

EFFICACY OF DIFFERENT FUNGICIDES IN WHEAT FOLIAR DISEASES MANAGEMENT

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Abstract

In Romania, major economic losses in wheat crop are registered for some foliar diseases: fusarium head blight or scab (*Fusarium graminearum*), septoria/stagonospora leaf spot/blotch complex (*Septoria tritici*, *Stagonospora nodorum*), powdery mildew (*Blumeria graminis*) and, for several years, tan spot (*Pyrenophora tritici-repentis*).

Foliar fungicides treatments are a major mean to prevent yield losses in wheat. Fungicides are the most effective when they are used as part of an integrated disease management strategy. Higher efficacy is expected when they are properly applied, in recommended dose and at optimal timing.

The efficacy of fungicides treatments in controlling foliar fungal pathogens was evaluated in field trials conducted between 2010 and 2012, in three different locations (Fundulea - Călărași; Iazu - Ialomița; Slobozia - Giurgiu).

Twelve fungicides (Artea, Alert, Amistar X-tra, Allegro, Capalo, Duett Ultra, Evolus, Falcon, Nativo, Opera Max, Osiris and Tango Super) applied in different schemes were tested. Fungicides efficacy was calculated based on foliar diseases incidence and severity compared to untreated control.

Foliar treatments under all schemes significantly reduced the diseases severity. Differences in fungicides efficacy have been registered and were depending on wheat cultivar, location and implemented schemes.

Key words: wheat, foliar diseases, treatments, efficacy, cultivars.

INTRODUCTION

Although wheat can be attacked by a large number of fungal diseases in Romania, only some of them are usually responsible for major economic losses: fusarium head blight or scab (caused by *Fusarium graminearum*), septoria/stagonospora leaf spot/blotch complex (caused by *Mycosphaerella graminicola* sin. *Septoria tritici* and *Stagonospora/Phaeosphaeria/Septoria nodorum*), powdery mildew (caused by *Blumeria graminis*) and tan spot (caused by *Pyrenophora tritici-repentis*).

Foliar fungicides treatments are an important part of wheat production.

Fungicides are used to manage efficiently wheat disease problems that farmers occasionally face. The use of fungicides has been common in recent years.

Fungicides are more effective when used as part of an integrated disease management strategy.

Effective crop monitoring methods will help farmers to make the right decisions about when and in what case it is necessary to apply fungicides.

Through field-testing fungicides over multiple years (2010-2012) and locations (Fundulea-Călărași; Iazu-Ialomița; Slobozia-Giurgiu), we obtained a lot of information on fungicides efficacy on several wheat foliar diseases.

Higher efficacy is expected when the products are properly applied at recommended dose and at optimal timing.

Under certain environmental conditions, can occur serious economic losses (Zală et al., 2004).

Measuring the ability of wheat breeders to offset disease and increase future wheat yields is important given the need to feed the large and increasing global population (Barkley et al., 2013).

The fungus *Pyrenophora tritici-repentis* produces oval an "eyespot" type of symptom, which is usually distinctive for the disease (Figure 1).

Mature lesions of *Stagonospora nodorum* are generally lens-shaped without the distinct yellow border typical of tan spot lesions (Figure 1).



Figure 1. Mixed infection: tan spot and stagonospora spot on wheat leaves; note tan necrosis spot in center and yellow halo

The lesions of *Mycosphaerella graminicola* are restricted to the leaf veins, giving the appearance of parallel sides.

Fusarium graminearum shows bleached spikelets, splayed awns, often pink or orange-red in color, especially at the base of the glumes; *Blumeria graminis* f. sp. *tritici* is easily recognized by cottony white fungus on leaves, stems, and heads.

MATERIALS AND METHODS

The objective of this research was to estimate the degree of attack of some foliar wheat diseases.

The efficacy of fungicides treatments on foliar fungal pathogens was evaluated in field trials conducted between 2010 and 2012, in three different locations (Fundulea - Călărași; Iazu - Ialomița; Slobozia - Giurgiu).

