

MICROBIOLOGICAL AND HOMEOPATHIC PREPARATIONS IN ORGANIC FOOD PRODUCTION

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Abstract: *Agriculture, as the most important strategic industry, is tasked with providing sufficient quantities of quality and safe food. Intensive and often excessive, uncontrolled and unskilled use of the means for protection and nutrition of plants, as well as means for the prevention or treatment of animals, is carried out to increase yields in the conventional production. This approach in food production has contributed to an increasingly common endangerment of the health of plants, animals and humans, as well as significant environmental endangerment. In response to this quantitative but not qualitative approach in food production, organic agriculture has developed. Application of microbial fertilizers, i.e. clean and multiplied cells of the most physiologically active strains of microorganisms with desirable properties in relation to plant, soil, as well as the environment, it provides numerous benefits in agriculture: it reduces overall production costs, eliminates the use of expensive mineral fertilizers and pesticides, increases the use of nutrients in the soil, contributes to better growth and increased plant yield, eliminates potential soil and groundwater pollution, increases biological soil activity, improves the production of safety food.*

Homeopathy is a holistic approach in the treatment of different pathological conditions of humans, domestic animals, but also with the potential for application in wartime production. It is based on the "principle of the like", i.e. the capacity that the substance that is the cause of a particular pathological condition, at the same time, has the potential to cure the condition, if applied in minimal doses. The application of homeopathic products in the prevention and treatment of animal diseases has great advantages because these products are not toxic, reduce and eliminate the use of antibiotics, hormones and other medicines that leave residues in animal

products and animal waste. On the other hand, the application of homeopathy in wartime production is directed in two directions. The first direction refers to the application of homeopathic preparations in healthy plants to increase their vegetative properties and yields (plant growth, increase in germination, flowering, increase in yield), as well as to reduce the negative impact of abiotic stress (high temperature, sunlight, untreated pH soils, salinity). The second direction refers to their application to control certain phytopathology, without the usual application of agrochemistry. Therefore, the application of microbial and homeopathic preparations seeks to "repair" at least one part of what has been "spoiled" by the aggressive action of man in nature, because these principles combine the best models from nature, with a high respect for environmental principles, preservation of natural resources, and with an effort to put the health of plants, animals and humans first.

Key words: *food safety, agrochemicals, organic production, microbial fertilizers, homeopathic preparation*

1. Food safety and use of agrochemy

The issue of food safety is coming to wide attention around the world, as a high connection between food consumed and health has been established. Just as essential a man's need to eat is, so is food safety a basic human right. Since food trade and transport today have an international character, the issue of food safety is a common problem and a subject of attention, both developed and developing countries. Unsafe food contains dangerous agents or pollutants which can lead immediately to the onset of disease in humans, or to create an increased risk of developing chronic diseases (Veskovic and Djukic, 2015). Such pollutants can get into food in many ways, during any stage of its production, transport and distribution. The most common risk for unsafe food is the presence of various physical, biological (bacteria, viruses, parasites, prions), chemical agents (pesticides, heavy metals, radionuclides, mycotoxins, veterinary medicine remedies, growth promoters, hormones, tranquilizers, chemical preservatives, etc., but also personnel and environmental hygiene (Fung et al. (2018).

On the other hand, the country's population is steadily increasing, which is also caused by an increase in global demand for food, which is particularly notable among developing countries. In such circumstances, organic agricultural production has developed, as a need to improve both health and productivity of all interconnected factors - soils, plants, animals and humans. Intensifying the development of agricultural production, in a sustainable way, is based on an overall knowledge of the diversity of the agroecosystem, as well as to look at their potential ability to mitigate the adverse effects that contribute to low soil fertility, to reduce the effects of abiotic stress, as well as the harmful effects of

potentially present pathogen and pests (Tillman and sar., Timmusk and sar., 2017). The concept of organic production, in addition to the production of safe food and the preservation and improvement of the eco system, implies a reduction of all forms of pollution (Golian et al., 2017). The use of chemical supplements is significantly cloaked or completely eliminated, at the expense of the application of permitted natural procedures and substances. This approach stemmed from a response to existing high pollution of the human environment, intensive urbanization and an imperative need to protect and preserve plant and animal life. It is not rare to know that conventional production and, often, uncontrolled use of pesticides and mineral fertilizers have contributed to the disruption of biocellability relations, increasing the cost of agricultural products, as well as the appearance of unwanted consequences on human health, most often chronic character (Veskovic and Djukić, 2015)

