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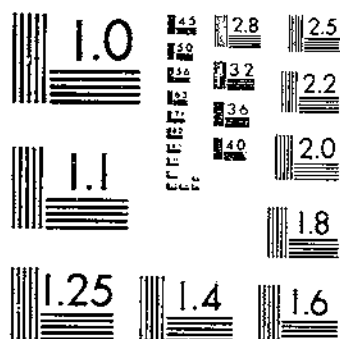
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FOUR SPECIES OF RANGE PLANTS NOT POISONOUS TO LIVESTOCK

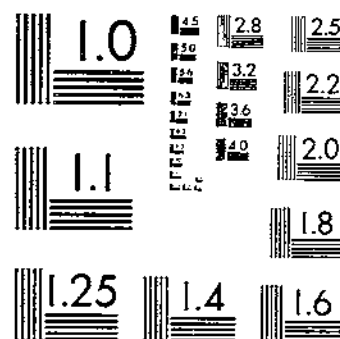
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

UNITED STATES DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

FOUR SPECIES OF RANGE PLANTS NOT
POISONOUS TO LIVESTOCK

By C. DWIGHT MARSH, Associate Physiologist in Charge of Investigations of Stock Poisoning by Plants, A. B. CLAWSON, Associate Physiologist, and G. C. ROE, Junior Physiologist, Pathological Division, Bureau of Animal Industry

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In the course of experimental work on stock-poisoning plants, there has resulted considerable information which has shown that certain supposedly poisonous plants are either entirely nontoxic or, if more or less toxic, are of no importance as stock-poisoning plants. It seems to be important, however, that the fact of their nontoxic character should be published in order that they may not be feared by stockmen, and also that the character and extent of the experiments should be stated, so that there may be no necessity for others to duplicate the work.

For these reasons this bulletin has been prepared on *Wyethia amplexicaulis*, Nutt., *Apocynum ambigens*, *Malva parviflora*, and *Symphoricarpos vaccinioides*.

WYETHIA AMPLEXICAULIS, NUTT

Wyethia amplexicaulis, Nutt., commonly known as "mule ears" or "sunflower," is very abundant on some of the ranges in Utah, and is generally considered a good forage plant. It is so quoted by Sampson (12, p. 329).¹ An analysis of *W. mollis*, made by Kennedy and Dinsmore in 1909 (8) indicated that this species was good forage, although not so good as some other plants. G. R. Hill, of the Utah Agricultural College, in 1922 reported at the Salina Experiment Station, near Salina, Utah, that he had received many positive reports that the common *W. amplexicaulis*, Nutt., was poisonous to animals. Because of the abundance of the plant, it was considered important to determine definitely whether or not the plant was poisonous. Accordingly, in 1923, a number of feeding experiments were made with cattle and sheep, which are summarized in Table 1. In all these experiments green plant was used.

¹ Reference is made by italic numbers in parenthesis to literature cited, p. 9.

TABLE 1.—Summary of feeding experiments with *Wyethia amplexicaulis*

Animal		Date of feeding	Method of feeding	Part of plant used	Per cent of animal weight given		Date of plant collection	Result	Remarks
Designation	Weight				Total	Average daily dosage			
<i>Cattle</i>	<i>Pounds</i>	1923							
971	405	June 11 to 16	With some hay	Leaves	39.5	6.6	Collected as used	Not sick	Fed 6 days.
983	369	do.	do.	do.	43.1	7.2	do.	do.	Do.
991	441	do.	do.	do.	36.0	6.0	do.	do.	Do.
970	438	June 17 to July 3	do.	Leaves with some stems and buds.	146.7	8.6	do.	do.	Given 3 pounds of hay daily. Fed for 17 days.
974	442	do.	do.	do.	133.7	7.8	do.	do.	Given 5 pounds of hay daily. Fed for 17 days.
906	410	do.	do.	do.	140.7	8.3	do.	do.	Given 2 pounds of hay daily. Fed for 17 days.
<i>Sheep</i>									
714	108.6	June 11 to July 3	do.	Leaves	207.1	9.0	do.	do.	Given 1 pound of hay daily. Fed 23 days.
717	64	June 12 to July 3	do.	do.	207.0	9.4	do.	do.	Given 0.5 pound of hay daily. Fed 24 days.

