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**THE TOXICITY OF THE RIPE FRUIT OF BLACKBRUSH  
OR TARBUSH (FLOURENSIA CERNUA) FOR  
SHEEP AND GOATS**

by

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serious losses in sheep and goats as a result of grazing the ripe fruit of Flourensia cernua have been observed on three ranches during the months of January and February. The characteristic pathological alterations were inflammation, ulceration and perforation of the gastrointestinal tract due to the presence of some intense irritant. In all cases the animals had been subjected to considerable handling and were quite hungry when they gained access to the plant. When sheep and goats have continuous access to the plant and are not subjected to handling during the winter months, there is no evidence that this part of the plant is grazed in sufficient amounts to cause toxic effects. The plant has not been associated with similar losses in cattle.

The toxicity of the ripe fruit was demonstrated by experimental feeding to sheep and goats. In this work a marked variation in the susceptibility of different individuals was observed, as well as a narrow margin between a slightly toxic and lethal dose of the material.

Losses from this source can be avoided by preventing hungry animals from gaining access to the plant during the winter months. There is no evidence that the green leaves constitute a hazard to livestock.

An acute inflammation of the abomasum + the first part of the duodenum was produced, with death within 48 to 72 hours, or a serious illness for several days which was associated with ulceration of the abom.

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# THE TOXICITY OF THE RIPE FRUIT OF BLACKBRUSH OR TARBUSH (*FLOURENSIA CERNUA*) FOR SHEEP AND GOATS

By

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The blackbrush of the Southwest, *Flourensia cernua*, which should not be confused with an Acacia of the same common name, is very lightly grazed under normal range conditions and has long been considered of slight to doubtful food value. Although a very common plant in the Southwest, its relation to livestock losses appears never to have been suspected by ranchers prior to 1940, although it is now evident that the grazing of the ripe fruit must have been the cause of some unexplained sheep and goat losses which antedate those herein reported. This plant was first suspected of being poisonous by the author during the investigation of a serious sheep loss on a ranch near Allamore, Hudspeth County, Texas, on January 16, 1941.

The history of this loss was as follows: On January 4, the owner gathered, for the purpose of "tagging," 720 lambs from one of his hill pastures and held them in corrals until the morning of the sixth when they were turned into another pasture than the one from which they were taken. At the entrance into this pasture was a large blackbrush thicket which covered about a section of ground. Two days later the owner found several dead and many sick sheep in this thicket and therefore removed the animals from the pasture on the following day. During the roundup he counted 30 dead sheep and at least 75 sick animals and was convinced that many sick and dead animals had been overlooked. Three weeks later it was found that the total loss amounted to 195 head. Upon examination of the blackbrush in this pasture during the initial investigation it was found that the fruit had been stripped from the plant to a height of about three feet, thus indicating extensive grazing.

This loss brought to the mind of the owner a similar experience with goats the previous year. In this case he had "worked" 300 head of goats for two days and then turned them into this same pasture above referred to at about the same time of year. During the following week or ten days 25 head died. This situation was not reported to the author until about two months after the loss occurred and as a result no investigation was made. The owner suspected the blackbrush, which appears to be the first time this plant has ever come under suspicion.

\*In cooperation with the U. S. Department of Agriculture, Agricultural Research Administration Bureau of Animal Industry, Washington, D. C.

On January 7, 1943, a rancher south of Alpine brought three dead goats to the laboratory for autopsy, the history being as follows: The latter part of December 1942 he had purchased 700 head of goats in New Mexico and shipped them to Alpine where they were unloaded and trailed to a ranch, a distance of about 60 miles. During the last day of the drive they passed through a large blackbrush thicket but there was no evidence of illness among the goats upon arrival at the ranch that night. The next morning several sick animals were found and new cases were constantly developing during the day. By the following morning eight animals were dead and at least 50 were sick. The mortality for the next five days amounted to 25 head, of which three were brought to Alpine for autopsy. At a later date it was learned that some of the sick animals recovered but in regards to the total loss the owner appeared reluctant to make a definite statement.

