

APPLICATION OF PROBIOTICS IN TOBACCO PRODUCTION - POSSIBILITY FOR PROTECTION AGAINST DAMPING OFF DISEASE ON TOBACCO SEEDLINGS

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ABSTRACT

A long-term usage of chemicals in crop protection causes various negative effects such as resistance to pathogens, residues, expensive and not always effective protection, etc. The consumers demand for pesticide-free food imposed the need to substitute these products in agricultural production. EM technology develops the concept of probiotics and their use in farming. Its basic principle is to apply and increase the population of effective and useful microorganisms in soil, which will displace degenerative microorganisms, especially soil pathogens.

The aim of this study was to determine the impact of probiotics on damping off disease and the possibility for their application in protection of tobacco seedlings.

Investigations were made with the enhanced probiotic - the biofungicide Ema 5 (300 ml/100 m²) and the preparation EmFarma Plus (1000 ml/100m²) in different variants - as standalone application of biofungicides or in combination.

In both assessments of the percentage of infected area, the highest intensity of attack was noted in the variant where both agents were applied 15 days after sowing. The lowest intensity was recorded with combined application of the biofungicide Ema 5 with preparation EmFarma Plus in the soil before sowing. These results were obtained in both cases: without the use of herbicides or with their application after sowing. Minimum two treatments are needed to achieve the full effect.

The tested preparations reduced the intensity of attack and can be used in the control of damping off disease on tobacco seedlings. Accordingly, probiotics have a good perspective in sustainable tobacco production.

Keywords: probiotics, EM-technology, tobacco seedlings, damping off, intensity of attack

INTRODUCTION

The integrated system of sustainable agricultural production is based on the principles of ecology and relationships between organisms and the environment. One of the main concepts of environmental management oriented towards sustainable agricultural production is the introduction of the EM-technology.

The basic principle of this technology is the application of probiotics in agriculture, in order to increase the population of effective and beneficial microorganisms in the soil. They eliminate degenerative microorganisms, especially soil pathogens and create a healthy environment for plants.

The increase of microorganisms that promote plant growth in the rhizosphere, beside its stimulating effect, reveals the main mechanisms of biological control: competition for food and space, creation of inhibitory substances and induced systemic resistance of plants to multiple pathogens. There are numerous data on the effect of probiotics on plant development and also on their antimicrobial activity and prevention of plant pathogens attack. In this respect, we should emphasize the role of the preparation Ema 5, which is mainly applied as a biofungicide. Certainly, the biological impact of a product should be tested in the specific conditions of cultivation of each crop.

The goal of the investigation was to study the use of probiotics in the production of tobacco seedlings and to determine the effect of the products EmFarma Plus and Ema 5 on pathogenic fungi *Pythium debaryanum* and *Rhizoctonia solani* - the causing agents of damping off disease. In addition, our aim was to study the effect of applying Ema 5 alone or in combination with EmFarma Plus and to determine the best model of application, using traditional agro-technical measures.

MATERIAL AND METHODS

Investigations were made on tobacco seedlings grown on adequately treated soil.

Tobacco seed of the variety P-66-9/7 was planted at a rate of 6,75g/10m².

Each treatment was made with three replications, each of 3,33 m².

EmFarma was applied in a rate of 1000 ml/100m², i.e. 30 ml/3,33 m².

Ema 5 was applied in a rate of 300 ml/100 m², i.e. 10 ml/3,33 m².

Tobacco seed (2,25 g/3,33 m²) was soaked in 3 ml prepared solution of EMFarma 100 ml/10m² and stored 24 hours before sowing.

The herbicide Gamit 4 EC was applied in all variants in a rate of 0,07ml/m².

The second treatment of all variants (including the post-emergence variants) was applied 15 days after. The standard variant was treated with fungicides Top M (0,1%) and Ridomil (0,25%) and fertilized the previous day with 15g/m² ammonium nitrate.

During investigation, seedlings were observed on daily basis and followed both for its growth and for damping off disease.

Two assessments of damping off were made (prior to the second and third treatment)

The percentage of infected area was calculated for each variant in three replications and average values were analyzed.

The graphic presentation shows the mean values of the two assessments of disease intensity.

Table 1. Variants and treatments

No	Variants	Treatment	
1	Check, untreated		
2	Standard treatment (herbicide, fungicide and saltpetre)		
3	EmFarma Plus +Ema 5; herbicide	EmFarma Plus + Ema 5	EmFarma Plus + Ema 5
4	Ema 5; without herbicide	after emergence of seedlings Ema 5	Ema 5
5	Ema 5; without herbicide	Ema 5	Ema 5
6	EmFarma Plus +Ema 5 after emergence of the seedlings; herbicide	after emergence of seedlings EmFarma Plus + Ema 5	EmFarma Plus + Ema 5
7	EmFarma Plus +Ema 5; without herbicide	EmFarma Plus + Ema 5	EmFarma Plus + Ema 5
8	Seed with EmFarma Plus +soil with Ema5; without herbicide	EmFarma Plus + Ema 5	EmFarma Plus + Ema 5
9	Seed with EmFarma Plus +soil with Ema5; herbicide	EmFarma Plus + Ema 5	EmFarma Plus + Ema 5

