

Iryna M. Lesik¹

MAJOR CONTRADICTIONS OF GENETICALLY MODIFIED ORGANISMS CULTIVATION AND USE

The article examines trends in the development of biotechnologies globally. The position of Ukraine on cultivation and use of genetically modified organisms is studied. Prospects of genetically modified organisms implementation and potential risks associated with their cultivation and use are explored.

Keywords: biotechnological production; genetically modified organisms; strategic opportunities; potential risks; health of the nation.

Peer-reviewed, approved and placed: 11.05.2016.

Ірина М. Лесік

ОСНОВНІ СУПЕРЕЧНОСТІ У ВИРОЩУВАННІ ТА ВИКОРИСТАННІ ГЕНЕТИЧНО МОДИФІКОВАНИХ ОРГАНІЗМІВ

У статті розглянуто тенденції розвитку біотехнологій на глобальному рівні. Вивчено позицію України щодо вирощування та використання генетично модифікованих організмів. Досліджено перспективи запровадження генетично модифікованих організмів та потенційні ризики, пов'язані з їх вирощуванням та використанням.

Ключові слова: біотехнологічне виробництво; генетично модифіковані організми; стратегічні можливості; потенційні ризики; здоров'я нації.

Рис. 3. Літ. 16.

Ирина Н. Лесик

ОСНОВНЫЕ ПРОТИВОРЕЧИЯ В ВЫРАЩИВАНИИ И ИСПОЛЬЗОВАНИИ ГЕНЕТИЧЕСКИ МОДИФИЦИРОВАННЫХ ОРГАНИЗМОВ

В статье рассмотрены тенденции развития биотехнологий на глобальном уровне. Изучено позицию Украины относительно выращивания и использования генетически модифицированных организмов. Исследованы перспективы внедрения генетически модифицированных организмов и потенциальные риски, связанные с их выращиванием и использованием.

Ключевые слова: биотехнологическое производство; генетически модифицированные организмы; стратегические возможности; потенциальные риски; здоровье нации.

Problem setting. At the global level, increasing of production capacity is discussed as a significant increase in the number of countries involved in biotechnological production. Evaluation of production shows there is a certain commitment to biotechnology which is proved by continuing growth of the areas designated for genetically modified crops. GMOs produced through genetic technologies have become part of everyday life, entering into society through agriculture, research, and environmental management. However, while GMOs have benefited human society in many ways, some disadvantages exist; therefore, production of GMOs remains a highly controversial topic in many parts of the world.

Recent research and publications analysis. Many domestic and foreign scholars, including G. Brookes and P. Barfoot (2006), I. Grigorieva (2015), C. James (2014),

¹ Mykolayiv National Agrarian University, Ukraine.

S. Knapton (2015), S. Malyuta (2007) and many others study the possibilities of biotechnology as a strategic element of productivity increase, improving food security and competitiveness at international markets. On the other hand, a lot of experts consider GMOs may be associated with potential risks to humans and the environment. To the authors of this scientific direction also belong M.A. Altieri and R. Rosset (1999), M. Khor (2006), E. Surovtseva (2013). Significant differences in opinions require further study of these issues under conditions of globalization.

The research objective is to study the development trends of biotechnologies at the global level and identify major contradictions related to cultivation and use of GMOs.

Key research findings. Continuous growth of areas designated for genetically modified crops has a steady rate of 3 to 4% or 6.3 mln ha per year, and this shows there is a place for global commitment to biotechnologies. Biotech crops were grown commercially at all 6 continents of the world. Of the 28 countries planting biotech crops in 2014, 19 planted 50,000 ha or more of biotech crops (James, 2014).

According to the opinions of European experts, there is a probable decision to grow biotech crops by the countries that are under development, and countries that have limited resources. As a consequence, the number of countries producing biotech crops could be doubled, increasing also the crops' numbers.

In some countries and in Ukraine, in particular, there is no single view on genetically modified crops.

Comparing the occurrence of GMO products, the use of biotechnology derived products and the application of one of the main methods of breeding (artificial mutagenesis) can be found in (Malyuta, 2007).

