Turkish Journal of Agricultural and Natural Sciences
Special Issue: 2, 2014

TÜRK
TARIM ve DOĞA BİLİMLERİ
DERGİSİ

TURKISH
JOURNAL of AGRICULTURAL
and NATURAL SCIENCES

www.turkjans.com

Quality of tomato seedling in application bioproducts

Hriska BOTEVA
The "Maritsa" Vegetable Crops Research Institute, 4003 Plovdiv, Bulgaria
*Corresponding author: hriska_mb@abv.bg

Abstract

The study was performed during the period 2009 - 2011 in the "Maritsa" Vegetable Crops Research Institute, Plovdiv. The effect of organic products Baikal EM – 1У, Bioglobin and Biolan on the quality of seedlings from tomato, variety Yana was studied in unheated glasshouses ro-ON type. Plants were grown on two substrates: peat-perlite substrate and substrate with Lumbrikal. The post-effect of the applied bioproducts on the plant productivity was studied in field conditions. Tomato seeds from Yana variety treated with Bioglobin and Baikal EM1 have a stronger influence on biometric indexes of the seedlings. The best expressed of this is established in weight of a plant and the diameter of the stem, which is decisive for the quality of seedlings. Using substrate with Lumbrikal and treatment of seeds with bioproducts result in increased of plant bio mass to 38.6% compared to the untreated. The greatest increase of yield compared to the control is observed in seeds treated with Bioglobin and Baikal EM1 - with 31.0 % and 29.8 %, respectively. Analogous results are obtained for number and weight of fruits per plant.

Keywords: *Solanum Lycopersicum* L., seedling, biofertilizer, vegetative mass, yield.

Introduction

The tomato is a traditional and economically important vegetable crop in Bulgaria (Ganeva. 2002). The production of quality seedlings is a necessary condition for improvement of the earliness, yield and quality of the produce. (Zaller, 2007; Lazcano et al.; 2009). Important element in organic production of seedlings is the choice of substrate, which provides optimal nutrition and helps protect against pests (Pasev et al., 2012). Vermicomposts have proved to be very promising as substrate amendments in transplants production (Shaheen et al., 2007; Tringovska and Dintcheva, 2012; Dintcheva and Tringovska, 2012). Application of vermicompsts is stimulated the growth of tomato plants, increasing plant aerial biomass, up to 2.2 times compared to untreated control.

It was observed stronger developed root system, higher stems, increased number and weight of the leaves, stronger development of the generative organs as a result of including of Biohumus in the composition of the mixtures (Tringovska, 2005; Atiyeh et all, 2000; Filipov and Kostadinov, 2013). The authors demonstrate the advantages of biofertilizer – absence of phytopathogens, better structure, thermal and water retention ability, more favourable conditions for survival of the microorganisms.

Vlahova (2012, 2013) has established a positive effect of the combined application of biofertilizers on the qualitative indexes and on pepper seedlings. The pre-sowing treatment of pepper seeds with Baikal EM1 and Bioglobin has a positive influence on the quality of seedlings and yield in pepper from 10.9 % to 28.4 % (Boteva and Georgieva, 2013). The electromagnetic treatment improved the sowing properties and morphological characters of tomato (Ganeva et al., 2013).

The purpose of the study was to determine the influence of organic products on the quality of seedlings and productive manifestations of the plants in the field in tomato, variety Yana.

Materıal and Methods

The experimental work was performed during the period 2009 - 2011 in the "Maritsa" Vegetable Crops Research Institute, Plovdiv. Attempts for establishment of the effect of the bioproducts: Lumbrikal, Baikal EM – 1Y, Bioglobin and Biolan on the quality of the seedlings and field experiments were conducted with purpose to study their effect on the biological manifestations of the tomato produce from variety Yana.

I. Effect of the bioproducts on the quality of the seedlings

The experimental work was performed in unheated glasshouses ro-ON type. Plants were grown from seedlings. Experience was set in 4 replications, each replication was composed of 10 plants. Sowing is done with treated seeds in a set:

Variants

1. *Control* – soaking the seeds in H_2O.

2. *Lumbrikal* - Prepare a solution of Lumbrikal and water in a ratio of 1: 1 (v/v). The solution was filtered after 48 h. The seeds are soaked in the extract for 4 hours.

3. *Baikal EM - 1Y* – 1: 100 for 2 h - 1 mL in 100 mL H_2O

4. *Biolan* – 5 drops in 100 mL H_2O for 2 h

5. *Bioglobin* - 8 drops in 100 mL H_2O for 24 h

Seeds are sown on different substrates:

C1*- Peat-perlite substrate - 1: 1 (v/v);

C2**- Substrate with Lumbrikal - Peat 55% vol., Agroperlit 30% vol., Lumbrikal 15% vol.

