consumed about 90 percent of their body weight of the plant during a period of about 2 months. However, it usually takes from 200 to 350 percent of their body weight, eaten over a period of several months, to produce death in cattle, sheep and goats. About 30 percent of body weight consumption will produce signs in a horse and about 75 percent may be fatal.

The toxic agent is suspected to be a substance loosely called "locoine." The specific toxin involved is suspected to be swainsonine. Swainsonine is thought to cause intercellular enzyme disfunction resulting in cellular damage to the brain, liver, digestive organs, placenta and testes. This accounts for various clinical signs evident in poisoned livestock. In early stages of locoism, cell damage is reversible. However, permanent damage results from long-term exposure. A factor that contributes to permanent damage is that animals appear to become addicted to locoweeds, selectively seeking the plants when grazing.

Symptoms

Symptoms develop from the involvement of sensory and motor functions. In cattle they are:

- carrying the head a little lower than normal
- a vacant stare, perhaps due to distorted vision
- trembling of the head and difficulty or inability to eat and drink
- abortion

Swainsonine also may be passed in the milk of cows, possibly explaining the unthriftiness of some suckling calves. Symptoms for sheep are much the same, while goats will develop an ascending paralysis which becomes increasingly severe, eventually involving the forelegs.

In horses the time between onset of symptoms and death is much shorter than in cattle. The horse will be listless and will not notice ordinary activities, but on being stimulated by some sudden event, will become excessively excited and wild. Other symptoms are similar to those for other species of livestock. Horses with chronic locoism rarely recover and are dangerous for riding because of unpredictable and permanent behavioral changes.

Integrated Toxic Plant Management

Livestock imported from areas where loco does not grow are the most susceptible to poisoning. Maintaining good range condition and sound supplemental and mineral feeding programs are good insurance against losses to loco. Affected animals should be quickly removed from pastures and placed on good feed, and then on locoweed-free pasture. Successful recovery depends on recognizing the disease early and preventing further consumption.

Animals will generally avoid locoweed when good quality forage is available. However, because locoweed often emerges before desirable forages begin growth, management to reduce locoweed poisoning is most critical in the early spring. Several locoweed-free pastures should be maintained for use during this time to reduce exposure to the plant. Locoweed infested pastures can be used later in the year when locoweed poisonings are less common. Placing large numbers of cattle on lightly to moderately infested areas for short periods may, at times, be an effective way to use such pastures, since high stock density reduces the amount of toxic plant material available to any single animal.

When locoweed dominates a particular area, it can be controlled chemically. Individual plant treatments with Grazon P+D® (mix 2 gallons with 1 to 2 quarts surfactant and water to make 100 gallons) applied directly to the leaves of the plant may be effective in small areas. When large areas are infested, aerial or ground broadcast applications of 0.94 pounds a.i./acre of Grazon P+D® (3 pints) have given good results. Since locoweed toxicity increases following chemical application, animals should be kept off treated pastures until the plants have completely dried up. Follow any chemical control with good grazing management after the deferment period to reduce reinfestation of locoweed.



Mesquite *(Prosopis glandulosa)*

Description

Mesquite is a small to medium height tree or shrub that is thorny and branching near the ground or single stemmed. The leaves are alternately located along the stems, are deciduous and dark green in color. The fruits are loosely clustered pods up to 8 or 10 inches in length.

Distribution and Habitat

Mesquite is common on dry ranges and in washes and draws at low elevations. It is especially common along streams and where the water table is high. It is found from California to Texas, Kansas and Mexico.

Toxic Agent

Cattle primarily are affected by mesquite beans, although goats are also known to be affected. Sheep are reported to be resistant. The biochemical pathology of mesquite poisoning is only partially understood. In some ways the syndrome produced by a diet of mesquite is best considered a nutritional problem. Mesquite beans have a high sucrose content which, together with inadequacy in other dietary factors, alters rumen microflora, inhibiting cellulose digestion and possibly contributing to rumen stasis and impaction. B vitamin synthesis is inhibited. Ketosis may follow in severe cases or in pregnant animals.

