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Environmentally Friendly Methods Of Plant Protection In Field Crops In Organic Agriculture.

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ABSTRACT

The article presents the rationale for the use of environmentally friendly methods of combating harmful organisms that adversely affect the development of cultivated plants. The main attention is paid to the biological method and agrotechnical measures, field crop rotation, restraining the development and spread of weeds, diseases and pests of field crops. Organic and microbiological fertilizers are offered instead of chemical based on associative bacteria of natural origin. To combat diseases and pests, biofungicides and bioinsecticides, artificially bred entomophages, as well as useful insects that inhabit micro-reserves of the surrounding crop rotation fields are provided. The proposed system of plant protection will allow to grow ecologically pure crop production.

Keywords: field crops, diseases and pests, weed vegetation, biological products, entomophages, organic products.

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INTRODUCTION

In recent years, in Russia, and throughout the world, ecologically pure crop production, obtained without the use of chemical means, is in high demand. This direction is often referred to as organic farming, meaning the abandonment of chemical pesticides and fertilizers and their replacement by means and methods that are safe for humans and the environment.

Therefore, it is necessary to search for and implement alternative farming systems that meet world standards [1], which allow to preserve and use natural complexes as much as possible and at the same time to receive environmentally friendly products in sufficient quantities and with high quality.

The purpose of our research was to justify the use of methods of protecting plants from weeds, diseases and pests that are safe for the environment, and their further application in organic farming in the cultivation of field crops. The recommendations are based on materials obtained in the field experiments of the plant protection laboratory and other departments of the North Caucasian FNAC (SNIISKH), as well as data of a number of other researchers on the safe use of pesticides and other means and methods.

RESULTS AND DISCUSSION

In our view, for the production of ecologically pure crop production in the cultivation of field crops without the use of chemical fertilizers and pesticides in biological agriculture, special crop rotations are necessary, the basis of which should be: cereals, legumes, fodder, cereals, oilseeds and honey plants [2]. They must meet the following requirements: not to be affected or slightly affected by diseases and pests, to attract useful entomofauna during flowering, to be highly productive, to stabilize the phytosanitary situation. To control harmful objects in these crops, agrotechnical techniques should be used as much as possible.

The farm, oriented to biological farming, can also grow domestic animals using the fodder produced on its territory. The most balanced feed can be hay, obtained from the excretory field of the restored natural agrosteppe introduced into a crop rotation, which has a wide variety of wild herbaceous plants [3]. In such areas, cattle can be grazed, hay should be harvested. In addition, agrosteppe is a factor in the anti-erosion stability of the agrolandscape, ensures the comfort of the ecotope, and is also a source of seed mixtures for planting and restoring steppe vegetation in new areas. It is equally important that in the areas of agro-steppe a useful entomofauna will accumulate, passing additional nutrition, including entomophages capable of controlling the propagation of harmful insects. Plants of agrosteppe are a source of nectar and pollen for wild bees and honey bees.

Накоплению полезных насекомых, сдерживающих вредителей в полевом севообороте, может способствовать использование «ловчих» культур и приманочных посевов энтомофильных и нектароносных растений (фацелия, кориандр) [4].

In addition to the natural populations of beneficial insects, in many regions, including the Stavropol region, biological laboratories that produce trichogram (Trichogramma evanescens West.) And Gabrobracon (Habrobracon hebetor Say.), The Bicillus thuringiensis bioinecticicide for the control of lepidopteran pests, var. thuringiensis). To combat diseases, biofungicides are produced: Alirin-B (Bacillus subtilis VIZR-10), G, Gliokladin (Trichoderma harzianum VIZR-18), F, Pseudobacterin-2 (Pseudomonas aureofaciens BS 1393), J. [5]. Work is being carried out on the use of the metabolites of actinomycetes - spinosyns as an insecticide [6].

To increase the fertility of soil in the technology of organic farming, the mandatory use should be the use of sideral fumes. Good results were obtained in the cultivation of winter wheat in a busy pair, where radish was used as a syderata [7], a promising method for grinding ciderates in organic farming technology was developed [8].

In the ecotourised crop rotation in the Ciscaucasia, the following crops can be cultivated:

1. Winter wheat and winter barley.
2. Sunflower.
3. Corn for silage and grain.
4. Soybeans.

5. The sainfoin.
6. Radish oil-bearing (siderat).
7. Phacelia.

To this list, you can add rape to winter, rye, buckwheat, alfalfa.

Apparently from this set of crops and should be a crop rotation for organic farming, where it will be produced environmentally friendly grain, oilseeds, animal feed, and honey in the presence of an apiary. It is highly profitable to grow alfalfa on seeds, which will be polluted by wild bees.

Winter wheat is grown with the use of resistant varieties and biopreparations. For less damage to pests and disease, as well as to reduce the infestation is sown in the optimally late period. Thus, when studying the development of diseases, pests and weeds in winter wheat sowings of different sowing times, we found that early and early sowing periods suffer the most from pests [9]. On the margins of later periods of sowing, there are practically no such intra-stem pests as black wheat and Swedish flies, lower numbers of corn ground beetle, and vectors of viruses - cereal aphids and leafhoppers. Thus, a wheat fly (Phorbia fumigata Meigen) during sowing on September 15 can kill 170 sprouts of wheat per 1 m2, while in sowing on October 5, only 7 plants per 1 m^2. The timing of sowing and the development of pathogens influence. In sowings of later periods, the damage of winter wheat germinations by root rot is 8 times, septoria is 6 times, brown rust 4.5 times, viruses 10 times.

