

UDC 632:631.147(477.41/42)

THE PRINCIPLES OF NATURAL PLANT PROTECTION UNDER ORGANIC FARMING

M. Kluchevich¹, S. Vyghera², N. Lesovoy²

¹ Житомирський національний агроекологічний університет

² Національний університет біоресурсів і природокористування України

Висвітлено особливості захисту рослин за виробництва органічної фітопродукції. Обґрунтовано роль організаційно-технічних заходів добору культур та оптимальних сівозмін. Наголошено, що за впровадження технологій захисту рослин за органічного виробництва фітопродукції в єдиному технологічному процесі необхідно використовувати лише природоохоронні, ефективні та безпечні методи, зокрема організаційно-технологічний, агротехнічний, імунологічний, біологічний, мікробіологічний, фітонцидний тощо. Обґрунтовано принципи виробництва органічної фітопродукції та ефективності її захисту без застосування синтетичних технологічних засобів. В основу цього покладено історичний досвід формування та функціонування агрофітоценозів на території України.

Ключові слова: органічне виробництво, природний захист рослин, фітоценоз, тритикале, полба.

The analysis of the agroindustrial complex in various countries testifies to the fact that they promote several ecosystem management trends essentially differing from each other by their economic, energy and nature protection parameters. Thus, these trends can be logically arranged in the following groups: the manufacture of phytoproducts with the use of synthetic preparations (extensive and intensive farming) and without their application (natural, biological or organic and biodynamic farming).

The recent years have seen the process of grounding prospective production trends on the basis of the modern maintenance and information support for technologies [1, 2], particularly with the application of no-till ones, the precision agriculture system (PAS), information phytotechnologies (IPh) and information farming system (IMS) in particular.

During the last two decades in Ukraine there began the scientific substantiation as to the revival of the traditions of developing

the manufacture of phytoproducts without using synthetic preparations, which is an important nature protection and economic factor. As a matter of fact, this traditional trend of phytoproduction was functioning on the territory of our country for many centuries, whereas synthetic preparations started to be applied only during the last century. It was the ungrounded application of manufactured chemical preparations, and, accordingly, the pollution of the environment and produce with toxic agrochemicals, especially, in the second half of the 20th century, that served as a stimulus to the revival of the traditions of phytoproduction without the use of synthetic preparations, based on biodynamic and natural (known in some countries as organic, biological and ecological) farming.

Purpose of the paper. The substantiation of the principles of manufacturing organic phytoproducts and the efficiency of their protection without the application of synthetic means is based on the historic experience of the formation and functioning of agrophytocenoses on the territory of Ukraine as well as

the efficiency of phytoproduction in some foreign countries, especially European ones [2–4]. Besides, in a number of cases the authors' personal results of the investigations conducted in Forest-steppe and Polissya of the Right-bank Ukraine within the last 35 years have been used for the substantiation of the monitoring system as to biodiversity and optimization of plant protection methods [1, 5].

RESULTS AND DISCUSSION

The manufacture of natural (organic) phytoproducts should be logically understood as an important but specific system of the forming and functioning of farm phytocenoses, which must include a number of basic but essentially improved as to conventional production, and individually accented links, particularly: organizational-and-technological; legal; certification and standardization on the basis of international standards; growing raw stuff, as a rule, in the close cycle with stock-raising; harvesting, transportation and storage of raw materials; processing and manufacturing quality and safe products; transportation and storage of produce; its sales at personified markets; consumption, etc.

With the manufacturing phytoproducts without the application of synthetic preparations, natural (organic) and biodynamic production with the substantiation and operation of proper farming systems should be used.

The principles of plant protection, particularly those of the control of economically unprofitable (detrimental) and profitable (beneficial) biodiversity, which is directly or indirectly relevant to growing crops, raw materials and produce, occupy an important place at all levels of production.

As to cultured ecosystems, the strategy of working out the effective and safe protection of phytocenoses must be directed at the creation of optimal conditions for the growth and development of protecting crops at the expense of keeping to the parameters of the unified technological process of growing them, where in the included plant protection systems natural regulating mechanisms and economic thresholds have been taken into account.

All this in the aggregate will achieve the goal set also due to the introduction of scientifically grounded crop rotations as one of the basic technological measures. Besides, it is also necessary to substantiate the set and proportion of crops with higher ento- and phytopathological resistance to harmful organisms (triticale, emmer wheat, field pea, etc.) fertilizer application level, nutrient balance, humus availability in the soil, water availability, varietal productivity of crops, etc.

Such being the case, the plant protection tactics is based on the knowledge of biotic and abiotic factors that influence plant productivity, species composition, biology of harmful complex, the level of influence on it by useful organisms, crop development characteristics and its growing technologies as well as the degree of realization of an individual technological method concerning useful and harmful organisms, which has not been studied yet.

The monitoring of phytocenoses, especially of their harmful and useful organisms as well as a verifiable forecast in the agrocenosis of a protecting crop and in the accompanying ecosystems should be accessible for production and form the basis for decision-making as to the peculiarities of choosing and carrying out protective measures.

With the purpose of improving the nature protection situation in the second half of the 20th century a new term has been suggested in plant protection — integrated plant protection which was accepted by the FAO's working group of experts in 1967 and by the International Organization for Biological Control in 1973 [2].

The present time necessitates phytoproduction proceeding from nature protection principles of growing raw materials. This approach, in its turn, requires the development and introduction of not economic thresholds of harmfulness in general, but economic and nature protection thresholds of the size of harmful biodiversity of aggrophytocenoses. The new strategy of plant protection optimization will make it possible, unlike the traditional one, not only to improve the state of the environment, but also to set preconditions

for stable growing of quality and safe raw stuff of agrophytocenoses and its products.