Symptoms

The chronic form of the disease, jaw and tongue trouble, develops gradually, usually after cattle have been eating beans for 2 months or more. They gradually become emaciated and may lose 50 percent of their weight. Afflicted cattle salivate profusely and chew continuously, sometimes without anything in their mouths, and will hold their heads to one side as if chewing were painful.

About 25 percent of affected animals have a partial paralysis of the tongue, which protrudes from the mouth 1 to 4 inches. At least 10 percent of poisoned animals will have swelling under their jaws or tongue, and some will have enlarged salivary glands.

Signs of acute poisoning include:

- loss of appetite
- rapid loss of weight
- nervousness
- a wild expression
- bulging eyes
- death usually within 2 to 4 days of the first signs of illness

Integrated Toxic Plant Management

Most cases of acute poisoning occur in pastures where large quantities of mesquite beans accumulate and where pack rats store them. Cattle should not be allowed to consume large quantities of beans for more than 60 days without adequate high quality roughage. A combination stocking of cattle and sheep will reduce cattle losses, since sheep are apparently not affected by the beans. If the disease has not progressed too far, three out of four animals will survive if given proper treatment.

Numerous control methods are available for mesquite. The plant is rarely controlled solely because of its toxicological implications, but also because it competes for moisture and space and can greatly reduce the growth of desirable forage. In severe infestations, plant density can impede other management activities as well.

Long-term mesquite control usually requires a variety of control and follow-up techniques. These may include ground or aerial broadcast chemical control, mechanical methods (grubbing, root plowing, etc.), individual plant treatments, and prescribed fire.

A Tactical Brush Management System (TBMS) focuses on preventive control measures, targeting the smaller, younger mesquites with individual plant treatments (chemical or mechanical) and/or fire. This system can reduce overall herbicide usage and expense and also can be used as a follow-up treatment after initial control measures. Chemical control recommendations for mesquite are numerous and specific. For herbicides and rates refer to Extension publication B-1466, "Chemical Weed and Brush Control Suggestions for Rangeland."



Woolly Paperflower *(Psilostrophe tagetina)*

Description

There are actually two species of paperflower in west Texas. Woolly paperflower, shown in the photo, is similar to cudweed paperflower (*P. gnaphalodes*) both in appearance and in its effects on livestock. The paperflowers are erect, perennial herbs of the sunflower family. The stems and leaves are thinly hairy. Leaves are alternate and narrow, and generally decrease in size as they move upward on the plant. The lower leaves form a rosette at the base of the plant. The flower heads are yellow and occur in loose to dense clusters at the ends of the branches. Flower petals are persistent, becoming pale and papery with age, hence the name paperflower.

Distribution and Habitat

The paperflowers are typically found on open, dry ranges in semiarid regions of Texas, Utah, New Mexico, Arizona and Mexico.

Toxic Agent

The toxic agent associated with woolly paperflower has been identified as a sesquiterpene lactone. This plant is more toxic in the young, green stage than after maturity. In most cases woolly paperflower is considered poisonous only to sheep, although cattle may be susceptible.

Symptoms

Woolly paperflower is relatively palatable to sheep and it is common for sheep to graze this plant for up to 2 weeks before symptoms of poisoning become apparent. At that time sheep may appear in good condition but will show some incoordination and stumbling when running. Later they become sluggish, lose their appetite and cough violently, causing vomiting of a greenish liquid. Eventually depression and emaciation result, and death follows after a week or more of partial coma.

