BRIEFER ARTICLES

ABSORPTION OF BARIUM CHLORIDE BY ARAGALLUS LAMBERTI[1]

During the progress of some experimental work on loco plants at Hugo, Colorado, we were led to suppose that these legumes contained much more barium salts than other plants growing in the same localities, and presumably possessed some qualities which enabled them to withdraw more of these salts from the soil. The question arose whether an increase of the quantity of barium in the soil would be followed by a corresponding increase in the plants, and to this end a series of experiments was undertaken. These experiments were not carried out as a complete study of the question, and were discontinued after the facts were obtained which had an immediate bearing on the problems which were under consideration. While the work was only preliminary in character, the results obtained may be of interest to others, and inasmuch as this work will not be continued, it may be best to publish the facts for the use of those who may be studying similar problems. While the general plan of the experiment was outlined by the writer, the detail was carried out by Assistant HADLEIGH MARSH. A plot of ground was selected on the ranch of Mr. OLSON, near Hugo, where *Aragallus Lamberti* grew with especial luxuriance. This plot was fenced in order that grazing animals might not interfere with the progress of the experiment.

EXPERIMENT NO. 1

Six thrifty plants of *Aragallus Lamberti* were selected for barium chloride treatment, and 7 plants, somewhat smaller, were selected for a control by treatment with an equal amount of water. A shallow trench was dug around each plant. These trenches were filled daily with barium chloride solution in the case of the plants experimented upon, and with an equal quantity of water in the case of the control plants. The barium chloride was applied in a 10 per cent solution. The solution was made with water containing some sulphates, so that there was a slight precipitation of sulphate of barium when the solution was made, but it is not

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to be presumed that this made any material difference with the amount of barium chloride in solution. Two liters of barium chloride solution were applied to each of the experimental plants daily. The 10 per cent solution was used from July 8 to July 11, 1908, inclusive. On July 13, 5·5 per cent solution of barium chloride was used. No more of the solution was applied, and on July 18 it was found that the plants treated with barium chloride solution had turned yellow and dried up, while those treated with water were still green and fresh. The grass which surrounded the trenches did not seem to be affected by the barium chloride solution. Both sets of plants were dug and dried for chemical analysis.

Unfortunately the plants treated with water were by mistake thrown away, so that no analysis could be made. However, an analysis was made of *Aragallus Lamberti* collected on the tract adjacent to the fenced patch at about the time when this experiment was going on, and this will serve as a basis of comparison, though not having the value of an analysis of the control plants. The analyses were made by the Bureau of Chemistry. The plants treated with barium chloride showed ash 41.08 per cent and barium 1.32 per cent. The *Aragallus Lamberti* collected in the area adjacent to the experimental plot showed ash 22.08 per cent and barium 0.106 per cent.

EXPERIMENT NO. 2

Inasmuch as it was shown that a 10 per cent solution of barium chloride was poisonous to *Aragallus Lamberti*, it was decided to use a very much more dilute solution and to duplicate the preceding experiment, using a 0.1 per cent solution.

In this experiment 9 plants were chosen for the barium chloride treatment, and 9 similar plants for the control experiment with water. Sixteen liters of barium chloride solution were used daily on the experimental plants, and 16 liters of water on the control plants, with the exception of one day when 14 liters were used. This experiment was carried on from August 4 to August 18, inclusive. During this time both groups of plants continued healthy and showed no effect of the treatment. On August 20 both sets of plants were dug up and dried for analysis, these analyses, as in the other cases, being made by the Bureau of Chemistry. The plants treated with barium chloride showed ash 52.26 per cent and barium 0.20 per cent. The plants treated with water showed ash 22.98 per cent and barium 0.0613 per cent.

EXPERIMENT NO. 3

In the third experiment, the barium chloride was used in a 1 per cent solution. As in the preceding experiments, one group of plants was watered with the barium chloride solution and the other with an equal amount of water. Sixteen liters of the barium chloride solution and of water, respectively, were used daily in this experiment. This was commenced on September 15, and was continued to September 21, inclusive. At this time both groups of plants were in good condition, showing no ill effects from the treatment. On September 22 the plants were dug up and dried for analysis. The analyses, made by the Bureau of Chemistry, showed the following results: the plants treated with barium chloride, ash 37.095 per cent, barium 0.636 per cent. The plants treated with water showed no barium.

RESULTS

These preliminary experiments appear to show the following results: That plants of *Aragallus Lamberti* endure barium chloride solution as strong as 1 per cent with no bad effects, while a 10 per cent solution is distinctly poisonous. Grouping the analyses, we find that the largest amount of barium was found in those that were treated with the 10 per cent solution, a less amount in those treated with the 1 per cent solution, and a still less in those receiving the 0.1 per cent solution. In other words, it appears that in these experiments the quantity of barium salts absorbed varied directly with the amount in the soil.—C. DWIGHT MARSH, *Bureau of Plant Industry, U.S. Department of Agriculture.*