RESEARCH INTO THE USE OF FOLIAR BIOFERTILIZERS BIONAT PLUS AND BIONEX FOR THE CULTURE OF STRAWBERRIES

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Abstract**:** *The straweberry represents the spiece with a big economical and alimentary attention, with a big production which is adapted to a large climate variety because of its large created spiecies. the strawberry culture was made in the spring of 2009, like classical, multianual culture in free plain the sort red gaunttlet, with ripening at the ending of may, this sort has a good resistance to the whitening spot of the leaves, at grey rot. the biofertilizations used Bionat plus and Bionex were applicated to two treatements with recomandated pesticides, in the two treatements: the first was the full infusion, and the second was to the showing inflorescence. the results reduced the attack frequency on the leaves with white spots (Mycosplaerella fragariac) in the first variant where were applicated biofertilizations Bionat plus and Bionex. the superior effectiveness was get in the first variant treated with Bionax plus, concentration 0,2% and Bionex, concentrated 0,2% towards the second variant treated with Bionex 0,2%. the treatements were applicated two times using the pesticides dithane, concentrated 0,2%in second variant to each treatement (t1, t2) where were good results by reducing the attack frequency caused by grey rot and flouring. from the production results we can see the best results came from strawberry in variant i were was applicated Bionat plus and the second treatement Bionex made a production of 7200kg/ha.*

Keywords: *strawbery, treatment, pesticides, effectiveness*

INTRODUCTION

The strawberry plant crop was founded in the spring of 2007, with fortified stolons, representing a multiannual classic crop in open field, the Red Gauntlet variety, with ripening at the end of May; this variety proves good resistance to common leaf spot (*Mycosphaerela fragariae*), powdery mildew (*Sphaerotheca macularis*) and grey mould disease (*Botrytis cinerea*).

At land preparation for crop, in 2007, we applied complex fertilizers NPK in a quantity of 700 kg/ha, and parcel's surface was 0.05 ha. The maintenance was carried out in concordance with the technology recommended for this crop.

Cropping was performed at intervals of 2-3 days, as ripening was full, when the pulp was still hard and the fruits were fully or 90% coloured.

The variety used was an English one, Red Gauntlet, which is suitable for open field crop and also for hothouses. The plant is medium strong and directed. It is one of the most cropping strawberry varieties, with productions that overtake 25 t/ha.

The main diseases and pathogens affecting the strawberry plant were: common leaf spot (*Mycoshaerella fragariae* (Tul) Lind., *Ramularia tulasnei* Sacc., *Septoria fragariae* (Lib.) Desm.).; grey mould disease (*Sclerotinia fuckeliana* (De Bary) Fuck., f.c**.** *Botrytis cinerea*); powdery mildew (*Sphaerotheca macularis* (Wallr.) Jasz. f.c. *Oidium fragariae* Harz).

Among the strawberry pests, the most significant was the blossom weevil (*Anthonomus rubi*). The attack caused by this pest is represented by the fact that the female

perforates, with the help of its rostrum, the floral buttons, and lays one egg; after that, it frays the floral peduncles, causing flower bending and drying.

In the case of strawberry moth (*Aphelia viburniana*), the attack is caused by the larvae of the two generations migrating on the back of the leaves and starting nourishing.
Successive to this attach, the foliar apparatus may be destroyed, with negative effects on plant assimilation capacity. Another negative effects are represented by the reduction of the number of flowers, the bad root system development and the impairment of stolon generation.

The strawberry mite (*Tarsonemus fragariae*) mainly attacks the young leaves in the middle of the leaf rosette, but it may also be observed on external leaves. These loose their shapes, get curly and the young ones fade, and later they turn brown and become frail. The plant stagnates from growing and may become dry or rotten in 1-2 years.

Strawberry nematodes (*Aphelencoides fragariae*, *Meloidogyne hapla*) develop externally at leaf base and internally in flowers. The attack may be easily recognized because the infested plants present thick and twisted leaf petioles, small size, and small and pleated leaves. This nematode may cause floral malformations, for example petals may turn green and the reproduction organs become obsoleted. During strong infestations, it is possible to find, in one plant, between 5000 and 10.000 nematodes.

The researches performed aimed especially at fighting against these pathogens and pests by using the foliar biofertilizers Bionat Plus and Bionex in complexes with the recommended pesticides.