Integrated Toxic Plant Management

There is no specific treatment for woolly paperflower poisoning, although if animals are moved to a non-infested pasture or put on feed as soon as symptoms first appear, most will completely recover. To minimize consumption of paperflower, supplement the diet with a high quality protein. Since paperflower can be grazed for approximately 2 weeks before symptoms occur, grazing can be managed so that large numbers of animals are on pastures for short periods of time to reduce plant density. Rotational grazing between infested and non-infested pastures also may be used to control losses. Another successful strategy is to first graze the pasture only with cattle, and then allow access by sheep after the paperflower has matured.



Rayless Goldenrod, Jimmyweed *(Isocoma wrightii)*

Description

Rayless goldenrod is a low-growing, half-shrub with erect stems arising from a woody crown to a height of 2 to 4 feet. The leaves are resinous, sticky, narrow, alternate, and may be even or slightly toothed along the margins. The stems bear flat-topped clusters of yellow flowers through late summer.

Distribution and Habitat

Rayless goldenrod is commonly found on dry rangelands, especially in river valleys, along drainage areas and irrigation canals, and on gypsiferous soil outcrops. It is a local problem in the Pecos valley drainage in southeastern New Mexico and western Texas. It usually grows at 2,000 to 6,000 feet elevation and is found from southern Colorado into Texas, Mexico, New Mexico and Arizona.

Toxic Agent

All species of livestock may be poisoned by rayless goldenrod. The toxic agent is trematone. This poison is cumulative in the animal and is present in both the green and dry leaves, making the plant toxic yearlong. A toxic dose generally consists of 1.0 to 1.5 percent of the animal's weight, consumed over a period of 2 to 3 weeks. The toxin in rayless goldenrod can be passed through milk. It is not uncommon for sucking young to exhibit symptoms of poisoning, but not their mothers. Most cases of poisoning occur in the late fall or early winter, but poisoning can occur year-round. Humans have been known to be poisoned by consuming the milk from affected cattle.

Symptoms

This plant produces symptoms often referred to as the “trembles.” Muscular trembling is particularly noticeable about the nose, hips and over the shoulders. The trembling is sometimes more pronounced after exercise. The animal will stand in a “humped-up” position and move with a stiff gait. The stiffness and weakness is most pronounced in the forelegs. The inactivity gradually increases and culminates in extended weakness. In later stages, the animal lies down and becomes unable to rise. Other symptoms may include:

- constipation
- vomiting
- quickened and labored respiration
- almost continuous dribbling of urine

The abnormal respiration of sick animals shortly before death is especially characteristic. Affected animals breathe with a prolonged inspiration followed by a pause and then a short and somewhat forcible expiration. In still later stages, the animal may breathe in a series of gasps. Horses sweat profusely in early stages of poisoning.

Post mortem findings include:

- congestion of the abomasum and intestine
- a pale liver
- distended gall bladder

Integrated Toxic Plant Management

Keeping animals from areas known to be infested with rayless goldenrod is the best method of management. There is no definite treatment for poisoned animals. They should be removed from the area of poisoning and given good quality hay and clean water. Veterinarians have found the intravenous administration of glucose and calcium gluconate to be helpful at times. The use of purgatives, smooth muscle stimulants, and laxative feeds also may assist with recovery. Oral administration of activated charcoal at 1 gram per kilogram of body weight may be helpful. Calves and lambs should be taken off poisoned dams, the mothers milked out and the milk thrown away.

Rayless goldenrod is somewhat difficult and expensive to control chemically. Chemical control is achieved through aerial or ground broadcast methods in the fall. The application of 0.45 ounces a.i./acre (3/4 ounce of product) of Escort® or 1/2 pound a.i./acre (1 quart) of Tordon 22K® mixed with 1 to 2 quarts of surfactant in water carrier has given good results. Because it is a perennial plant, mechanical methods must remove the entire plant, including the roots.



Sacahuista *(Nolina texana)*

Description

Sacahuista is a perennial member of the lily family. The plant forms a distinctive large clump of many fibrous, long, narrow leaves. The leaves may be up to 5 feet long. Stems are woody and mostly buried. Each plant gives rise to several flower stems each spring. These stems bear numerous flower clusters. The flower stalks usually are not apparent until the plant is in full bloom.