Twelve fungicides: Artea 330 EC, Alert SC, Amistar XTRA 280 SC, Allegro SC, Capalo SE, Duett Ultra SC, Evolus EC, Falcon 460 EC, Nativo 300 SC, Opera SE, Osiris LS and Tango Super SE applied in different schemes were tested at the recommended dose from CODEX (Henegar and Andru, 2013).

Fungicides efficacy was calculated based on attack degree (which is calculated based on frequency and intensity).

The attack value is represented by frequency (F%), intensity (I%) and attack degree (AD%).

Frequency is the percentage of plant attacked out of 100 examined wheat plants.

Intensity indicates the degree to which the wheat plant is attacked under examination. Intensity was noted directly in percentage.

The attack degree which present the severity of diseases was calculated based on frequency and intensity, using the formula:

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

For calculating the efficacy was taken into account attack degrees of variants with and without treatments.

The results were statistically assured by using variance analysis.

Differences in the efficacy of the fungicides were determined by direct comparison result of the tests in the field.

Cultivars treated were Arlechin, Apache and Glosa. Observations were made under natural contamination at growth stage BBCH 61 (Witzenberger et al., 1989).

RESULTS AND DISCUSSIONS

The scoring attack for *Blumeria graminis*, *Fusarium graminearum*, *Septoria tritici*, *Stagonospora nodorum* and *Pyrenophora tritici-repentis* has a particular importance for the wheat in establishing the need for chemical treatments during the vegetation season.

The data presented in Table 1 show the results on the behaviour of the cultivar Arlechin to the pathogens *Pyrenophora tritici-repentis* and *Stagonospora nodorum*.

It is noteworthy that there was no attack of *Pyrenophora tritici-repentis* in the variants treated with fungicides Capalo + Duett; Tango + Opera; Tango + Alegro; Tango + Osiris; Tango + Duett, where efficacy was 100%. Also, there was no attack of *Stagonospora nodorum* in the variants treated with fungicides Capalo + Duett and Tango + Duett. Efficacy for prevention of *Pyrenophora tritici-repentis* attack, ranged from 88.1% (in the variant Artea + Amistar) to 99.5% (in the variant Falcon + Nativo).

Table 1. Fungicides efficacy in cultivar Arlechin (Fundulea – Călărași, year 2010)

Variants	Pathogen							
	<i>Pyrenophora tritici-repentis</i>				<i>Stagonospora nodorum</i>			
	F (%) ¹	I (%) ²	AD (%) ³	E (%) ⁴	F (%) ¹	I (%) ²	AD (%) ³	E (%) ⁴
Untreated control	81.0	1.36	1.1	-	95.0	3.08	2.93	-
Artea + Amistar	54.0	0.25	0.13	88.1	74.0	1.06	0.78	73.4
Alert + Acanto	27.0	0.1	0.03	97.3	77.0	1.29	1.0	65.9
Falcon + Nativo	13.0	0.04	0.005	99.5	77.0	1.01	0.78	73.4
Capalo + Duett U	0.0	0.0	0.0	100.0	0.0	0.0	0.0	100.0
Tango S + Opera	0.0	0.0	0.0	100.0	32.0	0.1	0.03	98.9
Tango S + Allegro	0.0	0.0	0.0	100.0	20.0	0.03	0.006	99.8
Tango S + Osiris	0.0	0.0	0.0	100.0	60.0	0.3	0.18	93.8
Tango S + Duett U	0.0	0.0	0.0	100.0	0.0	0.0	0.0	100.0

DL 5% = 73.3%; DL 1% = 82.8%; DL 0.1% = 91.9% - for efficacy

¹F (%) = Frequency; ²I (%) = Intensity; ³AD (%) = Attack degree; ⁴E (%) = Efficacy of fungicide treatment.

