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CONTROL OF BARLEY LEAF STRIPE (*Drechslera graminea*) BY FUNGICIDAL SEED TREATMENTS

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ABSTRACT

Four systemic fungicides used as seed dressings were evaluated against barley leaf stripe disease caused by *Drechslera graminea* This evaluation was carried out at Gemmeiza Agric. Res. Station in 2006/07 and 2007/08 seasons to identify a suitable fungicide to control barley leaf stripe. Under laboratory conditions, the tested fungicides had not phytotoxic effects on seed germination of Giza123 cultivar, since germination % of seed ranged from 98.32 to 98.83 %. Under field conditions, no significant differences were found between the fungicides Tetraconazole (Bremis) and Diniconazole(sumi-8) in controlling the disease. Tetraconazole (2 cm/kg seed) , Diniconazole (1.5 cm/kg seed) and Teboconazole (1.2cm/kg seed) provided the best efficacy % of barley leaf stripe control releasing 96.29, 96.19 and 96.06 % efficacy, respectively. On the other hand , Semiconazole (1 gm/kg seed) showed the lowest efficacy % in this respect(87.83%,) . Grain yield expressed as spike weight and grain yield /m^2 was associated with fungicide efficacy. Tetraconazole (Bremis, 2.5%) showed the highest average of spike weight and grain yield /m^2 (4.98 and 258.50 gm, respectively), while, Semiconazole (sunlit) showed the lowest average (3.83 and 187.46 gm, respectively).High correlation was found between efficacy of fungicides and both of increase % of spike weight (r = 0.9793) and Increase % of grain weight /m^2 (r = 0.9999).

Keywords: *Drechslera graminea,* phytotoxic, Fungicides, Tetraconazole, Diniconazole, Teboconazole, Semiconazole

INTRODUCTION

Leaf stripe , *Drechslera graminea* (*Pyrenophora graminea)* is an important seed-borne disease of barley, especially in organic seed production where efficient chemical means to control the disease are not available. Gordon,. *et al*.,(1985) reported that barley leaf stripe, a seed borne disease caused by *Drechslera graminea,* has become a serious problem in the absence of an effective seed treatment. In Europe countries i.e. Scandinavian barley cvs. and in organic farming systems, it causes severe reductions in grain yield (Porta-Puglia *et al*.,1986). Bent J. Nielsen (2002) reported that little is known about the resistance in modern varieties against leaf stripe *Drechslera graminea* (*Pyrenophora graminea*) . Most of the hulled Egyptian barley varieties were susceptible such as Giza123 and Giza126 and Giza131(hull-less cultivar), to barley leaf stripe (El-Shamy, *et al.,*2007). In Egypt, no back-ground is known on the chemical control to barley leaf stripe and more information is needed. So, producers must rely on chemical control of the disease. Several investigations were carried out in many countries all over the world about seed treatments with fungicides (Loughman and Khan ,1993 and Cockerell *et al*.,1995). For this reason, the main objective of this study was conducted to evaluate some systemic fungicides during two consecutive (2007–2008) to identify a suitable seed treatment for controlling barley leaf stripe.

MATERIALS AND METHODS

Preparation of inoculated seeds.

To obtain inoculated seeds, two years were needed. In the first year 2005/06, the highly susceptible cultivar Giza123 was inoculated via natural infection by planting one row of inoculated seeds in-between two rows of healthy plants (8gm/row). Also, from border rows of a mixture of highly susceptible cultivars infected by a seed-borne leaf stripe population i.e. Giza123 and Giza126.The inoculated grains were harvested and sown in the second year (2006/07) to ensure the occurrence of barley leaf stripe disease(Fig.1) and to obtain infected seeds .

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Fig. (1): Symptoms of barley leaf stripe .

Fungicidal seed treatment:

The effectiveness of five fungicides represents 4 different groups were used as seed treatment for controlling barley leaf stripe disease. These fungicides were recommended for wheat loose smut. The evaluation was carried out at Gemmeiza Res. Station during 2006/07 and 2007/08 growing seasons. The inoculated seeds were treated with the recommended doses of the previous fungicides presented in Table (1). Then the treated seeds were left to dry under natural conditions.

Table(1): Trade name, formulae, common name and dose of application.

No.	Trade name	Formulae*	Common name	Dose
1	**Bremis 2.5%**	FS	Tetraconazole	2 cm/Kg seed
2	**Raxil 2.5%**	FS	Teboconazole	1.2 cm/Kg seed
3	**Sunlit**	WP	Semiconazole	1 gm/Kg seed
4	**Sumi-8 2%**	FL	Diniconazole	1.5 cm/kg seed

***FS = Flow-able suspension FL = Flow-able liquid WP = we table powder**

Effect of fungicides on seed germination:

One hundred of treated seeds were sown on filter paper in Petri dishes in five replicates (20/ dish) for each fungicide and moistened with water for germination. Five replicates were sown with un-treated seeds. After 7 days, the number of germinated seeds were counted when the control treatment was completely germinated. The germination percentages were calculated for each fungicide.

