

## THE MOVEMENT OF SELENIUM FROM GERMINATING SELENIFEROUS GRAINS

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Since no work has been reported in reference to the movement of selenium from grains which contain this element it was deemed fitting that some study of this be made which could later be used, possibly, in determining to what extent the toxicity of grains is dependent upon the seeds from which they were grown.

For this study wheat, corn, barley, and *Astragalus racemosus* seeds were used. The seeds were placed between dampened cloth towels in an incubator at a temperature of 33°C. The towels were kept moist by occasional sprinkling as well as by capillary action through the towels which were in contact with water at all times. After a period of time depending upon the size of sprout which was desired the germinated seeds were removed and their various parts were separated. The parts were dried at 60°C. for two days and the selenium determinations were then made by a modification of Robinson's method. All results reported here are on a dry basis.

Wheat from Gregory County containing 30 p.p.m. of selenium was germinated and the sprouted plants were separated into three parts, the stem, (or epicotyl) the root, (or hypocotyl) and the remaining kernel. The average of the analysis of five sets of germination trials is as follows:

Stems—45 p.p.m. selenium

Roots—23 p.p.m. selenium

Remaining kernel—35 p.p.m. selenium

The sprouts in one trial were separated into three classes according to the length of stem. Class I was composed of those sprouts having stems up to one-half inch long, Class II was composed of sprouts having stems one-half to 1½ inches long, and Class III was composed of those having stems 1½ inches long or longer. The usual separation of parts was made on each class and selenium determinations

were run. The per cent of the total selenium in the germinated seeds which was found in each part at each stage is as follows:

	Stem	Root	Remaining kernel
Class I . . . . .	14 %	6 %	80 %
Class II . . . . .	20 %	9 %	71 %
Class III . . . . .	38 %	10 %	52 %

The data show that there is a decided movement of the selenium from the kernel to the growing parts. The movement to the stem is about twice as rapid as it is to the roots.

The corn used in this experiment was obtained from Gregory County and it contained 22 p.p.m. of selenium. The sprouts were separated into four groups, namely, stems, roots, aerial roots, and remaining kernels. The aerial roots were considered those which grew from the epicotyl. Results obtained upon the analysis of these various parts for selenium show the stems to contain 66 p.p.m., the roots 61 p.p.m., the aerial roots 46 p.p.m., and the remaining kernel 23 p.p.m., indicating a slightly more rapid movement of the selenium to the stem than to the roots, and a comparatively slow movement of selenium to the aerial roots. Previous work has shown the selenium content of the germ of the corn kernel to be about twice that of the remainder of the kernel<sup>1</sup>. Thus the selenium content of the growing parts might well be expected to be higher than for the remaining kernel. It is felt, however, that such differences as have been found cannot be due to this factor alone.

In the germination of seleniferous barley obtained from Stanley County and containing 15 p.p.m. of selenium it was found that the stems and roots both contained 31 p.p.m. of the element as compared with 17 p.p.m. in the remaining kernel. Thus the rate of movement of the selenium to the stems and roots seems to be equal, at least in the early stage of growth.

*Astragalus racemosus* is important in selenium poisoning in that it is one of the more important members of a class of plants known as selenium converters. This plant

occurs quite generally over the seleniferous regions of South Dakota and it usually contains a relatively large amount of the element. Germination studies on this plant indicate a movement of the element from the seed to the growing parts, which contain about the same amount of it as does the seed itself before germination.

It seems then that plants grown from seeds containing selenium do depend to some extent, at least, upon the seed itself for part of their toxicity. The distribution of the selenium varies with the kind of plant and to some extent with the stage of growth. Several other factors probably contribute to variations in distribution. The work presented here is merely a preliminary report. We hope to conduct more extensive experiments on the problem.

#### Reference Cited

1. Moxon, Alvin L. Alkali Disease or Selenium Poisoning. S. Dak. Agri. Expt. Sta. Bulletin 311 (1937).