The results of the autopsies in this case brought to mind a similar loss in goats in 1937 but which could not be fully investigated at the time on account of a peculiar circumstance. Consequently our information concerning the blackbrush was not obtained until about four years later. In this case the owner had gathered 800 head of goats in February, 1937, held them in a corral one night and the next day drove them five miles to another pasture. A short distance from the new pasture they passed through a blackbrush thicket and as the animals were observed to be grazing the fruit they were allowed to drift, thus allowing time for the ingestion of considerable amounts of this material. The next morning many of the animals were sick and new cases were constantly appearing throughout the day. There was a mortality of 110 that day. The loss continued but at a slower rate for the next two weeks and amounted to "a little over 200 head." Upon arrival at the ranch six days after the initial loss the writer learned that a neighbor and not the owner of the goats had called for assistance. It also developed that the owner of the land, upon which the goats were being grazed, had informed the owner of the goats to say nothing about the loss. Under such circumstances no investigation of range conditions could be made, however, three autopsies were conducted at the owner's request; in the light of our present knowledge the cause of this loss has been determined.

The symptoms in both sheep and goats were practically the same. The outstanding features were the sudden appearance of many sick animals and fatal termination in many cases within 24 hours after the first evidence of illness appeared. The mortality rate subsided after the first 48 to 72 hours but continued for about two weeks. In many cases there was a complete loss of appetite and the animals were obviously very sick for five or six days. If the appetite was regained at this point it was followed by rapid and complete recovery. There was a listless attitude with a slight arch to the back and the abdomen had a tucked-up appearance. In many of the cases expiration was accompanied by a sort of grunt. Groaning and grinding of the teeth were observed in some but not all of the cases. The general attitude was that of very sick animals.

There was marked congestion of the liver and kidneys but the characteristic pathology was confined to the abomasum and the first foot or two of the duodenum. The changes varied according to the clinical appearance of the animal. In sheep which had been quite sick for five or six days but were showing evidence of possible recovery there was a marked ulceration of the abomasum with evidence that the ulceration was undergoing healing and the inflammatory reaction in both the fourth stomach and the first part of the duodenum had subsided. Illness for six to seven days with no evidence of recovery was associated with perforating gastric ulcers or a complete necrosis of the wall of the abomasum and the first foot of the duodenum. In such cases the peritoneum of the abomasum was adherent to that of the abdominal wall and in attempting to remove the viscera the necrotic mass was easily torn. In goats the necrosis was more apt to be confined to the posterior third of the abomasum and in this area the change was just as extensive as it was in sheep. In the duodenum the necrosis was not quite as extensive, but in every autopsy a perforated ulcer about a half inch in diameter was found about eight inches posterior to the pyloric orifice.

In the initial investigation of the outbreak near Allamore three outstanding facts were presented. First, extensive grazing of the fruit of the plant; second, no other forage to which suspicion could be directed in the blackbrush thicket, and third, in all probability many of the dead sheep had not ranged beyond the blackbrush thicket, thus excluding the possibility of obtaining some toxic plant in some other part of the pasture. With this evidence it was obvious that the blackbrush was the cause, however, experimental feeding tests were desired and a small batch of the fruit was collected and fed to a sheep the next day. The sheep died that night; it was the first animal to be employed in a series of experiments which have been conducted with ripe fruit during the past four years. The results of these investigations are reported in this publication.

#### BOTANICAL DESCRIPTION AND DISTRIBUTION\*

*Flourensia cernua* DC. is a very branching and leafy shrub, 1-2 meters high, with the aromatic bitterness and odor of hops. Its leaves are alternate and entire, dull-colored, obscurely veiny, ovate to oval, 17-25 mm. long and 6.5-11.5 mm. wide. Its heads are rather small, usually no more than one cm. long, yellow-flowered, without ray-flowers, nodding, solitary in the leaf axils, and form long leafy inflorescences. The involucre, the cup in which the head is seated, is shorter than the disk and is of 2 or 3 series of lanceolate erect imbricated bracts with some of the outer foliaceous and spreading ones passing into leaves. The achenes, the 1-seeded dry fruit, are compressed, narrowly oblong-cuneate, callous-margined and very villous. The pappus is of 2 subulate awns, one from each angle of the truncate summit of the achene, occasionally with some smaller awns or scales, the 2 awns unequal, half the length of the achenes and not surpassing the villous hairs.

