Effect of 2,4-Dichlorophenoxyacetic Acid on Seedling Development and Uptake and Distribution of Calcium and Phosphorus in Barley

Lawrence H. Smith and C. M. Harrison

Much time and effort have gone into attempts at elucidating the mechanisms whereby plants are killed by growth regulators, such as 2,4-D. Since the absorption and translocation of inorganic nutrients are essential to plant growth and development, 2,4-D may effect its toxic action partially through an interference with the absorption and translocation of various essential inorganic ions.

Recent experiments on broad-leaved plants have indicated an influence of 2,4-D upon nutrient ion uptake and distribution, with some ions being affected more than others.

The following experiment was devised to study the effects of 2,4-D on plant behavior with respect to:
1. varying amounts of 2,4-D applied at different stages on the development of barley seedlings and
2. uptake and distribution of phosphorus and calcium in these seedlings using radioactive tracer techniques.

**REVIEW OF LITERATURE**

Freiberg and Clark (4) found that the absorbing capacity of the roots of soybean plants was apparently changed when treated with 2,4-D, as indicated by the failure of treated plants to increase in total nitrogen. Stahler and Whitehead (11) erroneously sprayed sugar beet leaves with a solution of 2,4-D with a resultant increase in the nitrate content. Hamner et al. (7) noted that the total amount of phosphorus in leaves of cranberry plants treated with 2,4-D was lower, whereas that of stem tissue was higher, than that of the untreated plants. The amount of phosphorus in the roots of the treated plants was not appreciably different from that of plants not treated. Fang and Butts (3), found that P<sup>32</sup> activity of leaves from bean plants treated with 2,4-D was much less and the distribution of the isotope was different from that of control plants, while the activity in either the stem or root showed no significant differences. Nance (9) described excised roots of four-day wheat seedlings which showed a marked inhibition of nitrate absorption induced by 2,4-D within three hours after treatment. Weldon et al. (14) reported that the tops of tobacco seedlings treated with 2,4-D contained a lesser percentage of potassium, sodium, and phosphorus and a greater percentage of boron and iron than did untreated plants.

**MATERIALS AND PROCEDURE**

Barley (Hordeum vulgare L.) seeds of the Kindred variety were planted ½ inch deep in a quartz sand medium in 1½-pint cups.  

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2. Former teaching assistant (now Assistant Professor, Department of Agronomy and Plant Genetics, University of Minnesota) and Professor of Farm Crops, Michigan State University.