

SUMMARY

At present, pesticides, including herbicides, are a common, yet most effective way to protect orchards and vegetable plantations against pests, diseases and weeds. On the one hand, they provide effective protection of plants, but on the other, residues present in or on the edible parts of the plants pose a risk to the consumer's health. Analysis of carrots conducted in 2006 has shown that the biggest problem of the manufacturer of ground vegetables is plantation weeding. The aim of the thesis is to determine the course of exponential decay of linuron, fluorchloridon, metribuzin, oxyfluorfen and pendimethalin, active substances currently recommended for the weeding of field vegetable plantations.

Field studies were carried out on commodity plantations of ground vegetables in the south-eastern region of Poland, providing, among others, carrots, to a manufacturing plant producing food for infants and young children. All pesticides were used according to the manufacturer's instructions provided on the label. Soil samples were collected randomly with the use of Egner's soil sticks. Each laboratory soil sample is made up of four individual samples collected from the vicinity of crops (carrots, potatoes, onions, dill), which were also collected for analysis. Herbicide residue was extracted into a solvent system of acetone-dichloromethane, purified on a florisil column, and analyzed using a gas chromatograph equipped with a nitrogen-phosphorus detector (NPD), (column HP-5 MS, temperature program: initial temperature 100 ° C - 1 min → 10 ° C/min. → 260 ° C - 4 min; total analysis time - 21 minutes) and the gas chromatograph equipped with an electron capture detector (ECD), (column DB-1701, temperature program: initial temperature 120 ° C - 2 minutes → 3C/min. → 180 ° C - 2 min. → 4 ° C/min. → 260 ° C - 6 min. → 25 ° C/min. → 290 ° C - 6 min.; overall analysis time 57 min.), in the linearity of display.

The changes of residual active ingredients of the tested herbicides are described by the exponential equation $P_t = P_0 \times e^{-kt}$, in which P_0 is the average residue of the substance at the time $t=0$. On the basis of the obtained results there have been indicated the trends in residues and periods, followed by a decrease by half – live time ($t_{1/2}$), and to a level that is 10% of the initial value ($t_{1/10}$). Collection of individual substances together with food was evaluated by comparing the values of the ADI and ARfD.

The disappearance of tested substances proceeded at different pace. The medians of half-live time loss of linuron, fluorchloridon, metribuzin, oxyfluorfen and pendimathalin were respectively 27, 26, 13, 34, 50 days and 10% of its value reached respectively after 89,

99, 43, 112, 177 days. In light of the above, the long lasting substance in an arable soil environment seems to be pendimethalin.

On the basis of the average residues of linuron and fluorochloridon found in soil samples collected immediately after the treatment ($t=1$), a linear relationship of the dose of the active substance (D) and its residue P_0 was established. This relationship was dictated to the surface layer of soil with a thickness of 10 cm, took the form of a linear equation $P_0=0.260 \times D$ [mg/kg] and was used to calculate the initial residues in these experiments, in which sampling began indirectly after intervention.

The remains of active substances of the tested herbicides in the basic ground vegetables indicate that farmers use them in accordance with the principles of Good Agricultural Practice and as a result, with few exceptions, contained below the maximum residue levels (MRLs), while in most cases they exceed the permissible limit of 0.01 mg/kg, established for foods for infants and young children. In addition, collection of linuron, calculated for intake of 0.19 kg of carrots, does not exceed 8.7% of the ADI for children and 1.8% of the ADI for adults and for fluorochloridon was respectively 1.6% and 0.17% of the ADI, whereas single collection of linuron and fluorochloridon with the assumed consumption of carrots at a ratio of 1 kg calculated for the highest observed linuron residues did not exceed 16.5% of the ARfD for children and 8.9% of the ARfD for adults, and for fluorochloridon was 3.3% and 16% of the ARfD. In the light of current knowledge, identified residues should not cause health problems in children and adult consumers.

Key words: field vegetables, residue, disappearance, linuron, fluorochloridon, metribuzin, oxyfluorofen, pendimethalin, MRLs, ADI, ARfD