\*By V. L. Cory, Range Botanist, Texas Agricultural Experiment Station, Sonora, Texas.

At least seven other species of *Flourensia* occur in Mexico, but only the one species grows in the United States. In Mexico this species occurs from Nuevo Leon to Sonora and in the United States it occurs from West Texas to Arizona, the eastern boundary probably occurring in Andrews, Martin, Glascock, Reagan, Crockett and Val Verde Counties. While usually known in the United States as "tarbush," in Texas it is more commonly called "blackbrush," which is unfortunate since another and quite a different native plant of the State is known commonly by no other name than "blackbrush." Our *Flourensia* is common and abundant on dry plains, mesas and low foothills, often occupying large areas and forming a distinctive vegetation type. In northern Mexico the leaves and heads of this plant are sold in the drug markets under the name of "hojase" or "hojasen" and are taken in the form of a decoction for indigestion.

### EXPERIMENTAL PROCEDURE

The ripe fruit was collected from six different areas, one in Hudspeth, three in Brewster, one in Pecos, and one in Reeves Counties. The fruit was stripped from the branches, thus the material fed consisted of chaff, fruit, and a few dead leaves. Most of the collections were made during the month of January. Force feeding was required with all animals. The daily dose was divided into two equal parts, one part was given in the morning, the other in the afternoon. The animals employed in the first few feeding tests had been given their regular feed of alfalfa the evening preceding their introduction into the investigation. This method was later modified by subjecting the animals to 24 and later 48 hour fasting periods before administering the first dose of the fruit. A total of 13 sheep and 15 goats were employed in the investigation. Six of these animals were used in two or more feeding tests. The elapsed time between feeding tests on the same individual varied between 38 days and one year.

#### Feeding Ripe Fruit for One Day

The results of this method of feeding are summarized in Table 1. Ample proof of the toxicity of the fruit of this plant is to be obtained from a glance at this table as it will be observed that 11 out of a total of 19 animals were killed in this phase of the investigation. The smallest amount of the plant which was capable of producing fatal results was found to be a little over 0.9 per cent of the body weight for sheep and 0.9 per cent for goats. However, it will be observed that in some animals larger doses produced little or no toxic effects. The apparent contradiction in such results was first encountered while testing the toxicity of material collected from different areas and at that time was considered a variability in the toxicity of the plant in different regions but further investigation disclosed that this represented a variation in the susceptibility of different individuals, a subject which will be considered later. Beginning with goat No. 117 and proceeding to the bottom of the table it will be observed that

Table 1. Results of feeding the ripe fruit of *Flourensia cernua* to sheep and goats for one day

Animal Number	Weight Lbs.	Pounds fed	Per cent of body weight	Results
S170.....	100	0.7	0.85	Off feed two days; recovered
S163.....	80	0.7	0.875	Sick five days; killed for autopsy
S130.....	115	1.1	0.954	Died within 48 hours
S122.....	100	1.0	1.0	Died within 48 hours
S176.....	95	1.0	1.052	Off feed 24 hours; recovered
S175.....	75	0.9	1.226	No ill effects
S 30.....	95	1.5	1.577	Died within 18 hours
G133.....	70	0.5	0.714	Very sick for 6 days; recovered
G135.....	85	0.68	0.8	Off feed 3 days; recovered
G114.....	70	0.6	0.857	Off feed two days; recovered
G121.....	70	0.61	0.871	Off feed one day; recovered
G117.....	60	0.54	0.9	Died within 24 hours
G127.....	65	0.6	0.923	Died within 48 hours
G111.....	70	0.65	0.928	Off feed one day; recovered
G 92.....	75	0.75	1.0	Died within 48 hours
G130.....	55	0.55	1.0	Died within 24 hours
G111.....	85	0.85	1.0	No ill effects
G129.....	90	0.9	1.0	Died within 48 hours
G131.....	75	0.75	1.0	Died within 24 hours
G137.....	95	0.95	1.0	Died within 48 hours
G121.....	65	0.7	1.076	Died within 24 hours

fatal results were obtained with all but one animal. Since these tests include material collected from four different areas it is evident that the location of the plant is of minor importance. The one exception, goat No. 111, is a good example of a resistant animal. No variation in the toxicity of the plant from year to year was observed as Goats 117, 127, and 131, were fed material collected from the same area in 1942, 1943, and 1944.