II. The influence of organic products in growing seedlings in the field

Tomato seedlings were planted in the field by block method in 4 replications by 120+40/40 cm scheme with area of 9,6 m^2. Plants grown by technology for mid-early production.

Description of the bioproducts

Lumbrikal **–** Ecological bioproduct, obtained as a result of nutrition of red Californian worm (*Lumbricus rubellus* Hoffmeister, 1843). with organic remains. It is useful microorganisms rich. Contains nutrients, vitamins, amino acids, antibiotics, hormones (N 1,2-2,0%, P 0,8-1,6**%,** K 0,5-1,0%, Ca 4,0-6,0%, Mg 0,5-1,0%, Fe 0,5-1,0%, 40-50% organic content, humic acids to 14%, fulvo acids to 7%. Used directly or as an aqueous extract. Manufacturer - farm in Kostievo, Plovdiv.

Baikal EM-1Y -biologichen based product *Lactobacillus casei, Lactobacillus lactis, Phodopseudomonas palistris, Saccharomices cerevisiae.*

Bioglobin **–** water-salt extract from the placenta of the animals. Polypeptides with molecular weight 6000-8000 Д.

Biolan **–** product with biological origin, analog to the phytohormones. Plant extract + microelements

Indicators of study:

Biometric parameters of seedlings- weigh /g/, height /cm/ diameter /mm/ stem; number and weight /g/ leaf - analyze 10 plants of replications.

Number of standard fruits per plant; weight of pepper fruit (g fruit -1**) -** analyze 10 plants of recurrence and 10 fruits of replications in mass fruitage.

Yield – kg ha-1

Statistical analysis – all results are the means of four replicates. Data were subjected to Duncan's multiple range test in order to separate the means (Duncan, 1955).

Results and Discussion

The treatment of tomato seeds with bioproducts has a positive influence on the biometrical characters of the seedling. The differences for increase of the vegetative weight of the transplanted plants towards the control are statistically proven. This is well expressed in the root weigh, stem diameter, number and weight of the leaves that is determining for seedlings quality and it is a prerequisite better plant development on the field.

In comparison of the both substrates was established that the plants have better biometrical indexes after the application of substrate with Lumbrikal. The results confirm the examinations obtained for tomato and pepper (Dintcheva and Tringovska, 2012; Vlahova, 2012; Filipov and Kostadinov, 2013). The highest weight of the tomato seedlings was obtained after treatment with Bioglobin 12.09 g, followed by treatments with Baikal EM1 – 11.50 g compared to the control 8.53 g (Table 1). The difference between the variants is not proven mathematically. These plants are also with higher values of the remaining indexes of growth. Analogical results were also obtained for the seedlings grown on peat-perlite substrate. A positive effect was established in the seed treated with Bioglobin and Baikal EM-1U on the both substrates.

The effect of seed treatment is observed first and foremost during the vegetation. The plants easier overcome the stress from the abiotric factors and diseases, which reflects also positively on the yield. The use of bioproducts for pre-sowing processing of the seeds result in increase of yield as it is averagely with 14.7 % on peat-perlite substrate and up to 26.9 % on substrate with Lumbrikal.

The yield of tomato varies within 25950 kg ha-1 /untreated seeds/ to 34002 kg ha-1 /treated seeds with Bioglobin/, as the increase towards the control is with 14.9 % to 31.0 %, respectively.

The effect of the applied bioproducts for all variants is statistically proven towards the control plants. The greatest increase of the yield was established in the variants with seed treatment with Bioglobin - 34002 kg, followed by that treated with Baikal EM - 33700 kg ha-1 – the increase is with 31.0 % and 29.8 %, respectively. The differences are small and insignificant. The results for fruit weight correlate with those for the yield. Seed treatment with bioproducts results in increase of weight averagely with 13.2 g fruit-1

Table 1. Comparative effect of bioproducts on some plant growth indices

Substrate	Variants	Root	Stem			Leaves		Fresh mass of plant
		Weigh g	Weigh g	Height cm	Diameter cm	Weigh g	Numbers	g
C1*	*Control*	0.45 d	1.52 e	12.88 e	0.43 d	3.23 e	4,50 e	5,2 e
	Lumbrical	0.55 c	1.97 d	15.02c	0.54 c	5.13 d	4,88 d	7,65 cd
	Baikal EM	0.68 b	2.01 d	16.85d	0.58 c	5.02 dc	5,05 c	7,71 cd
	Biolan	0.60 b	2.20 c	16.02d	0.52 c	4.82 d	4,90 d	7,62 cd
	Bioglobin	0.75 ab	3.20bc	17.02b	0.62 b	5.53 c	5,30bc	9,48 b
C2*	*Control*	0.52 c	2.17 c	16.23 d	0.50 c	5.84 bc	5,02 c	8,53 c
	Lumbrical	0.65 b	2,93 b	16.82cd	0.57bc	6.23 b	5,45 b	9,81 b
	Baikal EM	0.80 ab	3.70ab	19.05 ab	0 67 b	7.00 ab	6,10ab	11,50 ab
	Biolan	0.67 b	3.05 b	17.65b	0.59 c	6.02 b	5,88bc	9,74 b
	Bioglobin	0.88 a	3.90 a	20.73 a	0.78 a	7.31 a	6,30 a	12,09 a

