



## The efficiency of some fungicide at two-row spring barley for fighting against spot blotch (*Cochliobolus sativus* Ito and Kurib) in the Bucovina area

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### Abstract

Fungus infects young leaves by direct penetration into epidermis or through stomata. The efficiency of some fungicides applied to seed and during vegetation was tested. In order to control this patogen, two trataments were applied. From the researches made by RSDS Suceava for a longer period of time we found out that the grain losses are almost 14% from the total production if there aren't made any seed treatments and of minimum 16% if there aren't applied two foliar treatments in the vegetation. During the experimental years, to the cultivars which were seed treated, the spring was uniform by succeeding a good protection of the young plants in the first phase of vegetation, the pathogen attack being much more diminished. In exchange for the variant on which wasn't applied the seed treatment, the spring was un uniform, and later during the vegetation period there were observed very clearly the symptoms of spot blotch by a late development and excessive twinning of a great number of plants.

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## Introduction

Leaf symptoms are obvious after heading and most frequent on lower leaves (Bhandari *et al.*, 2003). After penetration the mycelia grow in the leaf tissues as inter- and intra-cellular infection (Bhandari *et al.*, 2003). Mycelium is deep olive-brown, septated. Conidiophores emerge through stomata, less frequently directly between epidermal cells. Conidiophores are deep olive-brown, erect, single or clustered, 50.150 x 6.0.8.5 .m, septate. Conidia are deep olive or olive-brown, ovate to oblong, erect or slightly curved, 30-134 x 12.30 .m, with 2.13 septae (Bos *et al.*, 1995). They germinate by two polar cells (Bos *et al.*, 1995). The perfect stage is rarely found. Pseudothecia are dark-brown, bottle-shaped or globose, 300.400 .m in diameter. Asci are numerous, spindle-shaped or cylindrical with a short peduncle, 110.220 x 32.45.m, contain 1.8 (more often 4.8) ascospores (Bhandari *et al.*, 2003). Ascospores filamentous and spirally flexed within asci, 6.14 septate, hyaline or slightly yellowish, 160.360 x 6.0.9.0 .m (Chahal *et al.*, 2002). Fungus persists in abundance as mycelium and conidia principally. In the summer period the fungus develops in conidia stage.

Optimum temperature for the fungus growth is 27-28C, minimal. 10C, maximal 29.C; optimum for conidia formation is 16 . 25C (Chahal *et al.*, 2002). Light accelerates conidia formation. Mycelium and conidia survive at temperature 32-33C. Optimum humidity ratio of a substratum for the fungus development is 60 - 80%; optimum pH is 6-7 (Khasanov, 1992). The maximal infection of overground plant organs occurs at temperature higher than 15.C and relative humidity of air 95-97% (Tupenevich, 1970). *C. sativus* overwinters as mycelium and conidia on plant debris and on grain. In conditions of a droughty climate *C. sativus* conidia are kept in ground to 5 years (Tupenevich, 1970).

Grain yield losses due to the Spot Blotch reach 24-27 % in highly susceptible cultivars (disease severity is 80%

and higher). The loss of grain yield of the resistant cultivar reaches 3.4%, and those of the most susceptible ones reaches 25.6% (Khasanov, 1992).

When a target trait consists of several components or is associated with multiple traits, it is necessary to determine which components are most useful for indirect selection. In this multi-trait selection it is necessary to identify the genetical control of different trait and procedures to combine them together (Chahal *et al.*, 2002).

To improve a complex trait through multi-traits selection, the response to single trait selection may then be associated with so-called correlated responses to selection with regard to other traits (Bos *et al.*, 1995).

In Romania, the spot blotch succeeded to keep up at a low level towards other countries from Europe and America, where there have been significant crop losses. In the last years, in the area belonging to the Research Development Station Suceava (RSDS) were discovered powerful attacks of spot blotch which dominates the foliar diseases, and the classical pathogens (*Pyrenophora graminea* Rabh Ito and Kurib and *P. Teres* (Sacc, Drechs) which produce the tearing of the leaves, respectively the reticulated spotting are less and less present and they affect in a smaller measure the production of these cultures. Even if lately there were created new cultivars of spring barley with a high potential of production, still the complex of the foliar diseases succeeds to produce important losses to the farmers every year.