According to the Law of Ukraine "On ecological expertise" (9.02.1995, # 45/95-VR) there is an approved list of activities and objects, classified as highly hazardous genetically engineering activities on genetically modified organisms.

Regulation of such activity is carried out under the Law of Ukraine "On the State Biosafety System for creating, testing, transportation and use of genetically modified organisms" (31.05.2007, # 1103-V). It provides registration of genetically modified organisms and some restrictions on their use. But today the State Register contains no genetically modified crops as such. This means that in Ukraine genetically modified organisms are prohibited.

Considering the above mentioned it is appropriate to clarify the presence at domestic market of biotech crops and genetically modified foods.

The statutory banning of GMOs' cultivation in Ukraine, as well as their use in the food industry, is quite a formality. That is why the threat of large-scale cultivation of GM crops in Ukraine and their use is very real.

Obviously, the lack of effective surveillance programs on margins and control of seed encourages farmers to use GM crops. According to molecular genetic laboratory "Ukrmetrteststandart" about 30% of food products contain GMOs in Ukraine (life.pravda.com.ua, 19.02.2009).

Contemporary biotechnologies offer significant promise to the mankind and bring with them both advantages and possible unknown risks and threats.

The main argument of GM crops' growing supporters in Ukraine is that the use of GM technology would bring manufacturers annual increase in profits. And intro-

duction of biotechnology would reduce the volumes of herbicide application for processing plants, thereby reducing the burden on natural resources. In the cultivation of GMO crops supporters see prospects for rapid development of industries in Ukraine.

On the one hand, genetic engineering is a powerful tool of progress, but on the other hand, with inadvertent use, it can have a lot of negative consequences (Grigorieva, 2015).

British scientists are firm in their approval for genetic modification believing that it could help farmers produce plants which are healthier and need fewer pesticides. However a poll by YouGov (YouGov Survey Results, 2014) found that 40% of people believe that the government should not be promoting GM adoption, while only 22% believed they should (Knapton, 2015).

Many scientists believe the benefits outweigh the risks. Farmers have been changing the genetic make up of plants through breeding since agriculture began to improve yields and make larger and hardier specimens (Knapton, 2015).

The ability to grow more biotech crops on less acreage also aids farmers in being good stewards of the land. Reduction in plowing possible due to biotechnology use enables farmers significantly reduce fuel use and thus decrease greenhouse gas emissions. Studies show that biotech crops have saved farmers million gallons of fuel through reduced operations which in turn resulted in eliminating nearly 10.2 mln pounds of carbon dioxide emissions since 1996. This is equivalent to removing 4 mln cars from the road a year (Brookes and Barfoot, 2006).

Internationalization of intellectual property rights systems through the WTO has led to increased monopolisation, especially by transnational corporations, that are able to charge higher prices for their products than if there were greater competition. Also, high subsidization of and high tariffs on agricultural products strengthens the protection of the agriculture sector in many countries (Khor, 2006).

Biotech crops is not a panacea; but they have the potential to make a substantial contribution in cutting poverty by half, by optimizing crop productivity, which can be achieved by public-private sector partnerships (James, 2014).

Among categorically minded experts there is an opinion that leaders of agricultural producers with huge producing capacities than conceal and hide these risks' seriousness to health and the environment from cultivation of genetically modified crops and their further industrial use.

Let's analyze the related environmental, agrotechnical and food risks (Figures 1–3).

Today there are more than 500 kinds of pests which have developed immunity to conventional insecticides and thus are able to develop resistance to biotoxins from transgenic crops (Bilyavsky et al., 2005).

The main cause of biological risks and adverse effects from GMOs use is instability of microorganisms' development.

GMOs produced through genetic technologies have become part of everyday life, entering into society through agriculture, research, and environmental management. However, while GMOs have benefited human society in many ways, some disadvantages also exist. Therefore, GMOs production remains a highly controversial topic in many parts of the world (Encyclopxdia Britannica, 2016).

