

THE INFLUENCE OF SOME TREATMENTS WITH DIFFERENT PRODUCTS OF PHYTOSANITARY USAGE (FUNGICIDES) ON THE ATTACK OF SOME PHYTOPATHOGENIC FUNGI AND ON THE WHEAT PRODUCTION IN THE 2016 PEDOCLIMATIC CONDITIONS OF THE EASTERN BARAGAN

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Abstract

The wheat is under attack of many pathogenic agents during the vegetation period. Out of these pathogenic agents, we mention the following fungi in the Eastern Bărăgan area, in the year 2016: *Blumeria graminis* f. sp. *tritici* which produces wheat's mildew, *Puccinia recondita* f. sp. *tritici* (sin. *Puccinia triticina*) (fig. 2) which produces wheat's brown rust and *Septoria* sp. which produces wheat's brown leaf spotting (septoriosis) (fig. 3) (Velichi E. 2012). An experiment was conceived in the year 2016, using 4 products of phytosanitary usage, as follows: ACANTO PLUS (picoxistrobin + cyproconazole), EVOLUS (proquinazid + tebuconazole + prochloraz); BUMPER 250 EC (propiconazole) and TOPSIN 500 SC (thiophanate-methyl) (Pest – Expert). This experiment consisted in 7 variants (6 variants with phytosanitary treatments in different combinations of products, plus an untreated control variant). The experiment was placed in randomised blocks. The 7 variants had been placed in 6 repetitions. Among the pathogenic agents monitored, the biggest attacks had been produced by *Puccinia recondita* f. sp. *tritici* fungi, which produces wheat's brown rust. For this, the first two leaves beneath the spike had been analysed. The observations have shown that for all 6 variants of treatment, the degree of attack (D.A.%) of this rust had been lower than for the untreated control variant. The productions of the treated variants (V1...V6) had been higher than the production of the untreated control variant V7. The results of the variants' productions had been statistically interpreted through the method of the limit differences (LD %). Between the productions of some variants and the untreated control variant, there had been obtained differences statistically assured.

Key words: *Puccinia*, propiconazole, phytosanitary, randomised blocks

Triticum aestivum wheat is attacked by many pathogenic agents, such as: mildew *Blumeria graminis* f.sp. *tritici*, brown rust *Puccinia recondita* f. sp. *tritici*, brown leaf spotting *Septoria tritici*, *Septoria nodorum*, stem's fusariosis and spike's burn *Giberella zeae*, *Giberella avenacea* (Iacob Viorica, Hatman, M., Ulea, E., Puiu, I. 1998). The first half of the year 2016 was difficult for wheat, in what concerns the climatic conditions. Abundant rainfalls and low temperatures had been registered in this period, creating very favourable conditions to the attack of some pathogenic agents. Here we mention especially *Puccinia recondita* f. sp. *tritici* fungus which produces, at wheat, the disease called brown rust. This pathogenic agent attacks the wheat crops every year, at high attack intensities. The other mentioned pathogenic agents have proven to be less dangerous for wheat's crop, in the climatic conditions of the year 2016.

MATERIAL AND METHOD

An experiment with 7 variants of study was created for making the observations. This experiment comprised 6 variants of phytosanitary treatment (fungicide products, their combinations, number of treatments) and an untreated control variant. The variants of the experiment had been the following (tab.1):

- V1 - [BUMPER 250 CE 0.25 L/HA+TOPSIN 500 SC 0.5 L/HA 1 treatment applied at blooming;
- V2 - ACANTO PLUS 0.5 L/HA 1 treatment applied on April 17th + 1 treatment applied at wheat berry's filling;
- V3 - ACANTO PLUS 0.5 L/HA 11 treatment applied at blooming;
- V4 - EVOLUS 1 L/HA treatment applied on April 17th + 1 treatment applied at wheat berry's filling;
- V5 - EVOLUS 1 L/HA treatment applied at blooming;
- V6 - BUMPER 250 CE. 0.25 L/HA+TOPSIN 500 SC 0.5 L/HA] 1 treatment applied on April 17th + 1 treatment applied at wheat berry's filling;
- V7 - Control variant not treated.