The aim of this study was to investigate the symptoms produced by the pathogen in different stages of vegetation, the degree of attack produced by *Cochliobolus Sativus*, the evolution of the foliar disease and for the harvesting it was calculated the grains production. The experiences were made in randomized blocks with three repetitions, the surface of a lot being

10 sq.m. The fungus attacks the stalk's callus producing black-coffee spots which can afterwards become bigger. Because of these symptoms the plant is seriously affected, by producing major physiological unbalances that will produce the sibling's death, partial earing, sterility and grains degeneration and eventually to a significant decrease of the grain production.

### Materials and methods

In the years 2008-2010 at R.S.D.S. Suceava there was investigated the efficiency of some fungicide which were applied to the seed and in the vegetation for fighting foliar diseases and especially for fighting against spot blotch. The experiences were made in randomized blocks with three repetitions, the surface of a lot being 10 sq.m. During the vegetation period there was investigated the symptoms produced by the pathogen in different stages of vegetation, the degree of attack produced by *Cochliobolus Sativus*, the evolution of the foliar disease and for the harvesting it was calculated the grains production.

**Table 1.** Treatment used.

Experimental factors	Product	Active substance	Dose (l or kg/t)
Seed treatments	Amiral 3FS	tebuconazol 30g/l	1,0
	Cruiser 350 FS	tiametoxam 350g/l	1,5
	Lamador 400 FS	prothiconazol 250g/l + tebuconazol 150g/l	0,15
	Nuprid AL 600 FS	imidacloprid 600g/l	1,0
Vegetation treatments	Amistar Xtra 280 SC	azoxistrobin 200g/l + ciproconazol 80g/l	0,75
	Acanto plus	ciproconazol 80g/l + picoxistrobin 20 g/l	0,5
	Arteza 300 EC	iproconazol 80g/l + propiconazol 250 g/l	0,4
	Bravo 500 EC	clorotalonil 500g/l	1,7
	Alert	flusilarol 125g/l + carbendazim 250g/l	0,8

Under the aspect of the rainfall, the year 2008 was the most humid year, the excess of rainfall in comparison with the multi-annual average being ranged between 87 l/sq.m in April and culminated with 213 l/sq.m. in July. The year 2009 was a "normal year" from the

climatic point of view, the deviations towards the multi-annual averages to temperature and rainfall as well varying in very small limits. In exchange in 2010 the rainfall quantity from spring and summer are kept in high limits, by culminating in July with 71.5 l/sq.m. towards the multi-annual average. The temperatures were kept in reasonable limits towards the multi-annual average, being higher with 1-2° C towards this one.

### Results

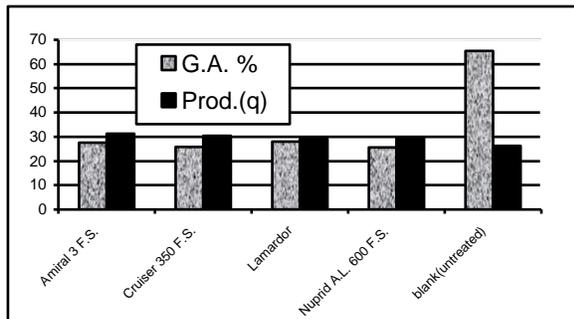
The circulation of *Cochliobolus sativus* fungus is realized through seed and soil as well, the attack manifesting on the young plants and also during the whole period of vegetation. The young plants are destroyed before coming out from the soil, and those which were affected later are developed very difficult. The plants which survive will have a dark green color, erectile position and will present an excessive twinning. For adult plants the attack is manifested on the leaves, glumes and grains. On the leaves, then on the glumes appear circular or oval spots of brown color with well-defined margins, and on the seeds in the embryo area appears a black dot. The fungus attacks the stalk's callus producing black-coffee spots which can afterwards become bigger. Because of these symptoms the plant is seriously affected, by producing major physiological unbalances that will produce the sibling's death, partial earing, sterility and grains degeneration and eventually to a significant decrease of the grain production.

