FUNGICIDE APPLYING EFFECT ON *BLUMERIA GRAMINIS F. SP. TRITICI* AND WINTER WHEAT YIELD, WITH DIFFERENT REACTION FOR POWDERY MILDEW

EFECTUL APLICĂRII FUNGICIDELOR ASUPRA CIUPERCII *BLUMERIA GRAMINIS F. SP. TRITICI* ŞI PRODUCŢIEI UNOR SOIURI DE GRÂU DE TOAMNĂ, CU REACŢIE DIFERITĂ FAŢĂ DE FĂINARE

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Abstract: *Fungicides effect on powdery mildew and wheat yield is studied in an experience placed at S.C.D.A. Lovrin. The purpose of this study is to register if the yield differences among treated variant and tester (no treated) are significant. In this experience are investigated and treated 25 winter wheat varieties with different reaction in case of Blumeria graminis f. spec. tritici attack (R – resistant, MR – medium resistant, S – sensitive). Because in experience are used some fungicides those 25 winter wheat varieties are divided in four groups: three groups with six varieties and a group with seven varieties. There is tested the fungicides efficiency on the background of natural infection. All the data are statistically analysed. The treatment with fungicides (fenpropimorph and epoxyconazole, triflumizol and clorotalonil, ciproconazol and propiconazol, azoxystrobin) from this experience is executed at 49-50 growth stage (after Zadocks scale – ear emergence). The disease where present in experimental field during treatment applying. Fungicides efficiency is appreciated as: very good for fenpropimorph and epoxyconayole in case of Arieşan sensitive variety and very good for medium resistant varieties from first varieties group; very good for triflumizol and clorotalonil (Boema sensitive variety) and totally efficient for the other varieties from second group; very good and totally effective for ciproconazol and propiconazol (Izvor, Turda 2000, and Ciprian sensitive varieties); satisfying and good action for azostrobin case of Partizanka and Bezostaia sensitive varieties. The yields obtained in the case of treatment experience are superior in comparison with non-treated variant; these proving that the fungicides from mixtures are biologically compatible and are influencing positively plants biochemistry in a positive way.*

Rezumat: *Efectul fungicidelor asupra făinării şi producţiei a fost urmărit într-o experienţă amplasată la S. C. D. A. Lovrin, cu scopul de a observa dacă diferenţele de producţie dintre varianta cu tratamente şi varianta fără tratamente, sunt semnificative. Au fost investigate şi tratate în experienţă 25 de soiuri de grâu de toamnă cu reacţie diferită la atacul ciupercii Blumeria graminis f. sp. tritici (R – rezistent, MR – mijlociu rezistent, S – sensibil). Deoarece în experienţă au fost folosite mai multe fungicide, cele 25 de soiuri de grâu de toamnă au fost împărţite în patru grupe: trei grupe cu 6 soiuri şi o grupă cu 7 soiuri. Testarea eficacităţii fungicidelor s-a făcut pe fondul infecţiei naturale. Toate datele obţinute au fost prelucrate statistic. Tratamentul cu fungicidele alese pentru această experienţă (fenpropimorph şi epoxyconazole, triflumizol şi clorotalonil, ciproconazol şi propiconazol, azoxystrobin) a fost executat la stadiul de vegetaţie 49 – 50 (după scara Zadocks – burduf-apariţia spicului). În momentul aplicării tratamentului boala era prezentă în câmpul experimental. Eficacitatea fungicidelor a fost apreciată în felul următor: foarte bună pentru fungicidele fenpropimorph şi epoxyconazole la soiul sensibil Arieşan şi foarte bună pentru soiurile mijlociu rezistente din grupa I-a de soiuri; foarte bună pentru triflumizol şi clorotalonil (soiul sensibil Boema) şi eficace total la celelalte soiuri din grupa a II-a; foarte bună şi eficace total pentru ciproconazol şi propiconazol (soiurile sensibile Izvor, Turda 2000 şi Ciprian); acţiune satisfăcătoare şi bună pentru fungicidul azoxystrobin în cazul soiurilor sensibile Partizanka şi Bezostaia. Producţiile obţinute în cazul experienţei cu tratamente au fost superioare comparativ cu varianta netratată, dovadă că fungicidele din amestecuri sunt compatibile biologic şi au influenţat biochimismul plantelor în sens pozitiv.*

Key words**:** *fungicides, Blumeria graminis, varieties, powdery mildew, yield, virulence*
Cuvinte cheie**:** *fungicide, Blumeria graminis, soiuri, eficacitate, intensitate, producţie, făinare*