Distribution and Habitat

Sacahuista is typically found on rocky range sites and mountain foothills from 3,000 to 7,000 feet in elevation. It is found in western Texas, Arizona, New Mexico and Mexico.

Toxic Agent

The flowering buds, blooms and fruit contain the toxin saponin. These plant parts are avidly eaten by sheep, goats and cattle on the range. The foliage also is eaten to some extent, particularly by cattle, but poisoning does not seem to follow ingestion of the foliage. Feeding experiments have found that a minimum toxic dose for sheep is about 1.0 percent of the animal's weight of buds or blooms. Ingestion of sacahuista fruit, blooms or buds causes severe liver damage. The minimum toxic dose and the minimum lethal dose are about the same. Under range conditions, almost all animals that develop symptoms eventually die. Goats seem to be more susceptible to sacahuista than sheep.

Symptoms

Sacahuista produces signs of:

- generalized jaundice
- loss of appetite
- liver and kidney damage
- progressive debilitation

Ingestion of sacahuista flowers or fruit and some green plants may produce photosensitization, as evidenced by a swollen face and ears. A purplish band may appear around the top of the hoof above the coronary band. Dermatitis with itching may occur in the early stages of photosensitization.

Integrated Toxic Plant Management

Only the fruit, blooms and buds of the plant are toxic, and because these parts are available in the spring, livestock should be restricted to pastures with the least density of sacahuista at this time. Severity of loss is correlated with the abundance of bloom, which is quite variable from year to year. Heavy blooms occur on the average only once every 5 or 6 years. Proper mineral supplementation programs may help reduce consumption of sacahuista by livestock. This plant is not easily controlled with broadcast herbicides. Individual plant treatments with Spike 20P® have been successful. Apply 1/4 ounce of pellets per plant, during May or June for best results. Sacahuista might be controlled in a few pastures so that animals can graze there when the plants are flowering in other pastures.



Sand Shinnery Oak *(Quercus havardii)*

Description

Sand shinnery is a low shrub, usually less than 3 feet tall, that forms thickets. It spreads by underground rhizomes and grows best in deep sands. Its acorns are generally large, but vary in size and shape. Leaves are alternate, deciduous, leathery and variable in size and shape.

Distribution and Habitat

In western Texas and eastern New Mexico, sand shinnery is found primarily in association with deep sands.

Toxic Agent

Tannin (in particular gallotannin) is the principle poisonous agent. Sand shinnery is toxic to cattle, sheep and goats. All parts of the sand shinnery plant contain tannins at all seasons of the year. Most toxicity problems occur when livestock consume the palatable buds, small leaves, stems and flowers in the spring.

Symptoms

Under range conditions, symptoms usually appear a week after heavy consumption of oak by livestock. Symptoms consist of:

- rumen stasis
- constipation
- rough coat and dry muzzle
- abdominal pain
- excessive thirst
- frequent urination

Cattle at first pass small amounts of hard, brownish-black, pelleted feces. If the animal remains alive long enough, this changes to diarrhea containing blood and mucus. Death occurs in more than 85 percent of cases if effective treatment cannot be given. Symptoms usually last 3 to 10 days, but an occasional death occurs within 24 hours.

Integrated Toxic Plant Management

Supplemental feed containing 9 to 10 percent hydrated lime has reduced losses of cattle in experimental feeding trials. The best preventive measure is to keep livestock out of infested pastures for 3 to 4 weeks when the oak first buds in the spring. Toxicity of oak declines rapidly after this time. Sand shinnery is not easily controlled with herbicide, but can be reduced with ground or aerial broadcast and individual plant treatment applications of Spike 20P®. For aerial or ground broadcast applications, apply 3/4 to 1 pound a.i./acre (3.75 to 5 pounds of pellets). Apply 1/2 ounce of pellets per 100 square feet of canopy for individual plant treatment.