#### *The influence of the seed treatments on the pathogen*

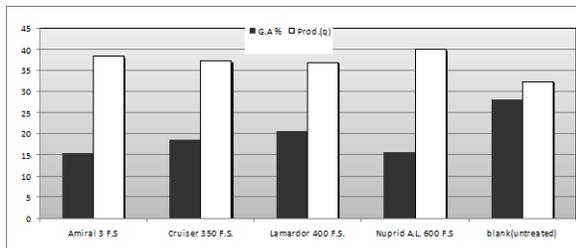
During the experimental years, to the cultivars which were seed treated, the spring was uniform by succeeding a good protection of the young plants in the first phase of vegetation, the pathogen attack being much more diminished. In exchange for the variant on which wasn't applied the seed treatment, the spring was un uniform, and later during the vegetation period there were observed very clearly the symptoms of spot blotch by a late development and excessive twinning of

a great number of plants. If in the first stage from 2008 when was registered the first degree of attack, this one had decreased values, including for the untreated variant, in the second stage, the pathogen evolved a lot, the most decreased degree of attack registering for the Nuprid (25.5%) treated variant and Cruiser 350F.S (25.8%). The highest production gain was registered for Amiral product with 500 kg/ha more than for the untreated variant (Fig. 1). The greatest attack was registered for the variant treated with Lamardor (28.0%), by obtaining at the same time the smallest production (300 kg more towards the witness.) The last column is the standard deviation.

In 2009 the pathogenic pressure was manifested with a more reduced intensity than in the former year, so that the greatest attack was of 20.6% for the treated variant with Lamardor, the untreated witness having a value of the attack degree of 28.0% (fig.2.).



**Fig. 1.** The efficiency of some fungicide applied to the seed in order to prevent the *Cochliobolus sativus* attack for the spring barley in 2008.

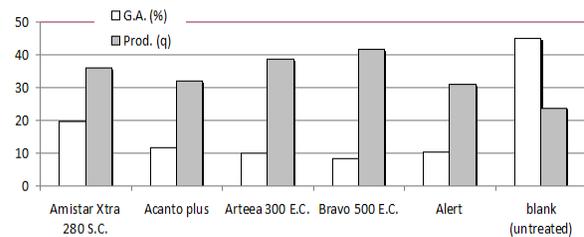


**Fig. 2.** The efficiency of some fungicide applied to the seed in order to prevent the *Cochliobolus sativus* attack for the spring barley in 2009.

*The influence of the foliar treatments over the pathogen*

In the year 2008, the degree of attack owed because of the *Cochliobolus sativus* was ranged between 8.5 and 19.5 % for the treated variants, and for the untreated witness, this one had values of until 45% (Fig.3).

The saved production was owed to the two treatments which were applied and is placed between 700 kg/ha for the inferior limit and 1760 kg/ha for the superior limit. The best variant was when the treatment was made with Bravo 500 EC product, with the mention that it was exceeded the producer recommended dose from 1.5 to 1.7 l/ha. Towards the untreated witness, the production was bigger with 1760 kg/ha. The variant with the weakest results was for the Alert treatment, where the production gain was with 1060 kg/ha smaller than the best variant. The other products brought production gains ranged between 800 and 1480 kg/ha.



**Fig. 3.** The efficiency of some fungicides applied in the vegetation period in order to prevent the *Cochliobolus sativus* attack for the spring barley in 2008.

**Discussion**

In 2008 the best production gain was registered for the Nuprid product (770 kg/ha more towards the witness) at a degree of attack of 15.5%. The variant treated with Lamardor remains the weakest variant with a production gain of 460 kg/ha towards the witness. In the year 2010 the greatest degree of attack was registered for the variant treated with Lamardor with 30.5 percentage and with a production of 320 kg/ha towards the witness.

In 2009, the pathogen exerted a more reduced pressure over the barley genotype, the degree of attack for the untreated witness being 21.5%, lower with 24 percents towards the former year. In this year, the production gain owed to the treatment was ranged between 950 and 1200 kg/ha. The best variant remains the same as in the former year, the variant treated with Bravo 500 EC, and the variant with the smaller production gain was realized for Acanto plus product, respectively 450 kg/ha towards the witness.

In 2010 the pressure exerted by the *Cochliobolus sativus* pathogen has determined an attack degree ranged between 9.5 and 21.6% for the treated variants and for the untreated witness was of 42%. The production gains were gained between 900 and 1200 kg/ha, the best variant being in this year that treated with Bravo 500 EC product and with a production gain towards the witness of 1160 kg/ha.

### Conclusions

The pathogen cannot be fought only by seed treatments, being necessary to be applied two treatments for a maximum production gain, because the present conditions in the soil produce secondary infections which in association with the classical foliar diseases could tithe the production in a very high percentage.

The most efficient seed treatment was with Amiral product which under a bigger pathogenic pressure has

obtained a very good production gain, followed by Nuprid. In the vegetation, the most efficient treatments have proved those based on chlorothalonil (Bravo 500 EC) obtaining the biggest production gain followed closely by Arteea 300 EC.

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