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SWEET-CLOVER-SEED SCREENINGS NOT INJURIOUS TO SHEEP

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CONTENTS.

	Page.
Alleged poisoning of stock by sweet-clover seed (Melilotus)	3
Experimental feeding of sheep	4
Preliminary trials with screenings of sweet-clover seed	4
Sweet-clover screenings fed with alfalfa hay	5
Sweet-clover screenings compared with bran as grain ration	6
Inferences from the experimental feeding	7

In the cleaning of sweet-clover seed for market a considerable quantity of immature seeds is included with the chaff, and the question has been raised of the practicability of using these screenings for stock feed. There has been some reason to suspect the seeds of having poisonous properties. This publication gives the result of experimental work with sheep.

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SWEET-CLOVER SEED SCREENINGS NOT INJURIOUS TO SHEEP.

ALLEGED POISONING OF STOCK BY SWEET CLOVER (MELILOTUS).

In the spring of 1919 the Department of Agriculture received a report from a ranch in North Dakota that sheep apparently had been killed by eating sweet-clover-seed screenings. The screenings consisted largely of immature seeds. About 500 pounds of these screenings had been fed in the afternoon to 500 ewes, and the next morning four of the animals were found dead. The flock in general was in good condition, and it was assumed naturally that the sweet-clover seeds might be the cause of the loss. This was the first report of the kind that had come to the Department of Agriculture and it seemed desirable to investigate the matter rather carefully, as there are considerable quantities of these screenings which may be utilized for stock feed, if it can be done safely and advantageously.

Little has been published on the subject. Carrey, in 1888, in *Journal de Médecine Vétérinaire*, tells of the deaths of three horses in France from paraplegia. These animals had been fed on dry lucerne, wheat straw, oats, and dry seeds of *Melilotus officinalis*. The three animals had received between 2 and 3 liters of *Melilotus* seed daily. The author assumed that the sweet-clover seed was the cause of the fatalities. He states further that rabbits fed on the seeds of the *Melilotus* died within a few days.

Later in the same year, in the same journal, Collas, another French investigator, reported the deaths of 10 sheep which had been fed on bean straw and hay containing a mass of sweet clover in the pod. He also reported the illness of a cow which had eaten cooked seed of *Melilotus*, the animal recovering after the grain was removed from the rations. Collas says very little in regard to the symptoms exhibited.

In the *Agricultural Gazette of New South Wales*, 1891, is a statement, presumably made by Mr. Maiden, that *Melilotus parviflora* is said to paralyze sheep and horses. Maiden, in 1897, says that *Melilotus parviflora* paralyzes horses in New South Wales. Müller, in 1897, in his book on poisonous plants, says that the seeds of *Melilotus officinalis* are narcotic and to a limited degree poisonous.

Ewart and Torey, in 1909, discussing the poisonous plants of Victoria, state that *Melilotus* contains coumarin, which in excess causes a disinclination to locomotion, produces paralysis, and ultimately results in death. Pammel, in 1910, in the "Manual of Poisonous Plants," says that *Melilotus* is looked upon as suspicious. Jepson, in 1911, in "Flora of Western Middle California," says that cattle in California avoid the herbage and the pods are said to be poisonous to sheep. Gain and Brocq-Rousseu in "Traité des Foins" speak of *Melilotus* as poisonous to horses, cattle, and sheep. Long, in 1917, in "Plants Poisonous to Live Stock," quotes Ewart, of Australia.

The foregoing are all the references that have been found in regard to the poisonous properties of sweet clover. Apparently the published statements are based on the experiences of the French investigators, Carrey and Collas, with certain hearsay evidence in New South Wales, Australia.

EXPERIMENTAL FEEDING OF SHEEP.

PRELIMINARY TRIALS WITH SCREENINGS OF SWEET-CLOVER SEED.

The *Melilotus* material used in the experimental feeding, with the exception of that given to sheep 537 and 535, was screenings received from North Dakota, consisting largely of immature seeds of white sweet clover (*Melilotus alba*) and containing in addition to the chaff, some seeds of green foxtail, yellow foxtail, Fremont's goosefoot, lambs'-quarters, barnyard grass, and marsh elder.

The material given sheep Nos. 537 and 535 was commercial material from a dealer in Salt Lake City, which was not analyzed by a seed expert but appeared to be essentially like the material from North Dakota.

Preliminary trials of feeding the sweet-clover seed were made with sheep Nos. 537, 535, 533, and 536. Sheep Nos. 537 and 535 were fed from June 24 to July 1. Nos. 533 and 536 were fed from June 25 to July 1. The average daily feed per hundred pounds of weight of the sheep was as follows:

Sheep No. 537-----	1. 79 pounds.
Sheep No. 535-----	1. 64 pounds.
Sheep No. 533-----	1. 73 pounds.
Sheep No. 536-----	1. 06 pounds.

At the beginning of the experiment each sheep was given 1 pound daily, and this was increased from day to day so that at the end of the experiment No. 537 was receiving 2.077 pounds a day; No. 535, 2.037 pounds a day; No. 533, 2.025 pounds a day; and No. 536, 2 pounds a day. These animals received nothing except the sweet-clover screenings.

