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Detecting resistant to action of herbicides — inhibitors of acetolactatsynthase of weeds

Purpose. Detection of potentially resistant herbicides - acetolacetate synthase inhibitors (ALS) of weed biotypes on the crops of leading agrarian companies of Ukraine and determination of methods for counteracting the emergence of resistant biotypes of weeds. Methods. Selection of seeds of control and potentially resistant species of weeds in field conditions. Detection of resistance in laboratory research. Statistical analysis. Results Resistance to the action of herbicides - ALS inhibitors of weeds (canal of Theophrastus and white loboda) has been found, which determines the need for information preparation for farmers, the immediate change of "reduced" crop rotation, and also the application of herbicides with another mechanism of action. For grain cereal problems, the presence of resistant crop weeds should be periodically treated with phenoxyacetic, benzoic or piconic acid derivatives (esteron, banvel, clopyralide, etc.) or mitotic cycle inhibitors and photosynthesis (for example, to introduce a marathon herbicide in the autumn). Conclusions For the first time in Ukraine, resistance to the action of herbicides - ALS inhibitors is identified by biotypes of theophylline rope weeds in white loboda. This determines the need for extensive studies of the presence of herbicide-resistant and other types of weeds resistant to the action, in appropriate informational support for farmers and the immediate implementation of measures to prevent the emergence and spread of weeds resistant to herbicides.

Key words: weeds, resistance, herbicides, acetolacetate synthase.

Aging of crops is one of the main obstacles in achieving high yields and profitable crop production. In Ukraine, the precipitancy of crops is very high. Reduced productivity of agricultural crops in the presence of weeds can reach from 20-50% of the potential yield (crop of a continuous sowing method) to 40-80% and even a complete loss of crop (broad-range crops) [1-3]. Without clearing crops from weeds, it is impossible to realize the productive potential of hybrids and varieties of cultivated plants, to achieve the efficiency of using organic and mineral fertilizers, and to make the most of the use of natural resources and opportunities of modern agricultural machines, as well as to obtain appropriate results from investments in the agricultural sector of the country. Modern requirements for the level of yield and cultivation technology require the use of high-intensity varieties with appropriate needs to the levels of fertilizer application. In view of the sharp increase in the cost of mineral fertilizers, the relevance of their intended use by cultivated plants increases [2].

The overwhelming majority of herbicides in Ukraine for cultivated plants (cereals, corn, sunflower, leguminous, etc.) under the mechanism of action belongs to acetolacetate synthase inhibitors (ALS). ALS (CF 4.1.3.18) is a key enzyme in the synthesis of branched chain carbon amino acids - isoleucine, leucine and valine. The class of ALS inhibitor herbicides include numerous - derivatives imidazolinones, pirymidyniltiobenzoativ, fonilaminokarboniltryazolinoniv sulfate, urea and tryazolopirymidyniv sulfonil-, but the exact mechanism of manifestation phytotoxic action has not been elucidated. Wide application of herbicides with one mechanism of action creates a threat to the emergence of resistant to herbicide types of weeds. For the occurrence and spread of resistant biotypes, weed control costs can increase substantially (by 60-100% or more). Currently, 461 unique cases of occurrence of resistant biotypes of weeds are known in the world, including 247 species of plants (144 2-lane and 103 1-lobes). Weeds have formed resistance to 22 of the 25 known herbicide sites and up to 157 different herbicides. Resistant to action of herbicides, weed-type biotypes are registered in crops of 86 cultures in 66 countries [4, 6, 8, 11]. Among the herbicide-resistant herbs, the most common biotypes resistant to ALS inhibitors [4, 9, 10]. In Ukraine, information on the determination of the presence of resistant biotypes of weeds on crops in crops is limited by this time. A particular danger on the emergence of resistant biotypes of weeds in recent years crops undergo companies with large land banks