Theoretically, modern integrated plant protection systems on a definite crop field fail to take into consideration biocenotic connections of cultivated plants and their harmful organisms with the environment, particularly primary and secondary biocenoses. This testifies to the fact that under definite conditions of the unified technological process of growing crops in agroecosystems, it is necessary to substantiate specific systems of integrated plant protection.

On the basis of the above-mentioned for all farming systems, both with the application of synthetic preparations and without them, the standard and generalizing term – integrated plant protection – is logical.

Then, for farming with the application of synthetic preparations, it is logical as to plant protection to use the term integrated natural-and-synthetic plant protection.

For farming without the application of synthetic preparations the term integrated natural plant protection or natural control of phytocenosis biodiversity is actual as to plant protection.

Integrated natural plant protection is a system of control in space and time of harmful and useful organisms, which, taking into account economic thresholds of harmfulness and correcting natural regulating mechanisms of protective and adjacent biocenoses, in the unified technological process of growing crops under the conditions of natural (organic) farming uses the materials of natural origin or natural technological ones, methods and techniques that meet economic, nature protection and toxicological requirements and are in conformity with the certification of the manufacture of quality and safe phytoproduce optimum on the basis of international standards.

The above confirms that, with a view to substantiating nature protection and safe systems of plant protection depending on the phytoproduction system selected, it is necessary to develop, analyze and introduce the effective modern and newest methods of plant protection.

Modern methods of plant protection. At the present stage all up-to-date means of control of phytocenosis biodiversity under natural plant protection are grouped as follows: organizational means (organizational-and-technological methods), agronomical, immunological, biological, microbiological, biotechnical, mechanical and physical methods [1].

Organizational means (organizational-and-technological method) are an organizational direction that creates unfavorable conditions for the multiplication and spreading of harmful organisms simultaneously ensuring optimum growth and development of crops grown and useful organisms. By its nature, this is creative work of a specialist that is based on his level of knowledge as to the choice of technologies of growing crops and their protection, particularly: zonal species composition, biology and harmfulness of economically unprofitable biodiversity both in the agrophytocenosis of a protecting crop and in bordering natural and cultural phytocenoses; crop rotation management; realization of varietal potential under definite conditions taking into account the degree of resistance to harmful organisms; substantiating of a farming system considering climatic and soil conditions, etc.

In recent years certain attention has been paid by proper state structures to the optimization of crop rotations. For instance, in order to regulate crop rotations the Law No. 1443-VI ‘On the introduction of changes into some legislative acts of Ukraine as to the soil fertility conservation’ was adopted on July 4, 2009. This law obliges agrarian enterprises having more than 100 ha to work out since 01.01.2013 a land-utilization scheme with the ecological and economic substantiation of crop rotations and regulation of farm lands.

The latest techniques of plant protection. At the present time the substantiation and development of the latest techniques of plant protection that result from the in-depth study of plant biochemistry and other factors are worth particular attention. Proceeding from the rapid development of scientific research, in recent years when working out plant protection systems, the newest methods started

to be successfully employed, particularly abiotic and phytoncid ones, the latter being worth the closest attention from a position of environmental protection.

Phytoncid method. Since 1994 the employment of the phytoncid method of plant protection, which is being founded on the nature protection basis and differs from other methods by its mechanism and range of action, has been initiated and scientifically grounded in Ukraine.

As to the peculiarities of employing this method more than 70 information sources have been published and a number of patents have been received [3].

Thus, the development of the principles of introducing organic produce manufacture in Ukraine is timely and has promising prospects.

CONCLUSIONS

While substantiating and conducting investigations into organic phytoproduce manufacture in Ukraine and during their productive introduction, it is necessary to use the experience of the leading countries of the world, especially those of Europe as well as investigation results of educational and scientific institutions and farming enterprises.

Forming the basis of natural plant protection design and its introduction under organic phytoproduce manufacture in the unified technological process, it is necessary to apply only nature protection, effective and safe methods, particularly organizational-and-technological, agrotechnical, immunological, biological, microbiological, phytoncid ones.

REFERENCES

1. *Вигера С.М.* Натуральний захист рослин та їх продукції при органічному виробництві / С.М. Вигера, О.А. Іваненко, М.М. Ключевич // Органічне виробництво і продовольча безпека: матеріали міжнар. наук.-практ. конф. (Житомир, 18–20 квітня 2013 р.). — Житомир: ЖНАЕУ, 2013. — С. 337–345.
2. *Вигера С.М.* Фітонцидологія з основами вирощування та застосування фітонцидно-лікарських рослин: навч. посіб. / С.М. Вигера. — Житомир: Рута, 2009. — 296 с.
3. *Бабич А.О.* Світові земельні, продовольчі і кормові ресурси / А.О. Бабич. — К.: Аграрна наука, 1996. — 570 с.
4. Статистичний щорічник України за 2007 рік. — К.: Консультант, 2008. — 556 с.
5. *Ключевич М.М.* Тритикале — перспективна культура для органічного виробництва / М.М. Ключевич: зб. тез міжнар. наук.-практ. конф. [«Перспективи розвитку рослинницької галузі в сучасних економічних умовах», присвячена 50-й річниці від початку рисівництва в Україні], (Скадовськ, 6–8 серпня 2013 р.). — Скадовськ, 2013. — С. 111–112.