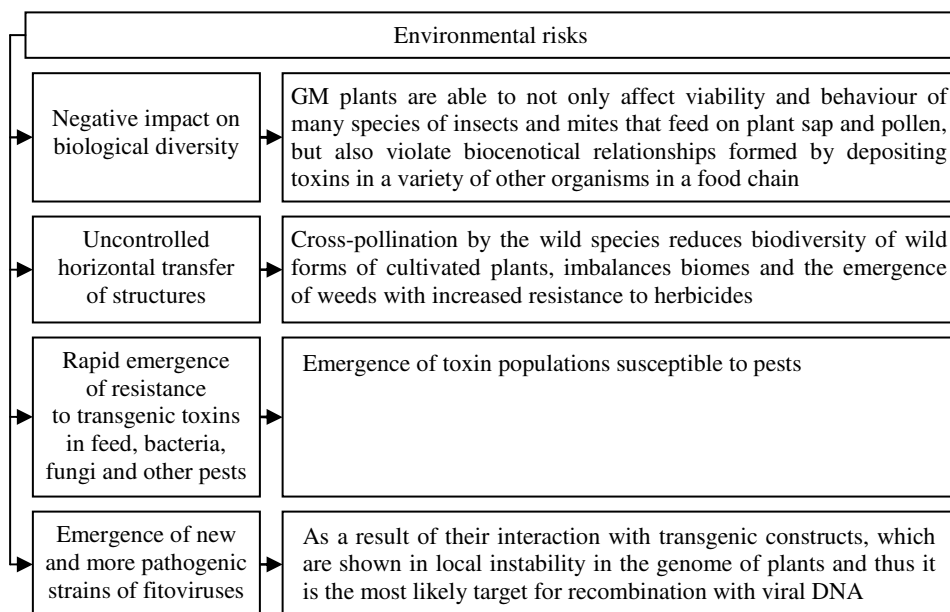


Figure 1. Environmental risks of biotechnology use, author's

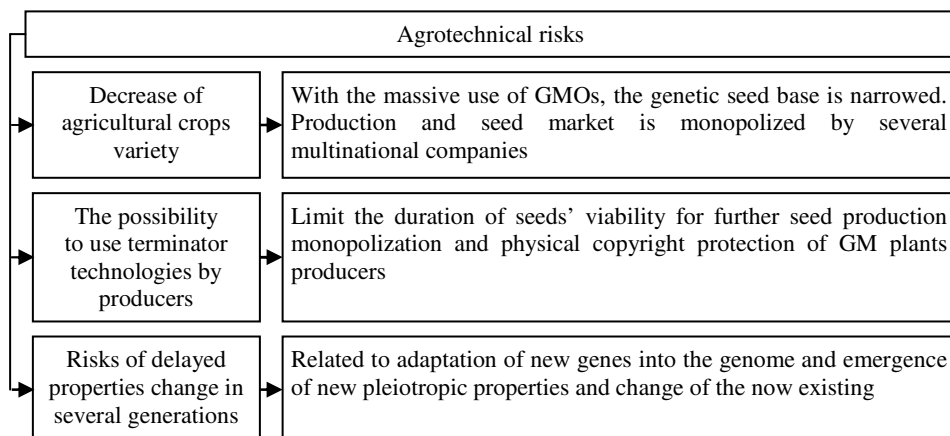


Figure 2. Agroenvironmental risks of biotechnology use, author's

Genetically engineered foods are beginning to flood markets in importing countries, yet no one can predict all their health effects for consumers, who are unaware they are eating such food. Genetically engineered food remains unlabeled, thus consumers cannot discriminate between genetically engineered (GE) and non-GE food, and should serious health problems arise, it will be extremely difficult to trace them to their source. Lack of labeling also helps shielding corporations that could be potentially responsible (Lappe and Bailey, 1998).

Scientists are concerned that biotechnology cannot provide secure food and reduce poverty in the developing world (Altieri and Rosset, 1999).