Silverleaf Nightshade *(Solanum eleagnifolium)*

Description

Silverleaf nightshade is an upright prickly perennial, usually 1 to 3 feet in height. This plant reproduces by seed and creeping rootstalks. The characteristic silver color arises from the densely-matted, tiny, star-like hairs that cover the surface of the entire plant. The leaves have wavy margins and are lance shaped to narrowly oblong. The entire plant may bear slender yellowish spines, or they may be scarce or wholly lacking. The showy flowers are violet and yellow or bluish.

Distribution and Habitat

Silverleaf nightshade is a serious weed of prairies, open woods, and disturbed soils in the southwestern U.S. and Mexico. It is found north to Missouri, and occasionally even further north.

Toxic Agent

Horses, sheep, goats, cattle, swine, chickens, ducks, rabbits and man have been reported to be poisoned by eating this plant. However, sheep and goats are more resistant than cattle, and under controlled experiments, goats were not poisoned at all. The toxic agent in this plant is the glycoalkaloid solanine. Both the leaves and fruit of silverleaf nightshade contain solanine. In some instances as little as 0.1 to 0.3 percent of an animal's weight of the plant is sufficient to be toxic.

Symptoms

The glycoalkaloid can cause two types of effects in a poisoned animal.

Nervous effects include:

- apathy
- drowsiness
- salivation
- labored breathing
- trembling
- progressive weakness or paralysis
- prostration
- unconsciousness

Effects of gastrointestinal irritation include:

- nausea
- abdominal pain
- vomiting
- diarrhea, sometimes with blood

The nervous effects sometimes completely overshadow any symptoms related to gastrointestinal irritation, while at other times the reverse may be true.

Integrated Toxic Plant Management

Veterinarians have had some success administering intestinal purgatives such as pilocarpine or physostigmine. Affected animals should be moved as little as possible and provided with good quality hay and water. Silverleaf nightshade is a relatively unpalatable plant, so problems usually occur when animals are forced to eat it. This can occur after serious overgrazing or if nightshade is baled up with hay. Livestock should not be fed from the ground in areas where there is a lot of ripe nightshade fruit available. Good range management practices can reduce the incidence of livestock poisoning. If infestations become severe, apply Grazon P+D[®] at 0.6 to 0.9 pounds a.i./acre (1 to 1 1/2 quarts) as an aerial or ground broadcast treatment in the spring when plants begin to flower. For individual plant treatments, mix 1 gallon of Grazon P+D[®] and 1 to 2 quarts surfactant with water to make 100 gallons. Thoroughly wet the leaves using a hand-held sprayer. Since the plant typically grows on disturbed sites, individual plant treatments with herbicide may be targeted around watering and holding facilities and other high traffic areas. Mechanical control practices may increase the severity of plant infestations.



Tansy Mustard *(Descurainia pinnata)*

Description

Tansy mustard is an annual forb that grows to a height of 2 feet. It is usually single-stemmed, leafy throughout, and covered with fine, gray hairs. The leaves are alternately placed along the stems, with each leaf divided into numerous small segments. Flower color varies from yellow to whitish, with flowers occurring in long clusters at the ends of the stems. Plants flower during February, March and April. The fruits are very distinctive: long, round, slender, two-celled capsules filled with numerous small, waxy seeds.

Distribution and Habitat

Tansy mustard is widely distributed throughout the southern and western U.S. up to 7,000 feet in elevation. Heavy stands may form on dry, sandy soils in arid areas. Abundance increases following moderate or heavy winter rains in the arid southwest.

Toxic Agent

The toxic agent is unknown. However, it is known that large quantities of the plant must be consumed by livestock before poisoning will occur. Tansy mustard also has been shown to accumulate toxic levels of nitrate.

Symptoms

Cattle are the only species of livestock reported to be poisoned.