EXPERIMENTAL FEEDING

Six head of cattle were fed, three for 6 days, and three for 17 days. The total quantities of the plant eaten by the cattle varied from 36 per cent of animal weight to 146.7 per cent, and the daily averages of the feedings varied from 6 per cent of animal weight to 8.6 per cent. The material fed, in the case of the first three cattle, was leaves, and with the other three, leaves with some stems and buds. Two sheep were fed the leaves of the plant, one for 23 days and the other for 22 days, receiving a total, in each case, of 207 per cent of animal weight, with a daily average, in one case, of 9 per cent, and of 9.4 per cent in the other. With all the animals, some hay was given in order to keep them in good condition. None of these animals showed any ill effects from the feeding of the plant, although it is assumed that the quantity eaten was very much more than they would consume on the range.

In connection with the sheep experiments it may be noted that Kennedy and Dinsmore (8) in their experimental feeding of *W. mollis* fed four sheep for six days, giving each an average quantity of 52 pounds, 9 ounces. Assuming that the sheep weighed approximately 100 pounds, the dosage would not be very different from that in the experiments at the Salina Experiment Station. They reported no bad effects from the feeding.

From the foregoing experiments, it can reasonably be assumed that no harmful effects will follow grazing on *W. amplexicaulis*, Nutt.

APOCYNUM AMBIGENS, Greene

For several years there were losses of cattle in the Toiyabe National Forest, Nev., presumably from some plants which they had eaten on the range. Repeated examinations by investigators from the Forest Service, the Bureau of Plant Industry, and the Bureau of Animal Industry failed to show that there was any plant which could reasonably be supposed to be the cause of the trouble. While there were a number of poisonous plants, none were there in large enough quantity to make it probable that the fatalities were caused by them. Ivar Tidestrom, of the Bureau of Plant Industry, who examined the area with great care, found an *Apocynum*, *A. ambigens*, which he suggested might be the cause of the difficulty. While there were no published statements in regard to the poisonous properties of this species of *Apocynum*, it seemed possible that it might be the cause of the deaths of the cattle, since two other species, *A. androsaemifolium* and *A. cannabinum*, were known to be poisonous. On that account it seemed wise, if material could be obtained, to make some feeding experiments with *A. ambigens*. A considerable area of the plant was located at Ephraim Canyon, Utah, and in 1924 a series of feeding experiments was undertaken with cattle and sheep. A summary of these experiments is given in Table 2.

EXPERIMENTAL FEEDING

There were six feeding experiments with cattle, the plant in all cases being mixed with alfalfa hay and given after the animals had been without feed for at least 24 hours. Three of the feedings were of

leaves, the animals receiving from 0.005 to 0.056 per cent of their weights of green plant. None of these feedings produced any symptoms. Green leaves and stems in proportions as gathered were fed in the other three experiments. Cattle 998 and 1016 received 1 and 2 per cent of their weights respectively. Cattle 1016, however, required two days for feeding, so that the average daily dose was 1 per cent of its weight. These feedings produced no effect. Cattle 998, in a second feeding, received then 1.1 per cent of its weight daily for three successive days, the total quantity being 3.3 per cent of the weight, with no bad results. Inasmuch as it is highly improbable that cattle on the range would ever eat as much of the plant as was given in some of these experiments, the conclusion was that the plant, under range conditions, would not be dangerous to cattle.

TABLE 2.—Summary of feeding experiments with *Apocynum ambigena*

Animal		Date of feeding	Method of feeding	Part of plant used	Per cent of animal weight given	Place and date of plant collection	Result	Remarks
Designation	Weight							
Cattle		1924				1924		
1031	350	July 2	With hay	Leaves	0.005	Ephraim Canyon, Utah, July 1	Not sick	
1031	370	July 3	do	do	.01	do	do	
1016	445	July 8	do	do	.056	do	do	
998	337	July 27	do	Leaves and stems	1.0	Ephraim Canyon, Utah, July 24	do	
1016	470	July 30, 31	do	do	2.0	do	do	
998	381	Aug. 16, 17, 18	do	do	3.3	Ephraim Canyon, Utah, Aug. 2	do	
Sheep								
815	50	July 2	Balling gun	Leaves	.01	Ephraim Canyon, Utah, July 1	Not sick	
815	44.5	July 5	do	do	.056	do	do	
821	45	July 7	do	do	.25	do	do	
822	78	July 9	do	do	.5	do	do	
833	48	July 15	do	do	1.0	do	do	
820	58	July 23	do	Stems	1.0	Ephraim Canyon, Utah, July 21	do	
800	49.5	Aug. 5	do	do	1.5	Ephraim Canyon, Utah, Aug. 2	do	
853	105	July 22	do	Leaves	1.5	Ephraim Canyon, Utah, July 21	do	
835	88	July 29	do	do	2.0	Ephraim Canyon, Utah, July 24	do	
826	92.5	Aug. 4	do	do	3.0	Ephraim Canyon, Utah, Aug. 2	do	
851	93	Aug. 8	do	do	6.62	do	do	Partly dried, had lost 21 per cent.