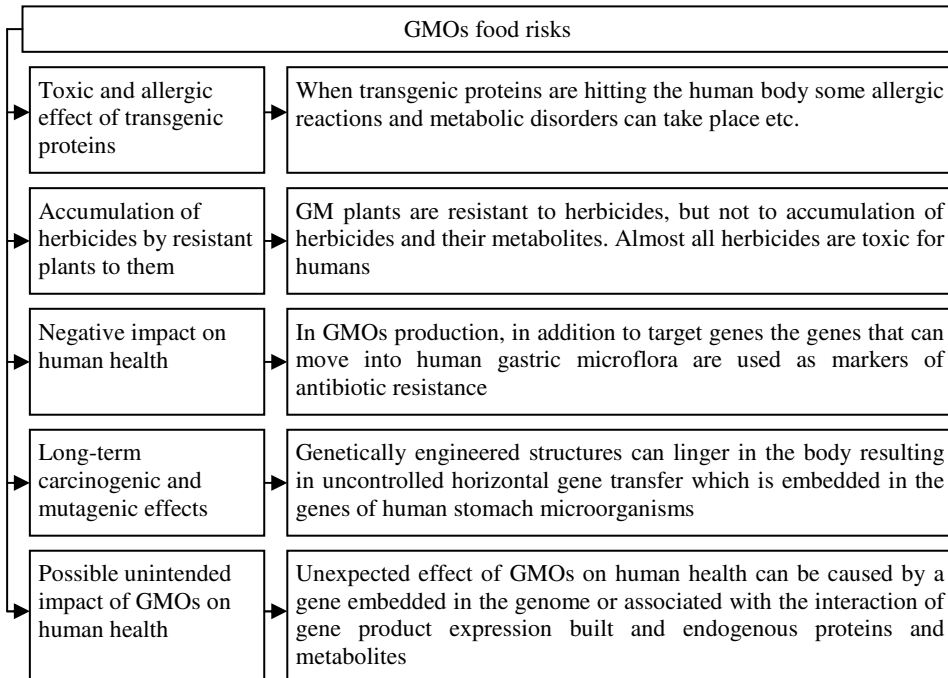


Figure 3. Food risks of biotechnologies use, author's

The list of countries affected by the policy of GM crops' introduction is significant and has its own characteristics. However, common to all of them all is a negative influence of environmental pollution, destruction of natural biogeocenosis and emergence of new species of plants and insects, which can not be coped. In addition, the number of lives is lost. GM seeds are transformed from a public good into "intellectual property" which you have to pay for. Typical behavior of TNCs includes various kinds of absorption of small owners, and, therefore, unimaginable debts and demand payments. As a result, farmers' indebtedness is growing, they are thus forced to sell their land for a pittance and fill the hungry army (Surovtseva, 2013).

Conclusions. More stringent monitoring of compliance and implementation of legislation related to GMO producers in Ukraine, could promote appropriate actions by checking the information manufacturers put on their products, which they should confirm, since the "No GMO" label does not fulfill its main functions such as information, warning consumers about the quality and safety of products. Today the issue of GMOs leaves a number of contradictions. On the one hand, we can not categorically state that consumption of GMO products is completely safe for humans as confirmation of this can be obtained after several generations. On the other hand, it should be noted that until dangers of GMO are proven, its use is considered to be safe. However, the main of these contradictions is the idea that everyone should have the opportunity to choose for their own – to use products with or without GMOs. The experience of the EU and the USA in creating a regulatory system to prevent (the use of) GMO can play a special role in developing countries. In Ukraine, in particular, the need to ensure harmonization of legislative and regulatory base, examining the

real situation with circulation of genetically modified crops and supplies at the domestic market, should be carried out with continuous monitoring of GMOS' use in order to ensure the health of the nation overall.

References:

Про державну систему біобезпеки при створенні, випробуванні, транспортуванні та використанні генетично-модифікованих організмів: Закон України від 31.05.2007 № 1103-V // zakon.rada.gov.ua.