Evaluation of the tested fungicides :

In 2006/07 and 2007/08 seasons, the treated seeds with each fungicide were drilled in plots of 6 rows (1.2 x 2 m). The treatments were arranged in complete block design with three replicates. Un-treated plots were sown as check to assess the efficacy of each fungicide.

Disease assessment :

At heading stage, the infection incidence was then determined at growth stage 61 (spikes emergence – flowering) according to Zadocks *et al. (*1974) based on visual assessments. The number of infected spikes were used to calculate the percentage of disease incidence according to the following formulae,

$$\text{Disease incidence\%} = \frac{\text{No. of infected spikes}}{\text{Total no. of spikes}} \times 100$$

Efficacy of each fungicide in controlling the disease were calculated according to the formulae adopted by Rewal and Jhooty (1985) as follow,

$$\text{Efficacy \%} = \frac{\text{Control - Treatment}}{\text{Control}} \times 100$$

Increase% of spike weight, healthy over infected, (Fig.2) and grain yield/ m^2, were recorded each treatment. The obtained results were statically analyzed according to Snedecor, (1957) .

A **B**

Fig (2): Healthy (A) and infected (B) spikes.

RESULTS AND DISCUSSION

The present study was initiated to investigate the effect of 4 fungicides on controlling barley leaf stripe disease and its effect on seed germination, Giza 123.

Laboratory evaluation:

Data in Table (2) showed that slight significant differences were found between the tested fungicides and the control treatment on seed germination. Percentage of seed germination ranged from 96.85 – 97.35 for fungicides, while it was 98.50 for the control treatment. Germination % ranged between98.32 -98.83 %, thus it could be say that these fungicides had no fungi-toxic effects on barley seed germination. Similar results were obtained by Gordon,*et al*. (1985) on barley plants. Also, Imbaby *et al*. (2006) who tested 7 systemic fungicides used for controlling loose smut of wheat on seed germination of cultivar sakha61. They stated that these fungicides had no effect on seed germination.

Table (2): Effect of 4 systemic fungicides on seed germination of the barley cultivar Giza123.

Fungicide	Average of Seed germination	Germination %
Bremis	96.90 cd*	98.37
Raxil 2.5%	97.25 bc	98.73.
Sunlit	96.85 d	98.32
Sumi-8 5%	97..35 b	98.83
control	98.50 a	
L.S.D. at 0.05%	0.37	

*** Average values with the same letter are not significant**

Data in table (3) reveal that all fungicide treatments reduced barley leaf stripe infection compared to the un-treated control .It could be noticed that efficacy of these fungicides ranged from 87.83 and 96.29%. Significant differences were found between fungicides and the control treatment. Tetraconazole (Bremis, 2.5%, FS) , Diniconazole (Sumi-8, 2%, FL) and Teboconazole (Raxil, 2.5%, FS) provided the best efficacy % of barley leaf stripe control (96.29, 96.19 and 96.06 %, respectively) compared to the untreated control (34.53%). On the other hand, Semiconazole (Sunlit) showed the lowest efficacy % in this respect (87.83%, respectively) . Similar results were obtained by Gordon,. *et al*. (1985) tested several fungicides provided a high level of disease control. Three of these, imazalil, CGA-64251, and iprodione, gave nearly complete control of barley stripe without phytotoxicity on barley plants. Also, Loughman and Khan (1993) evaluated Eight fungicide seed dressings in the southern cereal belt of Western Australia for controlling barley leaf stripe caused by *Pyrenophora graminea*. Flutriafol (100 µg/g seed) and triadimenol plus imazalil (225 + 75 µg/g seed) were most effective. Flutriafol and triadimenol plus imazalil offer effective control of leaf stripe .Also, EL-Shamy *et al*.,(2000) who reported that seed treatment with fungicides belonged to Diniconazol, Triticonazole and Metaconazole at the recommended doses gave good levels of control to wheat loose smut. No available data on chemical control to barley leaf stripe were found in Egypt.

Table (3): Efficacy percentage of 4 systemic fungicides used as seed treatment of Giza 123 cultivar in controlling barley leaf stripe in 2006/07 and 2007/08 seasons.