All the sheep were force fed and received the plant in a single day. To nine of the sheep leaves were fed and to two of them stems. The dosage of the animals to which leaves were fed was from 0.01 to 5.62 per cent of animal weight. The dosages of the animals fed stems, of which there were only two, were 1 and 1.5 per cent of animal weight. There were no symptoms in any of the cases of the sheep, although it will be noticed that the maximum dosage of 5.62 per cent was very much greater than the quantity of any given plant which a sheep is likely to consume on the range in a day's time.

In all but one case of the experimental feeding of both cattle and sheep, the plant was supposed to be green when fed. Since, as a matter of fact, in some cases several days elapsed between the collection and the feeding, in spite of the fact that the plant was kept closely packed and in a condition to prevent evaporation, so far as possible, there is very little doubt that, in such cases, there was more or less loss of moisture. If this was the case, as seems probable, the dosage in those experiments, which were made two or more days after the collection of the plants, would really have been somewhat greater if expressed in terms of green plant. Therefore it is possible that the actual experimental dosage was somewhat greater than that indicated in Table 2.

These experiments with sheep and cattle seem to be sufficient to show that whether or not *Apocynum androsaemifolium* has any poisonous qualities it is not dangerous to livestock on the range.

MALVA PARVIFLORA L. (CHEESE WEED)

The first definite statement in regard to the poisonous properties of *Malva parviflora* was made by Stewart in 1900 (15). In a discussion of staggers in sheep he stated that *M. parviflora* was suspected of causing that disease. The symptoms observed by him were that the animals after exercise would lag, walk stiffly, sometimes fall, and later rise and fall again, this being repeated until they would refuse to get up at all. The animals trembled or shivered, had a temperature of 105° to 108° F., a respiration of 100, and a weak and rapid pulse of about 140. He noted that the mucous membrane of the mouth was blanched.

Hester (6), in 1906, reported cases of poisoning of horses in California, which he thought were produced by a *Malva*, identified as *M. borealis*. The symptoms of these animals included weakness and quivering of the muscles. When they were urged on they would collapse. If the animals were left alone they generally recovered. In 1909, Walsh (17) in discussing "dronk grass" poisoning in South Africa, said that one cause of that trouble was *M. parviflora*.

In 1921 Dodd and Henry (3) published an article entitled "Staggers or Shivers in Live Stock," and in 1922 (4) a more elaborate article under the same title detailing the results of experimental feeding of sheep with *M. parviflora*, with which they claimed to have produced poisonous effects. This latter article was also published in the Journal of Comparative Pathology and Therapeutics (4), and as Science Bulletin No. 23 of the Department of Agriculture of New South Wales (4). Their experimental work was with sheep, and they stated that after exercise the animals would lag,

walk with stiff hind legs, arched backs, and stretched-out heads. The respiration and pulse were rapid. The animals had temperatures of from 104° to 106° F. Especially noticeable was the trembling or quivering, particularly of the shoulders and hind quarters. They would sometimes fall and not attempt to rise again. The urine was clear and colorless. In the post-mortem examinations the investigators found the liver pale and friable, with fatty infiltration. There was a slight excess of peritoneal fluid, also of the pericardial fluid. Their statements in regard to dosage were not very definite, but it may be deduced from their experimental work that from 6 to 36 pounds fed in from 5 to 16 days produced sickness, either in mature sheep or in the lambs of the experimental ewes.

Uphof, (16) in 1925 stated that *M. parviflora* in Arizona is considered by some stockmen as poisonous, particularly to horses. In 1925, Seddon (13) wrote that experimental work had confirmed the fact that continued ingestion of the plant leads to staggers in sheep. The attempts to produce staggers in calves and horses were unsuccessful.

The foregoing includes all that has been published on the subject of the poisonous properties of *M. parviflora*. The work of Dodd and Henry was apparently so conclusive and made more so by the confirmation by Seddon, that it seemed highly probable that the plant was a cause of possible poisoning where it grew in considerable quantities, as it does in the orchards of southern California.

