

USAGE OF BIOLOGICS ON TOMATOES AND PEPPERS

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Abstract: In fruit growing, nowadays a lot of chemical products are used (insecticide, fungicide etc.) in order to protect the plants. However, lately the markets are in need of gardening products which are not treated with pesticide but protected with biologics. In gardening, biological fight against the insects and the diseases is not much maintained because the shares are lower and the gardening products are on a great demand and are very profitable. Due to the great profit of the gardening products, less attention is paid to the biological fight for protection. However, the great environmental pollution evokes great interest in consuming healthy gardening products.

Due to the mentioned reasons, lately, fruit producers show interest for usage of biologics to protect the gardening products from some insects and diseases. There appear to be many biologics but the producers of gardening products are not well informed because the interest of usage of biologics is not high. By all means, the market provides verified biologics which show good production results. The great interest in usage of biologics to protect the gardening products from diseases and insects increases, whereas the interest of research institutions to discover better biologics is getting bigger.

Key words: biologics, biological fight, gardening products

Introduction

In agriculture in order to provide greater production, in accordance with agro technical scales, the fight with different diseases, insects and weed different chemicals are used which can have negative effect on the plants, the useful micro flora in the soil especially the consumer. In tendency of production of healthy food which is lately on a great demand in the world markets, the emphasize is on the usage of biologics to protect the plants from insects and diseases.

Due to the mentioned reasons we set a goal to explore the possibility to use biologics against some insects and diseases on some plants. For the exploration, two biologics are included whereas one of them has insecticide and the other fungicide effect.

FORAY 48 B is made of *Bacillus thuringiensis var. Kurstaki* which includes live cells and around 17 billion cells in 1cm³. Before it is used, it is dissolved in water, in 2,3% concentrate. It can be used to treat the fruit regardless its phase of development (until it starts to ripen).

AGT 25 K is made of 4 types of bacteria *Pseudomonas sp.* which produce 12 compounds with antibiotic character. It has fungicide effect, therefore we use it to protect the gardening products from some phi-to pathogenic diseases.

Materials and method

The exploration included the following biologics: **FORAY 48 B and AGAT 25 K**. It was performed in the region of Bitola because tomatoes and peppers can be found there. Due to safety, the two biologics were tested in a laboratory because they are imported and could be used in our climate and ecological conditions. The number of bacteria in 1cm³ was tested and afterwards the evidence which should be used in field conditions for the cause of the exploration. Furthermore, microbiological examinations have been made in terms of their contamination with other side microorganisms.

The examinations were made in three regions: Strumica, Gevgelija and Valandovo. Tomatoes and peppers have been planted on areas of 100 m² (100 m² with tomatoes and 100 m² with peppers) (3 x 100 m² with tomatoes and 3x 100 m² with peppers). This means 100 m² with tomatoes and 100 m² with peppers have been planted in all three regions (Strumica, Gevgelija and Valandovo).

Results and discussion

Biological FORAY 48 B was dissolved in water during use on the level of 2.3%, and then it was sprayed on tomatoes and peppers. This kind of dissolving achieves number of bacterial cells at approximately 17 billion on cm³ which is enough to cover most of the plant organs (leaves etc.). The results of these examinations are presented in Table 1.

Table 1 – Insecticide effect on FORAY 48 B on tomatoes and peppers

Variables of examination	Tomatoes		Peppers	
	Aphids <i>Fam. Aphididae</i>	Whitefly <i>Fam. Aleyrodidae</i>	Aphids <i>Fam. Aphididae</i>	Whitefly <i>Fam. Aleyrodidae</i>
Strumica	strong	average	Strong	average
Valandovo	strong	average	strong	average
Gevgelija	strong	average	strong	average

The examined insects were:

- Whitefly: *Trialeurodes vaporariorum* Westw
- Aphids: *Myzis persicae* Sulzer., *Aphis fabae* Scop., *Aphis gossypii* Glov., *Aulacorhynchus solani* Kltb.

These examination results have shown that the biological FORAY 48 B has smaller influence on the whitefly on both tomatoes and peppers compared to his influence on aphids. However, FORAY 48 B can be used as a biological insecticide for aphids and whitefly elimination on tomatoes and peppers, especially in rainy years, because in those weather conditions it is expected a massive appearance of whiteflies and aphids.

Seeing these results we can conclude that this biological can fully replace chemicals which are used as insecticides for whiteflies and aphids elimination, in order to get healthy products of tomatoes and peppers.

In Table 2 we can see the results from the influence of the biological AGAT 25 on some dangerous diseases of tomatoes and peppers. This biological showed highly fungicidal phytopathogenic action on many dangerous diseases of tomatoes and peppers.

Table 2 - Antimicrobial effect of AGAT 25 K on some diseases of the tomatoes and peppers

Causes of diseases	Quantity of AGAT 25K	
	0,05 g/m ²	5 g/m ²
P.capsici	0 (no increase)	0 (no increase)
P. infestans	0 (no increase)	0 (no increase)
A.solani	0 (no increase)	0 (no increase)
B. cinerea	0 (no increase)	0 (no increase)
S. lycopersici	+ (little increase)	+ (little increase)
L. taurica	0	0
Staphilococcus luteum	0	0
Botrytis sp.	0	0
Phylloxera	0	0

From the results it can be concluded that AGAT 25 K has a strong effect on the dangerous diseases of the peppers and tomatoes, and can be very successfully used as a biological preparation for protecting the tomatoes and the peppers from some insects and diseases as a replacement for the chemical preparations that the agriculturists use, because they can come to those chemical preparations. In order to include the gardening producers in the production of healthy garden products, it is necessary for them to be educated about the usage of biological preparations in the garden production because the Republic of Macedonia is a well-known gardening region in Europe where healthy garden products can be provided.