(over 50 thousand. Ha) and reduced crop rotation, consisting of sunflower, wheat, canola, corn and soybeans. The purpose of research - detecting the presence of potentially resistant to the action of herbicides - ALS-inhibitors weed species in crops leading agricultural companies in Ukraine and determining ways to counter the emergence of resistant biotypes of weeds. Research methods. The research was carried out in laboratory conditions. Control - seed of the theophyrate rope (Abutilon theophrasti Medik), provided by specialists of the National Botanical Garden named after MM Grisha of the National Academy of Sciences of Ukraine, as well as white bean seeds (Chenopodium album L.), collected in the forest park area of the Red Hut region near Kiev. To perform the tasks by the company "BASF Ltd." seed harvested weed species that can be potentially resistant to herbicides, the leading agricultural companies in all soil-climatic zones of Ukraine. Also, the staff of the Institute of Plant Physiology and Genetics of the National Academy of Sciences of Ukraine conducted a selection of seed samples of potentially resistant types of weeds in the farms of the Kiev, Cherkasy and Vinnytsia regions. The seed of the teofrast rope from industrial crops was provided by the employees of the PrAT "Urozhaj" Cherkasy region. Weed seeds were kept at +4-5 ° C and at -18 ° C for a week each time, and kept at room temperature. Aliquots of herbicide solution in the experiments: + florasulam flumetsulam (Derby 175 SC, HP, Syngenta) imazamoks + imazapir (Euro lightning, BASF) was added to the cooled solution to 40oS agar boiling. Weed seeds were spread out and germinated for 3 weeks on a frozen surface of 0.9% agar at a temperature of +15 - 17 ° C under aseptic conditions. The results of experiments are statistically processed in Exel. Results of research and discussion. Resistance of loboda white to herbicides - inhibitors of photosystem II was detected in 1973 in Canada, and to the action of ALS-inhibitors - in 2001 in the USA and Canada [4, 5]. In our experiments, the herbicide derby 175 SC, hp (Florasulam, 0.7 μM + flumetalsulam, 1.03 μM) inhibited the development of a control white biotype of white lobster by 35-55% as a result of a decrease in the mass accumulation of the crude substance of the germ. Instead, the development of seedlings of the biotype of white beetle, whose seeds were harvested at Vitaliy SFG, p. Chernecha Sloboda of the Buryn district of the Sumy region, was not inhibited by the action of the composition of the florasulam, 0.7 μM + flumetalsum, 1.03 μM. The detection of resistant biotypes of the teofrast rope in the USA (1984-2004) and in Serbia (2003) to the action of herbicides - photosystem II inhibitors is known. In our experiments, derby 175 SC, hp Inhibited the development of seedlings of the control biotype of the teofrast rope and had no effect on the plants of the biotype collected in the PrAT Scientific-Production Enterprise "Urozhaj" of the Cherkasy region. Development of seedling plants kanatnyka Theophrastus, seeds are collected in JSC NWF "harvest" of Cherkasy region. Inhibuvavsya not for herbicide lightning euro (imazapir, 0.19 mM + imazamoks, 0.36 mM). The development of seedlings of the control biotype of the theophyrate rope was inhibited by the action of euro-luting by 85-100% for the effect on the accumulation of mass of raw matter of the germ.

Invention of resistant herbicides - ALS inhibitors of weed species in Ukraine requires the proper education of farmers, immediate changes to existing "reduced" crop rotation, and the use of herbicides with another from the inhibition of ALS by the mechanism of action. For grain cereal problems (relative to the presence of resistant weed species), areas must be periodically treated with phenoxyacetic, benzoic or piconic acid derivatives (eg esteron, banvel, clopyralide, etc.) or mitotic cycle inhibitors and photosynthesis (for example, to introduce a herbicide marathon in the fall) .

Conclusions

The findings for the first time in Ukraine identified herbicide-resistant acetylacetate synthase inhibitors as the biotypes of the Weophyte and The White Lobot weeds. This requires extensive research into the presence of resistant herbicide and other types of weeds in crop rotation, the education of farmers and the immediate implementation of measures to counteract the spread of resistant weeds in crops.

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