THE ABSORPTION AND MOVEMENT OF SODIUM CHLORATE
WHEN USED AS AN HERBICIDE

W. E. LOOMIS, E. V. SMITH, RUSSELL BISSEY, and L. E. ARNOLD

Sodium chlorate is gaining recognition as one of the most effective chemical means now available for the control of perennial weeds and many experiment stations are distributing recommendations for its use. In spite of the proved effectiveness of this chemical as an herbicide, results in the hands of growers are too frequently unsatisfactory. Recommended methods of application may also involve serious fire hazards and the costs have been prohibitive for any but small areas. Greater efficiency in the use of sodium chlorate should follow a better understanding of its action and of the way in which it enters and moves within the plant. The present paper is a contribution toward the solution of the latter problem.

The common practice in the use of chlorate is to apply the material as a spray to the foliage of the growing plant. The greater effectiveness of chlorate when compared with other herbicides which are equally active in killing the exposed portions of the plants has been ascribed to a downward translocation of the herbicide in the stem and roots of the plant. Crafts (3) has shown that a mechanism for such penetration is present in field bindweed (Convolvulus arvensis L.) growing in dry soil, in which case, as the soil approaches the permanent wilting point, the cells of the roots develop a considerable water-absorbing power. When the tips of the vines of such plants were cut under eosin solution, the dye was drawn several feet into the roots as the tracheal sap, relieved of tension at the top, was absorbed by the living cells of the root. When herbicides were sprayed upon the foliage, however, the penetration into the xylem was much less effective, and it was only with dry soil and continued moistening of the tops that an appreciable downward movement of toxin could be obtained.

Oford (8) tested the effectiveness of a number of herbicides on Ribes sp. and found that materials which reacted rapidly with the protoplasm resulted in a quick killing of exposed portions of the plant, but that the crowns and roots soon sprouted, apparently uninjured. The chlorates, on the other hand, were slow but much

1Contribution from the Botany and Plant Pathology Section, Iowa State College, Ames, Iowa. Journal Paper No. B80 of the Iowa Agricultural Experiment Station. Project No. 304. Received for publication January 16, 1933.
2Associate Professor, Fellow, Fellow, and Assistant, respectively.
3Reference by number is to "Literature Cited," p. 739.