

## MECHANICAL INJURIES CAUSED BY WEEDS AND OTHER PLANTS.

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Weeds are usually regarded as a class of plants that cause damage by intruding upon the soil at the expense of more useful vegetation. A large number of weeds, however, cause considerable damage by inflicting injuries in a mechanical manner, a type of injury seldom considered when estimates are made concerning losses due to weeds.

Wool growers in all parts of the country suffer severe losses due to dockage occasioned by the presence of burs; many ranchmen lose heavily when grass awns cause loss of condition and death on the range, and tanners incur loss from hides damaged by grass punctures and bur scratches. In a variety of other ways plant-mechanical injuries are far reaching in effect.

**Kinds of plant-mechanical injuries.**—Among the various kinds of mechanical injuries caused by plants are:

1. The awned fruits of certain grasses and other plants sometimes cause death by penetrating the walls of the alimentary tract. Such plant parts may also puncture the skin, thus damaging the hides, and occasionally they penetrate the kidneys and other internal organs. Grass awns frequently cause such extreme soreness in the mouths of grazing animals that the afflicted animals are unable to eat and starve to death.

2. Various burs and other plant parts become entangled in wool and mohair, causing heavy dockage. The irritation and pain due to burs, spines, etc., are responsible for considerable loss of flesh of livestock and causes cows to give less milk. Occasionally burs lodge in the throats of animals in such a manner as to prevent the swallowing of food.

3. Heavy spines and thorns tear out the wool of sheep and injure the eyes of animals severely. They also tear clothing and frequently cause severe flesh wounds in man and animals.

4. Certain diseases, of which lumpy jaw (actinomycosis) is an example, enter the system only after the skin has been punctured by spines, thorns and other plant parts usually contained in the forage.

5. Certain plants, such as the nettles, possess stinging hairs capable of inflicting great pain.

6. The alimentary tracts of animals are occasionally clogged by seeds and bezoars, sometimes with fatal results.

<sup>1</sup>Contribution from the Botany Department, Purdue University Agricultural Experiment Station.

7. The pollen of a number of wind-pollinated plants possess spiculated coats which irritate the nasal mucosa, especially of persons subject to hay fever.

**Damage.**—Damage due to mechanical injuries by weeds and other plants occurs in all parts of the United States and there are probably few farms free from such injuries. The heaviest losses are suffered among grazing animals on our western ranges and by sheep wherever raised.

Although the loss due to mechanical injuries upon the individual farm are rarely heavy, except in the grazing regions of the west, the annual total of these minor losses throughout the United States is considerable. There is no data available upon which a reliable estimate can be based.

Undoubtedly the greatest damage is caused by awned seeds and fruits of grasses such as *Hordeum jubatum* and *Stipa spartea*. For instance, Fleming and Peterson, in discussing the losses to sheep incurred by the awns of *Hordeum jubatum*, state: "The actual deaths vary in different bands. . . . Unless preventive measures are taken the mortality is high, even from a short feeding season on hay containing a considerable percentage of squirrel-tail grass."

In Australia, where conditions somewhat similar to those existing in parts of the United States prevail, one authority estimates the mortality to sheep during seasons when grasses seed abundantly, to be as high as 50 per cent among lambs and 10 per cent in mature sheep. Several of the species of injurious grasses which are prevalent in Australia occur abundantly in the United States. The total value of sheep in the United States on January 1, 1920, was over \$500,000,000.00, so the possibilities for damage are great.

Not only are heavy losses caused by the death or loss of condition of animals, but the damage to leather and wool is considerable. Some indication of the extent of damage caused by cocklebur alone may be secured from the following statement by J. S. McHargue of the Kentucky Agricultural Experiment Station:

"A rather conservative estimate shows that cockleburs cause an annual loss of at least \$50,000.00 to the wool growers in Kentucky."

An attempt was made by the writer to ascertain the amount of loss to leather and to wool due to the presence of grass awns, grass seeds and burs, by sending inquiries to several large dealers in leather and wool. Some of the statements made in reply are interesting and serve to shed some light on the subject and they are therefore quoted:

"We believe that we can conservatively say that from 10 to 15 percent of our wool output through most months of the year is brought down very considerably in value due to the presence of burs and seeds. The damage to skins that we turn into leather is so great at certain seasons that they are practically ruined and the injury is quite difficult to cover with figures." Henry C. Hellwig, Legallet, Hellwig, Norton Company, San Francisco, California.

<sup>2</sup> Bulletin 97, Nev. Agr. Exp. Stat. Aug., 1919. p. 17.

<sup>3</sup> Ecology. Vol. 11, No. 2, April, 1921. p. 100.

"At certain times in the year, the skins from sheep from certain districts are rendered practically valueless by the presence of these seeds. In the spring and early summer skins taken from the sheep which were raised in California and other far western states are practically full of holes where these seeds have been. This reduces the value of the skins to about one-third of what it would normally be. As a concrete illustration, skins which today are worth \$11.00 per dozen when free from burs are only worth about \$5.00 or \$6.00 if they have these seeds or burs in them." A. C. Lawrence Leather Co., Boston, Massachusetts.

"A free wool sells at \$1.50 per pound. The same quantity of seedy wool when finished, sells for \$1.07. The damage (to skin) due to awned grass seeds is quite heavy. A seedy skin is usually reduced from 30 per cent to 40 per cent on value." Otis D. Swain, Winslow Bros. & Smith Co., Norwood, Mass.

"Wool and sheep skins are damaged approximately 35 per cent when they have cockleburs, cloverburs, spiralburs and foxtail in them. Some of these defects in wool not only reduces the value of the wool but also reduces the value of the slats and mutton. Approximately 50 to 75 per cent of the lambs killed in this section during May, June and July have skins which show damaged slats due to the wild oats and spiralburs penetrating the skins." R. M. Chaplin, Western Meat Co., San Francisco, California.

A note in the Agricultural Gazette of New South Wales states<sup>4</sup> that burless clover is recommended for sheep pastures in Australia since "burry wool" sells at 3½ to 4½d per pound while wool of the same quality, free from burs, sells at 6 to 7½d per pound. It further states that American buyers of Australian wool show a decided preference for wool free from burs.

In Oregon it was estimated that 10 per cent of the wool marketed from the ranches of the eastern part of the state was discounted about 20 per cent in value on account of the presence of hoarhound and al-filaria<sup>5</sup>.

On the Baltimore market one report shows that burry wool was discounted two to six cents per pound, according to the quantity of burs present. The quotations for regular grades at that time ranged from 17 to 23 cents per pound.<sup>6</sup>

Considered from the point of view of actual damage done, awned fruits and seeds and spiny burs are of the greatest importance. Next in importance is probably the losses due to impaction. Here again figures are difficult, if not impossible, to secure, but it is probable that, due to difficulty in diagnosis, the actual losses can never be correctly determined.

The losses caused by the formation of hairballs or phytobezoars in the stomachs of grazing animals have been greatly reduced during recent years on account of increased knowledge on the part of farmers regarding methods of avoiding the trouble.

<sup>4</sup> 16:76. January 3, 1905.

<sup>5</sup> Portland Oregonian, April 13, 1901.

<sup>6</sup> Daily Produce Report, Baltimore, Md., Sept. 3, 1901.

The injury to health attributed to the mechanical action of pollen grains is noteworthy.

All other plant mechanical injuries must be considered as minor when compared with those previously discussed, although in the aggregate they cause a large amount of damage every year.