#### Feeding Ripe Fruit for Two or More Days

The results of this method of feeding are summarized in Table 2. The object of this method was to prolong the life of susceptible animals by the administration of slightly smaller doses or in the case of resistant animals to overcome the resistance by repeated doses, thus providing the additional time which must be required for the necrosis of the abomasum to develop. By this method we were able to delay the fatal termination an average of about 54 hours, which was evidently not sufficient time for this condition to develop. For a two-day feeding period the smallest total amount required for fatal results was between 1.5 and 1.6 per cent of the body weight, an amount considerably in excess of that required when the feeding was confined to a single day. Since the final results were much the same in both cases the toxic effects appear to be determined by the amount of the plant ingested during the first 8 to 18 hours. Range observations tend to support such a conclusion as the grazing of the plant was confined to a few hours and probably did not exceed 24 hours in any case. By the end of 24 hours sufficient toxic effects must have occurred to produce a loss of appetite and thus prevent further ingestion of the plant under range conditions.



Table 2. Results of feeding the ripe fruit of *Flourensia cernua* to sheep and goats for two or more days

Animal number	Weight Lbs.	Pounds fed daily	Per cent of body weight.	Number days fed	Total amount fed	Results
S113	115	0.8	0.7	2	1.6	No ill effects
S172	75	0.53	0.706	2	1.06	Very sick five days; recovered
S173	70	0.53	0.757	2	1.06	Died three days after last dose
S130	115	0.9	0.782	2	1.8	Off feed 48 hours; recovered
S142	100	0.8	0.8	3	2.4	No ill effects
S124	80	0.65	0.812	2	1.3	Died 48 hours after last dose
S141	100	1.0	1.0	3	3.0	Died 72 hours after last dose
S170	85	1.04	1.223	3	3.12	Off feed two days; recovered
G132	60	0.45	0.75	3	1.35	Sick for five days after last dose; recovered
G131	50	0.4	0.8	2	0.8	Off feed 24 hours after last dose; recovered
G111	90	0.72	0.8	3	2.16	Off feed two days after last dose; recovered
G125	70	0.6	0.805	2	1.2	Died 48 hours after last dose
G127	50	0.45	0.9	4	1.8	Off feed for 24 hours after last dose; recovered
G120	60	0.6	1.0	1	0.6	Off feed after first dose, very sick for five days then began to recover; killed for autopsy
		0.3	0.5	1	0.3	

### Individual Resistance

In 1942 the ripe fruit was collected from three different areas devoted to sheep ranching and in which no evidence of loss from this source could be obtained. The three collections were fed to Sheep 142, Goat 111, Table 2, and Sheep 170, Table 1, with little or no toxic effects. These results suggested a variability in the toxicity of the plant in different areas, however, continued investigation proved that we had demonstrated a variation in resistance of the individual and not a variation in the toxicity of the plant. Goat 111 was used in three experimental feedings; in 1942 very slight toxicity was obtained from an amount equivalent to 0.928 per cent of its body weight, in 1943 three daily feedings equivalent to 0.8 per cent of the body weight produced the same effects and in 1944 no ill effects were obtained from feeding an amount equivalent to one per cent of the body weight of the same material that proved fatal in the same size dose for Goat 131 (Table 1). Sheep 170 was off feed but not apparently sick after receiving an amount equivalent to 0.85 per cent of its body weight in 1942; in 1943 it received three daily doses each representing 1.223 per cent of its body weight with but slight toxic effects. Sheep 175 and 176 showed little or no toxic effects as a result of receiving over one per cent doses, whereas an amount equivalent to 0.954 per cent of the body weight proved fatal for Sheep 130. In this case two different batches of fruit were used, but the material fed Sheep 175 and 176 was the same batch that proved fatal for Goat 131, thus demonstrating its toxicity. Further evidence in regards to individual resistance is to be observed in Goats 125 and 127 (Table 2). Goat 125 was killed with two doses, each representing 0.805 per cent of the body weight, whereas Goat 127 withstood four daily doses, each



