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RESIDUES AND CONSEQUENCES OF HERBICIDES FROM THE ANILIDE GROUP

Highly effective herbicides from the anilide group were recommended by A.V. Voevodin, 1970 and D.S. Vasiljev, 1972 for weed control on sunflower crops. However, the rate of residues and periods of their presence in soil have not been properly studied. The Soviet Union has been taking care of the environmental protection from pesticides, intensifying control for their application.

At present much research is done in this country to study the rate of herbicides inactivation in the soil and their influence on the following crop in crop rotation (A.F. Mozgovoi, G. S. Gruzdev, 1973; D.S. Vasilyev, L.A. Baranova, 1975).

The trephlane, nitrophor and lasso decomposition rate in the soil under sunflower (Peredovik variety) and their effect on winter wheat were studied on the VNIIMK experimental base in 1970-1975. The possible residual trephlane was determined in sunflower plants, seeds and winter wheat grains.

The plot's soil is precaucasian, leached, super deep and heavy loamy chernozem having high consumption volume (the sum of consumed bases equals 37.5-43.3 mg - equ./100 g of soil), and 3.8-4.2% of humus in the arable layer.

Weather conditions in the years of the experiment were varied. In 1970 and 1974 they were typical for the given zone, in 1972 and 1973 they were marked by heavy rainfall in July and August, and in 1971 and 1975 were droughty.

Herbicides residues in the soil were determined by biological methods of comparing the root length of oats in the experimental variants with the previously known herbicides quantity scale.

Trephlane content in the vegetative parts of

plants and in seeds was determined by gas chromatograph 'Tsvet-5' using the electron capture detector.

The experiments showed that herbicides decomposed in the soil during sunflower vegetation.

When trephlane (2 kg/ha of acting substance) was incorporated into the soil by cultivator its phitotoxicity was higher and decomposition in soil slower than was the case when it was applied before harrowing. Two, three and four months after application the first variant contained 1.12, 0.69 and 0.56 mg of trephlane and the second 0.88, 0.53 and 0.32 mg per one kg of absolutely dry soil. In five months its residues were 15 and 5%, respectively, of the dosage applied. By the time of sowing the following crop (winter wheat), when trephlane was applied before cultivation residues in the quantity of 0.12 mg/ha of absolutely dry soil were found, and when it was applied before harrowing it was completely inactivated. It should also be noted that trephlane decomposed more slowly in the soil in droughty years.

Trephlane was mainly in the upper, 0-10 cm layer of the soil. Weather little affected its movement.

Nitrophor decomposed quicker than trephlane. When applied at the dosage of 3 kg/ha of acting substance in all years of experiments it was completely inactivated 4-5 months later. The bulk of herbicide was in the upper soil layer. In the 10-20 cm layer its residues amounted to 13.3-15.3 % of the total (0.90-1.24 mg/kg).

Nitrophor toxicity for sensitive crops was approximately 1.5 times lower than that of trephlane. The herbicide index was 0.25 mg/kg for trephlane and 0.41 mg/kg for nitrophor.

Lasso as well as nitrophor, quickly lost toxicity in the soil and was not found 4-5 months later. A characteristic feature of lasso was its mobility, a considerable part of it (11-48%) be-

ing in the 10-20 cm layer. When ploughed into the soil by cultivator (4 kg/ha) it was found in the quantity of 0.89 and 0.97 mg/kg in the 0-10 layer, and 0.84 and 0.25 mg/kg in the 10-20 cm layer kg two or three months after application during two years an average. When lasso was ploughed into the soil by harrow the respective figures were 1.35, 0.37 and 0.63; 0.31 mg/kg of absolutely dry soil.

Herbicide residues were found only in the sunflower root on the plots with trephlane application. Thus two months after trephlane application in the quantity of 1.5 kg/ha on average for 3 years (1973-1975) herbicide residues were 38 mkg/kg of raw root mass, at the analysis sensitiveness being 5-10 mkg. Trephlane absorption by sunflower roots during the first period of its vegetation was 12-15%.

Trephlane was not found in the sunflower stem, leaves, head and seeds sampled before harvesting.

The after-effect of herbicides was studied on winter wheat crops (Avrora and Caucasus varieties) sown six months after herbicides were applied on sunflower.

The experimental data showed that trephlane and lasso did not make toxic effect on winter wheat when they were ploughed into the soil in different ways. Trephlane considerably reduced the contamination of the following crop. In the variant with its application along with cultivation there was 67.3% less weeds on winter wheat crops and when it was applied along with harrowing there was 61.9% less weeds than in the check.

As its after-effect lasso decreased the contamination of crops by 11.6-48.2%.

The structural analysis of sample winter wheat sheafs taken before harvesting has shown that in all cases plant height, spike length, productive stem quantity and vegetative mass and grain weight were on the level of the check.

There was a trend towards increased yields of winter wheat on plots cleared from weeds. For three years on average (1973-1975) there was a 1-1.5 c/ha winter wheat yield addition when trephlane and lasso were applied (in the check, grain yield was 38.8 c/ha).

Neither did nitrophor influence negatively winter wheat. The grain yield in the variant with nitrophor after-effect was 39.7 c/ha as against 39.4 c/ha in the check.

Winter wheat sowing qualities did not worsen. The mass of 1000 grains and germination rate were the same as in the check variants.

The herbicide residues were found in winter wheat grain sown after sunflower with trephlane application.

Hence trephlane, nitrophor and lasso applied to sunflower decompose in the soil during 4-7 months. The herbicides do not exert negative after-effect on winter wheat, the following crop in crop rotation.