

1955

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### Recommended Citation

Ruby, E. S.; Beasley, J.; and Stephenson, E. L. (1955) "Prussic Acid Poisoning in Common Vetch (*Vicia Sativa*) Seed," *Journal of the Arkansas Academy of Science*: Vol. 7 , Article 9.

Available at: <http://scholarworks.uark.edu/jaas/vol7/iss1/9>

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## PRUSSIC ACID POISONING IN COMMON VETCH (*VICIA SATIVA*) SEED<sup>1</sup>

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### INTRODUCTION

Poisoning of livestock by plants long has been a problem with livestock producers. It is a particularly important one in the South because of the production under certain conditions of prussic acid (hydrogen cyanide) by Johnson grass and the sorghums. There are other plants in the South that produce prussic acid poisoning, but they are of little or no economic value and are not present in great numbers. Also, many of these plants are not eaten by livestock unless the animals are on poor pasture.

Prussic acid is produced from glucosides in combination with an enzyme and water, according to Armstrong (1924). The enzyme and the glucoside are contained in the same plant parts, but they are in separate cells. Thus, it is not until the cells are ruptured and the water is added that prussic acid is produced.

Prussic acid is one of the most powerful poisons known. Death results in very little time after a sufficient dose is ingested. The glucoside enters the animals through the digestive tract. However, prussic acid poisoning may result from breathing the fumes, getting the poison in an open wound, or coming into contact with the mucous membranes, according to Nunn (1907).

Morrison (1950) reported that some species of *Vicia* are poisonous. No references for his statement are shown in the book. Further references in the literature were found which showed that there are some species of *Vicia* that are poisonous. Muenscher (1939) states that Crown vetch (*Coronella varia* L.) is poisonous. Although this is not a true vetch, the common name may be responsible for some misunderstandings in the literature.

Pammel (1911) reports that common vetch (*Vicia sativa*) causes tympanites in swine, but not in cattle. He reports that the seed is fed in Europe in large quantities to cattle.

Roseveare (1948) reports that Fernandez and Echenique have investigated the poisoning of pigeons by the seed of common vetch. They found that these seeds contain a glucoside which, by the action of its own diastase, and that of the pigeons digestive tract, is transformed into hydrocyanic acid, benzoic aldehyde, and sugar. Roseveare (1948) also states that the influence of the *Vicia sativa* poison on cattle has been proved.

Armstrong (1924) states that the glucoside vicianin has been found in the seeds of narrow leaf vetch (*Vicia angustifolia*). It is decomposed by an enzyme (vicianase) present in certain vetches. Seed of narrow leaf vetch is not regularly available, but it is commonly present in waste places and along roadsides in the Cotton Belt, according to Wheeler (1950).

The horsebean, (*Vicia faba* L.) seed was reported by Pammel (1911) to contain a glucoside which has been named convincin. The large seeded horsebean varieties commonly are grown for use as a vegetable and as a stockfeed. There are many varieties of this species, and Wheeler (1950) reports that these plants also are used as a green manure crop.

### EXPERIMENTAL PROCEDURE

Fifteen pounds of common vetch (*Vicia Sativa*) seed were obtained and ground in a Wiley mill. Some hairy vetch (*Vicia villosa*) seed was present in the sample. This ground seed was then substituted into Diet I at the following levels: 0 per cent, 20 per cent, 40 per cent, 60 per cent, 80 per cent, and 100 per cent vetch seed. The composition of experimental diets used in this study is shown in Table I. Diet I had relatively the same protein level as the vetch seed.

Mature female albino rats were used as the experimental animals. Their average initial weight was 231 grams. Twenty-three females were available. They were divided at random into six groups. Four animals were put on each diet except

<sup>1</sup> Research Paper No. 1100, Journal Series, University of Arkansas. Published with the permission of the director of the Arkansas Agricultural Experimental Station.

Diet 6 which had only three animals. Previous to their being put on the experimental diets, the rats had been on Diet 1 for several months.

Table I. Experimental Rations Used in Studying the Toxicity of Common Vetch (*Vicia sativa*) seed (1953).

Diet	Corn (Pct.)	Soybean oil meal (Pct.)	Alfalfa leaf meal (Pct.)	Vetch seed (Pct.)
1	45	45	10	0
2	36	36	8	20
3	27	27	6	40
4	18	18	4	60
5	9	9	2	80
6	0	0	0	100

The rats were put on experiment January 29, 1953 and were taken off February 25, 1953. Three rats from each diet were posted to determine any abnormalities of the digestive tract.

#### RESULTS

The results of the use of common vetch seed in the ration of rats in testing the material for prussic acid poisoning are shown in Table II.

Table II. Results of Toxicity Study on Feeding Common Vetch Seed to Rats.

Diet	Number rats	Number died	Average weights		Average	
			Initial (gms)	Final	Gain (gms)	Loss
1	4	0	229	225	--	4
2	4	0	229	228	--	1
3	4	0	232	239	7	--
4	4	0	232	239	7	--
5	4	0	230	259	29	--
6	3	0	245	271	26	--

It is apparent from the number of animals that died that either the common vetch seed did not contain a glucoside or that the enzyme was not present to produce prussic acid poisoning. The changes in body weight of the rats also indicate that these levels were no more toxic than Diet 1.

An autopsy revealed that rat one on Diet 1 had two tumor-like growths attached to the mesentery and partially surrounding the intestine. The body cavity was filled with sanguinous fluid. Otherwise the rat appeared to be normal. All other rats were normal except rat three on Diet 6, whose left lung had undergone hepatization. There was no basis for assuming that these conditions were caused by the experimental ration.

CONCLUSIONS

The seed of common vetch (*Vicia sativa*) was not poisonous to rats even when it constituted the sole source of feed.

The presence or absence of a glucoside capable of producing prussic acid poisoning was not demonstrated, as the enzyme for decomposing a glucoside may not have been present.

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