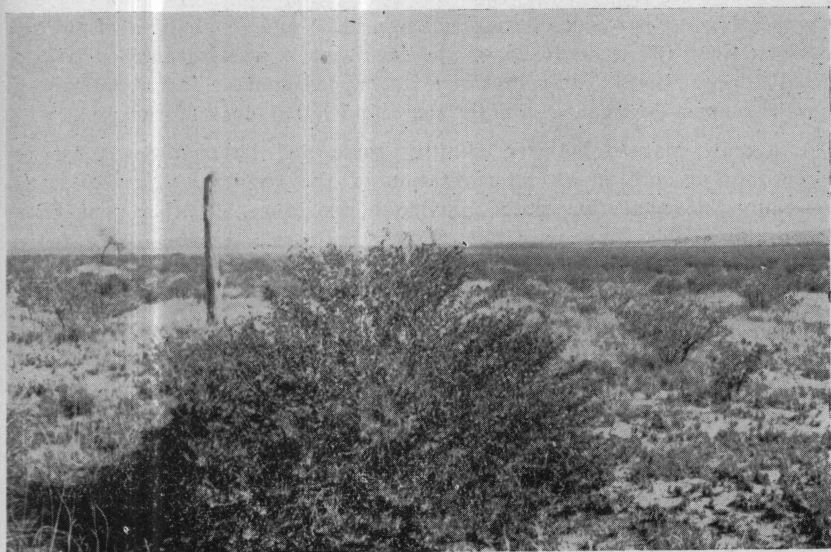


Fig. 1. *Flourensia cernua*, a single bush in the foreground and an extensive thicket in the background.

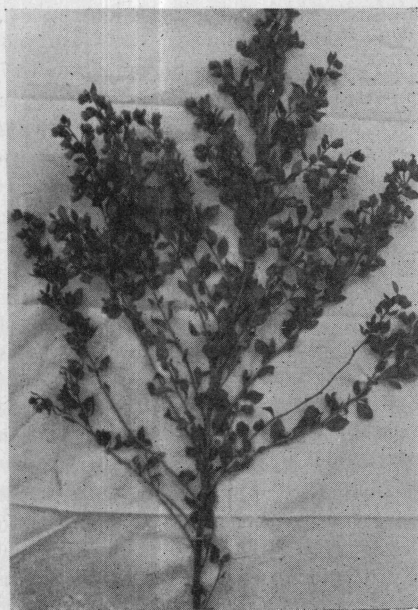


Fig. 2. A branch of the plant showing leaves and blooms.

representing 0.9 per cent of the body weight. A true evaluation of the results on Goat 127 is confused by the fact that it was later killed with a slightly larger dose (Table 1) which introduced another factor, namely, a narrow margin between a slightly toxic and lethal dose of the plant.

A narrow margin between slightly toxic and lethal doses must be taken into account in an interpretation of the results as a whole, and especially in connection with individual resistance. In this connection Sheep 130 (Table 2) showed but slightly toxic effects after being fed a dose equal to 0.782 per cent of the body weight for two days, and 41 days later an amount equal to 0.954 per cent of the body weight of the same material constituted a lethal dose (Table 1). Similar results were obtained with Goat 121 in which the feeding of 0.871 per cent of the body weight produced but slight toxic effects and one equal to 1.076 per cent of the body weight of the same material was found to be a lethal dose. In these two animals the short interval of time between the two feedings might indicate a carry-over of the toxic effects from the first to the second feeding, however, the results with Goats 127 and 131 appear to exclude such a possibility. Goat 127 (Tables 1 and 2) showed but slight toxic effects from four 0.9 per cent doses in 1942 and was killed with one 0.923 per cent dose one year later. In addition Goat 131 withstood two doses representing 0.8 per cent of the body weight in 1943 and was killed one year later as a result of feeding an amount equal to one per cent of its body weight for one day. The batch of fruit which proved fatal in either case did not appear to be any more toxic than that fed the previous year, as in the case of Goat 131 the same material was fed to Sheep 175 and 176 with but slight toxic results. The number of animals involved does not permit definite conclusions, but the average results for the four animals show that the difference between a slightly toxic and a lethal dose was equal to 0.15 per cent of the body weight. In considering the results of the investigation as a whole it is probable that this figure is not far from correct.

