ЗЕМЛЕРОБСТВО, РОСЛИННИЦТВО, ОВОЧІВНИЦТВО ТА БАШТАННИЦТВО

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THE BIOLOGICAL METHODS OF DISEASE COMBATING AND PESTS ON MILLET CROPS

Averchev O.V. *– Doctor of Agricultural Sciences, Professor,*
Professor at the Department of Agriculture,
Kherson State Agrarian and Economic University
orcid.org/0000-0002-8333-2419
Nikitenko M.P. *– Postgraduate Student at the Department of Agriculture,*
Kherson State Agrarian and Economic University
Yosypenko I.V. *– Postgraduate Student at the Department of Agriculture,*
Kherson State Agrarian and Economic University

The article reveals the main reason for the reduction in crop yields of millet on the territory of Ukraine. It deals with organic and biological methods of control and various ways to protect against pathogens, contamination of millet crops and pests. The study substantiates growing millet in the context of climate change in South Ukraine. We emphasize the characteristic biological features of this agricultural crop and the prospects for its adaptation to changed natural conditions of its development. The advantages of cultivation of cereals using biological methods are presented, which is an alternative to chemicals used in intensive agriculture. The main purpose of using biological preparations is to create regenerative soils. It reduces chemical load and cost of additional nutrient application. This way of growing crops is more economical and environmentally friendly.

In order to increase the yield of millet crops and improve product quality, an improved system of biological products application is introduced, which contributes to plant growth and development. Beneficial microorganisms in the soil and plants are formed under the influence of biological preparations. That is why the biological activity of the soil and its fertility increases. In plants, the defense system against diseases is improved.

The most common types of pathogens of diseases and pests of millet found in the steppe areas of Ukraine are listed. The application of proper environmental protection agronomic measures is substantiated. The article presents modern domestic preparations, namely Bio-gel and Helafit. Using them on crops as organic catalysts favors millet sustainability, preventing adverse growth factors in plant development. Using the above-mentioned products has a positive effect on the cultivation of millet, strengthening the immune status of crops against the negative impact of the changed natural and climatic conditions.

Key words: *millet, South Ukraine, biological agriculture, millet disease, cultivation, biological pesticides, bio-gel, helafit.*

Аверчев О.В., Никитенко М.П., Йосипенко І.В. Біологічні методи боротьби із хворобами та шкідниками на посівах проса

У статті визначено головну причину зниження урожайності проса на території України. Висвітлено органічні та біологічні методи боротьби та різні способи захисту від збудників хвороб, шкідників та забур'яненості посівів проса. Обґрунтовано доцільність вирощування проса в умовах змін клімату на півдні України. Звернено увагу на характерні біологічні особливості цієї сільськогосподарської культури та перспективи її адаптації до новостворених природних умов розвитку. Наведено переваги вирощування круп'яних культур біологічними методами, за альтернативного використання щодо хімічних засобів, які використовуються при інтенсивному землеробстві. Провідна мета використання біологічних препаратів – створення самовідновлювальних ґрунтів, у процесі використання яких відбувається зменшення хімічного навантаження та витрат на додаткове внесення поживних речовин. Такий спосіб вирощування культур є більш економічним та екологічним.

З метою збільшення урожайності посівів проса та підвищення якості продукції впроваджують удосконалену систему застосування біопрепаратів, яка сприяє покращенню росту та розвитку рослин. Використання біопрепаратів стимулює утворення корисних мікроорганізмів у ґрунті та рослинах, внаслідок чого підвищується біологічна активність ґрунту і його родючість, для рослин відбувається покращення захисної системи від хвороб.

Наведено найпоширеніші види збудників хвороб і шкідників проса, які зустрічаються в умовах Степової зони України, а також застосування відповідних еколого-захисних агротехнічних заходів щодо їх прояву. Наведені сучасні вітчизняні біопрепарати, а саме Біо-гель та Хелафіт. Використання їх на посівах як органічних стимуляторів стійкості проса запобігає несприятливим факторам росту і розвитку рослин. Використання наведених біопрепаратів позитивно впливає на вирощування проса, зміцнюючи імунний статус культур проти негативної дії новостворених природно-кліматичних умов.

