Scientific Papers. Series B, Horticulture. Vol. LXIV, No. 1, 2020
Print ISSN 2285-5653, CD-ROM ISSN 2285-5661, Online ISSN 2286-1580, ISSN-L 2285-5653

COMPARATIVE EVALUATION OF THE ECONOMIC EFFICIENCY BY THE APPLICATION OF BIOPRODUCTS FOR FERTILIZING WITH BIOLOGICAL GROWING OF MIDDLE EARLY TOMATOES

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Abstract

The experimental work was carried out during the period 2014-2016 at the experimental field of Technical University of Varna. There have been tested biological products for fertilizing: Biosol, Biofa and Emosan with determinant tomatoes, variety Kopnezh F_1, being grown with two plans - single-row and two-row scheme. The purpose of the research is to be realized an evaluation of the economic efficiency by the fertilizing and way of growing of middle early tomatoes in the conditions of biological agriculture. The highest profitability and rate of profitableness average for the period of research is established with combined fertilizing with Emosan + Biofa, respectively 2,00 % for the one-row and 2,18 % for the two-row scheme. There have been established higher values of the total incomes with the two-row scheme of growing, which is due to the higher realized yield. The total income with variety Kopnezh F1 average for the period is from 8 226.30 BGN/da for the control up to 10 724,70 BGN/da for the combination of Emosan + Biofa with the two-row scheme of growing. The high values of the economic indexes, in combination with the high average yield, determine the feeding up with Emosan, put independently or combined with Biofa with both schemes of growing as economically justified and appropriate for biological production of middle early tomatoes.

Key words*: bioproducts, economic evaluation, growing, organic production, scheme, tomato, yield.*

INTRODUCTION

During the last several years the biological production is one of the sectors, which develops with accelerated rates. The development of the bio-sector emphasizes not only on the production of safe foodstuffs, but also provides opportunity for sustainable income of the population, combining the traditions, innovations and environment protection (Dimitrakiev et al., 2016). There is a social effect in the same time as additional incomes of the population are created and new job positions are opened in comparison to the traditional production (Nikolova, 2013; MZH, 2016).

The pursuit of a high economic effect of the put into fertilizers contradicts to the requirement for environmental claims of the agricultural activity. One of the ways for combining the economic efficiency with the environmental claims is the introduction of alternative systems for fertilizing with organic origin, as well as the usage of biological methods for fight with the pests and diseases. Authors prove that the manure, BactoFil B and Lumbrical are an alternative with the biological production of broccoli, but the mineral fertilizers have higher economic effect (Dintcheva, 2013; Borisov & Dintcheva, 2014).

During the last years in countries with developed bio-agriculture the emphasis is put on perfection of the models for fertilizing, based on a more efficient usage of the nutrients and decrease of the quantities put in the soil (Nakano et al., 2003; Pascale et al., 2004; Kolota & Osinska, 2000; Plamenov and Naskova, 2017). Alternatives are sought; ecologically sound solutions for maintaining the nutrient regime, which conform to some of the basic requirements of the vegetable farming - biological control of the soil fertility and realization of an economic effect (Martins, 2010; Tringovska, 2012; Márquez-Hernández, 2013; Naskova, 2017). The vegetable farming is a specific branch where there is a clearly expressed seasonality in the generating of incomes during the farm year (Borisov et al., 2014). This determines lower turnover of the capital, which is invested in this type of

business, higher instability in the financial condition of the farm, as well as the difficult realization of new technological solutions, bringing additional risk for the farmer (Koprivlenski and Dirimanova, 2010). All this determines the Bulgarian farmer's strong reserve towards the biological production and the difficult acceptance of the decision for conversion of the traditionally underlying technology of production in his farm. Having equal other conditions, one of the important motivators for the farmers to realize a transition to the biological production is the economic effect of it (Nikolov et al., 2013). There are researches, which prove that the biological production in Bulgaria has a perspective for development (Mitova, 2010; Mitova, 2011), provided that the farm owners are convinced that it gives them competitive advantage.