### Feeding Green Leaves

The results obtained by feeding the green leaves were not as conclusive as one would desire. For some reason there was a tendency to choke the animal while engaged in the force feeding, probably due to the resinous, sticky nature of the boli. The feeding was further handicapped by regurgitation during the course of the feeding; a chain of events which nearly always results in some injury to the pharynx. One per cent doses were fed to three animals, Goat 131 receiving one dose, Goat 129 two doses and Sheep 141 three doses on consecutive days. The two goats were off feed for about two days, probably due to pharyngitis, but the sheep developed no indication of toxicity. As all three animals were later killed with ripe fruit it is evident that the failure to produce toxic effects was not due to resistance on the part of the animals.

## SYMPTOMS

Loss of appetite was considered as evidence of but slight toxicity, especially when this was the only symptom observed and existed for a period not to exceed 72 hours. In such cases the usual, lively attitude was presented with no evidence that they were actually sick. When the loss of appetite prevailed for more than three days there was a listless attitude, grinding of the teeth, the nostrils were clogged with mucus, the general attitude being that of very sick animals. The respiration was normal with the exception of expiration which was accompanied by a sort of grunt. Although evidence of very sick animals prevailed for five or six days evidence of improvement appeared within the course of a few hours and complete recovery within a few days thereafter. In the acute, fatal cases the first symptom noted was salivation, followed within two to four hours by slight muscular twitching, groaning and grinding of the teeth. There was a slight arch to the back and a tucked-up appearance of the abdomen, movement was avoided if possible and the animals remained on their feet until a short time before death. Little or no struggle accompanied the final stages. The symptoms thus noted are in accord with those observed under range conditions.

## PATHOLOGY

Death within the first 48 hours after feeding on the toxic fruit was associated with a marked inflammation of the abomasum and the first foot or two of the duodenum. It is rare to find such an extreme congestion as that observed in the mucosa of these organs; hemorrhage had undoubtedly occurred but could not be detected with the unaided eye. There was marked congestion of the liver and kidneys with albuminous degeneration in some cases. In the case of Sheep 141 there was a slight thickening of the mucosa of the abomasum which presented a bluish-red appearance. It was easy to visualize necrosis of the mucosa had death been delayed another 48 hours in this animal. No additional lesions were observed in the acute fatal cases.

Sheep 163 and Goat 120 had been quite sick for five days but began to eat on the sixth day. They were killed for post mortem examination on the seventh day since it was evident from past experience that such cases were on the way to complete recovery. Upon autopsy, extensive ulceration of the abomasum was found in both animals but all inflammatory reaction of the fourth stomach and duodenum had subsided. There was ample evidence that the ulcers were undergoing healing which probably would have been complete within the next two weeks. No other lesions were observed in these cases.

Microscopic examination revealed marked congestion and hemorrhage in the mucosa of the abomasum and duodenum. In Sheep 141 an occasional shallow area of necrosis was found which involved the epithelium and supporting connective tissue but did not extend into the gastric pits. Marked

congestions of the liver and kidneys and variable but constant albuminous degeneration were observed in all acute cases. Fatty changes were found in the livers of two animals. Active regeneration of the epithelium around the ulcerated areas of the abomasum in the two animals which were killed for autopsy indicated that recovery was in progress and would have been complete in a short time. There was no additional pathology in these two cases.

### DISCUSSION

From the first investigation it was obvious that the fruit of this plant is toxic and under certain conditions may cause serious losses in both sheep and goats. During the course of the experimental work many more animals were employed than are generally used to demonstrate the toxicity of a given plant. By the experimental feeding of the ripe fruit we produced an acute, fatal condition with death within 18 to 72 hours; also a marked illness for several days followed by recovery, which, in two animals, was found to be associated with ulceration of the abomasum similar to that observed in some cases under range conditions. However, we failed to produce extensive necrosis of the abomasum or a perforated ulcer of the duodenum. It was the failure to reproduce these two conditions that prompted the continued investigation and the employment of so many experimental animals. The failure to reproduce the complete clinical picture is probably due to one of two factors; first, administration of the exact dose required, and second, inability to reproduce exact field conditions. In connection with the exact dosage it is evident that this would require very careful regulation in view of the narrow margin between slightly toxic and lethal doses. Such an undertaking would require the expenditure of a large number of animals. In an attempt to reproduce range conditions 24 to 48 hour fasting periods were employed but had no influence on the results. On the ranges the individual seed clusters are grazed one at a time, thus consumption is slower than it is in experimental feeding and probably continuous for a period of 8 to 18 hours, a factor which would be difficult to reproduce by experimental methods. The surprising feature in field cases was the length of time an animal could live with such extensive pathology in the abomasum and duodenum.