Ключові слова: *просо, південь України, біологічне землеробство, хвороби проса, агротехнічні заходи, біологічні пестициди, Біо-гель, Хелафіт.*

Problem statement. Millet like other grains plants are prone to contaminated by harmful insects and illnesses. The most common methods used in Ukraine mainly chemical origin, adversely affects the environment. As an alternative to intensive production, biological farming is recommended. Based on another option for pest and disease control, based on combine agronomic and immunological methods to protect the plant. The process of apologizing agriculture is linked to introduction of a scientifically based structure of sown areas use of all organic fertilizers production costs, subsistence share of crops, as well as sideways, the ideal carbon-nitrogen ratio in fertilizer systems for to prevent unproductive losses of organic matter, and reducing CO2 emissions to the atmosphere.

Such means aren`t harmful to the environment and are used in the fields, where the use of chemical control methods is undesirable.

In addition, the use of modern bio medications contributes to conservation of soil fertility, reduction of chemical pressure on agricultural landscapes, create a favourable phytosanitary environment; high-quality, environmentally friendly products they are much less expensive than plant protection chemicals, and therefore economically more efficient. Therefore, the study of the effects of modern bio drugs in the plant protection system for introduce biological farming is very relevant and worthy of attention [1].

Targets. In recent years, more and more farmers in the south of Ukraine have paid attention to cultivate of millet, as a promising and profitable culture. They take into account weather and climate factors, promoting cultivate drought-tolerant crops.

Global climate change hasn`t only led to higher temperatures, but also drastically changed the measure and rainfall, longer intervals without frost in winter and other negative phenomena, give to the spread of diseases and pests, in turn, high crop yields are harmful. The use of chemical abatement techniques further enhances the negative effects of climate change are being further compounded.

It is therefore advisable to use biological methods to combat diseases that are safe for the ecological condition of the land. The use of modern biopharmaceuticals in the context of climate change helps to cut stress on plants during droughts by adapting to extreme weather, significantly reducing chemical pressure on the environment, contribute to a better absorption of plant nutrients, more intensive photosynthesis processes, higher yields and improved quality of the produce grown.

Analysis of recent research. Among these creative biomedications are Helafite and Bio-gel. The developer of modern domestic biopreparation Helafite and the founder of LLC «HELAFITE GROUPS» – Doctor of Agricultural Sciences Garmashav V.V. Inventor of the product Bio-gel, founder of the Association of Organic Agriculture – Candidate of Engineering Sciences, Professor, Osipenko S.B.. The use of such biopharmaceuticals makes it possible not only to increase crop yields and improve the quality of the produce grown, but also to improve soil fertility and the ecological situation. As these drugs activate soil microflora in the seed-bearing zone, they stimulate the germination, root formation and further growth and development of plants [2; 3].

Presentation of the main material of research. Millet is most common among the main cereal cultures of Ukraine. It is valuable for its processing product, which is of high nutritional quality. [4] If the cultivation process is followed, millet yields higher yields than other crops. In the south of Ukraine millet can be sown late. This is what makes it possible for plants to help productively from summer precipitation.

Millet is best able to withstand ground and air droughts. It has high heat resistance. Millet plants save on moisture. Only 25–30% of water is enough for seed to grow [4]. Millet will give produce well on different soil types, but best well-drained loamy and sandy soils. Prostrate to predecessors, from grasslands to meals grows slowly and is suppressed by weeds when present.

For millet crops, fertile weed-free fields should be taken away, as this is the period when the root system activity is low. The best predecessors' millet is grain pulses, fertilized potatoes, sugar beet, perennial herbs and gourds crops. Undesirable predecessors under millet there are – sorghum, sunflower, yarn barley and cultivation of millet in the second year [5]. Among cereals millet has a comparatively low incidence of pest infestation.

