Studii şi Cercetări	Martie 2020	Biologie	29/1	45-48	Universitatea"Vasile Alecsandri" din Bacău

THE INFLUENCE OF SOME BIOFERTILIZERS ON THE PRODUCTION OF CUCUMBER SEEDS IN ECOLOGICAL FARMING SYSTEM

Sebastian-Petru Muscalu, Neculai Munteanu, Petre Marian Brezeanu, Mariana Calara, Alexandru Bute

Key words: *organic, practices, yield, Mapamond cucumber variety*

INTRODUCTION

The main function of agriculture is that of suppliers of agri-food products for the internal consumption of the population or more simply that of ensuring the food of the population. Agriculture also fulfills a social function of great importance for economic growth in the other branches of the national economy, in that it is still a provider of labor. In developing agricultural policies aimed at harmonizing agriculture with environmental protection, it is essential to take into account a few essential elements, dependent on each other: the need to increase the positive contribution of agriculture to the environment; minimizing pollution caused by agriculture to the environment; agricultural policy to take into account the environment (Raja, 2013). Increasing population in world need to increase food production so they used chemical fertilizers to increase the vegetables who's their season is short without care to quality. This production and consumption of vegetables lead to bad effect for healthy and pollution, because of exceed rate of nitrate and oxzalate, in addition to the poison effect of pesticide in the eaten parts of vegetables. Application of organic fertilizer increase cucumber production, vitamin C, protein, sugar and decrease nitrates accumulation in cucumber fruit (Hong-mei et al., 2014).

Chemical fertilizers have been inflicting adverse effect on environment causing pollution and damage beneficial soil, flora and fauna, causing erosion and no longer able to sustain the productivity. For these reasons, many countries in world encourage to use bio and organic fertilizer to make agriculture sustainable (Hayat et al., 2010). Biofertilizer is natural materials contain one or more than one kind of beneficial microorganisms which is safety and has not any harmful chemical materials or pesticides. Biofertilizers and organic fertilizer have important role to improving nutrient supplies for yield. Biofertilizers are ecofriendly, save soil environment from pollution, low cost and safety source for nutrition. Biofertilizer can replace chemical fertilizer partly or totally in vegetable production (Mohammed, 2017).

The chemicalization of agriculture through fertilizers, herbicides, pesticides, phytohormones is closely linked to both the increase in agricultural production and environmental problems. These attacks on the intensification of agriculture by means relate mainly to the following: chemical fertilizers lead to the depletion of the natural fertility of the soil and, ultimately, to an imbalance in the natural composition of the soil; the residual effect of some chemicals that end up in the diet, along with other factors, contributes to the promotion of modern diseases; intensive agriculture, modifying the biocenoses creates an ecological imbalance (Zakaria, 2009).

Any agriculture is, in a way, an intervention against nature, which when practiced irrationally leads to decreased fertility, changes in biocenoses, ecosystems. It would be wrong to argue that the chemicals used in agriculture have no biological effect. Despite the development of the chemical industry producing mineral fertilizers, in the future, natural organic fertilizers will be an important means of increasing fertility, due to the importance that organic matter introduced into the soil has as a factor energy for microorganisms and for the improvement of the physico-chemical properties of the soil. (Bhardwaj, 2014).

Organic farming promotes sustainable, diversified and balanced production systems, in order to prevent crop and environmental pollution. Organic production in plant cultivation, without the use of harmful traditional products, has been a special concern for several decades in economically developed countries. Organic fertilizers containing bacteria play an important role in the free fixation of nitrogen in the air, support the processes of decomposition of organic matter in the soil, and facilitate access to the soil to essential elements, especially phosphorus, by solubilizing it (Mahato et al., 2009). Due to the increased concentration of bacteria present in the fertilizer, the amount of bacterial microflora in the soil increases significantly (Khan et al., 2009). Chemical fertilizers accelerate crop growth, but this is only a temporary and local effect, which does not compensate for the inevitable weakening of crops. Weakened plants have low