The quantity given at the beginning of the experiment, of course, was not sufficient to maintain the weight of the animal, granting that

sweet-clover seed is good feed, but at the end of the experiment the quantity eaten might be considered as a maintenance ration. The weights of the animals at the beginning and at the end of the experiment are given in Table 1. All the sheep lost weight, but there was no other evidence of any injurious effect, and the loss of weight might be ascribed to insufficient feed. The animals did not show any indication of digestive disturbances, although that might have been expected from the use of a single concentrated feed.

The length of the experiment and the quantity of the feed were sufficient to lead one to infer that the seeds had no poisonous qualities.

TABLE 1.—Weights of sheep before and after feeding.

Sheep No.	Before feeding.		After feeding.	
	Date.	Pounds.	Date.	Pounds.
537.....	June 21	81	July 2	76.5
535.....	June 19	93.5	July 2	87.5
533.....	June 19	97	July 2	86.5
536.....	June 23	99	July 2	86.5

SWEET-CLOVER SCREENINGS FED WITH ALFALFA HAY.

In the preceding experiment the animals ate only the sweet-clover seed. To determine what effects, if any, would follow the use of the sweet-clover seed in addition to other feed, two sheep, Nos. 542 and 534, were given all the alfalfa hay they could eat, and in addition it was planned to give each of them a pound of sweet-clover screenings daily per hundred pounds of animal. Sheep No. 542 received this ration from July 2 to August 3, eating a total of 33.049 pounds, or an average of 1 pound a day. Sheep No. 534 was fed from July 8 to August 3 on the same plan. As the latter did not eat the screenings quite so well, the total quantity eaten by it was 23.66 pounds, a daily average of 0.876 pound.

TABLE 2.—Weights of sheep before and after feeding.

Sheep No.	Before feeding.		After feeding.	
	Date.	Pounds.	Date.	Pounds.
542.....	July 2	101	Aug. 3	103
534.....	July 8	100.75	Aug. 3	109

As a partial control for this experiment, sheep Nos. 553 and 554 were used. These animals received all the hay they would eat and in addition a ration of bran. It was planned to give each 4 ounces of bran daily per hundred pounds of animal (this quantity being about what an average sheep would eat when receiving a bran ra-

tion). Sheep No. 553 was fed from July 10 to August 3, receiving an average daily ration of 0.3 pound of bran, with a total of 7.3 pounds. Sheep No. 554 was fed from July 2 to August 3, receiving an average daily ration of 0.24 pound of bran, with a total of 8.11 pounds.

TABLE 3.—*Weights of sheep before and after feeding.*

Sheep No.	Before feeding.		After feeding.	
	Date.	Pounds.	Date.	Pounds.
553.....	July 10	82	Aug. 3	82.5
554.....	July 2	95.5	Aug. 3	98.5

These sheep maintained their weight, but did not do quite so well as sheep Nos. 542 and 534 which were fed on the sweet-clover screenings. This might be because the ration of sweet-clover screenings was so much larger than the ration of bran.

SWEET-CLOVER SCREENINGS COMPARED WITH BRAN AS GRAIN RATION.

In order to make a test of the relative value of bran and sweet-clover screenings when fed in similar quantities two of the sheep, Nos. 537 and 535, were given a daily ration of three-quarters of a pound of sweet-clover screenings, and two others, Nos. 515 and 517, were given a daily ration of three-quarters of a pound of bran. This experiment continued from August 11 to September 27, the animals being kept in pasture during the day and receiving the grain ration at night. The daily quantity stated was used, as experiment showed this to be about the maximum quantity of bran that the animals would eat. The average daily quantities consumed by the sheep were as follows:

Sheep No. 537.....	0.75 pound screenings.
Sheep No. 535.....	0.678 pound screenings.
Sheep No. 515.....	0.75 pound bran.
Sheep No. 517.....	0.75 pound bran.

The last sheep, No. 517, received the bran only from August 11 to September 5, when it refused to eat it.

TABLE 4.—*Weights of sheep before and after feeding*

Sheep No.	Feed.	Before feeding.	After feeding.
		<i>Pounds.</i>	<i>Pounds.</i>
537.....	Screenings.....	97.5	103.5
535.....	do.....	103.5	108
515.....	Bran.....	125	134
517.....	do.....	115	¹ 118

¹Weight on September 6, when the animal refused to eat bran. On September 28 the sheep weighed 122.75 pounds.

All the sheep remained in good health and the sheep fed on sweet clover did well so far as this experiment is concerned, although it was thought that bran was the better feed.

INFERENCES FROM THE EXPERIMENTAL FEEDING.

Though it is recognized that broad generalizations should not be made from a few experiments, the following conclusions from the work with sweet-clover screenings seem justifiable.

1. Sweet-clover screenings are not poisonous.
2. Sweet-clover screenings can be fed to sheep with hay to advantage.
3. Sweet-clover screenings form a good grain feed, but they probably are not so good as bran.

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