For the purpose of organic farming, allelopathy can be an important element in balancing the relationship between density and weeds, pests, diseases and cultivars. Valcheva et al. (2019) establish that the applied concentrations of parsley, carrot, dill and onion extracts had stimulating, inhibiting or indigenous effect on tomato seed germination, growth and accumulation of dry biomass. Positive allelopathic influence have been observed on the height, the number of leaves and the root length of pepper plants for the extracts of roots by marigold and basil (Vlahova, 2014; Vlahova & Yoveva, 2014).

The research purpose is to be analyzed the economic effect of the application of biological products for fertilizing with moderately early tomato production, grown with different planting schemes.

MATERIALS AND METHODS

The experimental work is developed during the period 2014-2016 on carbonate black earth, in the experimental field of department "Plant-growing" at Technical University - city of Varna. One Bulgarian variety determinant tomatoes has been tested with three bio products for fertilizing with two growing schemes in the conditions of biological production. The following bio products for fertilizing have been tested within the research: Biosol, Emosan and Biofa with determinant tomatoes, variety Kopnezh F_1 with two growing schemes: 160/25 cm (single-row band) and 120+40/35 cm (two-row band) at the conditions of the biological production.

The following variants have been included in the research with purpose establishing the effect of the bio fertilizers brought in with the tomatoes:

1. Control - unfertilized;
2. Biosol - 100 kg/da - put in the soil single time, before planting;
3. Biosol - 100 kg/da (soil) + Biofa - (0.3-0.5%) - applied to the leaves: phenophases mass flowering and beginning of fruit formation;
4. Emosan - 20 L/da, put in the soil locally, two times: 15 L/da after planting and 5 L/da in phase mass flowering;
5. Emosan - 20 L/da (soil) + Biofa (0.3-0.5%) - applied to the leaves: phenophases mass flowering and beginning of fruit formation.

The economic evaluation is determined by the means of the indexes (Bogoev et al., 2002): Average realization price - BGN/kg; Prime cost - the proportion between the spent production expenses and the realized crop - BGN/t; Total income - BGN/da; Total expenses - BGN/da; Total income - BGN/da; Profit - BGN/da; Rate of profitability - the proportion of the total income towards the material expenses, %; Rate of profitableness - the proportion of the profit towards the total expenses, %.

RESULTS AND DISCUSSIONS

One of the main questions with inclusion of the biological fertilizing in the technology for moderately early field production of tomatoes is what is its efficiency and which variants of fertilizing are economically profitable, paying and remunerative.

The values of the index total income are directly bound with the quantity of the total crop and the average realization price.

Average for the period 2014-2016 with variety Kopnezh F_1 the realized total income is 8001.60 BGN/da for the control up to 10040.90 BGN/da for the combination of Emosan + Biofa with the single-row scheme of growing (Table 1). The formation of the total income follows the peculiarities of formation of the total income. The control with the two schemes

of growing has the lowest total income for the period of the research - 6261.74 BGN/ da (single-row scheme) and 6486.44 BGN/da (two-row scheme). The highest total income have variants, with which the total income is also the highest. With variety Kopnezh F_1 the highest total income is realized with the variant Emosan + Biofa 7939.54 BGN/da, followed by Emosan 7777.74 BGN/da with the single-row scheme of growing. Higher total income is realized with combined application of the bio products Emosan + Biofa (8623.34 BGN/da), with the two-row scheme, followed by the variant with the independent application of Emosan - 8370.44 BGN/da. Higher values of the total incomes have been determined with the two-row scheme of growing, which is due to the higher realized crop.

The total income average for the period of the experimental work is from 8226.30 BGN/da for the control up to 10724.70 BGN/da for the combination of Emosan + Biofa.