resistance to disease and pests and are less able to overcome other obstacles to growth and development (Wu et al., 2005). Biofertilizers, mixtures of different natural biocompounds, applied to plants stimulate natural processes leading to better assimilation and increased nutrient efficiency, better tolerance to climate stress and improved crop quality, with a positive impact on farm profitability (Vessey, 2003). Biological fertilizer refers to active microorganisms composed of specific microorganisms and organic matter, animal and plant residues after harmless treatment and decomposition and contains fertilizers with nitrogen, phosphorus and potassium rich in organic matter. Every beneficial bacterium is a deposit of fertilizer; the plant for the production of beneficial bacteria is moved underground and produces nitrogen, phosphorus, potassium and other trace elements for plant absorption, thus increasing yield and quality, improving soil quality, promoting cultivation and reducing the occurrence of pests and diseases (Anandaraj and Delapierre, 2010). Over time, the use of organic fertilizers can avoid environmental pollution, ecological destruction, declining fertility and other disadvantages caused by chemical fertilizers and pesticides. Organic farming promotes the cultivation of the land through those means that ensure a balance between agroecosystems and the environment (Shahdi Komalah, 2010).

Organic agriculture has the role: to produce food of high quality and in sufficient quantity; to maintain and increase the long-term fertility of soils; to use as many renewable resources as possible in agricultural systems; to maintain the genetic diversity of the agricultural system and its surroundings, including the protection of wild plants and habitats; to enable agricultural producers to obtain an adequate income and job satisfaction, including to ensure a secure job. Organic farming is based on keeping living organisms in the soil, especially microflora and microfauna, through proper crop rotations, through proper techniques and maintaining a high level of organic matter in the soil. (Saeed et al., 2015).

Fig. 1 Experimental field - general aspect *Mapamond* cucumber variety at Vegetable Research and Development Station Bacău

The eco-friendly approaches inspire a wide range of applications that led to improved nutrient uptake, plant growth and plant tolerance to abiotic and biotic stress (Bhardwaj, 2014).

The aim of present investigation was to study the effect of bio-organic fertilization on cucumber seed production.

MATERIAL AND METHODS

Research on the efficacy of biological products and herbal extracts was performed under laboratory and field conditions.

For the experiment, the following materials were used:

- cucumber seeds - ”Mapamond” cultivar;
- fertilizers allowed in organic agriculture (Table 1);
- distillated water;
- syringes for the preparation of fertilization solutions;
- the land chosen for the experiment;
- agriculture manual sprayer;
- scale for weighing cucumber seeds.

Table 1. The list of organic fertilizers used in experiment

Var	The product	Active substance	C (%)
V1	Funres	Extracts of *Mimosa tenuiflora* and citrus	0,25
V2	Blocks	Seaweed extract	0,25
V3	*Azospirillum lipoferum*	*A. lipoferum*	1
V4	*Azotobacter chroococcum*	*A. chroococcum*	1
V5	*Bacillus megaterium*	*B. megaterium*	1
V6	Rom-Agrobiofertil NP	Mix bacteria of *A. lipoferum, A. chroococcum* and *B. megaterium*	3
V7	Cropmax	The combination of microelements, amino acids, vitamins and polysaccharides	0,17
V8	Control	x	x

The land area for the experiment was 224 m^2. The experimental design used was random complete blocks with four replicates. It was chosen that a variant should be 5 m long and 1,4 m width which means that its surface was 7 m^2.

Two fertilizers treatments were performed in at a distance of eight days, in different phenophases, flowering and fruit setting.

For the preparation of the treatment solution a certain amount of substance was used from the fertilization product (Table 2).

Table 2. Fertilizers and water quality used in experiment

Variant	The product	Quantity of substance (ml)	Quantity of water (l)
V1	Funres	5	2
V2	Blocks	5	2
V3	*A. lipoferum*	14	2
V4	*A. chroococcum*	14	2
V5	*B. megaterium*	14	2
V6	Rom-Agrobiofertil NP	42	2
V7	Cropmax	3	2
V8	Control	x	x

To calculate the amount of seeds/ha, 10 cucumber fruits were chosen from each repetition, the seeds were removed, washed, dried and then weighed. An average was made, the quantity of seeds/fruit was calculated and depending on the number of plants and the number of fruits/ha from each repetition, was obtained the total quantity of cucumber seeds in kg ha^{-1}.

RESULTS AND DISCUSSIONS

Based on worldwide demand for biofertilizers since the last decade, we focused in our work on development of eco-friendly practices and technics to reduce the reliance on chemically derived fertilizers.
From figure 2 it can be observed that the highest quantities of seeds/fruit were obtained in the variants treated with Rom-Agrobiofertil NP (V6) - 2,7 g/fruit, respectively Cropmax (V7) - 2,5 g/fruit.
The smallest quantities of seeds/fruit had the variants treated with Funres (V1) obtaining only 1,6 g/fruit and *A. chroococcum* (V4) - 1,8 g/fruit.