EXPERIMENTAL FEEDING

Through the kindness of Professor Munz, of Pomona College, a considerable quantity of the plant was obtained, and trial feedings were made with sheep. A summarized statement of the results follows: In 1925, sheep 894 ate in 11 days 57.2 per cent of its weight of *M. parviflora*, estimated as green plant. This was an average dosage of 5.2 per cent of its weight daily. In 1926, sheep 972 in 26 days received 154 per cent of its weight, the plant as before being estimated as green plant. This was an average daily dosage of 5.9 per cent of its weight. Neither of these animals was injuriously affected by the plant. Both animals during this feeding were supplied with alfalfa hay, and maintained their weights with a little gain. The results of these two feeding experiments, in which such large quantities were given—much more than any sheep would eat under normal circumstances—indicated that *M. parviflora*, at least when dried, need not be seriously considered as an injurious plant.

No satisfactory explanation can be offered of the difference between these results and those of Dodd and Henry. It may be stated, however, that the plant as fed at the Salina Experiment Station had been dried, while the work of Dodd and Henry, to a large extent, was done with fresh plant. There is, of course, a possibility of a difference in harmful properties between the dried and the green plant. However, in the experiments of the Department of Agriculture many plants have been used in both the green and dry state, and it has been found that the great majority do not lose their toxic properties in drying.

SYMPHORICARPOS VACCINOIDES (SNOWBERRY OR BUCKBUSH)

Many inquiries have come to the Department of Agriculture in regard to the possible poisonous properties of species of *Symphoricarpos*. This genus, in a number of species, is distributed widely over the United States, and, because of the white fruit from which it gets its name of "snowberry," is a rather conspicuous group of plants. A number of other names have been applied to some of the species. By some authors *S. occidentalis* has been known as "wolfberry," "stag berry," and "buckbush." *S. orbiculatus* has been called "Indian currant" and "coralberry."

Very little specific information has come to the department in regard to the possibilities of stock poisoning by *Symphoricarpos*. One correspondent in Virginia was very certain that his cattle had been injured by *S. vulgaris*. In 1915, a number of sheep died from some unknown cause in the neighborhood of Belle Fourche, S. Dak., and an examination of some of those that died showed the presence of *Symphoricarpos* seeds in their stomachs.

The following résumé covers the published literature in regard to the possible poisonous character of species of this genus: In 1885, Amyot (1) published cases of violent poisoning of several children by *S. racemosus*. The fruit was found in their stomachs, and the physician regarded it as the cause of the illness. Kunkel (10, p. 981), in 1901, stated that *S. racemosus* was not poisonous to domestic animals, rabbits, or geese, but produced diarrhea in children. Chesnut and Wilcox (2, p. 138), in 1901, quoted a correspondent as stating that the berries were suspected of poisoning stock in winter. Greshoff (5), in 1909, stated that *S. orbiculatus* is used as a diuretic, and that *S. mollis* and *S. racemosus* contain a saponin. He also said that cases of poisoning by *S. racemosus* have occurred repeatedly. Pammel (11, p. 135), in 1919, stated that *S. orbiculatus* and *S. racemosus* were reported to be poisonous, and quoted Greshoff in regard to the presence of saponin in *S. racemosus*. Jepson (7, p. 395), in 1911, said that the berries poisoned children. Kobert (9, p. 55), in 1912, made the statement that great quantities produce diarrhea, delirium, and coma. Stevens (14), in 1923, quoted a newspaper report of cases of poisoning having been caused by the berries.

EXPERIMENTAL WORK

Because of the foregoing reports and also because of repeated inquiries from western stockmen in regard to the harmful character of the plant, a few feedings of the berries of *S. vaccinioides* Rydb. were made at the Salina Experiment Station in 1924. The feedings were of crushed fruit fed by balling gun, and four sheep received, respectively, the following percentages of animal weight: 0.5, 1, 2, and 4. The feedings of 0.5, 1, and 2 per cent were made in a single feeding. The feeding of 4 per cent of animal weight was made in two feedings in one day. None of these feedings produced any effect on the sheep. Inasmuch as 4 per cent of animal weight was evidently very much more than any animal would obtain in grazing, the conclusion was reached that, so far as sheep are concerned, the fruit of *S. vaccinioides* may be considered as harmless. By many, the species of *Symphoricarpos* are considered as excellent feed for

grazing animals, and are so quoted by Sampson (12), in 1924. Although these feedings were few in number, it was thought that they were sufficient to show that there is no reason why the plant should be avoided in grazing.

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