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Table 1

The results of the experiment with fungicide products (6 variants of treatment + 1 control variant not treated) in what concerns the attack (D.A. %) of *Puccinia recondita* f. sp. *Tritici fungus* at wheat ("flag" leaf and the next leaf). The observations had been made on the date of June 12th.

Variant	"Flag" leaf			The second leaf		
	D.A%	Dif. against the control variant	Significance	D.A%	Dif. against the control variant	Significance
V1 [BUMPER 250 CE 0.25 L/HA+TOPSIN 500 SC 0.5 L/HA 1 treatment applied at blooming	32.23	28.60	***	26.67	22.50	***
V2 - ACANTO PLUS 0.5 L/HA 1 treatment applied on April 17 th + 1 treatment applied at wheat berry's filling;	6.95	53.88	***	2.17	47.00	***
V3 - ACANTO PLUS 0.5 L/HA 11 treatment applied at blooming	15.2	45.63	***	5.22	43.95	***
V4 - EVOLUS 1 L/HA treatment applied on April 17 th + 1 treatment applied at wheat berry's filling;	10.08	50.75	***	7.89	41.28	***
V5 - EVOLUS 1 L/HA treatment applied at blooming	15.59	45.24	***	9.25	39.92	***
V6 - BUMPER 250 CE. 0.25 L/HA+TOPSIN 500 SC 0.5 L/HA] 1 treatment applied on April 17 th + 1 treatment applied at wheat berry's filling;	34.41	26.42	***	28.12	21.05	***
V7 – Control variant not treated	60.83	-	-	49.17	-	

LD D.A. % for the "flag" leaf

LD 5% = 3.06 x 2.04 = 6.24

LD 1% = 3.06 x 2.75 = 8.42

LD 0.1% = 3.06 x 3.65 = 11.17

LD D.A. % for the second leaf

LD 5% = 1.64 x 2.04 = 3.35

LD 1% = 1.64 x 2.77 = 4.54

LD 0.1% = 1.64 x 3.65 = 5.99

The experiment was placed in randomised blocks. The 7 variants were placed in 6 repetitions. Each experimental plot had an area of 14 m² (7 x 2m). The total number of experimental plots was 42. The surface of an experimental variant was of 14 m² x 6 repetitions = 84 m². The total area of the experiment was of 84 m² x 6 = 504 m². The treatments had been done manually, with a "Vermorel" type of equipment. In the spraying solution, "Trend" adjuvant product was added, in concentration of 0.03%. Weeds were fought against with the help of Granstar herbicide in a dosage of 40 g/ha applied, separately, with the Vermorel. An insecticide product was also added (Karate Zeon – 0.15 l/ha) in the herbicide solution for fighting against cereals' bugs - *Eurygaster* sp.

The purpose of the experiment had been the efficiency of the mentioned phytosanitary products, as reported to their price, as well as the efficiency and respectively, the profitability of applying one or two phytosanitary treatments during the wheat's vegetation period.

The assessment of the attack's frequency (F %), of attack's intensity (I %) and respectively of the degree of attack (D.A. %) was done separately, on each and every experimental plot, being analysed 10 plans each / experimental plot. The degree of affectation (attack intensity I %) of the last two leaves was assessed, especially of the "flag" leaf which has the greatest contribution to the production of a spike at strawy cereals. The phytosanitary analyses of the plants' samples had

been done with the help of the stereo-microscope and of the optic microscope at the laboratory of Braila's Phytosanitary Office – National Phytosanitary Authority. These analyses have revealed the presence of *Puccinia recondita* f.sp. *tritici* fungus in the analysed samples, which produces wheat's brown rust.