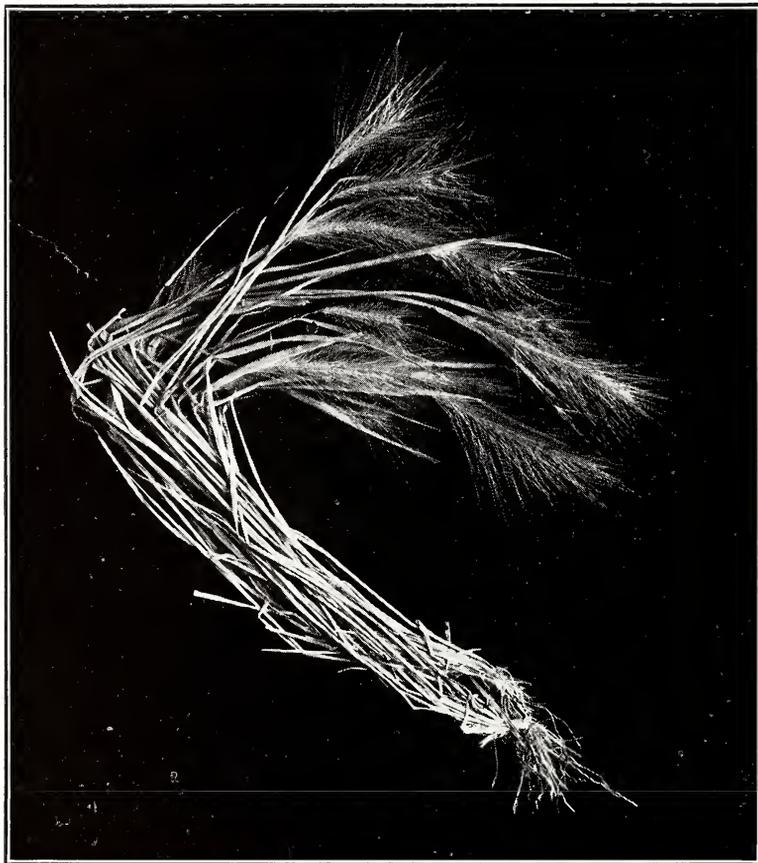


Fig. 1. Squirrel-tail grass (*Hordeum jubatum*), showing the bristly masses of awned fruits ("seeds").

#### MECHANICAL INJURIES CAUSED BY AWNED SEEDS AND FRUITS.

Of the various types of mechanical injuries caused by plants probably the most painful are due to the action of awned seeds and fruits. The awned grains (popularly called seed) of various members of the grass family are conspicuous in this respect. Horses, cattle, sheep, goats, chickens and dogs suffer from these mechanical injuries. The damage is greatest from July to September, the period during which most grasses ripen their seeds. Sheep, on account of their heavy fleece and comparatively thin skin and tender flesh, are probably more susceptible

to grass injury than are other types of animals. *Hordeum jubatum*, known by the common names squirrel-tail grasses, wild barley, foxtail, and tickle grass, (fig. 1) is noteworthy for the amount of damage it causes. Entire herds of sheep are sometimes infested with its barbed awns, and the plant is responsible for many deaths on the range. When ewes are killed at lambing time, the offspring usually perish with their parents, an indirect loss that may be heavy.

A source of considerable loss is the decreased flow of milk from milk cows and the loss of flesh in livestock, as a result of the extreme irritation caused by grass awns and other penetrating plant parts.



Fig. 2. *Left above.*—Fruiting head of false tickle-grass (*Sitanion hystrix*).

*Below.*—Awned fruits of false tickle-grass. These fruits become embedded in the eyes and flesh of animals, causing festering sores. They also injure the digestive tract. To the right of the false tickle-grass fruits may be seen a section of a steer's tongue showing a grass awn which has penetrated the flesh. The area surrounding the awn is infected with the organism causing lumpy jaw (actinomycosis). Highly magnified.

*Right above.*—Enlarged view of two awned fruits of alfilaria (*Erodium cicutarium*) showing the twisted awns and pointed, hairy tips. The fruits are similar in action and mechanism to the fruits of porcupine grass.

*Below.*—Awned fruits of porcupine grass or corkscrew grass (*Stipa spartea*). Note the twisted awn and the sharp, hairy tip of the fruit, the hair pointing away from the tip. A single tip enlarged is shown in the lower right corner.

**Species of Awned Plants Causing Mechanical Injuries.**—Among the species of grasses responsible for the greatest amount of damage are squirrel-tail grass, or wild barley, various species of porcupine or corkscrew grass (fig. 2) the most dangerous of which are *Stipa spartea* and *S. comata*; chess, (*Bromus tectorum*, *B. villosus* and other species of *Bromus*; fig. 3), three-awned grass (*Aristida* spp., particularly *A. fasciculata*); wild oats (*Avena fatua*, fig. 3, and *A. barbata*); bottle brush grass (*Hystrix hystrix*); foxtail, (*Setaria* spp.); false tickle-



Fig. 3. *Left*—Early chess or downy brome grass (*Bromus tectorum*). The range of this species has greatly increased during the past few years. *Upper center*—Single fruit of early chess, showing the awn. (Enlarged.) *Upper right*—Awned fruits of *Bromus villosus*. Directly underneath are shown the awned fruits of wild oats (*Avena fatua*). *Lower left*—Two fruits of early chess, enlarged to show the barbs on the awns which enable awn sections to penetrate the eyes and mucous membrane, causing serious irritation. The seeds mature early, when other grazing plants are scarce. *Lower right*—Enlarged view of the awns of squirrel tail grass (*Hordeum jubatum*), showing the tiny barbs on the awns.

grass, (*Sitanion hystrix*, fig. 2); buzzard grass (*Heteropogon contortus*); gramma grass (*Bouteloua aristidoides*), lovi-lovi grass (*Andropogon aciculatus*), a common pasture grass on the island of Guam and in the Philippine Islands; a species for which no recognized common name exists, *Raphis pauciflora*, and bronco grass, (*Bromus rubens*). In addition to the grasses, there are a number of other plants that produce awned seeds or fruits, such as alfalaria (*Erodium cicutarium*, fig. 2) and beggar-ticks (*Bidens* spp., fig. 5).

**Where the Greatest Losses Occur.**—Injuries from awned seeds and fruits are heaviest upon our western grazing lands, where the annual losses are considerable. Bronco grass is particularly bad in California. Stock eat the plants in the fall when other forage is short. Early chess (*Bromus tectorum*, fig. 3) grows in the same region as the bronco grass but it is not as troublesome because the species is not as palatable as bronco grass. *Bromus villosus*, an awned grass growing principally in California, was recently found in Maryland; the plant is apt to spread in sandy soil and may become exceedingly troublesome. Three-awned grass, (*Aristida fasciculata*) is especially troublesome in Arizona where its awned seeds occasionally kill sheep. *Hordeum jubatum* is troublesome throughout the western grazing areas while *Hordeum murinum* causes greatest damage in the southwest. Species of common foxtail, *Setaria* spp., are abundant in practically all agricultural areas of the United States.

**Mechanical Means by Which Injuries are Produced.**—The mechanical means by which the awned fruits and seeds cause injuries vary in different plants.

A common method is represented by the awned seeds of *Hordeum jubatum*, (fig. 1). This species produces seeds in abundance; each seed (fruit) is equipped with a long, slender awn or beard covered with numerous tiny barbs (fig. 3), all bent backwards, their tips pointing away from the seed. When cattle, sheep or horses browse upon the grass or eat hay contaminated with the pest the slender stiff awns break into small sections which penetrate the flesh. The tiny barbs permit the awns to work in but do not allow them to come out. The pieces of awns are heavily cutinized, consequently they do not decay rapidly. Other grasses which act in a similar manner are false tickle-grass, (*Sitanion hystrix*, fig. 2) and the cultivated plants wheat, rye and barley.

The awned seeds (fruits) of *Stipa spartea* work in a different manner. The tip of the seed is exceedingly sharp and the body is covered with hairs pointing away from the tip (fig. 2), in such a manner that when the seed once penetrates the flesh the hairs permit it to work inward but prevent egress. The opposite end of the seed is provided with a long, spirally twisted awn, sometimes five or six inches long, which works hygroscopically, relaxing when damp and coiling when dry. This constant twisting motion coupled with the body movements of the animal drives the pointed seed inward. Porcupine grass is particularly injurious to sheep and dogs. The awned "seeds" of alfalfa

(*Erodium cicutarium*), a member of the geranium family, operate in a similar manner (fig. 2).

**Character of Injuries Produced.**—In general, the penetrating plant parts may form (1) internal abscesses, (2) pustules directly under the skin, or (3) cysts unaccompanied by pus. The kinds of injuries inflicted are as follows:

1. *Eye Injuries.*—The awns or pieces of the awns enter the eyes of grazing animals and dogs, causing extreme soreness accompanied by a profuse flow of tears and the formation of pus, followed frequently by partial or absolute blindness. Animals with fine hair or wool surrounding the eyes, as sheep, are particularly susceptible to this form of injury.



Fig. 4. Tongue of a horse that died in Huntington County, Indiana, from the effects of eating over-ripe foxtail hay. Note the hundreds of foxtail beards which penetrated the flesh, resulting in swelling and death. (Photograph by Dr. R. A. Craig.)

