

LUPINS AS PLANTS POISONOUS TO STOCK.

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THE study of poisonous plants is a subject which is accompanied with certain peculiar difficulties. These difficulties are not insurmountable, but they render progress slow in this line of work. When the farmer finds some of his stock dead he attempts to discover the cause. If there seems to be no other reasonably assignable cause some plant is usually suspected. Specimens of the plant, or perhaps the contents of the stomach of a dead animal, are then sent to a chemist or veterinarian. The account of the conditions under which the animals were found just previous to their death is usually meagre and unsatisfactory. By the time the investigator arrives on the scene the trouble is past. The owner of the animals shows him some decomposing carcasses and certain plants growing near at hand which are supposed to have poisoned the animals. From these data the investigator is supposed to be able to diagnose the whole matter and suggest suitable preventions or remedies. I have known of the contents of sheep stomachs being sent for analysis ten days after death. I was once called to investigate a supposed poisoning of horses, and found three carcasses of horses which had been dead over two weeks. The horses had ranged over a tract of about 200 acres, yet the farmer seemed surprised that I could not determine the cause of the death of his horses.

My attention was first drawn to our native lupins as possible poisonous plants, in Montana, in the fall of 1896. Lupins are used for hay in Montana to a considerable extent. The more common species are *Lupinus leucophyllus* and *L. plattensis*. These plants, particularly the former species, are widely distributed in the State. Large areas of them are cut for hay, and I have seen many stacks of nearly clean lupin hay. In this condition it is readily eaten by horses, cattle, and sheep. Probably not less than 5000 tons of lupin hay are fed annually in Montana.

Although these plants are thus used extensively for fodder, it has long been believed that they are poisonous under certain circumstances. There seems to be no good reason for doubting this belief. I have myself witnessed or have gotten a definite description of a number of disastrous cases of sheep-poisoning where it appeared impossible to avoid the conclusion that lupin was the cause of the trouble.

It may be well briefly to relate the circumstances of some of these cases.

In August, 1896, a band of sheep while being driven from one range to another was allowed to stop and feed in a field of lupin. Within two hours' time a number of the sheep showed symptoms of serious illness, and of the 200 sheep in the band 100 had died before the following morning. The lupin pods were fully formed at the time, but the seeds were not quite ripe. No bloating was manifested until after death. The symptoms were such as usually appear in lupin-poisoning as described by European authors, and will be mentioned shortly.

One afternoon in the winter of 1897 a band of 150 bucks which were kept in a covered corral was given a liberal quantity of lupin hay. Previous to this time the sheep had received cultivated hay. The lupin was given to the sheep at 3 o'clock P.M. About three hours later the owner became aware of an unusual disturbance among the sheep. Upon arriving at the corral he found the majority of the sheep in a frenzied condition, and during the night about 90 of them died. Other hay was bought at once and no further trouble was experienced.

During the same winter three two-year-old colts which had been receiving cultivated hay as fodder were fed lupin hay for two days. All three died on the second day.

A somewhat similar case came under my observation, of a horse which had eaten lupin hay about two hours before I arrived. The owner of the horse had bought the hay earlier in the day, and, as he was not familiar with lupin, he did not recognize it in the form of hay. The horse became violently ill, but was given no more lupin, and recovered after two or three days.

During the month of October, 1898, unusually serious losses of sheep occurred in Montana. About 2000 sheep died in different parts of the State. Out of one band of 2500 about 1150 died. These last-mentioned cases occurred just after a snow-storm, when the short grass of the ranges was covered and the sheep were forced to eat the lupin, which stood up temptingly above the snow. We examined the stomach contents of ten of these sheep and found that lupin was almost the only food material. Stems, leaves, pods, and seeds could be easily identified.

Beside the observations which we ourselves have made we know of no work in this country to determine the poisonous or non-poisonous character of our native lupins with the exception of Dr. S. B. Nelson's single experiment. He fed one sheep eight and a quarter

pounds of lupin within three days without any poisonous effects being manifested. The experiment, however, was conducted in the month of May, and it should be remembered that the lupins are green at that season and could not possibly be in fruit. It was already well known to sheep raisers that lupin is freely eaten in its younger stages by sheep without bad consequences, and that lupin hay when cut before the fruiting period is often quite harmless. The chemical composition of all plants which have been carefully studied undergoes numerous and important changes during the various stages of growth. Many characteristic drugs and poisons are found only in certain parts of the plant, as, for example, in the roots or seeds. As is well known to pharmacists, most medicinal plants yield the desired drugs only when collected at the proper season. From such obvious facts as these alone it should be apparent that conclusions drawn from experiments with plants in only one stage of their growth must be limited to their application.