For assessing the production of each variant under study, samples of berries from each experimental plot, 4 samples each / plot, had been analysed by spot check. The delimitation of each sample was done with a metric frame with an area of 0.25 m² (0.5/0.5m). The average of the samples of an experimental plot had served for calculating each and every experimental parcel. The statistic interpretation was executed with the help of limit differences (LD %) (Săulescu N).

Andino variety was used. It is a French wheat variety, produced by Limagrain Company, Verneuil Holding. The variety is resistant to mildew, medium resistant to brown rust and sensible to septoriosiis (Agricultural Gazette 2012).

The assessment of the attack of pests can be done with the help of the following values (Methods of Prognosis and Warning 1980):

- Attack's frequency (F %);
- Attack's intensity (I %);
- Degree of attack (D.A %).

- Attack's frequency represents the relative value of the number of plants or organs of the plant under attack (n) reported to the number of plants or organs observed (N). The value of the frequency is

established by direct observation on a number of plants or organs, according to the case and to the conditions, existing different methods of sample taking and of performing the observations. In the case of our observations, for the foliar diseases, it was taken into consideration the number of plant organs attacked out of the total of plant organs observed (leaves), being thus established the attack's frequency expressed in percentages %. In the case of the blight, it is used the number of attacked spikes reported to the total number of spikes observed. The frequency is calculated with the formula $F\% = nx100/N$.

- Attack's intensity represents the degree or percentage in which a plant or a plant's organ is attacked and how much from the surface of the plant or of the organ analysed (leaf, fruit) is covered by the diseases under study.

The assessment of the surface attack is done with the naked eye or with the magnifying glass, assessing the percentage occupied by spots or burns caused by the pathogenic agent. There can be noted the affectation percentages, or grades can be given for each plant or organ attacked by the disease and/or by the pest. The usage of grades can make easier data summarization in a great extent. It can be used a scale with 6 degrees of intensity, as follows:

- Grade 0 no attack
- Grade 1 attack between 1 – 3%
- Grade 2 attack between 3 – 10%
- Grade 3 attack between 11 – 25%

- Grade 4 attack between 26 – 50%
- Grade 5 attack between 51 – 75%
- Grade 6 attack between 76 – 100%

After data's summarization, the attack's intensity is determined by the formula:

$$I\% = \frac{\sum (i \times f)}{n}$$

Where:

I% - attack's intensity (in %);

i – intensity according to the grade given to the organ or plant under attack;

f – number of cases (plants, organs) attacked;

n – number of plants attacked.

In our experience, there had been given grades from 1 to 6, separately, to the "flag" leaf and to the next leaf situated beneath it.

- The degree of attack is the expression of the extension of the seriousness of the attack onto the crop or onto the total number of plants at which we perform the observations. The value expression of DA is given by the relation:

$$D.A (\%) = \frac{F \times I}{100}$$

In most cases, there is a negative correlation between the degree of attack of a pathogenic agent or pest and the quantitative and/or qualitative level of the production of a crop.

Table 2

The results of the experiment with fungicide products (6 variants of treatment + 1 control variant not treated) in what concerns the production (t/ha) obtained at the treated variants, as compared to the control variant not treated.

Variant	Prod. (t/ha)	Difference against the control variant	Significance
V1 - [BUMPER 250 CE 0.25 L/HA+TOPSIN 500 SC 0.5 L/HA 1 treatment applied at blooming	6.15	0.07	-
V2 - ACANTO PLUS 0.5 L/HA 1 treatment applied on April 17 th + 1 treatment applied at wheat berry's filling;	6.26	0.18	-
V3 - ACANTO PLUS 0.5 L/HA 11 treatment applied at blooming	6.49	0.41	*
V4 - EVOLUS 1 L/HA treatment applied on April 17 th + 1 treatment applied at wheat berry's filling;	6.47	0.39	*
V5 - EVOLUS 1 L/HA treatment applied at blooming	6.51	0.43	*
V6 - BUMPER 250 CE. 0.25 L/HA+TOPSIN 500 SC 0.5 L/HA] 1 treatment applied on April 17 th + 1 treatment applied at wheat berry's filling;	6.44	0.36	*
V7 – Control variant not treated	6.05	-	-

LD 5% = 0.273 t/ha

LD 1% = 0.370 t/ha

LD 0.1% = 0.510 t/ha



Figure 1. Perspective from the experiment field (original).