2. *Injuries to the Nose, Mouth and Digestive Tract.*—The awned fruits of grasses and other plants readily penetrate the soft skin of the nose and the mucous membrane of the digestive tract, causing painful inflammation that may prove fatal. Infestation of the mouth is usually accompanied by excess salivation and bad mouth odors. Occasionally the tongue and throat become so swollen as a result of the penetration of the awns that the affected animals cannot swallow and the victim starves to death. The awns of squirrel-tail grass frequently insinuate themselves between the teeth, working their way through the gums and into the marrow cavity of the jaw bone, thus causing a loosening and falling out of the teeth and severe ulceration of the jaw bone. So great is the resulting swelling that affected animals are sometimes suspected of suffering with tuberculosis or with actinomycosis (lumpy jaw). The awned seeds of porcupine grass, and other seeds

similarly equipped, occasionally enter the intestines, puncturing the intestinal walls and causing death.

An interesting case of foxtail injury was reported by Dr. R. A. Craig of the Purdue University Agricultural Experiment Station. The trouble occurred in Huntington County, Indiana, where five horses died in the fall after eating feed containing considerable mature foxtail. In describing the case to the writer Doctor Craig said "The awns were distributed all through the lungs and mouth parts. The tongue, which was badly swollen, was completely riddled with the awns (fig. 4) and all the mouth parts were badly ulcerated. The lining membrane was completely gone." The awns were identified as common foxtail (*Setaria* sp.) by the Botany Department of the Purdue University Agricultural Experiment Station.

3. *Injuries to Wool and Mohair*.—The presence of the "seeds" of beggar-tick (fig. 5), porcupine grass, etc., in wool and mohair causes severe dockage since such plant parts are difficult to remove. In addition, infesting grass awns cause the shedding of both wool and mohair.

4. *Injuries to Hide and Flesh*.—"Seeds" with twisting awns, as porcupine grass, alfalaria and buzzard grass, frequently penetrate the skin, causing injury to the hide. A sheep was noted in Illinois with its skin so badly infested with the seeds of porcupine grass that the appearance suggested a pin cushion. Hides from badly infested animals may show thousands of tiny pits and punctures caused by seeds. The seeds are usually arrested in the tissue directly under the skin, but occasionally they penetrate the muscles and may even enter the heart, lungs, intestines and other internal organs, causing injuries that may prove fatal. The injuries to horses and cattle are apt to be superficial in character, while sheep and goats are more susceptible to internal injuries. Infested animals often refuse to graze since walking causes sharp pains. As a consequence of the lack of food, combined with severe pain, the animals lose flesh rapidly and in some cases die. Young, immature animals are more apt to succumb than adults. The condition of the skin and mouth parts is usually indicative of the trouble.

5. *Injuries to the Feet*.—The seeds and awns of a number of species of grasses, conspicuous among which are *Aristida fasciculata*, *Hordeum jubatum*, *Bouteloua aristidoïdes* and *Heteropogon contortus*, often penetrate the soft tissues around the hoofs of grazing animals. The resulting lesions may become infected by bacteria, producing inflammation that may spread to other parts of the leg. Foot injuries of this character may be mistaken for other foot diseases of animals, but a thorough examination of the affected tissue should reveal the plant parts responsible for the trouble, thus permitting a correct diagnosis. A typical example of this form of injury is presented by sand grass (*Aristida fasciculata*) in Arizona where death to sheep results from foot ulcerations produced by the awned seeds of this species.

## MECHANICAL INJURIES CAUSED BY SPINES, THORNS, ETC.

There are a number of plants which tear the flesh of animals. Such plants are usually equipped with large thorns, as thorn apple, (*Crataegus* spp.); with hooked fruits, as the unicorn plant (*Martynia louisiana*), or with spines, as the melon cactus (*Echinocactus* spp. fig. 5). Occasionally the plant part causing the injury may remain in the wound for several days, as in the case of the fruits of the unicorn plant.

A very abundant plant on the island of Guam is the aroma (*Acacia farnesiana*), which possesses thorns that inflict painful wounds on the legs of horses. The wounds swell and frequently develop into raw

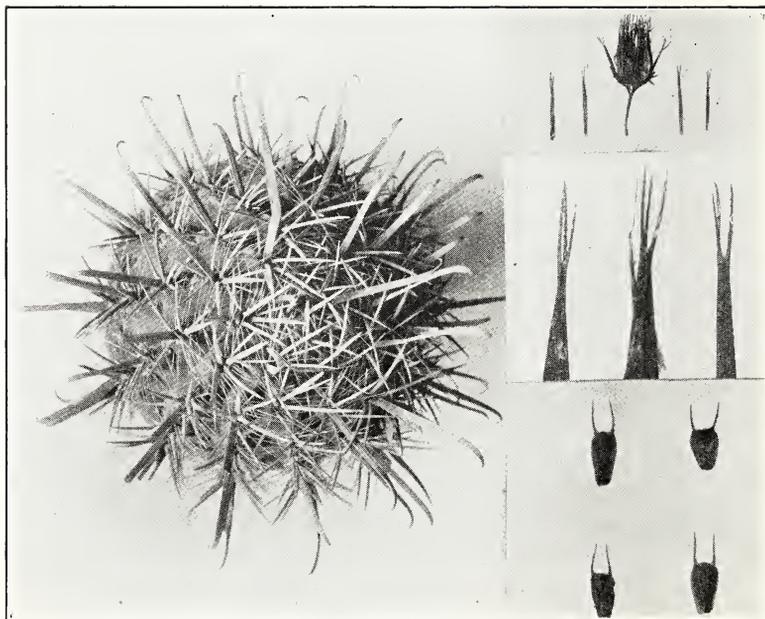


Fig. 5. Left. A cactus plant (*Echinocactus*) from Lower California, showing the curved spines, capable of tearing the flesh of animals.

Right above.—Fruiting head of Spanish needles (*Bidens bipinnata*) and four-awned fruits.

Middle.—Tips of awned fruits of Spanish needles, enlarged to show the barbed awns.

Below.—Awned fruits of beggar-tick (*Bidens frondosa*). The tiny barbs on the awns enable the fruits to attach themselves to wool, from which they are difficult to remove.

sores. The same species occurs on the plains and prairies of southern Texas, where it is called huisache, and to some extent in Florida.

In dry regions and during times of drought animals sometimes eat cacti or else attempt to split them with their hoofs in order to obtain the cool, succulent interior. In so doing the spines of the cacti may inflict painful wounds. Dr. Vasey,<sup>7</sup> in discussing the use of cacti as food for sheep and cattle, states: "A number of instances are reported of cattle having died from the accumulation of spines in the mouth and

<sup>7</sup> U. S. Dept. Agr., Div. of Bot., Bull. No. 3, p. 50.

stomach. The jaws and neck sometimes become swollen and inflamed from the presence of the spines. The tongue has been known to become so inflamed with them as to be rendered unfit for food. How this amount of injury can occur and not affect the growth of the animal it is difficult to see."

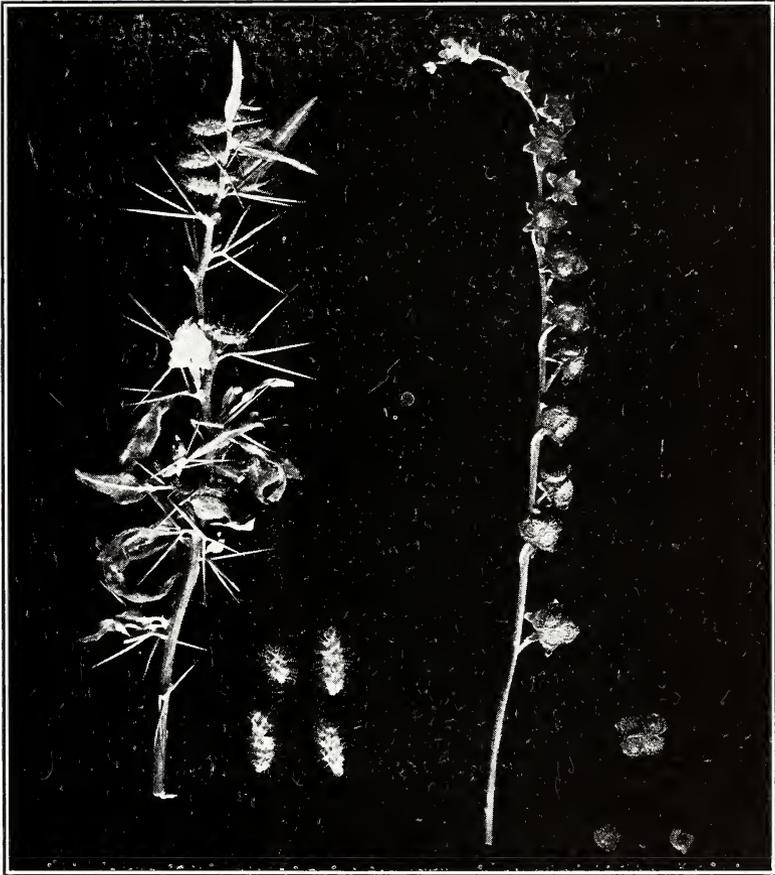


Fig. 6. *Left.*—Spiny cocklebur (*Xanthium spinosum*). The spines tear the flesh of animals and the burs infest the fleece of sheep. Four burs are pictured separately.