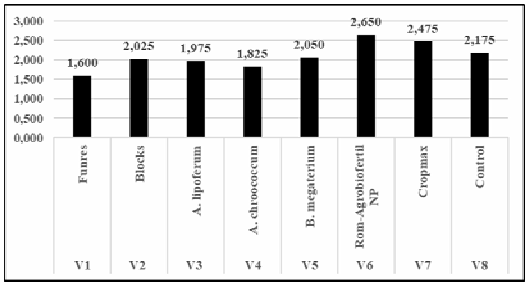

Fig. 2 The amount of seeds per fruit (g)

It can be seen from figure 3 that the variants with the highest number of fruits/ha are those treated with Rom-Agrobiofertil NP (V6) - 120.000 fruits/ha and *A. chroococcum* (V4) - 109.800 fruits/ha.

The lowest number of fruits/ha were obtained for the variants treated with *A. lipoferum* (V3) - 84.000 fruits/ha and for the control variant (V8) - 94.800 fruits/ha.

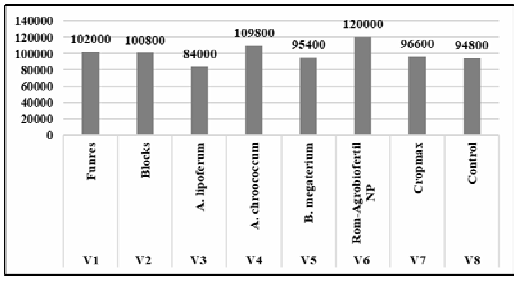

Fig. 3 Total number of fruits/ha

It can be observed from figure 4 that the most efficient variants that produced the largest quantities of seeds/ha are those treated with Rom-Agrobiofertil NP (V6) - 318 kg ha^{-1} and Cropmax (V7) - 239 kg ha^{-1}.
The lowest quantities of seeds/ha were obtained by the variants treated with Funres (V1) - 163 kg ha^{-1} and *A. lipoferum* (V3) - 166 kg ha^{-1}.

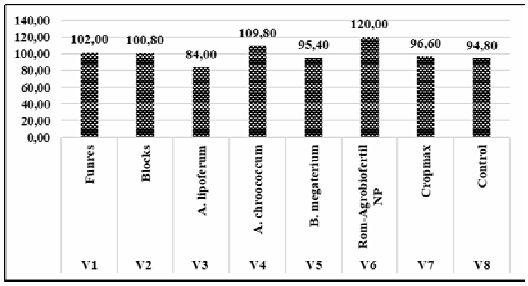

Fig. 4. The amount of seeds/ha (kg) for each variant

CONCLUSIONS

The best results in obtaining cucumber seeds had the variant treated with Rom-Agrobiofertil NP (V6), with a quantity of 318 kg ha^{-1}, while at the opposite pole, the lowest yield had it the variant treated with Funres with 163 kg ha^{-1}.

In general, yield improvement is not usually expected with organics and biofertilizers. However, the study demonstrates the suitability of *Mapamond* variety to ecological cultivation and also the influence of ecological fertilizers on cucumber seed yield.

ABSTRACT

The paper presents preliminary experimental results of the influence of seven ecological fertilizers on the cucumber seeds yield in ecological farming system conditions. The experiment took place in 2019 and the biological material was represented by *Mapamond* cucumber variety, developed at the Vegetable Research and Development Station Bacău, approved in 2006. The experimental device included seven fertilizers: Funres, Blocks, *Azospirillum lipoferum, Azotobacter chroococcum, Bacillus*

megaterium, Rom-Agrobiofertil NP, Cropmax, by comparison with control variant (untreated). Investigations related to yield components were registered. Rom-Agrobiofertil NP and Cropmax variants exhibit the strongest influence on the seed yield. The highest quantities of cucumber seeds were obtained in the variants treated with Rom-Agrobiofertil NP (V6) - 318 kg ha^{-1} and Cropmax (V7) - 239 kg ha^{-1}. The study demonstrates the suitability of *Mapamond* variety to ecological cultivation and also the influence of ecological fertilizers on cucumber seed yield.