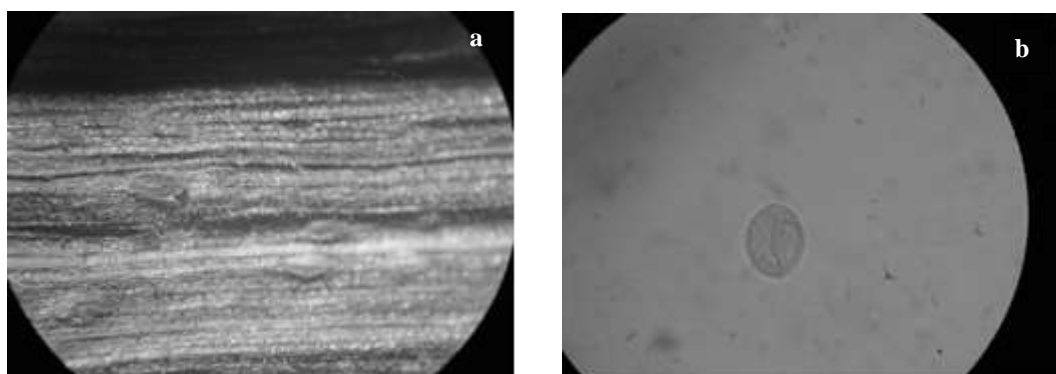


Figure 2. Wheat's brown rust *Puccinia recondita* f.sp. *tritici*: a – attack on wheat's leaf, b – uredospores (original)

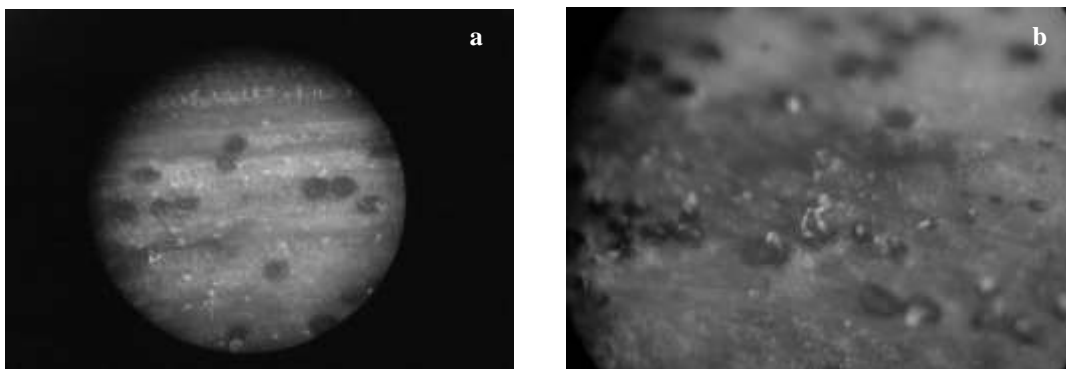


Figure 3. Wheat's Septoriosiis *Septoria* sp.: a – picnidia, b – picnidia which eliminate the picnospores (original).

RESULTS AND DISCUSSIONS

The 2015 – 2016 agricultural year was a year favourable for the occurrence of the attack of the complex of pathogens specific to wheat. However, the wheat is a species more resistant to the attack of pathogenic agents than barley. The rainfalls had been frequent up to the dates of June 20th – 21st, 2016, not being necessary the application of sprinkling to the wheat crop.

In what concerns the dynamics of the occurrence of pathogens to wheat, we mention the following aspects:

- Wheat's mildew - *Blumeria* (*Erysiphe*) *graminis* f.sp. *tritici* had insignificantly affected the wheat from the experiment in the year 2016 (D.A. < 1%).