*Right.*—Hound's tongue (*Cynoglossum officinale*). The prickly "seeds," illustrated in the lower right corner, injure wool and mohair.

The sharp spines of mature Russian thistle plants are so injurious to the legs of horses that in parts of the middle west the use of high boots as a protection to horses' legs has been resorted to.<sup>8</sup>

Cattle are also fond of the flowers, pods and the succulent crown of yucca (*Yucca* spp.) and poke their noses into the mass of leaves in order

<sup>8</sup> Pammel, L. H., Iowa Agr. Exp. Stat., Bull. 38, p. 17.

to get at the desired parts. In so doing the sharp tips of the leaves may cut deep gashes in the nose and mouth parts.

The grapple-plant of South Africa (*Harpagophyton* sp.) produces spiny fruits close to the ground which cling to the hoofs of deer and sheep for weeks at a time. It is said that when lions eat infested animals they are sometimes killed by the lodgment of the grapple-plant fruits in the throat.

The noses and lips of animals are frequently punctured by the stiff, needle-like leaves of low-growing, scrubby pines such as are sometimes found in grazing areas in high altitudes.

Several species of plants cause injury to the hands during harvesting, as for instance the Canada thistle (*Cirsium arvense*) and yellow burweed (*Amsincki intermedia*) which frequently cut flesh when mixed with wheat that is handled during harvest. In the southern states, saw brier (*Smilax glauca*), a weed of field crops, is responsible for similar trouble. Any person who has ever gone barefooted in the country is aware of the pain possible from thorns and spines of wild plants.

Hay frequently contains thistles and sharp-pointed thorns, spines and small plant parts, which tear the flesh of the nose and mouth parts of animals. It is interesting and important to note in this connection that the fungus which causes actinomycosis or lumpy jaw (*Streptothrix actinomyces*) cannot cause infection unless the tissues of the digestive tract (usually the mouth) are first penetrated by some such agency as thorns, spines or grass awns (fig. 2) contained in the food. The sharp or pointed parts of the plants actually inoculate the parasite into the animal tissues,<sup>9</sup> most frequently in the tongue and other mouth parts. It has been observed that lumpy-jaw seems to be more prevalent among cattle that have grazed during autumn in fields where there is an abundance of squirrel-tail grass, than among animals which have grazed upon land free from this plant. The spread of the disease in such fields is probably due to the inoculating effect of the awns. Thorns and sharp pointed plant parts generally, as rose thorns, are thought to cause inflamed sores by inoculating bacteria into the wounds they produce.

A considerable source of loss is due to the tearing out of wool and mohair by briars, bushes, etc., equipped with thorns or spiny branches. In the west, sage brush (*Artemisia* spp.) tears out the wool to such an extent that special breeds of sheep are used in some sections to avoid the plucking effect of the vegetation. Other western plants which are especially damaging due to tearing are buck brush (*Ceanothus sanguinea*), sticky laurel (*C. velutinus*), cactus and yucca. In the east blackberry brambles cause considerable trouble of this character.

A striking example of the tearing effect of vegetation was observed in Alpena County, Michigan. A band of about 1,000 western sheep was driven through a burnt-over area upon which a growth of brambles had appeared. So damaging was the tearing process that a strip about a quarter of a mile long was white with wool, having somewhat the appearance of bushes after a heavy snow storm. Several hundreds of pounds of wool were lost in this manner although a large

<sup>9</sup> Actinomycosis or Lumpy Jaw. U. S. D. A., Bur. An. Ind., Cir. 96, p. 5.

amount of it was salvaged by children who later gathered the wool from the brambles. Western burnt-over brush land is noted for the losses incurred by the tearing action of the vegetation on the fleece of sheep.

The tearing of clothes by spines and thorns is an incidental but not unusual form of damage. Unless special clothes are provided, a walk in the woods or through the fields always exposes the clothes to considerable risk of tearing.

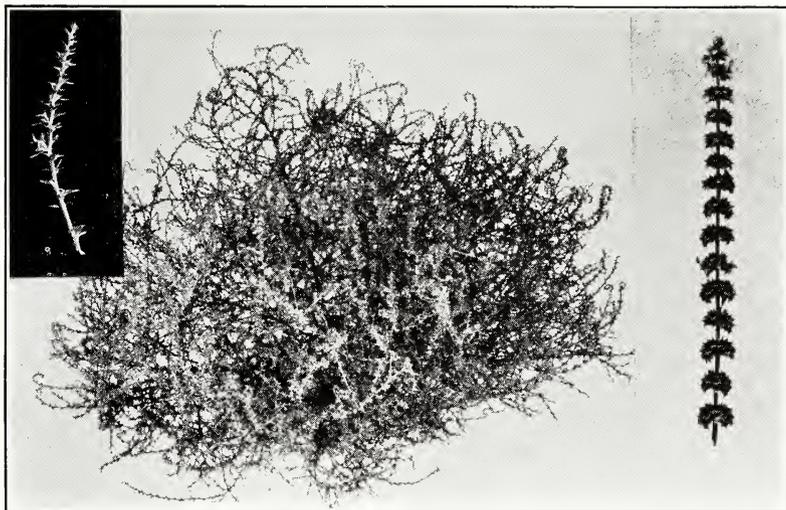


Fig. 7. Center.—Mature plant of Russian thistle (*Salsola pestifer*), showing spiny nature. A piece of a branch of the plant is pictured in the upper left corner. The spines do not develop until the plant matures. They are particularly injurious to the mouth parts of grazing animals.

Right.—Branch of a mature plant of motherwort (*Leonurus cardiaca*), showing the sharp spines of the calyxes. The spiny calyxes injure the nose and mouth parts of grazing animals.

Among the most important species, in addition to the ones already discussed, that cause damage by means of spines and thorns are honey locust, (*Gleditsia triacanthos*), devil's club, (*Echinopanax horridum*), greasewood (*Sarcobatus vermicularis*), various species of cactus, (fig. 4), wild roses, (*Rosa* spp.), spiny cocklebur, (*Xanthium spinosum*, fig. 6), motherwort, (*Leonurus cardiaca*, fig. 7), and Russian thistle (*Salsola pestifer*, fig. 7.)

#### MECHANICAL INJURIES CAUSED BY PLANT HAIRS

A single plant hair appears to be rather harmless, but nevertheless plant hairs may, in some cases, cause death to livestock and much pain and irritation to both animals and man.

From the viewpoint of mechanical injuries inflicted, plant hairs may be divided into three groups as follows:

1. **Stinging or Urticating Hairs.**—There are a number of plants equipped with stinging (urticating) hairs, principal among which are common nettle, (*Urtica dioica* and *U. gracilis*), and wood nettle, (*Laportea canadensis*), in the northern part of the United States and spurge nettle or tread-softly, (*Jatropha stimulosus*), in the South. Although the fluid that causes the sting is chemical in action, being a combination of formic acid with other substances, the manner of injection into the flesh is entirely mechanical.