1.1. Pesticides

An estimated 1.8 billion people worldwide are involved in agriculture, with the majority of the population using the convention principles of production. Therefore, it is not surprising that at the core of many of the world's environmental imbalances, as well as environmental disasters, there is an unethical use of agrochemicals (Alavanja, 2009). This data is not surprising given that at the beginning of this century, more than 850 chemical compounds were registered in the world market for agrochemistry, which are still applied today in different areas of agriculture, either as means of protecting crops from disease and pest, or for improving plant growth and fertility (Tomlin, 2004). In 2019, the world's agrochemical market was worth about US\$243.1 billion, with predictions that by 2024 this value will increase to nearly US\$300 billion. (Garside, 2021). According to available data from the Food and Agriculture Organization of the United Nations (FAO) on the amounts of pesticides used in the agricultural sector (last update 2020) worldwide pesticide production in 2018 was 4,122,334 tonnes. For the past 30 years, the Countries of the Asian Continent have been the biggest consumers of pesticides (52.8%), America is second with 30%, while Europe consumed 13.8% of the world's output annually. However, regardless of the application of agrochemistry, the world's crop productivity losses are estimated at 37%, due to the side effects of insects, 12% due to weeds and 12% from disease (Pimentel et al., 1991).

Although the criteria by which international and national regulators approve the registration and application of pesticides are very strict, both functional and toxic, ie. health aspect, however, there is ample evidence of the presence of their remains in the environment (Haynes et al., 2020; Silva et al., 2019). At the same time, primarily, in many developing countries due to the lack of a health risk control and assessment program, as many as 25 million

agricultural workers experience unintended poisoning each year due to exposure to pesticides (Jeyaratnam, 1999). Also very troubling are data from the U.S. Department of Agriculture that 50 million people in the U.S. use groundwater potentially contaminated with pesticides and other agricultural chemicals (Ward et al., 2000). It is amazing that children aged 3-6 playing with toys on carpets in their homes bring most of these harmful substances into the body (Whyatt et al., 2002; Bradman et al., 2005).

The remnants of pesticides, or their undegradable fractions, can be found everywhere in nature, from air (Majewski and Capel, 1995), soil and water (Aydinalp and Porca, 2004), food (EFSA, 2017). It's absolutely unbelievable that pesticide residues can be found far from intensive agriculture, such as Antarctica (Tatton and Ruzicka, 1967). Depending on the type of pesticide, its quantity, the length of exposure, the input pathways, as well as the individual health status of the individual, the health impacts are different. In the human or animal body, pesticides metabolize, secrete or, even, bioaccumulate in body fat tissue (WHO, 1990), while the adverse effects of their effects occur dermatological, gastrointestinal, neurological, carcinogenic, respiratory, reproductive and endocrine disorders (WHO, 1990). Sanborn et al., 2007). What is very worrying is the fact that high exposure to pesticides can lead to hospitalization and death (WHO, 1990).

In addition to the potential proven negative effect on human health, some pesticides can negatively affect land and water biodiversity, even at sublethal doses. The negative effect of atrazine on the sexual development of amphibians (Rohr, 2017) is known, while neonicotinoids act negatively on the diet of bees (Muth and Leonard, 2019).