- Septoriosiis - *Septoria* sp. had slightly affected the wheat, irregularly (D.A 1.5 – 3.5%), even if the variety is mentioned as being sensible to septoriosiis – *Septoria* sp., being affected especially the second leaf beneath the spike.

- Wheat's brown rust - *Puccinia recondita* f.sp. *tritici*, had affected the wheat (V7 – untreated control variant) in the limits comprised between the D.A. % - 60.63% to the “flag” leaf and the D.A.% -- 49.17% to especially the second leaf

beneath the spike. These values had been observed on the date of June 9th, 2016.

– No attacks of stem's fusariosis and spikes' burns, *Giberella sp.* and of wheat's flying blight, *Ustilago tritici*, had been observed.

In case we analyse the data from table 1, we observe that the degree of attack of *Puccinia recondita* f.sp. *tritici* fungus was differentiated as follows:

– V1 - [BUMPER 250 CE 0.25 L/HA+TOPSIN 500 SC 0.5 L/HA 1 treatment applied at blooming had determined a degree of attack (D.A.%) of *Puccinia recondita* f.sp. *tritici* fungus of 32.23% at the "flag" leaf and of 26.7% to the second leaf, so lower by 22.60% and respectively by 28.5 % as compared to the untreated control variant (V7)

– V2 - ACANTO PLUS 0.5 L/HA 1 treatment applied on April 17th + 1 treatment applied at wheat berry's filling had determined a degree of attack (D.A. %) of *Puccinia recondita* f.sp. *tritici* fungus of 6.95% at the "flag" leaf and of 2.17% at the second leaf, so lower by 53.88% and respectively by 47.00 % as compared to the untreated control variant (V7).

– V3 - ACANTO PLUS 0.5 L/HA 11 treatment applied at blooming had determined a degree of attack of *Puccinia recondita* f.sp. *tritici* fungus of 15.2% at the "flag" leaf and of 5.22% at the second leaf, so lower by 45.63% and respectively by 43.95% as compared to the untreated control variant (V7).

– V4 - EVOLUS 1 L/HA treatment applied on April 17th + 1 treatment applied at wheat berry's filling had determined a degree of attack of *Puccinia recondita* f.sp. *tritici* fungus of 10.08% at the "flag" leaf and of 7.89% at the second leaf, so lower by 50.75% and respectively by 41.28% as compared to the untreated control variant (V7).

– V5 - EVOLUS 1 L/HA treatment applied at blooming had determined a degree of attack of *Puccinia recondita* f.sp. *tritici* fungus of 15.59% at the "flag" leaf and of 9.25% at the second leaf, so lower by 45.24% and respectively by 39.92% as compared to the untreated control variant (V7).

– V6 - BUMPER 250 CE. 0.25 L/HA+TOPSIN 500 SC 0.5 L/HA] 1 treatment applied on April 17th + 1 treatment applied at wheat berry's filling had determined a degree of attack of *Puccinia recondita* f.sp. *tritici* fungus of 34.41% at the "flag" leaf and of 28.12% at the second leaf, so lower by 26.42% and respectively by 21.05% as compared to the untreated control variant (V7).

– V7 – The untreated control variant was affected by the attack of *Puccinia recondita* f.sp. *tritici* fungus in percentage of 60.83% at the "flag" leaf and of 49.17% at the second leaf.

Out of the analysis of table 2, there can be observed the production differences as compared to the untreated control variant V7, as follows:

– Variants: V1 - [BUMPER 250 CE 0.25 L/HA+TOPSIN 500 SC 0.5 L/HA 1 treatment applied at blooming and V2 - ACANTO PLUS 0.5 L/HA 1 treatment applied on April 17th + 1 treatment applied at the beginning of wheat berry's filling, had achieved larger productions than the untreated control variant (V7), but they are not statistically assured.

