BIOPREPARATIONS FOR THE PRODUCTION OF ENVIRONMENTALLY SAFE FOOD - Part II

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Abstract. The effectiveness of the bio fertilizer “NIKFAN” - one of the main biopreparations used in the Biologization System - was studied. This is a new modern biopreparation, which proved to be very effective for cultivating various crops in open and closed ground. In this article, as an example, the results of its application for cultivating cucumber in greenhouses are provided. The influence of the Nikfan biopreparation on the elasticity of leaves and the content of chlorophyll in them has also been confirmed.

Key words: biopreparation, vegetables, cucumber, growth stimulation

INTRODUCTION

BIOIN-NOVO LLC, the developer of the biopreparation “Biofertilizer “Nikfan”, has continued conducting its second year biological efficiency test on cucumber of various breeding variants at the Farming Enterprise “Poisk”, Moscow Region, Russia. Biofertilizer “Nikfan” is designed to increase immunity, stimulate growth and development of plants and is produced by cultivating endophytic fungi [1-5]. It has already been tested on a wide range of plants: vegetables, cereals, fruit trees, and shrubs, flowers, and herbs in different countries: Russia, Colombia, Africa, India, China, Bulgaria, Kazakhstan, and Lithuania [3-7].

The main effects observed after the treatment of seeds and then the vegetative mass of plants are as follows:

- increased germination and germinating capacity of seeds and tubers;
- increase in root formation (length and thickness of roots, the number of thin rootlets);
- increase in the size of fruits, corms, increase in the number of large fruits;
- enhanced nitrogen fixation, photosynthesis, leaf surface of plants and, as a result, increased yields;
- increased frost resistance and drought resistance;
- increased resistance to fungal diseases and reduced number of chemical fungicides applied;
- improved growth of rootstock and graft;
- increased quality of plants (increase in the gluten content of grain, technological properties of fiber, sugar content, vitamins);

- increased growth of shoots, bushiness, decrease in the lag in the ovaries;
- accelerated ripening by 1.5-2 weeks.

The second year test was aimed at confirming the effect of the Nikfan biopreparation obtained earlier on the Farming Enterprise “Poisk”, Moscow Region, Russia. The tests were carried out in polycarbonate heated ground greenhouses from December 27, 2016 to May 25, 2017. The aim of the studies was to confirm the high efficiency of the Nikfan biopreparation and its influence on the growth and development of cucumber seed plants.

MATERIALS AND METHODS

At the beginning of the cucumber growing process, the seeds were treated with a working solution of the biopreparation in a concentration of 8 ml per liter of water for 1 hour. In the control, water was used instead of the preparation. The first treatment of plants was carried out in Phase 1-2 of the leaves: before planting in the greenhouse, the concentration of the preparation was 3 ml/l of water, after planting in the greenhouse on a permanent place - 8 ml/l. Treatments were conducted every 10 days. To determine the functional state of the leaf cells membranes, the 0.5 cm diameter samples thereof were placed in bidistillate, incubated for 24 hours in a thermostat at 26°C, and measured the conductivity of the eluate on a conductivity meter. Then, the content of K^+ and Na^+ ions in the eluate was determined potentiometrically using ion-selective electrodes. Photosynthetic leaf pigments were analyzed by spectrophotometric method according to the conventional procedure [8].

RESULTS AND DISCUSSION

During growth of the cucumber plants, it was found that the seedlings were characterized by a more saturated green color, looked stronger and healthier in

comparison with the plants from the control group as shown in Fig. 1. Table 1 shows the scheme of test options that includes treatment of both the seed and the vegetative plants in their different variants.

Fig.1 Cucumber leaves treated with Nikfan (A) and without any treatment (B)

Table 1. Plant Treatment Scheme

Stage	Options							
	1	2	3	4	5	6	7	8
Seeds	+	+	+	-	-	-	+	-
Tubers	-	+	+	+	+	-	-	-
Plants	-	-	+	-	+	+	+	-

«+» – treatment, «-» – without treatment.

As a result of the treatment of plants, the following parameters were registered: the number of fruits, the total weight of the fruit, and the average weight of the fruit. Accounting was conducted every 2-3 days. Table 2 summarizes the

results. In addition, leaves were taken from the central part of the stem to analyze the chlorophyll content and the electrolyte ions output to determine the elasticity of the leaves. The results are shown in Tables 3 and 4.

Table 2. Results of biopreparation Nikfan application in cucumber seed-growing

Biopreparation Nikfan, Batch № 25		
Number of fruits, pcs. (Percentage of excess vs control)	Fruit weight, g	Average weight of 1 fruit, g
830 (27,6 %)	85575 (46, 4 %)	102.8 (27, 7 %)
Control		
650	58430	80,45

Biopreparation Nikfan, Batch № 9		
1128 (49, 8%)	86875 (55, 9%)	74.6 (6, 1 %)
	Control	
753	55720	70,3
TOTAL:		
Obtained with Nikfan		
1958 (39, 5 %)	172450 (51,0 %)	88.7 (75, 3 %)
1403	114150	75,3

Table 3. Permeability of the cell wall and content of K^+ and Na^+ ions

Parameter	Option	Treated with Nikfan, Batch No. 9		Treated with Nikfan, Batch No. 25
		Cucumber Variety		
		“Express”	“Ekipazh”	“Trapezny”
Electrolytes ions output in the eluate relative to their total content in cells, %	Control	29.17	34.49	34.29
	Active	29.04	31.98	31.74
Ions K^+ output in the eluate relative to their total content in cells, %	Control	2.60	2.90	3.36
	Active	1.60	2.18	2.43

Table 4. Chlorophyll content in leaves, mg per 1 g of raw material

Chlorophyll	Option	Cucumber Variety		
		Express F1	Forward F1	Trapezny F1
Chlorophyll “a”	Control	1.03	1.40	1.53
	Active	1.81	1.42	1.67
Chlorophyll “b”	Control	0.45	0.59	0.64
	Active	0.70	0.55	0.68
Chlorophyll total “a+b”	Control	1.48	1.99	2.17
	Active	2.51	1.97	2.25
Chlorophyll Ratio (“a/b”)	Control	2.29	2.37	2.39
	Active	2.59	2.58	2.46
Sum of chlorophyll and carotinoids (“x+c”)	Control	0.21	0.27	0.32
	Active	0.38	0.30	0.33

CONCLUSION

From the received data it is obvious that treatment with biological preparation "NIKFAN" can strengthen plants. As a result of the treatments, cell membranes become less "leaking", that is, they are more stable and elastic. There are differences which depend on the variety. The content of pigments (chlorophyll A and B) in the treated plants is also higher. The biopreparation Nikfan in the seed production of cucumber results in increased productivity of the plants as to the number of fruits by 39.5%, the weight of the fruit by 51%, and the average weight of the fruit by minimum 27 %.

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БИОПРЕПАРАТИ ЗА ПРОИЗВОДСТВО НА ЕКОЛОГИЧНО БЕЗОПАСНИ ХРАНИ – ЧАСТ II

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Резюме: Проучена е ефективността на биотора "Nikfan", който е един от основните биопрепарати, използвани в биологизираща система. Той е нов и модерен биопрепарат, който се оказва много ефективен за отглеждането на различни култури на открит и закрити площи. В настоящата статия като пример са представени резултатите от неговото приложение при култивиране на краставици в оранжерии. Влиянието на биопрепарата „Nikfan” върху еластичността на листата и съдържанието на хлорофил в тях също е потвърдено експериментално.

Ключови думи: биопрепарати, зеленчуци, краставици, стимулиране на растежа

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