THE ACID-ARSENICAL METHOD IN WEED CONTROL

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Many inquiries are received each year concerning the acid-arsenic treatment for killing deep-rooted perennial weeds. This paper attempts to clarify the status of this method by accurately describing the conditions and technic necessary for optimum results, pointing out factors that limit its use, and presenting additional data indicating certain improvements. Though practical in the semi-arid West, the general use of this method in more humid districts can only lead to disappointment if its limitations are not fully recognized.

MECHANICS OF ARSENIC ABSORPTION AND MOVEMENT

Experience has corroborated interpretations relating water balance in the plant to the absorption and movement of the arsenic spray. Continued use of the method has indicated more clearly the relative importance of certain factors such as the amount of absorbing leaf surface and the relation of transpiration and soil moisture deficit to water balance.

Although the experiments of Gray (14, 15), Kennedy and Crafts (16), Crafts and Kennedy (11), Morgan (18), and Crafts (3, 4, 5, 6) indicate the conditions under which absorption and movement of arsenic take place, a brief resumé of the mechanics of the process seems timely.

When transpiration exceeds water absorption, a water deficit is developed throughout the plant and all living plant cells acquire the capacity to absorb water. If the plant with this water deficit in its tissues is rapidly killed, liquid is absorbed from the xylem vessels and their contents are replaced by any available water or by air. A strongly acid spray rapidly kills the foliage of plants, and if this spray contains arsenic there is presented a dilute arsenic solution for absorption into the xylem vessels. A virtual reversal of the transpiration stream occurs and all tissues infiltrated with the poison are killed. The acid-arsenical spray technic consists largely of fulfilling the requirements for the successful absorption and movement of arsenic from the sprayed portion of the plant into the root.

Since the competition between the plant and the soil for water is so important in the water balance of the plant, and hence in the mechanics of arsenic absorption and movement, the soil-plant water relation is vitally concerned. The root system of most higher plants can absorb water and supply it to the top with a force of only about two atmospheres. Since this force is inadequate, under field conditions, to meet the normal needs of the plant, most of the water absorbed from soils by higher plants is drawn in as a result of transpiration by leaves, a maximum force of about 16 atmospheres (19) being available for such absorption. The development of sufficient water deficit within the plant for action of the

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3Figures in parenthesis refer to “Literature Cited”, p. 942.