Table 2. Fungicides efficacy in cultivar Apache (Iazu – Ialomița, year 2011)

Variants	Pathogen							
	<i>Mycosphaerella graminicola</i>				<i>Stagonospora nodorum</i>			
	F (%) ¹	I (%) ²	AD (%) ³	E (%) ⁴	F (%) ¹	I (%) ²	AD (%) ³	E (%) ⁴
Untreated control	40.0	0.8	0.32	-	11.0	0.38	0.04	-
Tango	10.0	0.07	0.007	97.8	6.0	0.1	0.006	85.0
Duett U	25.0	0.26	0.07	78.1	0.0	0.0	0.0	100.0
Tango + Duett U	19.0	0.22	0.04	87.5	9.0	0.11	0.009	77.5
Tango + Alert	0.0	0.0	0.0	100	0.0	0.0	0.0	100
Alert	33.0	0.4	0.13	59.3	7.0	0.25	0.017	57.5

DL 5% = 69.2%; DL 1% = 81.6%; DL 0.1% = 88.4% - for efficacy

Table 3. Fungicides efficacy in cultivar Glosa (Slobozia – Giurgiu, year 2012)

Variants	Pathogen							
	<i>Mycosphaerella graminicola</i>				<i>Stagonospora nodorum</i>			
	F (%) ¹	I (%) ²	AD (%) ³	E (%) ⁴	F (%) ¹	I (%) ²	AD (%) ³	E (%) ⁴
Untreated control	100	5.3	5.3	-	26.0	1.0	0.26	-
Capalo + Duett U	33.0	3.9	1.29	75.7	2.0	1.0	0.02	92.3
Capalo + Opera	40.0	3.4	1.36	74.3	3.0	1.0	0.03	88.5
Tango + Duett U	25	1.5	0.37	93.0	1.0	1.0	0.01	96.2
Tango + Allegro	0.0	0.0	0.0	100	0.0	0.0	0.0	100
Tango + Osiris	15	1.0	0.15	97.2	1.0	1.0	0.01	96.2

DL 5% = 73.1%; DL 1% = 86.5%; DL 0.1% = 90.4% - for efficacy

Efficacy on *Stagonospora nodorum* attack, ranged from 65.9% (variant Alert + Acanto) to 99.8% (variant Tango + Allegro).

In 2011 (Table 2) were manifested only *Mycosphaerella graminicola* and *Stagonospora nodorum*.

There was no attack of *Mycosphaerella graminicola* and *Stagonospora nodorum* in the variants treated consecutive with fungicides Tango + Alert, while in other variants efficacy ranged from 59.3% (variant Alert) to 97.8%. (Tango Super) for *Mycosphaerella graminicola* and from 57.5% to 97.8%. (in the same variants) for *Stagonospora nodorum*.

Blumeria graminis appeared sporadically.

In 2012 (Table 3) fungicides efficacy on *Mycosphaerella graminicola* and *Stagonospora nodorum* was 100% in the variant with Tango Super applied to the first treatment and Allegro applied to the second treatment.

Fungicide efficacy on *Mycosphaerella graminicola* ranged from 74.3% (variant Artea + Amistar) to 99.5%. (variant Capalo + Opera) and on *Stagonospora nodorum* ranged from 88.5% (variant Capalo + Opera) to 96.2%. (variants Tango + Osiris and Tango + Duett).

In the three years of research *Fusarium graminearum* appeared sporadically in control variants (Figure 2).

CONCLUSIONS

The presence wheat disease varies from one year to another, from one variety to another and from one location to another.

Almost in all cases in which Tango fungicide was applied in different combinations the efficacy was 100%.

The management of foliar diseases of wheat can provide direct benefits by preventing yield losses in many cases.

Foliar fungal diseases of primary concern in romanian cereal production include the following: *Mycosphaerella graminicola*, *Stagonospora nodorum*, *Blumeria graminis* and *Pyrenophora tritici-repentis*.



Figure 2. Typical symptoms fusarium head blight or scab

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