One of the main reasons for the decrease in millet yields is the loss of plant pathogens as they threaten crops throughout their growth and development. Crop failure, which can cause diseases and pests, ranges from 15 per cent to 50 per cent. Looking at the fields under cultivation, the plan includes measures to combat the diseases of this crop. Let the common types of illnesses millet that occur when it is cultivated on the territory of Ukraine – common head millet, brown spot, or helminthosporosis, root rots and others.

Ordinary landing of a request (Sphacelothecadestruens (Schlecht. S. panici-miliacei (Pers.) Budak; Sorosporium panici-miliacei (Pers.)) Manifests itself during the period of a meteor shower ejection. The disease is very harmful to plants – if the crop is highly contaminated, the crop deficit can be as low as 20–30% and more.

The causative agent of the disease is brown patch, or helminthosporosis (Drechsler panici-miliacei) winters in plant residues, namely in infected writing, on the soil surface or at a depth of up to 10 cm. The pathogen may also stay on the surface of the seeds. The disease develops intensively on the leaves of adult plants in the form of burly spots and when the disease develops the leaves grow and die.

Root rots (Helminthosporium panici-miliacei Nisikado) appear during autumn vegetation and spread during spring cooking and progress in dairy-waxy ripening

and deformation of germs, formation of brown strips and spots on leaves, russeting of the root system and stitch part of the stem.

In order to combat diseases in biological farming, it is necessary to know the life cycles of micro-organisms perfectly. After harvest with any technology the field is left with an extremely large amount of organic cropping residues, which eventually degrade in the soil with the help of micro-organisms. The problem is that organics are laid by both beneficial and harmful microorganisms. Crop residues can be a source of pathogenic infection for later crops in crop rotation, and under ideal conditions will turn into root rots.

One effective way to cut infection in the soil is to artificially introduce beneficial micro-organisms that replace pathogens in competition for nutrients. Such preparations on the market of Ukraine are called stern destructors. Fungi of genus Trichoderma are considered one of the best cellulose destroyers. This fungus suppresses develop phytopatogenes through direct parasitization, competition for substrates, and the release of biologically active substances that inhibit the development of many types of pathogens and inhibit their reproductive capacity. Soil saturation with useful micro-organisms is carried out by various methods, such as treatment of plant residues in the field and subsequent earning in the soil, sowing of seeds treated with biological agents and other [5].

As established by our research on apply biomedications in the KSAEU Test Fields and testing of other scientific institutions based on such drugs as Bio-gel and Helafite have a strong preventive fungicidal effect. This is due first to the ability of the «wild» bacteria to capture the ecological niche and to inhibit the development of pathogenic micro-organisms especially fungal ones. Second, when treating the leafy surface of plants the preparation acts as a natural immunostimulator and organic fertilizer increasing resistance of plants to phytopatogenes [2; 3].

Biopharmaceuticals are particularly effective as a preventive agent for plant protection. They are best used before a disease occurs. If the disease develops slightly (up to 25 per cent) the use of biomedications at a dose of 1–2 l / ha can almost completely stop the disease. It is recommended to combine with fungicides of chemical origin at higher levels of contamination. The recommended dose of fungicide should be reduced by 30–50% [2; 3].

Biomedications different in their intended use. Some types of bacteria increase yields, others are responsible for atmospheric nitrogen content and still others give protection against fungus.

The preparation Bio-gel can be used for preserving all kinds of plants and crops under extreme conditions which manifest themselves in the form of droughts or frosts. It consists of carbohydrates in accessible form, vitamins and amino acids, useful micro and micro-elements and other biologically active substances that positively affect all types of micro-organisms in the soil [3].

In the control of pathogens, it can be used as a fungicide in organic farming. Bio-gel strengthens the action of fungicides preparations, thanks to positive influence of amino acids and enzymes positively influence resist plants. Another quality of the drug can be used as a humate, which is the environment. It has fulfil compounds of enzymes and amino acids that enhance the effect of humic compounds. For all these indicators the biopreparation has a positive influence on the growth of cereal plants, including the development of millet [3].

The use of Helafite is possible for weed control in agro-phytopenesis on millet crops. Through integrated action, it increases yields and improves product quality. It is also used to optimize root food and plant development during critical growing periods.