Each stinging hair of the common nettle acts like a miniature hypodermic needle (fig. 8). The upper part of the hair is silicified,

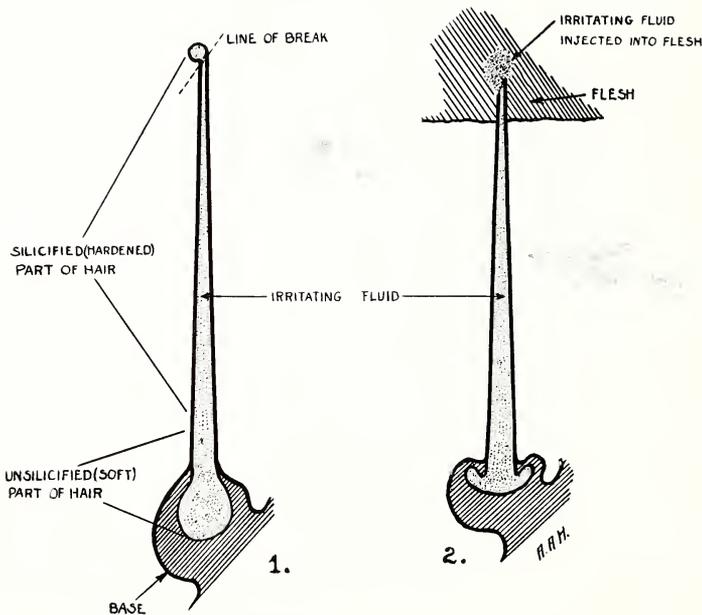


Fig. 8. Diagram of the mechanism of a stinging hair of nettle. Pressure, such as may be due to touch, causes the spherical tip to break off in such a manner that the sharp point penetrates the flesh. At the same time the silicified, hardened portion of the hair is forced into the soft, bulbous base, thereby causing a hypodermic injection of the irritating fluid contained in the hair.

hence hard and brittle, while the swollen base is soft and yielding. The tip is a tiny sphere and the point of attachment is thinned in such a manner that the head is readily broken off, leaving a slanting, extremely sharp, penetrating point. The interior of the hair is hollow and filled with the stinging fluid. When the skin comes in contact with the hair the pressure breaks off the spherical tip, the slanting point readily penetrates the flesh and the hard portion of the hair, on being pressed into the soft base, causes a hypodermic injection of the irritating fluid. Nettles may safely be stroked in a direction parallel to the leaf and toward the leaf tip, since by so doing the hairs are pushed flat upon the leaf surface and can do no harm.

The irritation and pain caused by stinging hairs is considerable both to man and animals. It is alleged that one species, *Urtica holosericea*, has been known to kill horses in California.

2. **Hairballs or Phytobezoars.**—The formation of bezoars in the stomachs of horses, mules, sheep, goats and cattle is a subject about which there is not sufficient popular information, although the phenomenon is familiar to most veterinarians.

It seems that bezoars are formed in the stomach as a result of eating plants equipped with fine hairs or spines, although concretions of various shapes may form as a result of over-indulgence in certain kinds of fibrous fodder. Hairballs may also result from the accumulation

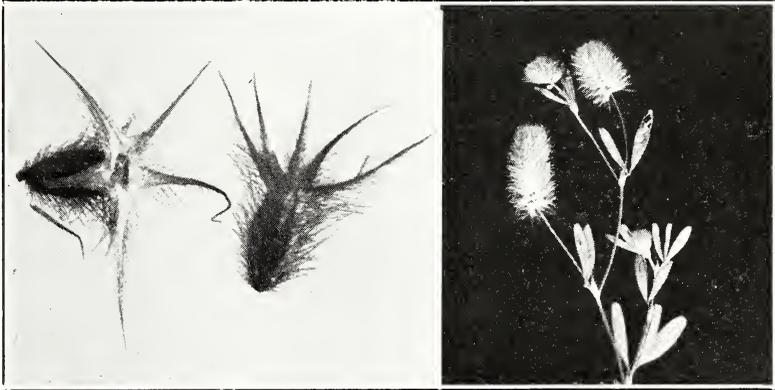


Fig. 9. *Left.*—Rabbit foot or field clover (*Trifolium arvense*). The fuzzy heads are capable of forming hair-balls in the stomachs of grazing animals. Horses seem particularly susceptible to injury from this species.

*Right.*—Calyxes of crimson clover (*Trifolium incarnatum*). The numerous hairs cause the formation of hair-balls in the stomachs of animals that graze on mature plants. Enlarged.

of hairs in the stomachs of animals that constantly lick themselves. The list of plants reported to have been responsible for the formation of bezoars in the stomach includes crimson clover, (*Trifolium incarnatum*, fig. 9), pasque flower, (*Anemone patens*, fig. 10), field clover or rabbit-foot clover, (*Trifolium arvense*, fig. 9), various species of cacti, (*Opuntia* spp.), mentzelia, (*Mentzelia* spp.), cocklebur, (*Xanthium* spp.), millet, oats, barley and ripe rye.

When the plant parts are equipped with barbs, as in the case of the hairs of the calyxes of crimson clover (fig. 9) the bristles of cacti and the awns of millet, oats, rye and barley, there is greater likelihood of the formation of bezoars. The barbed structures accumulate in the stomach, the barbs holding the parts together in a mass. A microscopical examination of crimson clover bezoars revealed that the hairs were all arranged in such a manner that the barbs pointed from the center outward. In one case, on the St. Mary's Academy Farm, Notre Dame, South Bend, Indiana, the seeds of crimson clover were accidentally included in a pas-

ture mixture. The hay was fed and four cows died. The animals were posted by Dr. Ira V. Carpenter of South Bend and numerous crimson clover hairballs were found in the stomachs and intestines. The plant was identified by the writer.

A unique method of bezoar formation may be caused by the rayless goldenrod (*Bigelovia heterophylla*). The species grows vigorously during early spring and when other food is scarce cattle graze on the plant rather heavily. The leaves of the rayless goldenrod are exceedingly resinous and they occasionally form indigestible bezoars in the stomachs of animals, the resin evidently acting as the medium of cohesion. Death to cattle due to this cause has been noted in Arizona. It is possible, however, that the trouble may be poisonous in nature.<sup>10</sup>

A case of death to a pony due to the accumulation of rye bezoars in the stomach was noted in southern Indiana. The rye was fed in a dry, over-ripe condition.

Phytobezoars may reach extraordinary dimensions. Trelease<sup>11</sup> reports one 3½ inches in diameter that weighed 7½ ounces, which was the average size of 16 removed from the stomach of a bull. He men-

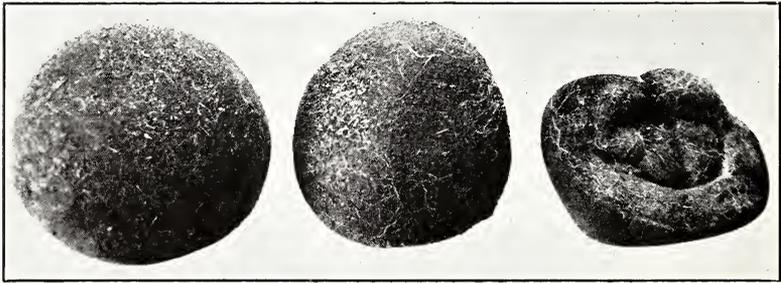


Fig. 10. Hair-balls taken from the stomach of sheep and shown natural size. The plant responsible for the formation of these hair-balls was the pasque flower (*Anemone patens*). A section of a hair-ball is shown to the right. (Photograph by Dr. William Trelease.)

tions another that measured 25½ inches in circumference and weighed 4 pounds 11 ounces. Coville<sup>12</sup> reports that 30 bezoars were said to have been removed from the stomach of a single horse.

Hair balls recently removed are usually almost perfect spheres of a brownish yellow color. When dried (fig. 10), they take on the appearance of brown felt; they are smooth, even of texture, very durable and surprisingly light in weight.

Hair balls are said frequently to enter the intestines, clogging the alimentary tract and thereby causing a particularly painful form of death from peritonitis. Some veterinarians are of the opinion that death from this cause is unusual and that the hair-balls may remain in the stomach indefinitely with little harm to the animal. On the other

<sup>10</sup> Thirty-first Annual Report, Arizona Agr. Exp. Sta., p. 459.

<sup>11</sup> An Unusual Phyto-bezoar. Trans. St. Louis Acad. Sci., Vol. VII, No. 18.

<sup>12</sup> Crimson Clover Hair Balls. U. S. D. A., Div. Bot., Cir. No. 8.

hand a veterinarian in Delaware, where considerable trouble has been experienced in the past, states his belief that only one case out of about a hundred infested animals recover.