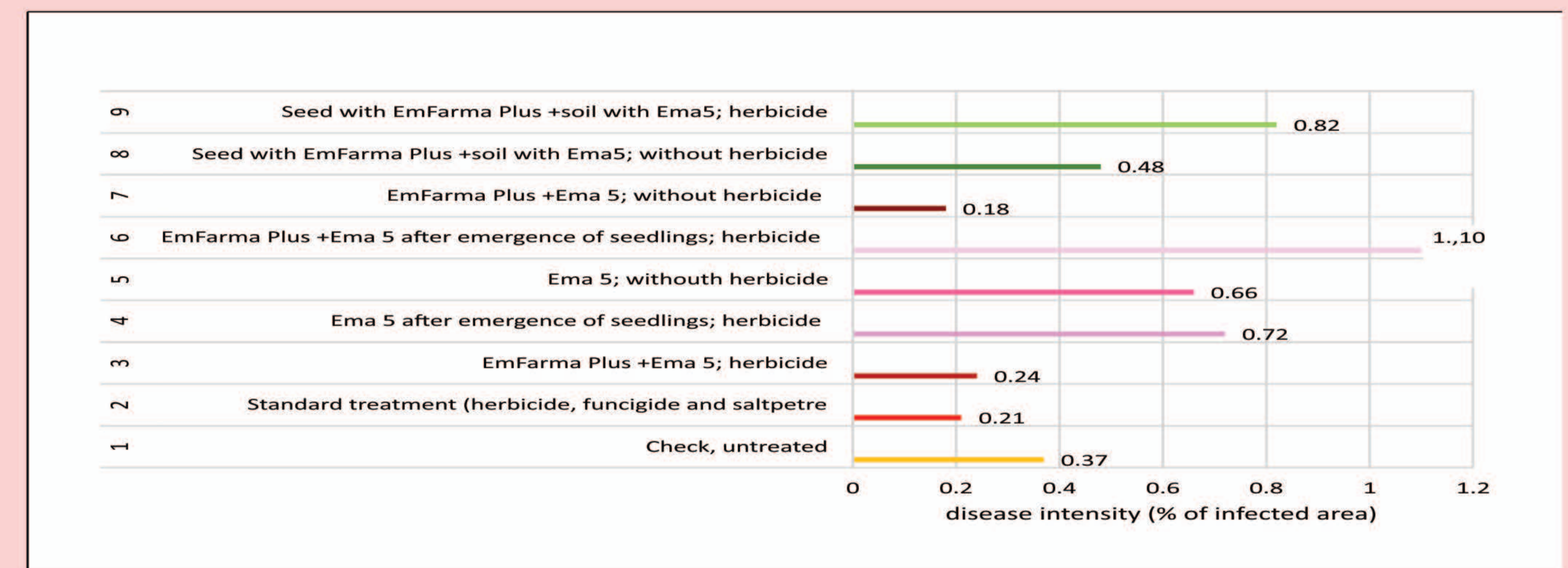
RESULTS AND DISCUSSION

Table 2. The effect of probiotics on the percentage of infected area (1st estimation)

No.	Variant	Replication			Average value
		I	II	III	
1	Check, untreated	0,23	-	-	0,08
2	Standard treatment (herbicide, fungicide and saltpetre)	-	-	-	0
3	EmFarma Plus +Ema 5; herbicide	0,05	-	0,04	0,03
4	Ema 5; without herbicide	0,03	-	-	0,01
5	Ema 5; without herbicide	0,05	-	0,01	0,02
6	EmFarma Plus +Ema 5 after emergence of seedlings; herbicide	0,23	-	-	0,08
7	EmFarma Plus +Ema 5; without herbicide	0,01	-	0,08	0,03
8	Seed with EmFarma Plus +soil with Ema5; without herbicide	-	-	0,10	0,03
9	Seed with EmFarma Plus +soil with Ema5; herbicide	0,04	-	0,03	0,02

Table 3. The effect of probiotics on the percentage of infected area (2nd estimation)

No.	Variant	Replication			Average value
		I	II	III	
1	Check, untreated	1,3	-	0,65	0,65
2	Standard treatment (herbicide, fungicide and saltpetre)	1,26	-	-	0,42
3	EmFarma Plus +Ema 5; herbicide	0,08	-	0,37	0,45
4	Ema 5; without herbicide	4,0	-	0,26	1,42
5	Ema 5; without herbicide	1,48	0,23	2,21	1,30
6	EmFarma Plus +Ema 5 after emergence of seedlings; herbicide	2,34	-	5,82	2,05
7	EmFarma Plus +Ema 5; without herbicide	0,05	-	0,91	0,32
8	Seed with EmFarma Plus +soil with Ema5; without herbicide	-	-	2,79	0,93
9	Seed with EmFarma Plus +soil with Ema5; herbicide	1,17	0,01	3,67	1,61



Graph. 1 Intensity of damping off disease - infected area % (average value of two estimations)



Ph. 1 Tobacco seedlings in the check



Ph. 2 Seedlings in the variant: EmFarma Plus+ Ema 5



Ph. 3 Tobacco seedlings in the variant Ema 5; without herbicide

CONCLUSIONS

- The investigated probiotics reduce the intensity of damping off disease.
- Compared to the untreated check, the treatment with fungicide application prior to sowing gives good results in reducing the disease intensity.
- The lowest intensity of disease attack was observed in the variant with the biofungicide Ema 5 in combination with EmFarma Plus applied in the soil before sowing.
- The preparations achieve their complete effect after the second application.
- The highest intensity of attack was observed in the variant with application of both products or only with Emma 5 15 days after sowing.
- The bioproduct Emma 5 increases its effect in combined application with EmFarma Plus.
- The application of products on the seed before sowing did not give the expected results.
- EmFarma Plus and Ema 5 can be used in protection of tobacco seedlings from damping off disease. At least two treatments are needed to achieve the desired effect.
- Probiotics have a good prospects in the sustainable tobacco production.