women who have the ability to generalize, the power to think and the initiative to find a way to do and invent new things. In short, they have the genius to create that which makes life pleasant.

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TOXICITY OF SELENIUM-CONTAINING PLANTS TO APHIDS

IN the course of studies[1] of the effects of selenium on wheat it was noted that aphids, *Rhopalosiphum prunifoliae* (Fitch), did not attack plants injured by selenium in solution cultures or soils. Since both rats and larger animals are able to detect the presence of selenium in their food and are reluctant to eat it,[2] the question arose as to whether the aphids found the selenium absorbed by the plants distasteful and migrated, or whether they died as the result of sucking the selenium-containing juice. The following experiments were accordingly designed to determine their behavior under conditions of artificial infestation.

Nutrient solutions, in 600 cc flasks, were made to contain various concentrations of sodium selenate ranging from amounts so small as to supply but 1 p.p.m. of selenium to concentrations as high as 12 p.p.m. Known numbers of aphids were placed on wheat plants growing in these solutions, and records of survival made daily. By placing each flask in the center of a large saucer of water it was possible to prevent migration and to account for the aphids that dropped from the plants.

Aphids placed on 2-months-old plants supplied with concentrations of selenium greater than 3 p.p.m. all died within a few days, while those with lower concentrations lived for as long as a week, although without reproducing actively. Similar results were observed with the red spider, *Tetranychus telarius* (L.). The plants were stunted by concentrations greater than 3 p.p.m. selenium.

The experiment was repeated with younger plants one month old. Comparatively few aphids survived on the plants grown with but 1 p.p.m. selenium, although some reproduction did take place. No damage to the plants themselves was apparent at this concentration. A few aphids survived for several days on plants supplied with 3 and 4 p.p.m., but did not reproduce. As the selenium concentration increased, it was necessary to add more aphids daily in an attempt to keep the plants infested with living aphids. Only on the control plants without selenium did the insects live and multiply normally.

The aphids were evidently sensitive to concentrations of selenium in the plant too low to visibly affect the plant itself. This was also obvious in some experiments with wheat, rye, oats and barley grown in soil treated with sodium selenate at a rate of 10 p.p.m. selenium, a concentration having little effect on the plants but almost completely inhibiting aphid infestation. For some reason more of the aphids persisted on the rye plants than on the others, although here also the number was greatly reduced. Adjacent control plants without selenium were all severely infested.

It is concluded that this species of aphid is killed by selenium taken up by plants from small amounts in the substratum. Evidently concentrations even lower than 10 p.p.m. in the soil would prevent serious attack. Whether or not this sensitiveness can be utilized as a means of insect control, with non-food crops or ornamentals, is problematical in view of the extreme toxicity of selenium to both plants and animals. Certainly the utility of the more readily absorbed selenium salts, such as the sodium selenate used in the experiments reported in the present paper, would seem limited to cases where the land is not to be utilized for food crops or where rapid leaching or irrigation insures complete removal of any residual toxicity.

The toxicity of selenium-containing plants to aphids is in accordance with their singular toxicity to higher animals. Selenium absorbed by vegetation on virgin soils has been shown to be the cause of a sometimes fatal disease of live stock.[3] White rats are injured by concentrations as low as 6 p.p.m. in a diet containing seleniferous grain.[4] The toxicity of selenium has led to various recommendations for its use in insecticides. It has been found especially effective in combatting red spiders,[5] although caution in its use has been urged.[6] It is not recommended by the Department of Agriculture because of the danger of contaminating foodstuffs, and because of a question as to possible injury to the persons making the applications.

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THE RÔLE OF CERTAIN INORGANIC ELEMENTS IN THE CAUSE AND PREVENTION OF PEROSIS

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