A somewhat different type of ball formation was described to the writer by Dr. R. A. Craig of the Purdue University Agricultural Experiment Station as follows: "When horses are allowed to eat barley, the awns sometimes coalesce into spheres under the tongue. The animals are unable to dislodge these spheres and the assistance of a veterinarian is usually needed. The barley awns may also penetrate the tissues of the tongue."

3. **Irritation Due to Simple Plant Hairs.**—There are a number of plants, as for instance the common cocklebur, that do not possess stinging hairs but nevertheless are equipped with hairs that cause severe itching.

The woolly covering of the leaves of mullein (*Verbascum thapsus*), is made up of thousands of fine, branched hairs which adhere readily to the mucous membrane of the mouth and to the human skin where

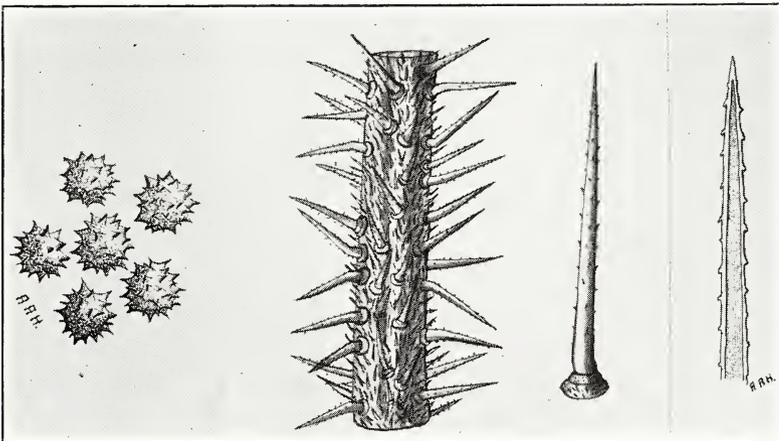


Fig. 11. *Left.* Pollen of sneezeweed or bitterweed (*Helianthemum tenuifolium*), showing prominent spicules. Pollen of this type may cause mechanical irritation of the nasal mucosa. Victims of hay-fever are especially susceptible to such injury. Magnified.

*Middle.* Enlarged view of stem of blueweed, or bugloss (*Echium vulgare*). Note the prickles, which cause severe irritation of the nose and mouth parts of grazing animals. A single prickle is illustrated in the center.

*Right.* Tip of stinging hair of velvet bean (*Stizobium decringianum*). Magnified.

they may cause severe itching. This form of irritation is familiar to persons who have been unfortunate enough to drink mullein tea not thoroughly strained.

The fruit and stem of the hop plant (*Humulus lupulus*) possess hairs that cause "hop-rash", a disease occasionally so troublesome that hop-pickers are compelled to wear gloves for protection.

In addition to spines, certain cacti known as prickly pears form numerous barbed hairs or bristles around the buds. The barbs all

point obliquely, so when the bristles enter the soft flesh of the nose, mouth or anus they can travel inward only, causing festering sores. This type of injury is not limited to animals since human beings are frequent sufferers.

The hairs or young leaves of plane trees (*Platanus* spp.), are sometimes found in the atmosphere in large numbers during the spring of the year, and they may cause a great deal of coughing and other forms of distress to persons inhaling them.

Among other plants that are injurious to persons with sensitive skins are primrose (*Primula obconica*), wild parsnip, (*Pastinaca sativa*), yellow lady's slipper, (*Cypripedium hirsutum*), viper's bugloss or blueweed, (*Echium vulgare*, fig. 11), borage, (*Borago officinalis*), the pods of the velvet bean, (*Stizolobium deeringianum*, fig. 11), and the leaves of various species of oaks. In general, the skin seems most susceptible to injury from irritating hairs when it is moist from perspiration, although the degree of susceptibility varies with the individual.



Fig. 12. *Left.* Sharp-pointed rootstock of southern nut grass (*Cyperus rotundus*) that has penetrated a potato. Specimen collected at Tarboro, N. C.

*Right.* Fruiting heads of the common wood rush (*Juncoides campestris*). The tiny, hard seeds are apt to clog the intestines of animals feeding upon this plant. An enlarged view of the seeds is shown in the lower left corner.

#### MECHANICAL INJURIES CAUSED BY IMPACTION

The alimentary tract may sometimes be clogged with seeds or other parts of plants. An interesting case of this type was noted in Pennsylvania. A number of cattle and horses browsing upon a permanent pasture became ill and many of them died, seemingly from the effects of eating poisonous plants. A botanist was consulted, but no poisonous plants could be found in the pasture. The autopsy, however, showed a large accumulation of small, shiny, triangular, black "seeds" in the stomachs and intestines of the dead animals, and the "seeds" were

identified as the fruits of the common wood rush (*Juncoides campestris*, fig. 12) which made up about one-third of the herbage of the pasture upon which the animals had been feeding. The verdict of the veterinarian was that death was due to eating the stalks and indigestible fruits of the wood rush, which so clogged the alimentary tract that food could not pass through.

Other plants which are said to be dangerous due to the formation of impaction are horsetail or scouring rush, (*Equisetum arvense*), Colorado rubber plant, (*Hymenoxys floribunda*), the seeds of mesquite, (*Prosopis chilensis*), and corn stalks and rye straw eaten without sufficient drinking water.

#### MECHANICAL INJURIES CAUSED BY POLLEN

The mechanical effect of various pollens upon the nasal mucosa of many human beings may result in extremely unpleasant irritation and sickness. Experimental evidence suggests that hay fever is due in part to the mechanical action of the pollen grains. Many hay fever sufferers sneeze and in other ways exhibit signs of their affliction the moment they enter a room containing irritating pollen. On account of the immediate effect it is a reasonable assumption that the initial cause may be mechanical in action.

Pollen grains that cause irritation possess coats equipped with tiny spines or spicules, (fig. 11); where spicules are large, as in the case of sneeze-weed pollen, (*Helcnium quadridentata*), the mechanical effect is irritating even to persons not susceptible to hay fever.<sup>13</sup>

Among plants which are wind pollinated and which possess mechanically-injurious pollen coats are common ragweed, (*Ambrosia artemisiifolia*), western ragweed, (*A. psilostachya*), kinghead, (*A. trifida*), wormwood, (*Artemisia biennis*), horsetail or fleabane, (*Erigeron canadensis*), thoroughwort, (*Eupatorium serotinum*), false ragweed, (*Franseria acanthicarpa*), sandbur, (*F. dumosa*), sunflower, (*Helianthus annuus*), poverty weed, (*Iva xanthifolia*), false wormwood, (*Parthenium hysterophorus*), and cocklebur, (*Xanthium pennsylvanicum*).

#### MECHANICAL INJURIES CAUSED BY BURS

There are a large number of plants equipped with spiny burs which injure mechanically in the following ways.

1. **Bur Injury to Wool and Mohair.**—The greatest loss due to burs is to wool and mohair. The presence of burs and other vegetable matter in wool (fig. 13) and mohair results in heavy dockage and causes difficulty in shearing. In at least one section of the country it was found necessary to wear buckskin suits when handling sheep infested with the burs of the common sand bur. Burry wool is sometimes docked as much as 40 per cent. The damage to mohair is not so great as the damage to wool, because mohair is not as readily infested. Furthermore, the

<sup>13</sup> Hay-fever and Hay-fever Pollens. Scheppergrell. Archives of Internal Medicine, June, 1917. Vol. 19, pp. 959-980.

amount of mohair raised in the United States is small compared with the quantity of wool produced. The trade name for wool containing vegetable matter is shivy wool. The principal plants which offend in this respect are those equipped with burs such as burdock (*Arctium* spp. fig. 13),