At later terms of sowing of winter wheat, the harmfulness of weed vegetation decreases. The main weeds on winter wheat are annual, wintering, dicotyledonous weeds. Their number in the fields of early sowing can reach up to 240 pcs / m^2, decreasing to 30 pcs / m^2, that is, 8 times when sowing at a later date.

Winter barley is also grown resistant to disease varieties for pesticide-free technology for livestock or croup.

Sunflower is grown on oilseeds for non-herbicide technology, the basis for combating weed vegetation is later planting, harrowing, cultivation, hilling. Biological preparations are used to destroy pests.

Corn, depending on the need, can be sown in one field part of the silage, part of the grain. Silage can be sown in a mixture with soy. It is grown on the non-herbicide technology with the use of biologics.

Soy is grown for grain, to meet the needs of livestock or oil. To increase nitrogen fixation, it must be treated with nitragin (Bradyrhizobium japonicum K.) or rhizotrophin (Rhizobium sp.) Before sowing. It is grown on the non-herbicide technology [10] using biologics in the fight against pests and diseases. To reduce the contamination of this technology, it involves late sowing, several pre-plant cultivation and harrowing of shoots, while the number of weeds is reduced by almost 30 times compared to the May sowing. Biological insecticides are used to control polyphagous soy pests: bitoksibacillin (Bacillus thuringiensis var. Thuringiensis), lepididicide (Bacillus thuringiensis var. Kurstaki). To reduce the severity of the main soybean pest soybean, the Bicolus thuringiensis var. Thuringiensis (Bacillus thuringiensis var. Thuringiensis) showed good results [11]. Pseudobacterin (Pseudomonas aureofaciens BS 1393) and Bactofit (Bacillus subtilis ИПМ 215) are used against diseases.

Espartzet is cultivated depending on the need of the farm, also partly on hay, partly on seeds. However, hay is harvested only after a massive flowering for 5-6 days, to attract bees and entomophages. When harvesting seeds, plant remains are embedded in the soil.

Radish oilseed (siderat) is an excellent predecessor for winter cereals, used as a siderat, is embedded in the soil after 6-10 days of flowering, thereby providing honey collecting and attracting entomophages. In addition, the plant mass embedded in the soil plays the role of a biological herbicide and fungicide.

Phacelia fodder and honey culture, which contributes to the accumulation of entomophages and other useful insects. Can be sown by a separate crop in a crop rotation or along the perimeter of fields.

Such a rich set of honey-plants, such as rape, sainfoin, radish, olive, sunflower, phacelia, coriander can not only provide a stable conveyor of honey, but it will also save and accumulate useful entomofauna in the agrocenosis, including wild pollinators and entomophages.

For successful functioning of the system of biological agriculture it is necessary to use the following elements of technology, the cultivation of ecologically pure products:

1. Application of microbiological fertilizers on the basis of associative phosphorus and nitrogen-fixing microorganisms Bacillus mycoides and Azotobacter vinelandii, bacteria Bacillus megaterium, Azospirillum zeae.
2. Use of organic fertilizers: manure, biohumus, siderates.
3. Application of biological insecticides, fungicides and rodenticides based on living bacteria and fungi.
4. The use of entomophages to control pests of agricultural crops.
5. The use of growth regulators that have immunizing properties on the basis of plant extracts and humic acids.
6. Use of resistant to diseases and pests varieties of crops.
7. To reduce the damage to winter wheat diseases, damage to pests and plugging, the timing of sowing should be postponed to later ones using frost-resistant varieties that can be planted in the spring.

CONCLUSION

With the rational use of the proposed set of measures, their effectiveness in combating diseases, pests and weeds can be no lower than chemical pesticides, and the cost of processing 1 hectare is much less.

In biological agriculture, there must be a high level of agrotechnics: high-quality and timely tillage, high-quality seeds, recommended seeding time, timely maintenance measures, etc.

From the point of view of ecological orientation, the field crop rotation represents the model of stabilization of the steppe landscape ecosystem, which includes elements of farming.

In the center of the whole system there should be a site of recreated agrostepi, the so-called micro-reserve for entomofauna. Grazing is carried out here in periods when it is impossible to get food from the fields.

On the perimeter of the fields and the whole crop rotation, it is necessary to provide artificially created grass belts up to 10 m wide, connected with a micro-reserve. Their main goal, conservation and accumulation of entomophages, controlling the reproduction of harmful insects in crop rotation fields and erosion control. Along the perimeter, the entire economy is planted with blown forest belts with the species composition of trees and shrubs, also selected according to the principle of low damage and damage by pests and diseases, and attracting useful entomofauna, for example, acacia white, yellow, etc.

Field sizes should not exceed 50 hectares. This is justified by the fact that parasitic insects, capable of destroying pests, fly no more than 200-300 meters from a permanent habitat. Insects-pollinators are most effective also within such sizes of fields.

Compliance with these rules will preserve soil fertility, stabilize the phytosanitary situation in the agrocenosis, aimed at obtaining environmentally friendly products.

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