INTRODUCTION

Powdery mildew is one of the first diseases mentioned by western Romanian farmers during spring in field. Appearance moment differs from a year to another under the influence of climatic conditions and cultivated variety. In Romania powdery mildew appears in the cultivation area of medium resistant and sensitive wheat and without fungicides application. The risk to have harvest loses under qualitative and quantitative aspect is increased (AL. BĂRBULESCU *et al.*, 1990; C. A. GRIFFEY, M. K. DAS, L. E. STROMBERG, 1993; P. HART, R. WARD, 2000; V. BRUDEA, 2002; C. E. DRYE, 2002). Harvest loses are produced when *Blumeria graminis* fungus affect flag leaf of sensitive varieties. There are mentioned variants as: 16% harvest loses when flag leaf is affected before ear; 25% loses when infection arises on flag leaf; 5-8% loses in case of resistant varieties when powdery mildew progress from base on flag leaf (*** - Purdue University, 2000). Fungicides effect on powdery mildew and yield is studied at S.C.D.A. Lovrin with the purpose to notice if the yield differences between treated and non-treated variant are significant. There are investigated 25 winter wheat varieties with different reactions in case of powdery mildew disease. Those 25 winter wheat varieties are divided in four groups (three groups with six varieties and a group with seven varieties) because there are used some fungicides.

MATERIAL AND METHOD

Testing of fungicides effect is done on the background of natural infection. Fungus virulence values are expressed as marks (on 0-9 scale) and percentage (a unit from scale represents 10%) being reported to control variant (Mt) infected and non-treated. Fungicides efficiency is appreciated as is follows: infection lack – totally effective fungicides (FET); 0.1 – 1.0 (1-10%) infection – very good fungicide (FB); infections from 1.1 -2.0 (11.20%) – good fungicide (B); 2.1 – 4.0 (21 – 40%) – fungicide with satisfactory action (AS); 4.1 – 9.0 infection (41 – 100%) – fungicide without toxicity or non-combat (NC). The yields from every plot are weighted being calculated the wheat yield per hectare for non-treated control and treated variants. All the data are statistically analysed.

RESULTS AND DISCUSSIONS

First powdery mildew patches have appeared at Lovrin in experimental plots at the beginning of May (2005). In comparison with 2003 and 2004 experimental years, when powdery mildew has appeared at the beginning of April, in this year the disease have appeared later ant with lower intensity. We can say that lowest temperatures in comparison with normal values registered during this period and greatest rainfalls amount during March and April have negatively influenced *Blumeria graminis f. spec. tritici* fungus. Fungicides chosen for treatment is realised during 49-50 growth stage (after Zadoks scale – ear emergence). During treatment applying the disease is present in experimental field. There is marked attack intensity before attack intensity and after treatment (at about 10 days from treatment). Also there is registered the attack for control non-treated variant. For first varieties group that is treated with fenpropimorph 250 g/l and epoxyconazole 84 g/l the efficiency is very good in case of Ariesan variety with great sensitivity for powdery mildew. For the other medium resistant varieties fungicides efficiency is good for sensitive variety Boema and resistant variety Falnic. In this group, in case of very resistant variety Dor powdery mildew haven't appeared during this year (table 1). Ciproconazole and propiconazole efficiency is appreciated as total (FET) because in case of Izvor and Turda 2000 varieties haven't appeared new powdery mildew patches on wheat plants after the treatment applying.

Table 1

Efficiency of fungicides used in *Blumeria graminis f. sp. tritici* control

No.	Varieties group	Fungicide	Affected foliar surface (%)			Yield kg/ha		Powdery mildew resistance	Fungicides efficiency
			Before treatment	After treatment	Non-treated control	Non-treated	Treated		
Ist group fenpropimorph 250 g/l + epoxyconazole 84 g/l – Tango Super									
1	Fundulea 4		8	2	10	6920	8760	MR	FB
2	Lovrin 34		6	0	25	6090	6460	MR	FET
3	Arieşan		10	3	35	7800	8110	S	FB
4	Dropia		4	3	25	5300	6270	MR	FB
5	Alex		4	0	30	6900	7760	MR	FET
6	Ardeal		8	0	38	6900	7670	MR	FET
IInd group triflumizol 30% + clorotalonil 500 g/l-Trifmin+ Bravo 500 SC									
1	Romulus		4	0	15	6160	6450	MR	FET
2	Boema		8	6	40	6780	7370	MR	FB
3	Crina		4	6	25	6000	7500	MR	FB
4	Delabrad		4	2	40	6280	6390	S	FB
5	Dor		0	0	0	5520	7190	R	FET
6	Farmec		4	0	10	6080	6300	MR	FET
7	Falnic		4	2	10	6740	8100	R	FB
IIIrd group ciproconazol 80 g/l + propiconazol 250 g/l - Artea									
1	Gloria		4	0	10	6560	6740	R	FET
2	Gruia		4	0	15	7140	7330	R	FET
3	Izvor		8	0	50	5790	6000	S	FET
4	Turda 2000		8	0	30	7720	7800	S	FET
5	Turda 95		6	2	25	5540	7310	S	FB
6	Ciprian		6	1	35	6530	6720	S	FB
IVth group azoxystrobin 250 g/l - Quadris									
1	G. K. Othalom		8	0	25	6340	7260	MR	FET
2	Bezostaia		14	15	50	5280	5840	S	B
3	Partizanka		6	25	40	5800	7290	S	AS
4	Renan		4	0	10	5440	7210	MR	FET
5	Holda		6	1	10	3300	5160	MR	FB
6	Flamura 85		8	3	25	5280	8040	S	FB