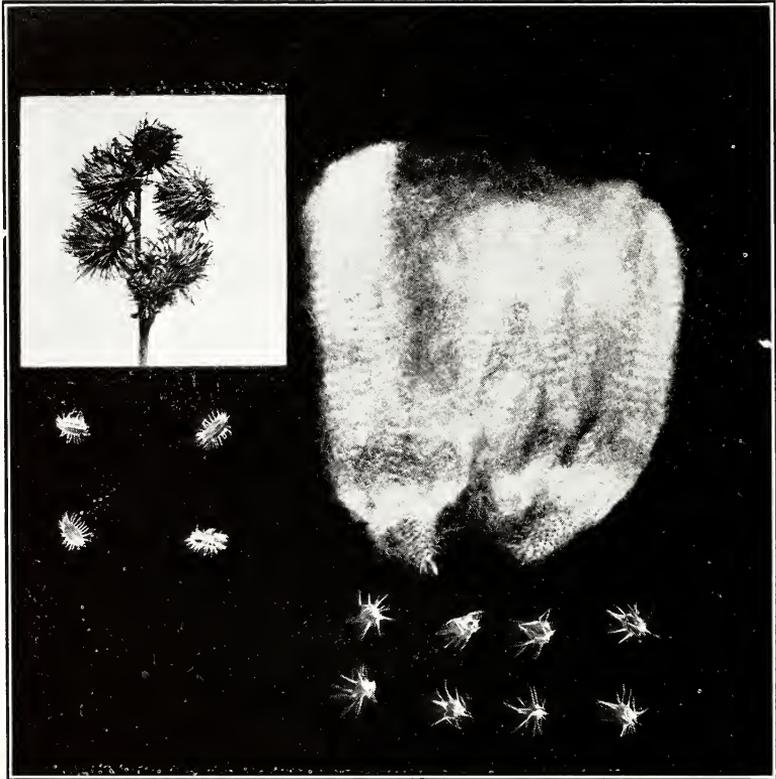


Fig. 13. *Upper left*.—Burs of common burdock (*Arctium minor*). Burs of this type are very injurious to wool, mohair and the manes and tails of horses.

*Lower left*.—Fruits (seeds) of wild carrot (*Daucus carota*). Note the spines by which they become attached to the coats of animals. (x2.)

*Upper right*.—Burry wool infested with cockleburs. The burs lodged next to the skin of the animal.

*Lower right*.—Burs of sandbur (*Cenchrus pauciflorus*). They injure wool and tear the flesh of grazing animals. The burs occasionally cause foot lesions. Natural size.

cocklebur, (*Xanthium* spp. fig. 6), sand bur, (*Solanum rostratum*), and hound's tongue (*Cynoglossum officinale*, fig. 6).<sup>11</sup> The common name of buffalo bur owes its origin to the fact that the burs formerly caused matted areas in the coats of the American buffalo.

The presence of vegetable matter in wool is particularly objectionable because it refuses to take the color of dyes as does the wool.

<sup>11</sup> The total number of burs or stick-seed bearing plants described in Britton and Brown's Illustrated Flora is 97 species, representing 34 genera.

Other vegetable matter contained in wool and mohair is due to the presence of the awns of various grasses such as squirrel-tail grass, the barbed fruits of plants such as Spanish needles, (*Bidens* spp., fig. 4), and the seeds of wild carrot, (*Daucus carota*, fig. 13).

2. **Foot Injuries Due to Burs.**—The burs of sand bur (fig. 19), ground burnut, (*Tribulus terrestris*), and other plants occasionally compact around the hoofs of sheep, horses, and other animals. The burs are readily driven into the flesh by the walking of the victims, causing inflammation, lameness, and a general unthrifty condition, due to the difficulty infected animals experience in seeking food. It is notable that foot injuries from burs continue late into the fall, since the fallen burs remain on the ground for a long period.

3. **Bur Injury to the Nose and Digestive Tract.**—A plant that is very injurious to the nose and mouth parts of grazing animals is the buffalo bur, (*Solanum rostratum*). In some sections in which this species is abundant, a number of pastures replete with good grazing grasses have been abandoned as pasture land because of the prevalence of the weed. Animals grazing on such land frequently emerge from the pasture with their faces dripping blood, due to the tearing effect of the spiny burs and stems of the weed.

The sharp spines contained on the burs of sand bur (fig. 13) are sometimes responsible for the formation of ulcers in the mouths of grazing animals.

Occasionally burs lodge in the throat, sometimes forming such compact masses as to prevent the passage of food. Unless the masses are removed, the effects are necessarily fatal. The burs of cocklebur are noteworthy in this connection. Attempts to swallow sand burs occasionally result in tearing of the throat tissues and the formation of ulcers.

The burs of the cocklebur sometimes enter the stomach, especially of hogs, where they may cause irritation of the stomach walls, resulting in inflammation and sometimes death. Occasionally they enter the intestines, clogging the intestinal tract, oftentimes with fatal results.

4. **Burs are Unsightly.**—The presence of burs in the manes, tails and coats of horses and other animals is very unsightly and may be regarded as an esthetic loss.

5. **Bur Injury to Automobile and Bicycle Tires.**—A novel form of bur injury, and one which is reported to cause considerable damage, is the puncturing of automobile and bicycle tires by means of the burs of the ground burnut, (*Tribulus terrestris*), a European weed called puncture vine in California. In Kern County, California, it is estimated that "50 per cent of all the punctures in bicycle tires and a large proportion of punctures and slow leaks in automobile tires are due to this bur."<sup>15</sup> The weed is said to be spreading to all parts of the state. Since this and similar species are distributed over a large area of the United States it is possible that injuries of this character will be reported from other sections.

<sup>15</sup> Weekly News Letter, Calif. Dept. Agr. Aug. 28, 1920.

## MINOR MECHANICAL INJURIES DUE TO MISCELLANEOUS CAUSES

There are a number of plant-mechanical injuries due to miscellaneous causes that are minor in consequence. These injuries are considered here not only because they are of general interest but to illustrate the number of different ways in which plants may cause mechanical injuries.

1. **Cutting Edges of Plants.**—A large number of plants, principal among which are the grasses and sedges, as for example the common saw grass, (*Cladium Jamacensis*) of the Florida everglades, have leaves possessing tiny projections (fig. 14) very much resembling the teeth of a saw. These projections are sharp-pointed and heavily cutinized and are capable of cutting deep gashes into the flesh. Eyes are commonly injured by this means. The leaves of corn sometimes cut the faces and hands of farmers. The leaves of the screw pine, (*Pandanus* spp.) illustrate well the character of cutting edges. Injuries of this type, par-



Fig. 14. Saw edge of Guinea grass, a weed causing injury to the flesh and eyes of cattle in Porto Rico. A large number of plants are equipped with similar cutting edges. Magnified 75 diameters.

ticularly when the eyes are affected, are oftentimes followed by inflammation and extreme soreness. Cut grass, (*Homalocenchrus* spp.), common along the banks of streams, causes severe cutting injuries to the hands when grasped by persons in passing canoes and boats.

In this connection the recent spread of the Japanese plume grass, (*Miscanthus sinensis*), is noteworthy. The leaves of the plant have sharp-cutting edges capable of inflicting severe injuries. The species is a native of the Orient that was introduced into the United States as an ornamental. It is said that in China stock reject the plant but sheep sometimes eat it with fatal results.

Some species of wild plants, as for instance species of bedstraw, (*Galium* spp.), have stems with saw-edge corners that frequently cut the flesh.

2. **Tripping.**—Brambles, briars and grasses sometimes grow in such a manner as occasionally to trip animals, causing broken limbs and other injuries. Bermuda grass and dewberry vines in the south, and blackberry vines in the north, are noteworthy in this respect.

3. **Entangling.**—An odd form of mechanical injury is illustrated by the experience of Radcliffe Hordern, of Warrenton, Virginia. While walking through the woods he was attracted by the bleating of a sheep. Investigation revealed that the animal had become enmeshed in a growth

of saw brier, (*Smilax glauca*), and its efforts to disentangle itself so exhausted the animal that it died soon afterward. A short time previously a horse on the same farm was extricated from a similar situation just in time to save its life. In regions in which the vegetation consists largely of brambles, briars, and similar plants, there seems to be possibilities for considerable damage of this character.

Of a somewhat similar nature is the mechanical injury caused by the molasses plant, (*Cuphea petiolata*). The stems of this species are covered with a sticky substance that is capable of catching and holding young chickens unfortunate enough to rub against it. Three cases of this character were noted within a ten-day period near Brookland, D. C.

4. **Irritation Due to Crystals.**—A number of plants produce a sensation of severe burning in the mouth and throat if eaten raw. The irritation in some cases is due to bundles of needle-shaped crystals of calcium oxalate (raphides) contained in the cells of the plant.

The tissues of the taro, (*Caladium colocasia*), one of the principal foods crops of Guam, contain needle-like crystals that are held in capsules which discharge their contents with considerable velocity as soon as moisture is absorbed, as is done in chewing. When the taro is eaten after being insufficiently cooked, the resulting irritation in the mouth and throat is very painful, a complaint said to be common in Guam. A closely related plant to the taro is *Alocasia indica*, which is similarly equipped with needle-like crystals. The plant is so acrid, according to Dr. H. W. Wiley,<sup>13</sup> that the Pacific Islanders resort to its use only in cases of great scarcity of food.

