

LOSS OF SELENIUM BY VARIOUS GRAINS¹ DURING STORAGE

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During the fall of 1937 it became apparent to the authors that several grain samples, which had been known to have a relatively high selenium content before storing, contained, when analyzed months later, less selenium than formerly. This observation was in agreement with the views of certain farmers in the seleniferous area who have expressed the belief that old grain is less toxic than new grain.

To determine just how great the loss of selenium during storage is, a group of samples that had been in storage for from three to five years were analyzed and the analyses compared with the original analyses for the samples. The analyses were made by an adaptation of the Robinson, Williams, Dudley and Byers method which is a digestion of the sample with sulfuric acid and estimation of the selenium in a distillate from the digest.

The results and comparisons may be briefly summarized in the following table:

Table I

Sample	Date	Original Se Value	Se Value Dec. 1937	Years	% Loss
459	Wheat 1934	25.0	24	3	4
582	Wheat 1932	30.0	20	5	33.50
583	Wheat 1932	27.0	17	5	37.
591	Wheat 1932	18.7	8	5	57.2
607	Wheat 1932	32.0	22	5	31.25
471	Wheat -----	15.0	10	----	33.33
585	Barley 1932	22.0	14	5	36.36
586	Barley 1932	23.0	14	5	39.13
587	Barley 1932	15.0	7	5	53.33
608	Barley 1932	24.0	15	5	37.50
531	Barley -----	11.0	3	----	72.7
388	Corn -----	30.0	16	----	46.66
568	Corn 1932	13.0	10	5	23.08
663	Corn 1934	23.0	12	3	47.82
523	Corn -----	34.0	22	----	35.3
594	Corn 1932	18.7	15	5	19.8
664	Corn 1934	16.0	14	3	12.5
665	Corn 1934	25.0	12	3	52.0
570	Corn 1933	29.0	11	4	62.1

Six wheat samples were analyzed. Five of these wheats were five years old, and the exact age of one is not known but it probably is seven years old. Of the five year old samples, one sample apparently lost no selenium, the rest lost 33½ per cent, 37 per cent, 57.2 per cent and 31.25 per cent of their original selenium content. The other wheat sample lost 33 1/3 per cent of its selenium.

Five barley samples were analyzed for this comparison. Four of these samples were five years old and the age of the other is not known. The five year old samples lost 36.36 per cent, 39.13 per cent, 53.33 per cent, and 37.5 per cent of their original selenium content. The sample of unknown age lost 72.7 per cent of its original selenium content.

Eight corn samples were used in this comparison. Two of these samples were five years old, one was four years old, three were three years old, and the age of two of these samples is not known. The two five year old corn samples lost 23.08 per cent and 19.8 per cent respectively, of their original selenium content. The one corn sample which was four years old lost 62.1 per cent of its selenium. The three year old samples lost 47.82 per cent, 52.01 per cent, and 12.5 per cent of the original selenium content, respectively.

The grains used in these tests have been kept in cloth sacks during the entire period of storage. During the summer of 1937 the grains were stored in a small, slightly ventilated room, with a very low roof. This room became very hot during the days and cooled only slightly at night.

A somewhat similar loss of selenium from green vegetation during drying has been reported by Beath and others of Wyoming². Beath believes that odor of plants such as *Astragalus bisulcatus* is due to a volatile selenium compound, because "selenium free plants of *Astragalus bisulcatus* do not have this odor." Beath performed a simple experiment that gave support to this belief. A quantity of fresh *Astragalus bisulcatus* was placed in a tube and air drawn over it at room temperature, the gases then being passed through concentrated sulfuric acid. A small amount of selenium was collected in the acid. In later experiments this

loss of selenium was found to be much greater when the plants were heated slightly.

In our laboratory preliminary experiments show that this loss of selenium is much greater at higher temperatures. A corn and a wheat sample dextrinized at 160°C. for two hours lost 27.3 per cent and 23.76 per cent of their selenium respectively.

The results of these experiments indicate that there is no close relationship between the age of the sample and its loss of selenium. Rather, it seems that the amount of loss of selenium seems to be related to the form of the selenium in the grain.

Bibliography

1. Moxon, Alvin L. Alkali Disease or Selenium Poisoning. Agri. Expt. Sta. S. Dak. State College, Bulletin 311 (1937).
2. Beath, O. A., et al. Selenium and Other Toxic Minerals in Soils and Vegetation. Univ. of Wyo. Agri. Expt. Sta. Bulletin 206 pp. 19-20, (1935).