

Halogenated Pesticides

Localization of Dieldrin in Wheat Tissue

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The localization of root-absorbed ^{14}C -dieldrin in wheat leaves was studied by means of microradio-

autography. The label is found in xylem vessels, tracheids, and the adjacent mechanical tissue.

A number of studies have indicated that chlorinated hydrocarbon insecticides are found in the tops of plants growing in soil containing these insecticides (Lichtenstein and Schulz, 1960; Morley and Chiba, 1965, Muns *et al.*, 1960). A previous study (Wheeler *et al.*, 1967b) from this laboratory has shown that considerable dieldrin may be taken up from sand and soil under controlled conditions. Wheeler *et al.*, (1967a) observed that quantitative extraction of root-absorbed dieldrin required the use of chloroform-methanol (1 to 1), which suggests localization of the pesticide with membranes (surfactant lipids). The present study was undertaken to determine if internal localization of dieldrin in the leaf tissue could be determined directly by radioautography. This technique should prove valuable for the localization of pesticides in cells and vascular tissue (Liao and Hamilton, 1966; Radwan *et al.*, 1960).

EXPERIMENTAL

Several wheat plants were grown in 100 grams of sand containing 1 μc . of ^{14}C -dieldrin. After three weeks the plants were harvested and prepared for microradioautography. The wheat blades embedded in 5% gelatin were quick-frozen, by immersion in isopentane containing 8% methylcyclohexane which had been cooled with a dry ice-acetone mixture, and placed in a freezing microtome at -25°C . (Jensen, 1962).

The blades were then cut into 12- to 14-micron thick transverse sections and placed on a microscope slide. After drying in the microtome, the slides were dipped in Ilford K-5 liquid emulsion. The emulsion was air-dried and the slides were placed in light tight boxes with silica gel. Following a one-month exposure at 4°C ., the slides were

developed (Kodak D 19) and the sections were stained with Azure B.

RESULTS AND DISCUSSION

Since previous studies (Wheeler *et al.*, 1967a) have indicated that dieldrin is not appreciably metabolized by wheat plants, the radioactivity in this study is assumed to be dieldrin.

Figures 1 and 2 are cross sections of a wheat leaf midrib vein. Examination of these sections reveal that dieldrin is located in the mechanical tissue cells or on their cell walls and in the xylem tissue. Both the vessels and the tracheids of the xylem contain label. Dieldrin was not found in any phloem tissue. Figure 3 shows a section of the xylem tissue near the end of a vascular bundle along the leaf edge. The dieldrin concentration increases as one approaches the edge of a leaf.

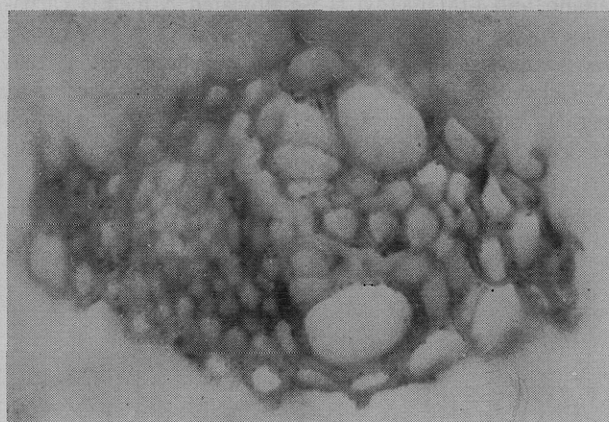


Figure 1. Microradioautograph of a wheat leaf cross section showing midrib vascular bundle

Label may be noted in xylem vessels, tracheids, and mechanical tissue

784X

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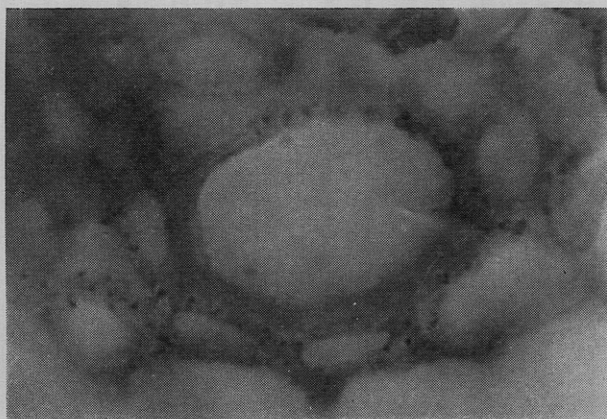


Figure 2. Higher power magnification of a section of wheat midrib shown in Figure 1

2060 ×

Repeated experiments carried out in this laboratory have demonstrated that dieldrin is located in the xylem tissue and in the mechanical tissue surrounding the xylem tissues, apparently on or in the cell walls and in the interstitial spaces. The methods used to prepare the sections do not allow one to determine if the dieldrin seen on or in the cell walls was located in these areas in the living plant. Some dieldrin may have been moved and become attached to the cell walls during the preparation. However, the complete lack of dieldrin in the phloem and other tissues clearly shows that dieldrin is not present in these tissues of the living plant. In any event, the localized radioactivity indicates internal translocation of dieldrin in xylem in these plants.

ACKNOWLEDGMENT

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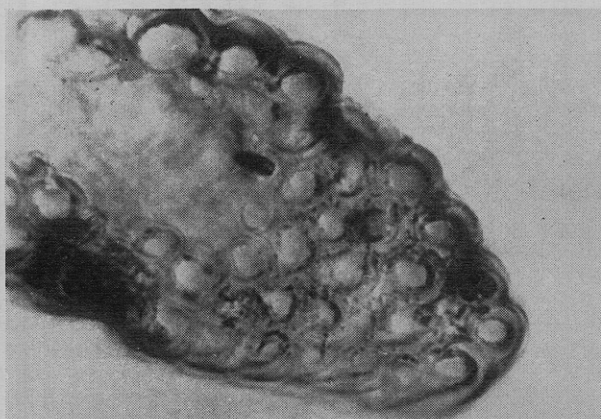


Figure 3. Microradioautograph of wheat leaf cross section showing labeling in xylem and mechanical tissue near end of a vascular bundle along leaf edge

700 ×

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