5. **Rootstock Injury.**—There are a number of plants equipped with strong-growing rootstocks that cause injury to crops such as potatoes, beets and carrots. The rootstocks are frequently equipped with growing tips that are almost as sharp as needles, as for instance in the southern nut grass (*Cyperus rotundus*, fig. 12). The tips readily penetrate potatoes and other fleshy underground plant parts and cause them to be unmarketable. The injury seems to be entirely mechanical since there is no union of tissues involved, although occasionally tiny suckers are formed by the invading rootstock. The injured portion of penetrated potatoes turns black and such tubers have little market value. Beets are likewise injured, while carrots, though usually not penetrated, are sometimes malformed in such a manner as to lower their market value.

On a farm at Beverly, Massachusetts, the total yield of market-size potatoes in 1916 was 140 bushels per acre. Due to injury by the rootstocks of quack grass (*Agropyron repens*) about 20 bushels per acre (approximately 14 per cent of the total yield) were almost worthless and were sold as culls. In another field in Franklin County, New York, about 20 per cent of the potato crop was practically ruined by the rootstocks of quack grass.

<sup>13</sup> Quoted by Stafford in "Useful Plants of Guam," contributions from the National Herbarium, Vol. 9, p. 71.

## INJURIES OF DOUBTFUL PLANT—MECHANICAL ORIGIN

There are a number of examples of plant injuries that may or may not be mechanical in nature. A case of this character is reported by Maiden<sup>17</sup> in which the development of a skin rash was possibly due to numerous particles of eucalyptus bark.

In the delta section of the San Joaquin and Sacramento Valleys of California there occurs a growth known as tule, composed principally of *Scirpus lacustris* var. *occidentalis*. During the dry season if one walks upon tule land clouds of dust, largely made up of particles of plants, are frequently produced and severe itching of the skin usually results. This itching is thought to be purely mechanical in nature. Similar itching results after walking on newly-drained saw-grass land in the Florida everglades.

The true cause of injuries of this nature is not definitely known. A number of theories can be advanced to account for the trouble. It is possible that the injuries may be chemical in nature or caused by bacteria. Again, it is well known that certain caterpillars, of which the caterpillar stage of the brown tail moth (*Euproctis chryorrhoea*) is an example, cause severe nettling. The harmful effects are produced not alone by direct contact with the insect, but also on contact with objects over which the caterpillars have crawled and left their hairs. This is cited merely as an example of the manner in which injuries apparently due to the mechanical action of plant parts may have their origin in an entirely different manner.

## REMEDIAL AND PRECAUTIONARY MEASURES

Most of the grasses responsible for mechanical injuries furnish excellent hay or forage if utilized previous to the formation of seed. For instance, *Heteropogon contortus* is a valuable forage plant in Hawaii and Queensland when grazed early. The same is true of alfilaria in our western states, a plant that is said to give an excellent flavor to dairy products. The chemical analysis of *Hordeum jubatum* indicates that the feeding value of the young plants compares favorably with timothy and bluegrass. *Stipa setacea*, when young, is said to provide nutritious and palatable feed that is relished by stock. Some of the species of beggar's tick likewise provide excellent forage when young.

Heavy grazing when such grasses as brome grass, three-awned grass and porcupine grass are immature is therefore the best treatment. In the case of the porcupine grasses, it may be best to cut for hay after the awns have fallen. Occasionally ranges infested with *Hordeum jubatum*, *Heteropogon contortus* and similar injurious grasses are burnt over when the seeds begin to ripen, but the practice is destructive and is to be recommended only in cases of severe infestation.

The building up of the soil creates favorable conditions for the growth of desirable grazing plants, which tends to crowd out the weeds. Bronco grass (*Bromus rubens*), for instance, will usually disappear when the soil is improved.

<sup>17</sup> Agri. Gaz. New South Wales, Mar. 2, 1916, p. 212.

The early shearing of lambs is of distinct advantage in reducing mechanical injuries to a minimum. It is also helpful to remove the wool from the region of the eyes. If the animals are badly infested they should be dipped in an antiseptic solution immediately after shearing.

When practicable, grazing animals should be removed from infested pastures as soon as the injurious seeds begin to ripen, and placed on grazing land free from the troublesome plants. Sections of the range free from the injurious grasses may be reserved for use after the injurious seeds have ripened. After the seeds have been shed, the animals may be returned to such pastures with lessened chances of injury. When practicable, mowing the injurious growth before the seeds mature is helpful. If it is impracticable to mow the entire area, the spots most heavily infested and the areas most frequented by grazing animals should be cut. Close grazing cannot always be depended upon to prevent the formation of seed.

When spines, grass awns, etc., have penetrated the tongue, gums and eye, the animals will be greatly aided if the plant parts are first removed by means of a pair of forceps, and the infested area treated with a suitable antiseptic. A formula recommended for treating eye injuries of sheep is iodoform, one part; burnt alum, one part; boracic acid, two parts.<sup>18</sup> A small quantity of the powder should be blown into the eyes daily by means of a small quill until the injuries are healed.

Trees and shrubs equipped with dangerous spines and thorns, as thorn-apple, osage orange, (*Machura pomifera*), and locust should be cut down or grubbed out wherever they cause trouble.

Plants such as rabbit-foot clover and crimson clover that are known to form hair balls in the stomachs of animals should be fed before they ripen. The hairs of crimson clover, which frequently form hair balls, are dangerous only after the flowering stage; previous to this time the plant may be fed with impunity. A. E. Grantham, formerly agronomist of the Delaware Agricultural Experiment Station, states that "Our farmers are fully aware and take the precaution of cutting the crimson clover early before the heads have reached that stage when they have become so mature as to produce indigestible material. It is very rare now that crimson clover hay is injurious, since the farmers have learned to cut it at the proper stage of maturity."

Cases of dermatitis due to plant hairs and prickles should be treated with carbonate of soda. A good method of application is to gently daub a wet rag containing the soda, over the affected area. Chalmers recommends treating sadd dermatitis, (a disease due to the mechanical irritation of the hairs of *Panicum pyramidale*), by first washing and drying the diseased areas and then applying a lotion made of menthol, 3 grams; calomine, 4 grams; spiritus vini rectificate, 200 c.c. made up to 250 c.c. by water.<sup>19</sup> It is possible that a similar lotion may be beneficial in other obstinate cases of dermatitis due to the mechanical irritation of plant hairs.

<sup>18</sup> Stewart, Agri. Gaz. New South Wales, 1901, p. 357.

<sup>19</sup> Journal Tropical Med. and Hygiene, 23:57-59. 1920.

In the case of the spines and prickles of cacti a good practice is to scorch or roast the plants with a gasoline torch or bonfire. It is claimed by some cattlemen that if the cacti are severely burnt they become laxative, hence burning is sometimes objected to on this ground.

An excellent treatment for severe cases of inflammation due to stinging nettles is to rub the swollen areas with macerated stems of common jewel weed, (*Impatiens biflora*). Quick relief may be secured by this means. This method has been tried with success by the writer.

When rye straw, corn stalks and other fodder is used that tends to produce impaction, the free use of bran in the feed will prove very helpful in overcoming the trouble.

The problem of burs and other vegetable matter contained in wool and mohair is a very difficult one to solve since the vegetable matter cannot usually be combed out. Sometimes hard burs such as cockleburs can be removed during the manufacturing process, but it is practically impossible to remove soft burs by mechanical means.

Burs that cannot be separated in carding may sometimes be removed by running through a bur picker. When burs are removed by a bur-picking machine a shrinkage results that may range from five to 25 per cent or more of the weight of the scoured wool. The bur guards on the card also help in the removal of burs. Shorter wools containing a large number of burs, or burs which cannot be removed mechanically, are subjected to a process termed carbonizing. The burry wool is treated with sulphuric acid or aluminum chlorid and heated to about 200° F. The vegetable matter is charred at this temperature, after which it is crushed and dusted. The process is not only expensive in itself, but causes a heavy shrinkage loss that may range from 7 to 27 per cent or more in the weight of the scoured wool. Combing wools are practically never subjected to the carbonizing treatment.