1.2. Inorganic mineral fertilizers

Conventional agriculture is unimaginable without the use of inorganic mineral fertilizers, which are often used to achieve higher crop yields, but only 10% – 40% of applied fertilizer plants can be directly absorbed and used. It has long been a rule that "land should be restored to what the harvest takes away." As "macro" elements nitrogen, phosphorus and potassium are extracted, followed by sulfur, calcium and magnesium, like others, in traces, the necessary elements for plants. Global consumption data on total inorganic mineral fertilizers (N+P₂O₅+K₂O) indicates that this is quantity of more than 313,000 tonnes (FAO, 2019). Nitrogen is the most used fertilizer nutrient in the European Union's agricultural industry in terms of volume. In 2018 and 2019, some 11.8 and 11.5 million metric tons of nitrogen fertilizer were used to encourage optimal crop production on Europe's farmlands.

Inorganic mineral fertilizers are relatively inexpensive, have high but known nutrient content, usually nitrogen, phosphorus and potassium, which plants

quickly assimilate. However, the use of their larger quantities can lead to a number of problems, such as the loss of nutrients and soil acidification, surface and groundwater pollution, the reduction of beneficial microbial communities while increasing plant sensitivity to the effects of harmful insects (Chen, 2006). Very often, the residual mineral fertilizers in the soil (most commonly in the form of insoluble anorgan salts) are rinsed into the nearest water flows, leading to a reduction in soil biodiversity (Barazani et al., 1999), which significantly harms the health and life of plants. Namely, soil microorganisms, primarily riospheres, participate in the biogeochemical cycle of nutrients in the soil (McNear, 2013), helping plants to undertake abiotic stresses (drought, low temperatures, salinity, metal toxicity, and high temperatures) (Milošević et al., 2012), produce phytohormone that improve their growth (Costacurta and Vanderleyden, 1995), while endophiles prevent diseases caused by phytopathogens (Dutta et al., 2014). Mineral fertilizers lower the number of ammonificators (Pešaković et al., 2003), and high doses of nitrogen and potassium mineral fertilizer (especially in the case of their long-term application) lead to an increase in the number of toxicogenic microorganisms in the soil, with the following occurrence of microbial toxicity of the soil (Atlas and Bartha, 1992; Djukic et al., 2007). Any disruption of qualitative and quantitative microbial composition has a direct impact on plant yields. The fertilizer industry is considered a potential source of natural radionucleids and heavy metals (Cd, Pb, Hg) (Asghar et al., 2002), which absorb plants from the soil, thus bringing them into the food chain, which becomes unsafe and risky to the health of animals and humans.

In addition to serious environmental problems, many diseases occur in humans, such as stomach cancer, asphyxiation and several vector diseases. In newborns, the uncontrolled application of nitrogen fertilizers and their finding in the drinking water is associated with the emergence of "blue baby syndrome" (Majumdar, 2003).

It is important to note that mineral fertilizers are permitted in organic agricultural production, but only natural ones (e.g. raw phosphate, aluminum calcium phosphate, calcium sulfate), and with the approval of a certification body.

2. Organic agricultural production

Organic production as part of ecological, sustainable development includes food production (primary agriculture, processing to distribution), but also some other products of plant and animal origin (fabric, leather). The term organic agriculture (U.S.), biological agriculture (Germany, Denmark, Western European countries) or ecological or organic agriculture (R. Serbia and countries in the region) indicates activities aimed at introducing an ecological dimension into agricultural production, i.e. management of agriculture with

respect to the principles of environmental preservation (Tabaković, etc., 2017). Organic food is now increasingly attracting interest from modern consumers, and we can see it as the food that is grown with the utmost consideration for the environment and animals, which is safe and quality (Carlson and Jaenicke, 2016; EC, 2017). Organic agriculture is based on the application of the principles of agroecology, which includes a prohibition on the use of artificial mineral fertilizers and pesticides, as well as genetically modified organisms (Gomiero, 2018). Similarly, related to animal production, organic production regulations prohibit the use of hormones, growth promoters, etc., while the use of antibiotics is severely restricted (only in special cases). It also prohibits the use of many other synthetic compounds that, like food additives, are used in the conventional food chain (e.g. preservatives, coloring agents) (EC, 2016; IFOAM, 2017). In organic animal production, all actions are directed towards the health and well-being of domestic animals.