– Variants: V3 - ACANTO PLUS 0.5 L/HA 11 treatment applied at blooming, V4 - EVOLUS 1 L/HA a treatment applied on April 17th + 1 treatment applied at the beginning of wheat berry's filling, V5 - EVOLUS 1 L/HA applied at blooming and V6 - BUMPER 250 CE 0.25 L/HA + TOPSIN 500 SC 0.5 L/HA] 1 treatment applied on April 17th + 1 treatment applied at the beginning of wheat berry's filling, had achieved higher productions than the untreated control variant (V7). The differences, by comparison to it, were smaller, being comprised between 0.36 and 0.43 t/ha and they had a statistical assurance significantly higher than the control variant (LD 5% - 0.273 t/ha) (tab. 2).

CONCLUSIONS

The 2015 – 2016 agricultural year had been a year favourable to wheat crop. The attacks of the pathogenic agents had been very different, from case to case, varying quite a lot, according to the cultivated technology and to the selected cultivar.

The observations made in the spring of the year 2016 on the wheat experiment, in the pedoclimatic conditions of the Eastern Bărăgan, have lead to the following conclusions and recommendations:

1. The most dangerous pathogenic agent of wheat has proven to be *Puccinia recondita* f.sp. *tritici* fungus. Its attack has affected first of all the "flag" leaf, being, as a matter of fact, the only pathogenic agent to which Andino variety has manifested a certain sensibility.

2. Slight attacks of the following fungi have been observed: *Blumeria* (Erysiphe) *graminis* f.sp. *tritici*, wheat's mildew and septoriosiis – *Septoria* sp.

3. For a reliable protection of the wheat crop, in case of using Andino variety, we recommend to perform, in the years with rainy springs, a

treatment with different fungicide products, applied alone or in combinations, homologated for wheat, like those from the experiment. In the conditions where in the year 2017 it is foreseen a price of 0.6 lei/ kg of wheat, choosing the fungicide product is most important from the price's point of view. For example, Evolus product has a price of approximately 230 lei/l and it is applied 0.75 – 1 l/ha. Acanto Plus product has a price of around 310 lei/l and it is applied in a dosage of 0.5 l/ha. Bumper 250 EC product costs between 176 – 180 lei/l. It is homologated at 0.5 l/ha applied alone. Topsin 500 SC product costs 75 lei/l and it is homologated at 1.25 l/ha applied alone. The combination used in the experiment was of 0.25 l/ha Bumper 250 EC and 0.5 l/ha Topsin 500 SC and it had proven to be economically efficient in the conditions of applying two treatments. It must be underlined the fact that the production increase, ensured statistically through LD 5%, was, in average, of 0.4 t/ha, i.e. of 240 lei, at a price of 0.6 lei/kg. The extra cost of the manpower is added to the cost of the treatment.

In the years with rainy springs and summers, in case the wheat follows after itself, two treatments

can be applied, using fungicide products which comprise 2 or 3 active substances (Acanto Plus, Evolus etc). The variety used in this experiment – Andino, had proven to be resistant to the attack of the pathogenic agents' specific to wheat, present frequently in the area of Eastern Bărăgan Plain – Brăila County. The production achieved by this variety, in conditions of 0 phytosanitary treatments (V7) has been good, of 6.15 t/ha.

BIBLIOGRAPHY

- Iacob Viorica, Hatman M., Ulea E., Puiu I., 1998** – *Agricultural phytopathology*. Ed. " Ion Ionescu de la Brad", p. 16-18, 26-28, 31-33.
- Săulescu N. 1967** - *Experiment field*. Agro– Sylvan Publishing House, Bucharest, p. 217, 311.
- Velichi E. 2012** - *General and special phytopathology*. University Publishing House, Bucharest, p. 136-137, 143-145.
- *** 2012 *Agricultural Gazette*
- *** 1980 *Methods of Prognosis and Warning*, 1980 M.A.I.A., Bucharest, p. 7-9.
- *** *Pest – Expert*, Ministry of Agriculture and Rural Development, web page of the National Phytosanitary Authority