The first symptom observed is partial or complete blindness ("blind staggers") which causes animals to wander aimlessly until exhausted, or to stand pushing against a solid object in their path for hours. This is followed or accompanied by an inability to use the tongue or to swallow ("paralyzed tongue"). Cattle may be observed standing at water unable to drink or trying unsuccessfully to graze.

Integrated Toxic Plant Management

A simple and effective treatment is administering 2 to 3 gallons of water (with nourishment such as cotton seed meal in it if the animals are seriously weak) twice daily by stomach tube. This gets the digestive system functioning again and symptoms gradually disappear. The plant is a relatively non-toxic, cool-season forb, so moderate amounts may be desirable. Furthermore, stands thick enough to lead to the heavy consumption necessary for poisoning don't appear every year. Because of this, herbicidal control is not recommended except where dense stands occur around watering and holding facilities and other areas of high livestock use. Good range management practices and grazing a mixture of cattle, sheep and/or goats may aid in controlling excessive intake by cattle.



Tarbush, Blackbrush *(Flourensia cernua)*

Description

Tarbush is a strongly aromatic, perennial shrub and member of the sunflower family. Leaves are alternate, smooth along the edges and obovate or oblong in shape. The flowers are solitary in the leaf axils, forming a leafy inflorescence. Tarbush plants may vary from 1 foot in height on dry sites, to more than 6 feet in deep, overflow areas.

Distribution and Habitat

Tarbush is common on dry plains, hills and mesas from counties just east of the Pecos River in Texas, west to Arizona, and south to Mexico.

Toxic Agent

Sheep, goats and cattle may be poisoned by tarbush. The actual toxin contained in tarbush is unknown, except that it is alcohol insoluble. Experimental forced feeding of tarbush fruits to a relatively large number of sheep and goats showed the fruits to be lethal at about 1 percent of the animal's weight. There was considerable variation in individual susceptibility, and a very small margin existed between toxic and lethal doses. The foliage, in moderate quantity, was not found to be toxic.

Symptoms

Symptoms appear under range conditions a day or less after ingestion of a toxic amount of the plant. Depending upon the acuteness of poisoning, death may follow within 24 to 72 hours, or occasionally longer. Some animals may recover rapidly after showing symptoms for several days to a week. Symptoms are somewhat modified by the severity of poisoning, but consist in general of:

- loss of appetite
- abdominal pain
- reluctance to move
- occasional respiratory distress

In acute cases, salivation may be observed. Animals generally remain on their feet until shortly before death, which usually occurs without struggle. Poisonings occur mostly in January through March after the fruit has matured (green fruit is not eaten) but before it falls.

Integrated Toxic Plant Management

Tarbush is extremely unpalatable, and will not be grazed unless animals are starving or have severe phosphorus deficiencies. Avoidance of overgrazing and use of proper supplemental feeding programs (including phosphorus) will usually eliminate livestock losses to this plant. Spike 20P® will control tarbush on a large broadcast basis, but the treatment is relatively expensive. However, dense stands compete with desirable forage species and controlling them with herbicide may be beneficial. For aerial or ground broadcast applications, apply Spike 20P® at 3/4 to 1 pound a.i./acre (3.75 to 5 pounds of pellets). Individual plants on smaller areas can be hand-treated with 1/2 ounce of pellets per 100 square feet. Proper stocking rates and good grazing management practices should follow herbicide treatments. On "tobosa flats," where adequate fine fuel exists, fire may be incorporated into the management strategy.



Threadleaf Groundsel, Senecio *(Senecio longilobus)*

Description

Threadleaf groundsel is a many-stemmed, evergreen composite. Leaves are pinnately divided into three to seven segments and may be hairy or nearly smooth. The stems are herbaceous, although somewhat woody at the base, and may have variable hairiness. Stems and leaves are gray-green in color. Flowers are yellow.