However, organic agriculture is not only producing without artificial fertilizers and other agrochemicals, as well as antibiotics and hormones. It is more of a holistic production system that functions as a sustainable unit, and unites interconnected and conditioned actors: plants, animals, microorganisms, insects, organic and mineral soil matter and humans (Mirecki et al., 2011). In other words, the role of organic agriculture is to sustain and improve the health of the ecosystem as a whole, as well as all present organisms, from the smallest ones found in the soil, through plants and animals, to man. On this basis, the International Federation of Movements for Organic Agriculture (IFOAM, 2017) has defined the basic principles of organic agriculture development, whose primary goal is to produce high quality healthy food, with preventive environmental action and well-being: the principle of health, the principle of ecology, the principle of fairness and the principle of nurturing and aging. Based on these principles, all current documents in the field of legislative are based, starting with Codex Alimentarius (FAO/WHO), through ISO documents, European laws (EEC) No. 2092/91 on organic production of agricultural products and indications referring to agricultural products and foodstuffs - revised in 1999, to our domestic regulations (Law on Organic Production) Official Gazette of RS", no. 30/10, Rulebook on Control and Certification in Organic Production and Methods of Organic Production, Official Gazette of RS", No. 95/20, Rulebook on Documentation submitted to an authorized control organization for issuing of certificate, as well as on the conditions and manner of sale of organic products, Official Gazette of RS, No. 88/16).

The growing level of educating modern consumers, accompanied by expressed awareness of the need for healthy food and healthy lifestyle, has contributed to increased interest and demand for organic products. This legality is particularly pronounced in highly developed countries where we have

significantly higher demand relative to supply, which provides great opportunities for the development of this agriculture sector.

Organic production in Serbia has a growth tendency. Data from 2019 indicate that the total organic status has 13,726 ha, whereby the arable land on which crops are grown has 9,880 ha, while under meadows and pastures there are another 3,845 ha. In the period of food conversion there are another 7,539 ha (source: MPŠV, 2021). Largest organic production surfaces are still in Vojvodina, where grains and industrial herbs are grown the most, while fruit species are grown in Sumadija and Western Serbia, as well as in Southern and Eastern Serbia.

In organic cattle, the largest number are bees (9969), chickens (17751) and sheep (6099). The total number of organic producers has risen from 434 in 2017 to 513 manufacturers in 2019. Exports of organic products in 2017 amounted to 23,113,073 euros, and growth of more than 5.5 million euros (\$29.75 million) was found in 2019. Most organic products, primarily raspberries, were exported to European Union countries (mostly Germany).

2.1. Microbiological fertilizer in organic agricultural production

By analyzing the current state of agriculture and objectively looking at the facts that indicate the existence of certain negative scenarios in modern food production, it imposes the need for certain measures that would contribute to ecological stabilization, as well as the immediate restoration of agricultural land. In this field of action, there is a particularly important aspect of the application of achievements in the field of biotechnology, especially in the field of agricultural microbial biotechnology. Activities in this area are based on the application of useful interactions of plants-microorganism-microbiome that would enable a sustainable solution for the restoration and improvement of agricultural production (Timmusk et al., 2017) in the future. Although there are now more than 100,000 species of microorganisms in nature, there are only a few hundred in the biological application, of which those microorganisms that have the potential to produce microbial fertilizers (Popov, 2007) are very important.

The production of microbial fertilizers involves the application of "clean", multiplied and physiologically active cells of selected strains of microorganisms that show desirable properties in relation to plant, soil and environment (Luci et al., 2004; Bargaz et al., 2018). This added active cells act as biocatalysts present in microorganisms in the soil, allowing nutrients from the rhizosphere to become available to plant roots while increasing the assimilation of nutrients (Spanoghe et al., 2020).