It helps to restore damaged crops to the cellular level as a result of adverse environmental conditions. Prevents plant growth and development delays that can be caused by chemical stress from pesticide use or other adverse factors and mechanical damage. The use of biomedications is safe for humans, animals, bees and the environment [2].

In addition to being infected by pathogens, millet crops suffer from pests. The most widely known and popular of these is a Anisoplia austriaca beetle (cereal chafer), a stenodiplosis panici and a barley flea beetle.

The cereal chafer (Anisopliaaustriaca H.) [7], or as it is called 'Kuzka' is the most common in southeastern Western Europe. It causes significant damage to cereal crops, including millet, in the steppe and forest-steppe zones of Ukraine. Cereal crop yield loss from cereal chafer damage is 20-40 per cent, with a shortage of 7–10 per cent per year.

The cereal chafer appears on grain crops during the grain supply period, with winter crops from the end of May, with summer crops until the beginning of the sickle. The beetle eats grains of cereals during the period of dairy ripening, while the solid grains kick out on the ground. The larvae this beetle damage the roots of the plants.

The general distribution area of the stenodiplosis panici (Stenodiplosispanici Rohd.), coincides with the growing region of the crop millet. Significant insect damage is observed in the steppe zone of Ukraine. In sowing, the seeded mosquito appears early in the summer, when the average air temperature reaches 20° C when precipitation is present. The appearance of the insect is very similar to that of the Hessian fly.

The larvae can winter in post-harvest residues and in grain, which has crumbled and are also found in the seeds of the burials. The larvae migrate inside the flower, where they develop for 7–8 days feeding on the juice of flower scales, pests, stamens. With many of larvae the flower flakes open and the larvae fall out of the flower and die.

The barley flea beetle (Phyllotretavittula) is common in cereal crops. Wheat, barley, rye, millet, corn, cereals are most often damaged. Insects winter on the slopes of ravines and beams, in the topsoil of forest strips or under the fallen leaves. In the spring they spread to the fields, first to winter crops and then to summer crops. The barley flea beetle first damages the leaves of the young plants, observed immediately after growing. Young plants are depressed, yellow and dry. When the females lay their eggs in the soil, the larvae of the barley flea beetle feed on the roots of the plants.

The world scientific community for practical reasons is interested in the use of biopharmaceuticals and biocontainment technologies in agriculture. Biological methods of plant protection against pests and diseases prevent pesticide poisoning of seeds and plants of millet. There are three main ecological methods of controlling illnesses and pests:

Environmental safeguard measures are integrated plant protection systems with an environmental focus.

– A peculiarity of the agricultural technique is the alternation of crops in crop rotation.

– The biological method is the activity of natural resources of useful organisms.

– The system of protection of crops against pests and pathogens is a rather complex process and is carried out consistently by a set of ecological, agricultural and biological measures.

Integrated plant protection offers a comprehensive application of methods for the long-term regulation of the development and spread of harmful organisms, based on forecasts of economic, energy-saving and environmental technologies, providing reliable plant protection and ecological balance in the environment.

Environmental protection measures include minimizing the use and harm from pesticides to human health and the environment using integrated methods and monitoring

pests and diseases, monitoring of the number and rate of spread of diseases and pests, as well as one or more control methods, including preventive methods and other non-chemical methods.

The main measures to protect the millet against diseases and pests include meeting the requirements of the zonal cultivation technology namely the sowing time and the seed seeding rate, the determination of the fertilizer and soil treatment system, the timely harvesting, the immediate felling of the rod, use of mainly disease-resistant varieties of millet, careful cleaning, sorting, calibration and treatment of seeds with biological fungicides. [8].

Attention should also be paid to the implementation of institutional and management measures to prevent the mass spread of pests and pathogens and to cut the use of chemical agents. Through the introduction of crop rotation in space and time, the efficiency of mineral fertilizers is improved.

