ABSORPTION, TRANSLOCATION AND DISTRIBUTION
OF LINDANE AND DDT IN THE CORN PLANT

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INTRODUCTION

It is well established that organochlorine compounds occurring in the soil are absorbed by plants, where they accumulate in variable amounts. Thus, BHC and lindane residues were found in wheat (5,6), potato (10) and carrot (13); aldrin, dieldrin, heptachlor and heptachlor epoxide residues in soybeans, barley, corn and oats (2,3); dieldrin and endrin residues in wheat plants (12); DDT residues in cotton seeds and BHC residues in cotton seed oil (11).

Moreover, it is known that as a result of application with organochlorine pesticides, the amounts of residues absorbed from the soil and accumulated in the corn plant are higher than those in the kernels (4). With regard to the accumulation and distribution of residues in the plant, up to the present time it has been demonstrated that these are translocated, but it is still unclear whether they are or not evenly distributed in the plant and which are the factors possibly involved in this translocation.

In the present paper, data are given on the translocation and distribution of lindane and DDT in the corn plant and their accumulation in the kernels.

MATERIALS AND METHODS

The present studies were carried out between 1966 and 1968, using two products containing lindane and DDT, and formulated as emulsions according to the same formulation. Our studies were conducted with these two preparations since it is an established fact that lindane has the lowest molecular weight and equal sizes, whereas DDT has different molecular weights, one of these having a value exceeding the known sizes of all other organochlorine pesticides.

Two procedures were used for introducing the insecticide in the plant, that is by soil absorption and injection.

For a study of absorption from the soil, corn plants were grown in concrete insulators buried in the soil. About 25 to 30 days before harvesting, each insulator received 20 g of the emulsifiable product diluted in water and then every day an amount of 3 to 5 liters water.

As to the second procedure used, the field-grown corn plants received by

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injection each about 4.000-7.000 µg of the active substance formulated as emulsifiable concentrate. In order to follow the absorption and translocation in terms of plant age, several variants were included in which the products were injected 45, 35, 25, 15, and 5 days, respectively, prior to harvesting.

The trials were made with lindane 20% EC and DDT 20% EC. The dilutions used currently were 1% and the amount injected was 2 ml. The injections were made at the level of the IIIrd internode, between the leaf sheath and the stalk.

Each variant consisted of 5 plants of HD 311 corn. The plants were harvested between September, 15 to 20. The internodes of the harvested plants were cut and numbered, the first internode above ground being considered as no. 1. Each sample consisted of the internode bearing the same number in the respective 5 plants. The samples were then air-dried and ground.

Residue extraction with methyl chloride was carried out in a Soxhlet device. The Hancock and Laws method (16) was used for the determination of lindane, and the Schechter-Haller one (17) for DDT. The values obtained for each sample were divided by the number of plants of each variant, this representing the mean value of an internode from a single plant.

The climate conditions characteristic to the period from the first treatment and up to harvesting, were as follows during the years surveyed.

In 1966 — precipitation average 41 mm, in August mostly during the first ten days. The average temperature was 28°C; the average of the maximum soil and air temperatures was 49°C and 30°C respectively. Relative air-humidity — 60-70%. In September, up to harvesting, the precipitations averaged 34 mm, the other climate conditions being the same as in August.

In 1967 — the first part of August was dry, and during the second part the rainfalls averaged 60 mm. September was a dry month. The relative air-humidity ranged between 60 and 70%. As compared to 1966, the period during which the trials were run in 1967 was characterized by a warmer and drier weather.

Due to the climate conditions which prevailed in 1967 the vegetation was more advanced and the plants more ripened than in 1966.

In 1968 — the whole period when the trials were carried out was characterized by abundant rainfalls. The relative air-humidity generally ranged between 70 and 90%.

A close resemblance was observed between 1968 and 1966 as regards plant development at the beginning of the trials the only difference being the abundant rainfalls in 1968.