* Values in columns followed by the same letter are not significant at P<0.05 according to Duncan's Multiply Range Test

C1*- Peat-perlite substrate; C2*- Substrate withLumbrikal

.

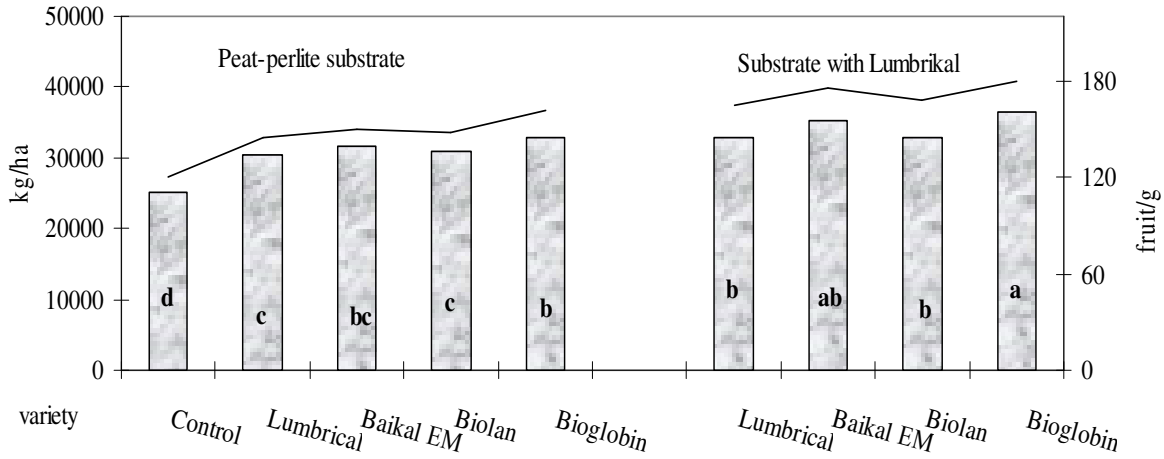

Figure 1. Effect of seed treatment with bioproducts on yield

Analogical results were obtained for fruit number and weight per plant (Figure 2). The results demonstrate that the treatment of seeds with bioproducts enhances the fruit number per plant averagely with 8.3. The greatest increase of this index was recorded in treatment of seeds with Bioglobin and Baikal EM as the differences between the both variants are not statistically proven.

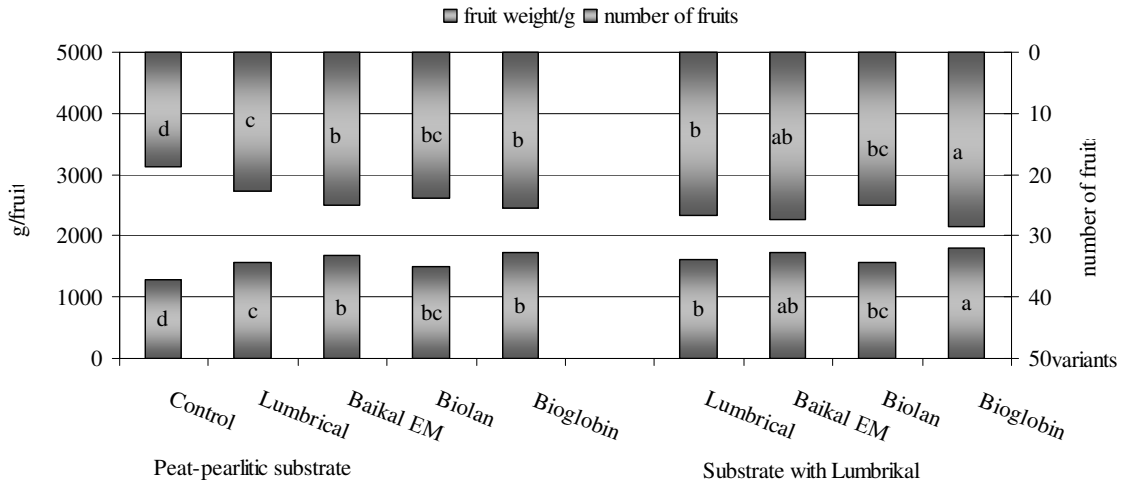

Figure 2. Number and weight of fruits per plant

Conclusion

The pre-sowing treatment of seeds from tomato variety Yana with bioproducts has a positive effect on the biometrical indexes of the seedlings. The including of Lumbrikal in the composition of seedlings mixtures as well as the use of bioproducts for seed treatment results in increase of seedlings weight up to 38.6%, compared to the standard technology.