In turn different plant groups exchange a different amount of useful nutrients (nitrogen, phosphorus and calcium) from the soil. Grains use more nitrogen and phosphorus, root crops and tubers use potassium.

An important agronomic activity, ensures the yield of millet, is the application of fertilizers. Compared to other grain crops millet requires an increase in nutrients.

The high sensitivity of the millet to fertilizers is largely due to the development of the root system, as well as the ability to produce high grain yields in a relatively short growing period. The root system is well developed in the millet and has a weak absorptive capacity. Consequently, it needs an adequate supply of nutrients for its normal development [6].

Most nutrients are absorbed within a short period of time from eating to flowering. Providing plants with nutrients contributes to a more economical use of water by plants [8].

In more moisture-rich areas, millet yields are higher when fertilizers are applied than in arid areas. However, in areas where there is insufficient rainfall, fertilizer contributes to higher yields.

Another agronomic activity that should be used in crop production is millet feeding. When combined with other equally effective measures, it maximizes its yield during the harvest season. But account must be taken of the use of resources that have enough nutrients for the crop.

Conclusions. In millet cultivation the use of organic technologies results to increase natural biological activity in the ground and restoring the balance of natural nutrients. Enough humus accumulates in the soil and increase its fertility for later crops in crop rotation. There has been an improvement in the quality of the agricultural produce and an increase in the overall yield. The immunity of millet plants is being strengthened to maintain resilience to adverse factors such as drought or disease. Nowadays the use of biomedications is the most effective measure to increase crop yields and protect seeds and crops without the risk of damaging the ecosystem. Clean field maintenance from weeds, pests and diseases – is an essential prerequisite for high crop productivity.

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ВИРОЩУВАННЯ БОБОВИХ КУЛЬТУР ТА РОСЛИН-СИДЕРАТІВ НА ПІВДНІ УКРАЇНИ В КОНТЕКСТІ РОЗВИТКУ ОРГАНІЧНОГО ЗЕМЛЕРОБСТВА

Алмашова В.С. *– к.с.-г.н., доцент,*
доцент кафедри екології та сталого розвитку імені Ю.В. Пилипенка,
Херсонський державний аграрно-економічний університет

Стаття висвітлює актуальну проблему сьогодення в Україні, пов'язану з виробництвом органічної сільськогосподарської продукції, яка для виходу на світовий ринок повинна відповідати вимогам ЄС та бути безпечною для споживача. Також у статті проведено моніторинг сучасного стану та перспектив розвитку органічного виробництва як в Україні, так і на Херсонщині. Проаналізовано, яким чином аграрії нашого регіону дотримуються принципу вирощування органічної сільськогосподарської продукції та як сприяє введення в сівозміну бобових культур вирішенню цього питання на півдні України.

У процесі проведення аналізу моніторингового дослідження встановлено, що Херсонська область активно займається вирішенням питання вирощування органічної продукції, але є низка чинників, які заважають прискоренню темпу збільшення органічного землеробства. По-перше, відсутність необхідної кількості перегною в нашому регіоні (причиною є скорочення поголів'я ВРХ та свиней). По-друге, зменшення використання в польовій сівозміні бобових культур (гороху, чини, сої, нуту, люцерни) та мала тенденція вирощування в тій самій сівозміні сидеральних культур, які відновлюють запаси гумусу у ґрунті та покращують його структуру. Так, поповнення органічної речовини можливе шляхом «повернення» родини бобових на наші поля. Такі культури, як соя і горох, уже поступово займають свою нішу в Херсонській області, але йдеться про багаторічні бобові культури, які формують потужну кореневу систему. Це сприяє накопиченню органічної речовини та створенню густої сітки капілярів для руху вологи по всьому профілю ґрунту.

На основі проведених досліджень, присвячених вирощуванню гороху на дослідному полі ХДАЕУ, встановлено низку чинників, які сприяють отриманню органічної сільськогосподарської продукції та подальшому розвитку органічного землеробства в умовах півдня України.

Ключові слова: *органічне землеробство, горох, бобові культури, органічна продукція, гумус, сидерати, бульбочкові бактерії, родючість ґрунту.*