Table 1. Economic results from the fertilization of tomatoes

Variant Yeild, kg/da		Average price, BGN/kg	Total earning, BGN/da	Total expenses BGN/da	Total income, BGN/da
Single-row scheme of growing					
Control	2667.20	3.00	8001.60	1739.86	6261.74
Biosol	3038.50	3.00	9115.20	2163.86	6951.34
Biosol + Biofa	3177.50	3.00	9532.50	2343.86	7188.64
Emosan	3240.50	3.00	9721.60	1943.86	7777.74
Emosan + Biofa	3346.50	3.00	10040.90	2101.36	7939.54
Two-row scheme of growing					
Control	2742.10	3.00	8226.30	1739.86	6486.44
Biosol	3206.40	3.00	9619.20	2163.86	7455.34
Biosol + Biofa	3364.80	3.00	10094.40	2343.86	7750.54
Emosan	3438.10	3.00	10314.30	1943.86	8370.44
Emosan + Biofa	3574.90	3.00	10724.70	2101.36	8623.34

The total income average for the period of the experimental work is from 8226.30 BGN/da for the control up to 10724.70 BGN/da for the combination of Emosan + Biofa.

The impact of the average realization price is less, which is permanent for the separate variants. The spent material expenses are of big significance with the formation of the total income. Determining for them are the prices of the fertilizers, which are used with the tomato growing, which are between 30 and 50%, followed by the labour expenses with the plants growing.

The prime cost of the produce depends on the resources used in its production and the spent total expenses. It is lowest with the variants Emosan with single-row scheme and Emosan+Biofa with the two-row scheme (Figure 1). The changes in the prime cost of the produce influence the modification of the profit, which is manifested by the modification of the total income and the total expenses.

The profit is a summary index, determining the economic benefit, depending on the way of fertilizing, type and dose of the used fertilizers. Unidirectional tendencies in the profit formation are determined average for the period 2014-2016. The highest profit with variety Kopnezh F_1 is realized with combined fertilizing of Emosan + Biofa (3969.77 BGN/da), as the increase in comparison with the control is with 26.8%. High profit is also realized with the variant Emosan (3888.87 BGN/da) with single-row bed.

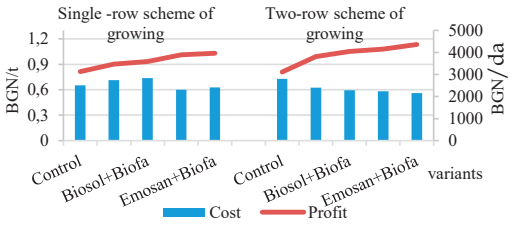

Figure 1. Profit and cost in cultivation of determinant tomatoes

The rate of profitability and the rate of profitableness are indexes, which describe more completely the economic advisability of organization, bringing out and realization of a certain production. The rate of profitability and the rate of profitableness are indexes, which describe more completely the economic advisability of organization, bringing out and realization of a certain production.

Average for the period 2014-2016 all tested variants have high rate of profitability, which shows that the growing of tomatoes as per technology for moderately early field production and the usage of biological fertilizers is economically justified (Figure 2).

The lowest rate of profitability has the control, and the highest has the variant with the

combined soil and leaf fertilizing with Emosan + Biofa. The rate of profitableness is also the highest with the same variant. The quantity of both indexes is determined by the realization of a bigger profit, on the grounds of achieved bigger increase of the total crops. The rate of profitability with the variants of independent fertilizing with Biosol and Emosan is commensurable with the one of variants with soil and leaf fertilizing.

The tendency for high profitability and profitableness with the two-row growing scheme is confirmed. The results are unidirectionalwith the obtained for the single-row scheme.

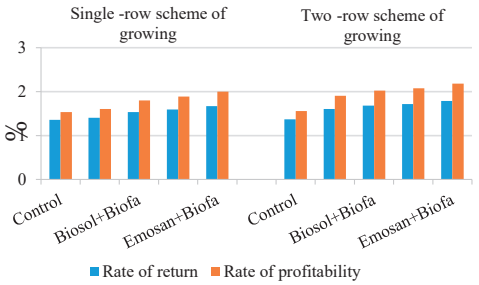

Figure 2. The rate of return and profitability in cultivation of determinant tomatoes

CONCLUSIONS

The biggest economic efficiency of biological tomato production is determined with the combined application of Emosan and Biofa, notwithstanding the growing scheme.

The values of the economic indexes in combination with the obtained crop, determine the fertilizing with the bio product Emosan, brought in independently or combined with Biofa, as economically justified and appropriate for biological production of moderately early tomatoes.

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