It has long been known that the European species of lupins contain poisonous principles. Dioscorides, Cato, Pliny, Columella, and Theophrastus give good accounts in their writings of the use of lupins as food for man and animals, and describe the methods by which the poisonous principles are removed from the seeds so as to render them safe. Since that time a rather voluminous literature of the subject has been developed in Europe. This literature covers the medicinal use of lupins (Pliny enumerated thirty-five different medicinal uses of these plants), their value as green manure, their use as forage plants, and as food for man. A great amount of work has been done on the chemistry of lupins, and numerous methods have been devised and patented for the extraction of the poisonous alkaloids, especially from the seeds, in order to render them safe for food.

The European species of lupins have caused extensive poisoning of stock, particularly of sheep, and there has been much discussion as to just which constituents of the lupins produce the poisonous effects. A number of alkaloids have been isolated and carefully studied from chemical and pharmacological stand-points.

The symptoms of sheep-poisoning by lupins are well known, and the disease is ordinarily called lupinosis in Europe. It may be of either an acute or lingering form, and the sheep live from a few hours to about three days. The symptoms, as I have observed them in poisoning from our native species of lupins, are practically identical with those described by European writers. There is usually great cerebral congestion, accompanied first with mental excitement,

during which the sheep rush frantically about, butting one another and other objects. This stage is followed by locomotor ataxia, spasms, convulsions, and collapse. In the lingering form of the poisoning I have observed a marked weakening of the pulse and slowness of respiratory movements. In one case in a horse I noticed an increase in the amount of urine and in the frequency of urination.

There are a number of native species of lupins which grow abundantly at all altitudes throughout the Rocky Mountain States. They are eaten by stock to a greater or less extent at all stages of growth. The California Agricultural Experiment Station has been experimenting for the past seven years with species of European and native lupins for the purpose of determining their value as green manures. Only two native species gave promise of value for agricultural purposes, *Lupinus affinis* and *L. micranthus*.

Lupins may be considered quite important native forage plants. They are actually used to a considerable extent for hay, and seem to furnish a safe and nutritious fodder if cut before the seeds are ripe. They have, however, caused large losses of stock when used in a ripe condition. It would seem unwise to recommend the cultivation of lupins for forage, and the fact that the poisonous alkaloids must be extracted from the seeds before they can be used as food for man would probably make their cultivation for this purpose unprofitable in this country. For green manures some of the lupins have been found well adapted, but no more so than many other leguminous plants. The seeds of lupins are always poisonous and the foliage appears to be poisonous under certain circumstances. In localities where losses of stock occur from lupin-poisoning, it seems proper to recommend that stock-raisers should put less dependence in dangerous lupin hay and cultivate standard forage crops for winter-feeding.

So far as is known to the writer there has been no chemical work done upon our native lupins. They are plants of considerable agricultural importance in the Rocky Mountain States, both as native forage and as the cause of great losses of stock. The present paper is prepared for the purpose of calling attention to the importance of the subject, and of giving a list of the related literature, which will, it is hoped, be of help to chemists and veterinarians who may take up this work.

The bibliography which follows includes all the books and articles which I have consulted in the study of lupins. It will be seen that the titles cover a considerable variety of topics, including botanical, agricultural, chemical, physiological, and pharmacological studies of

lupins. I make no sort of claim to its being complete, but shall be grateful for the receipt of references not included in my list.

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SELECTIONS.

CANINE INFLUENZA—ITS SYMPTOMS AND TREATMENT.

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THE various articles headed "Canine Influenza," "New Diseases in Dogs," "Gastro-enteritis," etc., which have appeared in the pages of the *Veterinary Record* of late, are, I am sure, most interesting, especially to veterinary surgeons who, like myself, have made a specialty of canine surgery and pathology. It strikes me very forcibly that there exists amongst members of our profession great diversity of opinion as to what this new disease amongst dogs really is. Although I do not claim to be an old practitioner, nor wish in any way to preach or try to teach my elders, I nevertheless venture to hope that a few remarks on this new disorder affecting dogs, based only upon continued hard work and observations made upon cases under my care, may not be considered out of place, and may even be worthy of the attention of the readers of the *Record*.

To study this disease properly I have considered it expedient in some cases to sit up with the dogs all night to notice the symptoms from the commencement of the disease to its finish.

My experience up to the present date leads me to pronounce at once that this new disease in dogs is nothing more nor less than "influenza" in its various forms and complications. Let me, therefore, give my reasons for this statement.

As far as I am aware influenza is liable to attack any animal. It seems even communicable from man to animals, but not so communicable from animals to man.

Whilst in Edinburgh, as a student, I turned my attention to