ACKNOWLEDGEMENTS

This work was supported by a grant of the Romanian Ministery of Research and Innovation, CCCDI - UEFISCDI, project number PN-III-P1-1.2-PCCDI-2017-0850/ contract 14 PCCDI /2018, within PNCDI III.

REFERENCES

1. ANANDARAJ, B., DELAPIERRE, L.R.A., 2010 - *Studies on influence of bioinoculants* (*Pseudomonas fluorescens*, *Rhizobium* sp., *Bacillus megaterium*) *in green gram*. J. Biosci. Technol., vol 1, pp. 95-99.
2. BHARDWAJ, D., ANSARI, M.W., SAHOO, R.K. *et al.,* 2014 - *Biofertilizers function as key player in sustainable agriculture by improving soil fertility, plant tolerance and crop productivity*. *Microb Cell Fact* **13,** 66 (. https://doi.org/10.1186/1475-2859-13-66.
3. HAYAT, R., ALI, S., AMARA, U., KHALID, R., AHMED, I., 2010 - *Soil beneficial bacteria and their role in plant growth promotion: A review*, Annal. Microbiol., vol 60, pp. 579-598.
4. HONG-MEI, Z., HAI-JUN, J., XIAO-TAO, D., TING, H., 2014 - *Effects of application of organic and inorganic fertilizers on the growth, yield Quality of cucumber in greenhouse*. J. of P. N. and Fertilizer, pp. 247-253.
5. KHAN, A.A., JILANI, G., AKHTAR, M.S., NAQVI, S.S., RASHEED, M., 2009 - *Phosphorus solubilizing bacteria: Occurrence, mechanisms and their role in crop production*. J. Agric. Biol. Sci., vol 1, pp. 48-58.
6. MAHATO, P., BADONI, A., CHAUHAN, J.S., 2009 - *Effect of azotobacter and nitrogen on seed germination and early seedling growth in tomato*. Researcher, vol. 1, pp. 62-66.
7. MOHAMMED, W.F., 2017 - *Effect of bio-organic fertilization in some nutrients availability, growth and yield of cucumber (Cucumis sativus L.)*. IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS), vol. 10(10), pp. 13-17.
8. RAJA. J., 2013 - *Biopesticides and Biofertilizers: Ecofriendly Sources for Sustainable Agriculture Biofertil Biopestici*, 4:1 http://dx.doi.org/10.4172/2155-6202.1000e112
9. SAEED, K.S., AHMED, S.A., HASSAN, I.A., AHMED, P.H., 2015 - *Effect of Bio-fertilizer and Chemical Fertilizer on Growth and Yield in Cucumber (Cucumis sativus) in Green House Condition*. Pakistan Journal of Biological Sciences, vol. 18, pp. 129-134.
10. SHAHDI KOMALAH, A., 2010 - *The investigation of effects of there promoting biological organic products and plant growth regulator on the qualitative and quantitative yield of rice (Oriza sativa)*. Research Report of Special Project in Years 2008, 2009, Rice Research Institute, Iran.
11. Vessey, J.K., 2003 - *Plant growth promoting rhizobacteria as biofertilizers*. Plant Soil, vol. 255, pp. 571-586.
12. WU, S.C., CAO, Z.H., LI, Z.G., CHEUNG, K.C., WONG, M.H., 2005 - *Effects of biofertilizer containing N-fixer, P and K solubilizers and AM fungi on maize growth: A greenhouse trial*. Geoderma, vol. 125, pp. 155-166.
13. ZAKARIA, A.A.B., 2009 - *Growth optimization of potassium solubilizing bacteria isolated from biofertilizer*. Engineering Thesis, Faculty of Chemical and Natural Resourses Engineering, University Malaysia, Pahang, Malaysia.

AUTHORS ADDRESS:

MUSCALU SEBASTIAN - PETRU, BREZEANU PETRE MARIAN, CALARA MARIANA, BUTE ALEXANDRU - Vegetable Research and Development Station Bacău, Calea Bârladului, No. 220, Bacau, code: 600388, e-mail: fonseba27@yahoo.com; brezeanumarian@yahoo.com; calaramariana@gmail.com; alexandru.bute@outlook.com;

MUNTEANU NECULAI - "ION IONESCU DE LA BRAD" University of Agricultural Sciences and Veterinary Medicine Iaşi, e-mail: nmunte@uaiasi.ro.