MR – medium resistant FB – very good fungicide AS – fungicide with satisfactory action
R – resistant FET – totally efficient fungicide
S – sensitive B – good fungicide

Azoxystrobin (fourth varieties group) efficiency for Partizanka sensitive variety is satisfactory, attack intensity after treatment being affected 25% from foliar surface attacked by fungus. In case of Bezostaia variety (sensitive), efficiency is good (after treatment 15% from foliar surface is covered with powdery mildew mycelia). In case of medium resistant varieties the efficiency is very good (table 1). Obtained yields in case of the experience with treatments are superior in comparison with non-treated variant.

The results concerning yield statistically analysed for a more accurate interpretation. In case of Fundulea 2 variety (treated variant with fenpropimorph and epoxyconazole) the registered difference is positive very significant in comparison with Fundulea 4 variety (non-treated) (table 2). Fundulea 4 wheat variety is chosen as control for the interpretation of obtained yield data because it is used as control by wheat varieties testing institutions from Romania. For Arieşan and Falnic varieties the registered difference is distinctly significant, and in case of Alex and Ardeal varieties is significant.

Most of the registered varieties have registered non-significant differences from statistical point of view in comparison with Fundulea 4 non-treated tester. After the comparison with the average of non-treated experience we can say the next things: yield difference is positive very significant in case of Fundulea 4, Arieşan, Alex, Ardeal, Falnic, Turda 2000 and Flamura 85 varieties; the differences are distinctly significant for Boema, Crina, Gruia, Turda 95 varieties; yield difference is distinctly significant for Dor, G. K. Othalom, Partizanka and Renan varieties. The differences are non-significant for the other varieties from experience (table 2).

Table 2

Average wheat yield (kg/ha) in experimental field with treated in comparison with non-treated control

No.	Variety	Average yield kg/ha, treated	Difference in comparison with:		Difference signification compared with:	
			Control nontreated	Non-treated experience average	Control non-treated.	Non-treated experience average
Fundulea 4- non-treated control		6920	-	-	-	-
1	Fundulea 4	8760	1840	2592.4	***	***
2	Lovrin 34	6460	-460	-292.4	-	-
3	Arieşan	8110	1190	1942.4	**	***
4	Dropia	6270	-650	102.4	-	-
5	Alex	7760	840	1592.4	*	***
6	Ardeal	7670	750	1502.4	*	***
7	Romulus	6450	-470	282.4	-	-
8	Boema	7370	450	1202.4	-	**
9	Crina	7500	580	1332.4	-	**
10	Delabrad	6390	-530	222.4	-	-
11	Dor	7190	270	1022.4	-	*
12	Farmec	6300	-620	132.4	-	-
13	Falnic	8100	1180	1932.4	**	***
14	Gloria	6740	-180	572.4	-	-
15	Gruia	7330	410	1162.4	-	**
16	Izvor	6000	-920	-167.6	00	-
17	Turda 2000	7800	880	1632.4	-	***
18	Turda 95	7310	380	1142.4	-	**
19	Ciprian	6720	-200	552.4	-	-
20	G. K. Othalom	7260	340	1092.4	-	*
21	Bezostaia	5840	-1080	-327.6	0	-
22	Partizanka	7390	370	1122.4	-	*
23	Renan	7210	290	1042.4	-	*
24	Holda	5160	-1760	-1007.6	000	0
25	Flamura 85	8040	1120	1872.4	**	***
Average of treated experience 7081.2 kg/ha						
Average of non-treated experience 6167.6 kg/ha						
DL 5% = 824.36 kg/ha DL 1% = 1099.15 kg/ha DL 0.1% = 1431.36 kg/ha						

CONCLUSIONS

In conclusion we can appreciate fungicides efficiency as is follows: very good for fenpropimorph and epoxyconayole in case of Arieşan sensitive variety and very good for medium resistant varieties from first varieties group; very good for triflumizol and clorotalonil (Boema sensitive variety) and totally efficient for the other varieties from second group; very good and totally effective for ciproconazol and propiconazol (Izvor, Turda 2000, and Ciprian sensitive varieties); satisfying and good action for azostrobin case of Partizanka and Bezostaia sensitive varieties. Fungicides efficiency can be correct appreciated using the winter wheat varieties with greatest sensitivity for *Blumeria graminis f. sp. tritici* fungus attack. Also, the yields of non-treated plots are superior in comparison with non-treated plots.

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