MATERIALS AND METHOD

The strawberry plant crop was founded in the spring of 2007, with fortified stolons, representing a multiannual classic crop in open field, the Red Gauntlet variety, with ripening at the end of May; this variety proves good resistance to common leaf spot (*Mycosphaerela fragariae*), powdery mildew (*Sphaerotheca macularis*) and grey mould disease (*Botrytis cinerea*). At land preparation for crop, in 2007, we applied complex fertilizers NPK in a quantity of 700 kg/ha, and parcel's surface was 0.05 ha. The maintenance was carried out in concordance with the technology recommended for this crop. Cropping was performed at intervals of 2-3 days, as ripening was full, when the pulp was still hard and the fruits were fully or 90% coloured.

The biofertilizers used, Bionat plus and Bionex, were applied during two treatments, in complexes with the pesticides recommended, in the following stages:

T_1 – at full leaf – 21.04.2011

T_2 – at the apparition of inflorescences (white button) – 2.05.2011

RESULTS AND DISCUSSIONS

Results obtained in fighting against common leaf spot (*Mycosphaerella fragariae*)
Regarding diseases, especially the ones caused by the pathogens *Mycosphaerella fragariae* (strawberry common leaf spot), at the beginning of flowering, we achieved the results presented in table 1:

Table 1.

Results of the observations on the attacks caused by *Mycosphaerela fragariae* (strawberry common leaf spot)

Variant	***Pesticides***	***Conc. %***	***Frequency of leaf attacks caused by Mycosphaerella fragariae***
V_1	T_1 – Systhane 12,5 CE	0,05	7,3
	Fastac 10 CE	0,01	
	Bionat Plus	0,2	
	T_2 – Systhane 12,5 CE	0,05	
	Fastac 10 CE	0,01	
	Bionex	0,2	
V_2	T_1 – Systhane 12,5 CE	0,05	11,7
	Fastac 10 CE	0,01	
	Bionex	0,2	
	T_2 – Systhane 12,5 CE	0,05	
	Fastac 10 CE	0,01	
	Bionex	0,2	
V_3 Mt.	T_1 – Systhane 12,5 CE	0,05	13,1
	Fastac 10 CE	0,01	
	T_2 – Systhane 12,5 CE	0,05	
	Fastac 10 CE	0,01	

According to these data, we may conclude that the best efficiencies were recorded in the variant 1, with an attack frequency of *Mycosphaerella fragariae* of only 7.3% compared to 11.7% in the variant 2 and 13.1% in the variant 3.

Results obtained in fighting against grey mould disease (*Botrytis cinerea*)

According to the data presented in table 4.2., the frequency of leaves attacked by *Botrytis cinerea* got reduced in the variants treated with pesticides and biofertilizers to 2.3 – 5.7% compared to 8.3%, determined in the control variant, treated with pesticides but without the biofertilizers Bionat Plus and Bionex.

The best results were achieved in the first variant, treated with the fungicide Systhane 12.5 CE – 0.05% (at treatement 1) and also with the biofertilizer Bionat Plus 0.2%. At treatment 2, we applied the same pesticide, but the fertilizer used was the biopreparate Bionex 0.2%.

Good results were also achieved in the second variant, where the fungicide used was Dithane M-45 – 0.2%, in both treatments.

Table 2.

Results of the observations on the attacks caused by *Botrytis cinerea* (strawberry grey mould disease)

Variant	***Pesticides***	***Conc. %***	***Frequency of leaf attacks caused by Botrytis cinerea (%)***
V_1	T_1 – Systhane 12,5 CE	0,05	2,3
	Fastac 10 CE	0,01	
	Bionat Plus	0,2	
	T_2 – Systhane 12,5 CE	0,05	
	Fastac 10 CE	0,01	
	Bionex	0,2	
V_2	T_1 – Dithane M-45	0,2	5,7
	Fastac 10 CE	0,01	
	Bionat Plus	0,2	
	T_2 – Dithane M-45	0,2	
	Fastac 10 CE	0,01	
	Bionex	0,2	
V_3 Mt.	T_1 – Systhane 12,5 CE	0,05	8,3
	Fastac 10 CE	0,01	
	T_2 – Dithane M-45	0,2	
	Fastac 10 CE	0,01	

Results obtained in fighting against powdery mildew (*Sphaerotheca macularis*)

Table 3.