Distribution and Habitat

Threadleaf groundsel is a common range plant in Colorado and Utah, and south to Texas and Mexico.

Toxic Agent

Threadleaf groundsel owes its toxicity to the pyrrolizidine alkaloids. Generally, it takes a dose of 1 to 5 percent of the animal's weight, consumed over a few days, to cause acute poisoning. This type of poisoning is rare under range conditions. Most losses are from chronic poisoning, which can be caused by an animal consuming 30 percent of its body weight of threadleaf groundsel over a period of weeks.

Symptoms

Cattle and horses have about equal sensitivity to this plant. Sheep and goats are more resistant, generally requiring up to twice the amount for the same effect as in cattle and horses. During diagnosis, it is important to remember that there is generally a time lapse of up to 6 months between consumption of this plant and the appearance of symptoms under natural conditions. First signs of poisoning may include:

- standing apart from other animals
- appearing depressed or sluggish
- lack of appetite

The advanced stage of the disease is characterized by:

- continuous walking
- sudden appearance of nervous disturbances
- frequent voiding of small amounts of liquid
- bile-stained feces

In the advanced stage, animals may remain relatively quiet or become agitated. If the latter, they may become dangerously aggressive, attacking any nearby moving object.

Integrated Toxic Plant Management

There is no general treatment because liver damage is severe and tends to be permanent. Range management practices that improve range condition will reduce losses to threadleaf groundsel. Proper mineral supplementation, especially with phosphorus, also will help. Sheep and goats, because of their higher resistance to the plant, can be used to graze off some threadleaf groundsel before cattle or horses are given access to infested pastures. Supplements containing urea should be avoided if threadleaf groundsel toxicity is suspected.

Individual plants can be treated with Grazon P+D[®] (mix 2 gallons with 1 to 2 quarts surfactant and water to make 100 gallons) applied directly to the leaves. When populations are widespread, aerial or ground broadcast applications of 0.94 pounds a.i./acre of Grazon P+D[®] (3 pints) or 1/4 ounce a.i./acre (4/10 ounce of product) of Escort[®] have given good results.



Twinleaf Senna (*Senna roemeriana*)

Description

Twinleaf senna is an erect, gray, pubescent, perennial herb with few to many stems from a thickened root. Leaves are spirally arranged as a single pair of leaflets (hence the name "twinleaf"). The yellow flower petals are about twice as long as the sepals, and prominently nerved when dry. Flower stamens are straw to light brown in color.

Distribution and Habitat

Twinleaf senna is common in pastures and open woods on limestone soils in central and western Texas and west to New Mexico.

Toxic Agent

The actual toxin involved is unknown. Twinleaf senna is primarily toxic to cattle, goats and probably horses. Sheep are highly resistant, but also can be poisoned with high consumption. Little information is available on minimum lethal doses.

Symptoms

Symptoms of twinleaf senna poisoning include:

- loss of appetite
- diarrhea
- weakness
- in later stages, reddish urine

Affected animals often lie down, look alert, but will not be able to get up. Animals that reach this stage usually do not recover. If poisoning is detected early and animals moved from infested areas, approximately 40 percent will recover. In post mortem, muscle tissue of poisoned animals will be pale in color as compared to the red color of normal animals. Effects on muscle tissue are most pronounced in the skeletal muscle tissue of cattle and in the cardiac muscle tissue of goats.

Integrated Toxic Plant Management

The best prevention is to maintain excellent range condition. Supplemental feeding programs, especially with regard to minerals, also reduce twinleaf senna losses. Because of their higher resistance, including sheep in the grazing mix may reduce the amount of twinleaf senna consumed by cattle or goats. Individual plant treatments with herbicides are effective in controlling small populations of plants. Mix 1 gallon of Grazon P+D® or 1 gallon of Weedmaster® herbicides with 1 to 2 quarts of surfactant and water to make 100 gallons of mixture. Proper stocking rates and grazing management practices should follow chemical applications.