A common feature in the four outbreaks which have come to our attention is extensive grazing of the ripe fruit by hungry animals which gained access to the plant during the months of January and February. On the ranch near Allamore part of the same thicket in which the loss occurred extended into another pasture. In this pasture 200 ewes were maintained during the winter without loss, but they were subjected to no handling during the winter. The ewes were observed in the occasional plucking of a head of seed but there was no evidence of extensive grazing as was observed on the other side of the fence where the loss in lambs had occurred. This observation is in keeping with observations on many ranches where blackbrush is a common plant and where no loss has been experienced.



The results of the experimental work do not definitely determine the status of the green leaves, but they are in accord with range observations which have disclosed no reason for suspecting this part of the plant. There are many ranches in the Southwest where this is a common plant and where poor range conditions are of periodic occurrence. Under poor range conditions the green leaves of this plant may constitute a large part of the green forage, nevertheless ranchers are able to subject both sheep and goats to considerable handling and return them to the pasture with no loss. Under such conditions the leaves are grazed but after watching them do so one finds it hard to believe that any animal will consume as much as one per cent of its body weight over a 24-hour period.

There is no evidence to cause blackbrush to be viewed with concern in connection with cattle ranching as no losses have been encountered which could be associated with the grazing of this plant. The different grazing habits of cattle, sheep and goats is probably an important factor in this connection as the small clusters of seed sticking out from the stem is an ideal presentation of the material for sheep and goats, whereas, in the case of cattle, large quantities of the woody stems would have to be consumed in order to obtain a great deal of the seed. This type of grazing has never been observed.

The toxic principle was not soluble in alcohol as alcoholic extracts did not produce toxic effects in rats. The extracts contained large amounts of a heavy resinous material and some volatile substance, probably a volatile oil, the latter material being very irritating to the nasal passages. Much discomfort is experienced in gathering the plant as a result of the volatile substance, which is evidently the causative agent in severe attacks of hay fever of some individuals, the mere driving by a thicket of the blackbrush being sufficient to bring on a severe attack of the disease.

### CONTROL

Never turn hungry sheep or goats into a blackbrush thicket during the months of January, February and March. As the ripening stage of the fruit is hastened by low temperature, December may be included in this period as a result of an early hard freeze. Wind thrashes out the seed by the middle or latter part of March, thus removing the hazard. The green fruit is not grazed.

Grubbing the plant has been practiced in a few areas under soil conservation programs, a practice that can not be recommended. There is no evidence that this plant interferes with the growth of more desirable forage, and under normal grazing conditions the green leaves probably have some food value. In addition there are many areas where the blackbrush provides the greater part of the shade for sheep and goats during the hot summer months. Under such conditions the presence of the plant is desirable.

### SUMMARY

An investigation of a serious loss in sheep which was found to be due to the grazing of the ripe fruit of blackbrush is reported. Similar losses in three flocks of goats are also reported.

The characteristic pathology consisted in marked inflammation, ulceration and perforation of the gastro-intestinal tract.

Under range conditions losses from this plant occur as a result of turning hungry sheep and goats into a thicket of the brush upon which the ripe fruit is abundant.

The feeding of the ripe fruit to sheep and goats produced an acute inflammation of the abomasum and the first part of the duodenum with death within 18 to 72 hours, or a serious illness for several days which was associated with ulceration of the abomasum.

A marked variation in the ability of various animals to tolerate the toxic principle was observed.

The margin between slightly toxic and lethal doses of the plant was found to be narrow.

There is no reason to believe that the green leaves constitute a hazard to livestock.

Cattle losses from this source have never been observed.