Depending on the selected microorganisms, i.e. the bioactivity of their different metabolism products, there are different mechanisms for encouraging

and improving biological processes within the plant-microorganization-soil complex (Singh et al., 2016). The biological properties selected by microorganisms are most often directed towards four fields of activity: (1) active nitrogen action processes, (2) phosphorus dissolving/mobilization procedures, (3) composting processes and (4) bioactivities that classify them as biopesticides (Pathak and Kumar, 2016). It should be noted that in addition to their main function for which microorganisms or their groups are selected, they may also show other positive properties on the plant, which contributes to increased yield.

A pioneering venture in the production of microbial fertilizers with the properties of nitrogenfixators was a commercial risobi-based preparation called *Rhizobium leguminosarum*, which Nobbe and Hiltner patented and called "nitrogin". Since then, for more than a century, many scientists have been working to explore new species of microorganisms that have the ability to stimulate the growth of different types of plants. As components of microbial fertilizers, there can be different bacteria from the genus *Azotobacter*, *Bacillus*, *Pseudomonas* and others.

Given the importance of nitrogen in plant nutrition, it is clear that a special place is attached to bacteria located near the roots and which have the ability to translate elemental, atmospheric nitrogen into those forms that are accessible to plants. In addition to nitrogen, plant growth directly depends on phosphorus, which is most commonly present in the soil, for them, in inaccessible forms. Bacteria from the genus *Bacillus* and *Azotobacter* synthesize organic acids and phosphates, which translate this inaccessible form of phosphorus into a form suitable for use. Some bacteria, thanks to the presence of *siderofor*, contribute to the supply of plants with iron. It is also known that bacteria from the *pseudomonas* genus transform organic forms of sulfur into inorganic, rendering it accessible to plants. In the world market for microbial fertilizers, nitrogen-resistant bacteria and phosphorus solubilising/mobilizing microorganisms make up more than 75% of biostimulants on a microbial basis (Agro News, 2014).

Useful rhizospheric microorganisms, as *part* of microbiological formulations of fertilizers, they can increase plant growth through several regulatory biochemical mechanisms: a) plant hormonal signals, b) by preventing the growth of present pathogenic strains of microorganisms in the earth, and c) by increasing the bioavailability of nutrients in the country (Van der Heijden et al., 2008; Jacobi et al., 2017). Of course, they must possess a good ability to survive and adapt to the specific conditions of the new environment while possessing a high ability to compete with the present indigenous populations of microorganisms. After the extinction of microorganisms entered the land, the amount of total biomass increases, which indirectly contributes to increasing land fertility and providing the necessary

mineral nutrients to plants.

Definitively, the application of microbial fertilizers achieves numerous benefits in agriculture, starting with the reduction of total production costs, eliminating the use of expensive mineral fertilizers and pesticides, nutrients from the soil are better used, growth and yield of plants is better, eliminating potential pollution of soil and groundwater, increasing biological activity of the soil, establishing ecological balance in the soil, and thus increasing the production of health safe food. This agrees with the saying "big potential in small packages" by Matt Kleinhenz (Third world congress on the use of bio stimulants in agriculture 2017, Miami)

2.2. Homeopathic preparations in organic agricultural production

Homeopathy is currently an evolving holistic approach in the treatment of various pathological conditions both in humans and domestic animals as well. Its application continues to grow throughout the world thanks to advances in the field of quantum physics. It has even been proposed to rename homeopathy as „adaptive network nanomedicine” (Bell and Schwartz, 2015). Homeopathy is a division of alternative medicine based on the „principle of the like” (latin: „*Similia Similibus Curentur*”), in other words, “like treats like”, and in minimal doses. It actually means that a given substance which in a huge dose generates pathological symptomatology, in the same time has the potential to cure it, if applied in the minimum doses. These minimal doses are gained through the process of dilution and intense agitation, also well known as homeopathic succussion (Toledo et al., 2011). Through this process, medicinal products were obtained, called potencies, dilutions or dynamisations in decimal, centesimal, thousands and others (Teixeira, 2013). However, despite its high dilution, it is still possible to detect a few or even a single molecule or nanoparticles of the „*ponderable active principle*” in dynamisations, even in high centesimal dilutions.