Table 3 – Quantity of AGAT 25K and time of its usage in the wine-production

Spraying	Time	Quantity
First spraying with AGAT 25K	In the phase of budding	20g/ha
Second spraying with AGAT 25K	In the phase of developed leaf mass	30 g/ha
Third spraying with AGAT 25K	In the phase of blossom	30 g/ha
Fourth spraying with	In the phase of blossom	40 g/ha

some fungicide against wheat rust		
Fifth spraying with AGAT 25K	In the phase before the beginning of the	20 g/ha
Sixth spraying with AGAT 25K	15 days before the harvest	10 g/ha

If this recommendation is used for the usage of AGAT 25K during the vegetation of the tomatoes and the peppers, the protection from these inspected pests is successful and the agricultural producers will produce healthy tomatoes and peppers.

Conclusion

If we analyze the results presented in the charts, we can come to the following important conclusions:

1. The biological war for the protection of the tomatoes and the peppers from some dangerous pests and diseases is successful for the production of healthy products from garden products.
2. FORAY 48 B through the species of bacteria *Bacillus thuringiensis* var. *Kurtsaki* has a successful impact on the elimination of the dangerous insects (lice and white winged lice) that cause the decrease of the harvest from the gardening.
3. AGAT 25 K is a very successful biofungicide that protects the tomatoes and the peppers from the dangerous diseases and helps the production of healthy garden products.

Several results have been published about the biological fight against the harmful insects using biologics. A lot of literature about biologics use with *Bacillus thuringiensis* can be found in the American literature (Kaufman and Kamerun, 1992), also in the Russian literature etc.

In our country little is being done for the biological fight using *Bacillus thuringiensis*, therefore these results will be the first of this kind.

Some results can be found about the use of AGAT 25 K in the Japanese literature and (Jang Shi, 1987) and in the Russian literature (Lebanov, 1989).

In our country hasn't been worked on the biological fight using this biologic so far, therefore these results will be the first of this kind.

Literature

1. Agros, G. 1988: Plant pathology. Academic press. Inc., 1-803.
2. Aleksic, Z., Aleksic, Dobrila, Sutic. D.1990: Bolesti povrca I njihovo suzbijanje. Nolit, Beograd.
3. Daxl, R. Integrated Pest Management. GTZ. TZ. Verl. Rossdorf.
4. GTZ, 2009: Водич за имплементација на правилникот за начините на земање на мостри од храна. Macedonian.German development cooperation, Скопје, ГТЗ, ISBN 978-608-65036-3-5, Скопје.
5. Commission Regulation (EC) No 884/2007 on emergency measures suspending the use of E 128 Red 2G as food colour .
6. Commission Regulation (EC) No 1334/2008 on flavourings and certain food ingredients with flavouring properties for use in and on foods and amending Council Regulation (EEC) No 1601/91, Regulations (EC) No 2232/96 and (EC) No 110/2008 and Directive 2000/13/EC.
7. Codex standard for processed tomato concentrate, CODEX STAN 57-1981.
8. Kaufman and Kamerun , A.,1992 : Influenci of the Bioinsecticide of the Agriculture. Canadian Jour.
9. Krasilnikov , O. 1980 : Primena biopreparatov v selkohazjasvo. Mikrobiologija, vol.10, Moskva .
10. Jan Si. 1987: Biological protection. Tokio.
11. Lazarevska, Stanislava, Jovan;ev, P.2001: Integralna zaštita a kompirot. Зем. Фак., Скопје.
12. Maceljiski, M., Kispatic, J. 1987. Zaštita povrca. Znanje, Zagreb.
13. Maceljiski, M. 1997: Zastita povrca od stetocinja. Znanje, Zagreb.
14. Postolovski, M., Pej~inovski, F., Kostov, T., Nakova, Roza. 2000: Pregled na pesticidite registrirani vo Republika Makedonija. Zdr. za zaštna rast. na R. Makedonija, Skopje.

15. Risteovski, B., Kiprijanovski, M., Kiprijanovska H. and Ziberoski, J. (2004): Maintenance of soil surface in integrated and organic pear and apple production. Sym. For Ecology in Novi Sad.
16. Rostov , i. 1988 : Primena na AGAT 25 K vo zemedeliето . Mikroiologija, vol.10, Moskva
17. Ziberoski J. ,2000 : Primena na AGAT 25 k vo zemjodelstvoto . Izveštaj za Ministerstvoto za zemj.elstvo.
18. Ziberoski J.,2000 : Primena na AGAT 25 K vo oran`eriskoto proizvodstvo na domati i krastavici . 9-to Sov.za zaš. na rast. Ohrid.
19. Petreska Meri, 2013: Interakciski odnos na mikroorganizmite i herbicidite vo po~va nasadena so domati. Doktorska disertacija, MIT Univerzitet Skopje.