The greatest weigh of the tomato seedlings was obtained after seed treatment with Bioglobin – 12.09 g, followed by the ones treated with Baikal EM1 – 11.50 g compared to the control plants 8.53 g. These plants are also with proven higher values of the remaining indexes of growth.

The use of bioproducts for pre-sowing treatment of the seeds result in increase of yield as it is averagely with 14.7 % on peat-perlite substrate and up to 26.9 % - on substrate with Lumbrikal. It is established that the greatest increase of yield is recorded in the variant with treatment of the seeds with 14.7 %, followed by that with Baikal EM - 33700 kg ha-1 and the increase is with 31.0 % and 29.8 %, respectively. The differences are small and statistically insignificant. The results for fruit number and weight per plant are analogical.

References

Atiyeh, R. M., Arancon, N., Edwards, C. A. and Metzger, J. D. 2000. Influence of earthworm-produced pig manure on the growth and yield of greenhouse tomatoes. *Bioresource Technology* 75: 175-180

Boteva, Hr. and Georgieva, O. 2013. Application of bioproducts to improve the quality of seedlings of pepper. Plant Science, L., №2, 38-42

Dintcheva, T. and Tringovska, I. 2012. Growth response of tomato transplants to different amount of vermicompost in the potting media . Acta Hort. (ISHS) 960:195-201

Doikova, M., Boshnakov, P. and Cholakov, D. 1993. Handbook for practices in vegetable growing and seed production: 181.

Duncan, D. 1955.Multiple range and multiple F-test. Biometrics.; 11: 1-42.

Ganeva, D. 2002. Tomatoes – food for good health and long life. Scientific conference with international participation “Food, health, longevity - 2002”, Smolian, 04-05 November 2002, 382-386

Ganeva, D., Mihov, M., Palov, I., Sirakov, K. and Zahariev, S. 2013. Results of laboratory tests after pre-sowing electromagnetic treatment of seed of Bulgarian tomato varieties. Agricultural Engineering 3: 13-21.

Filipov, S. and Kostadinov, K. 2013 Influence of amount of Lumbrikomposta on the quality of the thick seedlings of greenhouse tomatoes. Science & Technologies, Plant studies, vol. III, № 6, 182-185.

Pasev, G., Tringovska, I., Kostova, D., Dintcheva, T. and Radeva, V. 2012. Effect of vermicompost on tomato transplant response against *Tomato mosaic virus* (TOMV). Acta Hort. (ISHS) 960:333-340

Rani, S. T., Dev, U., Mathur, S., Rajani, B. and Padmavathi, V. 2008. Algae as Bio - fertilizers. *Int. J. Agric. Environ & Biotech.*, Vol. 1 (№ 4), p. 291-292.

Shaheen., M., Fatma, A., Rizk, Omiama, Sawan, M., and Ghoname, A. 2007. The Integrated Use of Bio-inoculants and Chemical Nitrogen Fertilizer on Growth, Yield and Nutritive Value of Two Okra (Abelmoschus esculentus, L.) Cultivars. *Australian Journal of Basic and Applied Sciences*, 1 (3), p. 307-312.

Spasov V., Tonev, T. and Galnov, I. 1995. Handbook for practices in agriculture: 142.

Tringovska, I and Dintcheva, Tz. 2012. Vermicompost as Substrate Amendment for Tomato Transplant Production. Sustainable Agriculture Research.1:115-122.

Vlahova, V. 2012. Application of the Biofertilisers Baikal EM-1Y and Bio One upon the Production of Pepper Seedlings Cultivated under the Conditions of Organic Agriculture. Journal of agricultural science and forest science VOL. XI, No. 4, Sofia, 39-45.

Vlahova, V. 2013. Influence of the Biofertilisers Emosan, Boneprot and Lumbrical on the Qualityof Pepper Seedlings. Journal of agricultural science and forest science, vol. XII, No. 3–4, Sofia, 85-92.

Zaller, J. G. 2007. Vermicompost as a substitute for peat in potting media: Effects on germination, biomass allocation, yields and fruit quality of three tomato varieties. *Scientia Horticulturae*, 112: 191–199.