The principle of similarity should be understood as the parallelism between the toxic effect of a given substance and its therapeutic use for the treatment of similar, but not necessarily identical symptomatology. For the example, some drugs used for the treatment of vertigo, muscle cramps, anxiety or headache, can induce similar symptoms in a healthy person when they have been homeopathically energized by means of a dilution-succussion process (Serretti et al., 2010).

The most controversial aspect of homeopathy is that these serial dilutions have a measurable effect when they are given to an animal or even a plant in infinitezimal doses, which leave no possibility to placebo effect. The use of homeopathic remedies in the prevention and treatment of animal diseases has great advantages in organic food manufacturing because they are

non-toxic, they reduce and eliminate the use of antibiotics, corticosteroids and hormones, which leave residues in animal products and animal waste. In veterinary medicine, homeopathy is used, among others, for the treatment of fetal death in pigs (Day, 1984), control of mastitis in cattle (Ruegg, 2009; Varshney and Naresh, 2005) and sheep (Day, 1986), elimination of ticks in bovines (Figueiredo et al., 2018), salmonellosis in chickens (Berchieri et al., 2006), gastroenteritis in dogs (Epstein and Bell, 2016). Generally, clinical veterinary practice showed that homeopathic remedies could also be highly effective in the treatment of eye infections, eczema, allergies, cough, gastrointestinal, urinary, locomotor, hormonal and neurological disorders, diarrhea in calves, respiratory infections in piglets and so on (Hektoen, 2005). Homeopathic remedies can be administered in food or added directly to culture water (Mazon-Suastegui et al., 2018a) to promote resistance to pathogens of the biotic or abiotic stress conditions. Recently published results (Mazol-Suastegui et al., 2017; Ortiz-Cornejo et al., 2017) have shown that aquacultural homeopathy is able to produce measurable biological effect in marine molluscs, shrimp and fish, which trigger physiological, humoral and genomic responses (Mazol-Suastegui et al., 2018; Garcia, 2017; Garcia-Corona, 2018; Khuda-Bukhsh, 2012) to recover the lost internal homeostasis, i.e., health. Homeopathic treatment of the plants dated from the pioneering work of Lili Kolisko in 1923, to the nowadays (Dinelli et al., 2012). In late 20th century Kaviraj (2011) opened a new dimension in agricultural sciences using homeopathy. He focused on Agrohmeopathy and made it attractive to the scientific community for research purposes. According to him, treatment of plant is actually similar to the treatments of animals and humans. Generally, all experimental findings could be divided into two groups:

- effects of homeopathy on seed germination, growth of seedlings, flowering, fruiting of different crops, and soil health as well (Sen et al., 2018). It is generally conducted on healthy plants or on plants subjected to abiotic stress such as high temperature, solar irradiation, high aridity or high salinity (Feres et Soriano, 2007; Frahm et al., 2004; Majewsky et al., 2009; Mazon-Suastegui et al., 2018b; Ojeda-Silvera et al., 2015);
- applicability of homeopathic remedies to the control of phytopathology and managed on artificially infected plants (Betti et al., 2009).

The most replicated study is the protective effect of homeopathically ultradiluted arsenic versus the effect of arsenic itself in ponderable doses (pre- and post-treatment) on maize seeds (Brizzi et al., 2005). Positive results have been achieved in prevention and control of plague-organisms in the *Solanum quitoense* Lam crop (Narvaez-Martinez et al., 2014), in germination and initial

growth of *Hancornia speciosa* Gomes (Pinto et al., 2014) and in remediation of soils affected by heavy metals (Dos Santos et al., 2016). The homeopathic medicine Natrium muriaticum has been successfully used to manage high aridity (Frahm et al., 2004; Ojeda-Silvera et al., 2015) and to increase resistance to salt stress in *Solanum lycopersicum* (Giardini-Bonfim et al., 2012).