Results of the observations on the attacks caused by *Sphaerotheca macularis* (strawberry powdery mildew)

Variant	***Pesticides***	***Conc. %***	***Frequency of leaf attacks caused by Sphaerotheca macularis***
V_1	T_1 – Systhane 12,5 CE	0,05	3,7
	Fastac 10 CE	0,01	
	Bionat Plus	0,2	
	T_2 – Systhane 12,5 CE	0,05	
	Fastac 10 CE	0,01	
	Bionex	0,2	
V_2	T_1 – Dithane M-45	0,2	5,1
	Fastac 10 CE	0,01	
	Bionat Plus	0,2	
	T_2 – Dithane M-45	0,2	
	Fastac 10 CE	0,01	

	Bionex	0,2	
V_3 Mt.	T_1 – Systhane 12,5 CE	0,05	5,3
	Fastac 10 CE	0,01	
	T_2 – Dithane M-45	0,2	
	Fastac 10 CE	0,01	

According to the data presented in table 4.3., the frequency of leaf attack caused by *Sphaerotheca macularis* (strawberry powdery mildew) got reduced in the variants treated with pesticides and biofertilizers from 3.7 to 5.3% determined in the control variant treated with pesticides, but without the biofertilizers Bionat Plus and Bionex.

The best results were achieved in the first variant, where we applied treatments with the fungicide Systhane 12.5 CE conc. 0.05% (at treatment 1) and also the biofertilizer Bionat Plus 0.2%. At treatment 2, we applied the same pesticide, but the biofertilizer applied was Bionex 0.2%, and the powdery mildew attack frequency was 3.7%.

Good results were also achieved in the second variant, where we applied, as fungicide, only Dithane M-45 – 0.2% at both treatments, and the powdery mildew attack frequency was 5.1%.

PRODUCTION RESULTS

The production results achieved in the strawberry variety Red Gauntlet, successive to the application of biofertilizers in complex with pesticides, are presented in table 4.

According to the data presented in table 4.4., the best production results were achieved in strawberry in the variant 1, where, beside or in complex with the pesticide applied at treatment 1, Bionat Plus conc. 0.2%, and, at treatment 2, Bionex conc. 0.2%, generated a mean yield of 7200 kg/ha in the variety Red Gauntlet.

In the variant 2, where we applied a foliar fertilizer in complex with pesticides, only Bionex conc. 0.2%, the mean yield was 6700 kg /ha. In the variant 3, with treatments including only pesticides, without biofertilizers, the mean yield was 6500 kg/ha.

According to the observations performed, the stolons got more prolonged in the variant treated with Bionex only. We may also observe a thickening of them in the variant treated with Bionat Plus at the first treatment and Bionex at the second treatment.

Table 4.

Production results in strawberry crop, Red Gauntlet variety, in the experimental variants from 2011, in Farm no. 3 Lugoj

No. Var.	***No. treatment***	***Pesticides and biofertilizers***	***Conc. %***	***Yield achieved per 0.05 ha***	***Mean yield /ha***
V_1	T_1	Systhane 12,5 CE	0,05	360	7200
		Fastac 10 CE	0,01		
		Bionat Plus	0,2		
	T_2	Systhane 12,5 CE	0,05		
		Fastac 10 CE	0,01		
		Bionex	0,2		
V_2	T_1	Systhane 12,5 CE	0,05	335	6700

		Fastac 10 CE	0,01		
		Bionex	0,2		
	T_2	Systhane 12,5 CE	0,05		
		Fastac 10 CE	0,01		
		Bionex	0,2		
V_3 Mt.	T_1	Systhane 12,5 CE	0,05	325	6500
		Fastac 10 CE	0,01		
	T_2	Systhane 12,5 CE	0,05		
		Fastac 10 CE	0,01		
Σ production growth compared to V_1					700

CONCLUSIONS

- In strawberry, the best results of production and in the reduction of the spring attack caused by common leaf spot *Mycosphaerella fragariae* were achieved in the variant with application of phyto-sanitary treatments until flowering, beside pesticides, of the foliar biofertilizers Bionat plus conc. 0.2% at treatment 1, in full leaf phenophase, and Bionex conc. 0.2% at treatment 2, in the white button phenophase (at the apparition of inflorescences).
- The best results in fighting against strawberry common leaf spot (*Mycosphaerella fragariae*) were achieved when we also applied pesticides in complexes with the biofertilizers Bionat Plus conc. 0.2% at treatment 1 and Bionex conc. 0.2% at treatment 2. Similar results, successive to the application of the same treatments, were also achieved in fighting against grey mould disease (*Botrytis cinerea*) and powdery mildew (*Sphaerotheca macularis*).
- The production growth achieved, successive to the application of these biofertilizers in complexes with pesticides, was 700 kg/ha.
- The complexes of biofertilizers (Bionat Plus conc. 0.2% and Bionex conc. 0.2%) with the pesticides recommended against the main strawberry diseases did not cause phyto-toxicity phenomena on strawberry leaves and fruit.
- In the variant treated with biofertilizers in complex with pesticides, we may also observe a better stolon thickening.

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