Fungicide	Disease incidence%		Average disease incidence	Efficacy %
	2006/ 07	2007/ 08		
Bremis	1.50 c*	1.06 d*	1.28	96.29
Raxil 2.5%	1.29 d	1.44 c	1.36	96.06
Sunlit	4.38 b	4.16 b	4.27	87.83
Sumi-8 5%	1.54 c	1.17 d	1.32	96.17
Control	35.68 a	33.38 a	34.53	
L.S.D. at 0.05%	0.13	0.18		

***Average values with the same letter are not significant**

Data in Table (4) reveal that there were yield differences among treatments either with spike weight or grain yield /m^2. In the two seasons, Increase % of 1000 grain weight and grain yield/ m^2 run in a parallel line with fungicides efficacies. Also, yield response to fungicide treatment was greatest when compared with the un-treated control. Fungicide seed dressings resulted in an increase % in spike weight ranged from 16.76 to 51.82% and grain yield/ m^2 ranged from 8.95 to 46.91%. Tetraconazole (Bremis) treatment showed the highest values of spike weight (4.98gm) and grain yield/ m^2(258.50 gm) . On the other hand, the lowest spike weight (3.83gm) and grain yield /m² (187.46gm) were associated with Semiconazole (sunlit fungicide). High correlation was found between efficacy of fungicides and both of increase % of spike weight (r = 0.9793) and increase % of grain weight /m² (r = 0.9999).

Table(4): Effect of 4 systemic fungicides on spike weight and grain yield /m² Giza123 barley cultivar affected by *Drechslera graminea*.

Fungicide	Spike weight		Main spike weight (gm)	Increase %	Grain weight/m² (gm)		mean Grain weight/m² (gm)	Increase %
	2007	2008			2007	2008		
Bremis	5.04[a]	4.92[a]	4.98	51.82	252.56[a]	264.45[a]	258.50	46.91
Raxil 2.5%	4.60[b]	4.79[a]	4.69	43.14	250.34 [a]	263.89[a]	257.11	46.12
Sunlit	3.76[c]	3.91[b]	3.83	16.76	184.71 [b]	190.21[c]	187.46	8.95
Sumi-8 5%	4.77[b]	4.94[a]	4.85	47.86	256.17 [a]	258.62[b]	257.39	46.28
control	3.32[d]	3.25[c]	3.28		171.76 [c]	180.14[d]	175.95	
L.S.D. at 0.05%	0.19	0.21			6.30	1.78		

*** Average values with the same letter are not significant.**

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مقاومة مرض تخطيط أوراق الشعير (درشسليرا جرامينيا) بمعاملة التقاوي بالمبيدات

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تم تقييم أربعة مبيدات جهازيه كمعاملة بذرة لمقاومة مرض تخطيط أوراق الشعير المتسبب عن الفطر درشسليرا جرامينيا لأول مرة فى مصر . ولقد تم هذا التقييم بمحطة البحوث الزراعية بالجميزة فى موسمي ٢٠٠٦/٢٠٠٧ و٢٠٠٧/٢٠٠٨ على التوالي . تم دراسة تأثير هذه المبيدات على نسبة انبات حبوب الشعير (صنف جيزة ١٢٣) تحت ظروف المعمل . أظهرت النتائج أنة لم توجد أي تأثير سمى للمبيدات المستخدمة على إنبات حبوب الشعير. وقد تراوحت النسبة المئوية للإنبات بين ٩٨,٣٢ -٩٨,٨٣ % مقارنة بمعاملة الكنترول. أظهرت النتائج أن مبيد التتراكونازول (البريمس ٢,٥%) بمعدل ٢ سم/ كجم بذرة يليه مبيد الدينيكونازول (سومى-ايت٢%) بمعدل ١,٥ سم/كجم بذرة ثم مبيد التيبوكونازول (راكسيل ٢,٥%) بمعدل ١,٢سم /كجم بذرة هي الأفضل حيث حققت ٩٦,٢٦ و٩٦,١٩ و٩٦,٠٦ % كفاءة فى مقاومة المرض على التوالي. هذا ولم تكن هناك فروق معنوية بين المبيدين البريمس (٢,٥%) و سومى-ايت (٢ %) في مقاومة المرض. بينما كان المبيد سيميكونازول (سانليت) بمعدل ٢ جم/ كجم بذرة الأقل كفاءة فى مقاومة المرض (٨٧,٨٣%).ولقد كان محصول الحبوب متمثلا فى وزن السنبلة – وزن محصول المتر المربع متمشيا مع كفاءة المبيدات في مقاومة المرض. حيث أعطى التتراكونازول (البريمس) أعلى متوسط لوزن السنبلة ٤,٩٨ جم وكذلك متوسط وزن محصول المتر المربع ٢٥٨,٥٠ جم وكان أقلها مبيد السيميكونازول (سانليت) حيث أعطى٣,٨٣ جم و ١٨٧,٤٦ جم على التوالي. وقد وجد أن هناك درجة عالية من الارتباط بين كفاءة المبيدات وكل من وزن السنبلة (٠,٩٧٩٣) ووزن محصول حبوب المتر المربع(٠,٩٩٩٩).