Pro derzhavnu systemu biobezpeky pry stvorenni, vyprobuvanni, transportuvanni ta vykorystanni henetychno-modyfikovanykh orhanizmviv: Zakon Ukrainy vid 31.05.2007 № 1103-V // zakon.rada.gov.ua.

Про екологічну експертизу: Закон України від 09.02.1995 № 45/95-ВР // zakon.rada.gov.ua.

Pro ekolohichnu ekspertyzu: Zakon Ukrainy vid 09.02.1995 № 45/95-VR // zakon.rada.gov.ua.

Білявський Г.О., Фурдуй Р.С., Костиков І.Ю. Основи екології: Підручник. – 2-ге вид. – К. : Либідь, 2005. – 408 с.

Bilivskiy H.O., Furdui R.S., Kostikov I.Iu. Osnovy ekolohii: Pidruchnyk. – 2-he vyd. – K. : Lybid, 2005. – 408 s.

Ввезення в Україну продукції з ГМО обмежили // Українська правда. Життя. – 19.02.2009 // life.pravda.com.ua.

Vvezennia v Ukrainu produktsii z HMO obmezhyly // Ukrainska pravda. Zhyttia. – 19.02.2009 // life.pravda.com.ua.

Григорьева И.Я. О государственной деятельности республики Казахстан в области обеспечения безопасности использования генно-модифицированных объектов // Эволюция научной мысли. – Уфа: Аэтерна, 2015. – Ч. 1. – С. 4–7.

Grigoreva I.Ia. O gosudarstvennoi deiatelnosti respubliki Kazakhstan v oblasti obespecheniia bezopasnosti ispolzovaniia genno-modifitsirovannykh obektov // Evoliutciia nauchnoi mysli. – Ufa: Aeterna, 2015. – Ch. 1. – S. 4–7.

Малюта С.С. Мутагенез // Екологічна енциклопедія: У 3-х т. / А.В. Толстоухов (гол. ред.). – К.: Центр екологічної освіти та інформації, 2007. – Т. 2. – С. 321.

Maliuta S.S. Mutahenez // Ekolohichna entsyklopediia: U 3-kh t. / A.V. Tolstoukhov (hol. red.). – K.: Tsentr ekolohichnoi osvity ta informatsii, 2007. – T. 2. – S. 321.

Суроцева Е.Ю. Трансгенные культуры как новый инструмент создания глобальной экономической зависимости // Управление экономическими системами: Электронный науч. журнал. – 2013. – №3 // uecs.ru.

Surovtseva E.Iu. Transgennyye kultury kak novyi instrument sozdaniia globalnoi ekonomicheskoi zavisimosti // Upravlenie ekonomicheskimi sistemami: Elektronnyi nauch. zhurnal. – 2013. – №3 // uecs.ru.

Altieri, M., Rosset, P. (1999). Ten Reasons Why Biotechnology Will Not Ensure Food Security, Protect The Environment, And Reduce Poverty In The Developing World. The J. Agrobiotechnology and Economics, Vol. 2, No. 3–4.

Brookes, G., Barfoot, P. (2006). Global Impact of Biotech Crops: Socio-Economic and Environmental Effects in the First Ten Years of Commercial Use. PG Economics.

Genetically modified organism (GMO) (2016). In: Encyclopdia Britannica // www.britannica.com.

James, C. (2014). Global Status of Commercialized Biotech. GM Crops: 2014. SAAA Brief No. 49. ISAAA: Ithaca, NY // www.isaaa.org.

Khor, M. (2006). Globalisation, liberalisation, protectionism: impacts on poor rural producers in developing countries // www.ruralpovertyportal.org.

Knapton, S. (2015). Genetically modified crops could be planted in England this year // www.telegraph.co.uk.

Knapton, S. (2015). GM crops: what it will mean for you if British farmers get green light // www.telegraph.co.uk.

Lappe, M., Bailey, B. (1998). Against the grain: biotechnology and the corporate takeover of food. Monroe, Maine: Common Courage Press.

YouGov Survey Results (2014) // cdn.yougov.com.