Homeopathic treatments also showed activity against *Fusarium oxysporum* who caused one of the most important diseases affecting tomato crop, i.e. vascular wilt. The control of fungal diseases in agriculture is controlled by agrochemicals including toxic pesticides whose excessive and indiscriminate use has caused the decrease or loss of fertile soil layer and death of microorganisms in soil. Additionally, the pathogens have developed resistance to the active ingredient of the agrochemical that generally has a high cost (Maneses, 2017). From the work of Betti et al. (2003) it has been proposed that decimal homeopathic potencies induce significantly increased resistance to tobacco mosaic virus. Moreover, the significant results obtained with potentized water treatments suggest that solvent potentization alone is able to induce effect similar (but weaker) than homeopathic arsenic trioxide, As₂O₃ (Brizzi et al., 2000).

3. Instead of a conclusion

Excessive and uncontrollable, and often unskilled, use of plant protection and nutrition agents, as well as agents meant for prophylactic or therapeutic purposes in animals, has led to problems with food safety, human health, and to negative environmental impacts. As a result of the non-selective use of agrochemistry, today natural cycles, necessary for the survival of the plant world, are significantly impaired and endangered so different environmental imbalances and environmental disasters are not rare in various parts of the world. In such circumstances, organic agricultural production combines the best models from nature, with a high respect for environmental principles and the preservation of natural resources, as an imperative to implement natural procedures and substances, while limiting or completely eliminating synthetic chemical substances.

Today in R. Serbia organic agriculture is increasingly popular and has a tendency to grow. Thanks to the potential, which are primarily reflected in small properties, land that is not contaminated with harmful substances, this type of agriculture can contribute significantly to the development of rural areas, and thus, in general, agriculture in the country. The main focus in the coming decades, both in our country and elsewhere in the world, would be the development and production of microbial fertilizers, i.e. useful, safe and environmentally acceptable microorganisms and their application in ecological

production of crops and cultures. Their application would affect reducing production costs, reducing the use of expensive mineral fertilizers, better utilising nutrients in the soil, improving plant growth and plant development with a substantial increase in yields. In addition, the importance of the application of microbial fertilizers is reflected in the fact that they do not pollute soil and groundwater, to increase the biological activity of the soil by maintaining its ecological balance, thereby comprehensively improving the production of health-safe food.

The application of homeopathic preparations in the prevention and treatment of animal diseases is an extraordinary potential, because these products are not toxic, they reduce and eliminate the use of antibiotics and other medicines that leave residues in animal products and animal waste, are efficient, affordable, have a low price and, often, solve problems in cases where conventional therapy is not appropriate. Organic animal production is a mandatory choice for the treatment of animals. Agrohomoepathy represents a new approach in controlling certain plant diseases without the use of common agrochemistry. Also, this holistic principle may act on improving productivity, i.e., improving productivity growth and yield of healthy plants, as well as on reducing the impact of negative soil properties and external environmental factors. The results obtained so far suggest that veterinary and agricultural homeopathy are viable alternatives from the economic, ecological and social point of view to contribute to the environment and start to reduce the harmful footprint left on the planet by the indiscriminate use of various toxic mineral fertilizers and agrochemicals. Therefore, it is necessary to search for ecological and less polluting alternatives for the control of pests and diseases in agriculture, ensuring the safety and future of the agroindustry, particularly when we think about organic food manufacturing.

However, despite all the benefits and numerous scientific and field evidence of their overall agronomic and veterinary efficacy, efforts are still needed to make them full agro – veterinary substances that farmers and livestock farmers will use without thinking in their production.

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