



Assessment of the Seedling Reactions of Some Turkish Barley Cultivars to Barley Stripe*

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Abstract: Seedling reactions of 15 barley cultivars grown in Turkey were determined under greenhouse conditions to five isolates of *Drechslera graminea*, the causal agent of barley stripe disease. Isolates were collected from different parts of Ankara province. Differences were observed among the reactions of the cultivars to the isolates of the fungus. There were also pathogenicity differences among the isolates. The cultivars Çumra 2001 and Yerçil 147 were resistant to all five isolates. Cultivar Sladoran was resistant to 4 isolates. The cultivars Erginel 90, Orza 96, Çetin 2000 and Aydanhanım were susceptible to three isolates of the fungus. The reactions of other varieties ranged between resistant and susceptible depending on the isolates. Isolate Dg3 was the most virulent.

Key Words: *Drechslera graminea*, *Pyrenophora graminea*, barley stripe, barley, Turkey

Bazı Türk Arpa Çeşitlerinin Arpa Çizgili Yaprak Lekesi Hastalığına Karşı Fide Dönemi Tepkilerinin Tespit Edilmesi

Öz: Türkiye’de yetiştirilen 15 arpa çeşidinin arpa çizgili yaprak lekesi hastalığı etmeni olan *Drechslera graminea* ’nın 5 izolatına karşı fide dönemi tepkileri sera şartlarında tespit edilmiştir. İzolatlar Ankara ilinin değişik bölgelerinden toplanmıştır. Çeşitlerin fungus izolatlarına karşı gösterdiği tepkilerde farklılıklar görülmüştür. İzolatlar arasında da patojenisite açısından farklılıklar görülmüştür. Çumra 2001 ve Yerçil 147 çeşitleri 5 izolatın hepsine dayanıklı olarak görülmüştür. Sladoran çeşidi 4 izolata karşı dayanıklı olarak görülmüştür. Erginel 90, Orza 96, Çetin 2000 ve Aydanhanım çeşitleri fungusun 3 izolatına karşı hassas olarak bulunmuştur. Diğer çeşitlerin tepkileri, izolatlara bağlı olarak, dayanıklı ile hassas arasında değişmiştir. Dg3 izolati en virulent izolat olarak bulunmuştur.

Anahtar Kelimeler: *Drechslera graminea*, *Pyrenophora graminea*, arpa çizgili yaprak lekesi hastalığı, arpa, Türkiye

Introduction

Barley (*Hordeum vulgare* L. emend Bowden) is an important crop both in the world and in Turkey. In Turkey, it is cultivated on 3.6 million ha with a production of 9.5 million tonnes and a mean of 2653 kg/ha (Anonymous 2007). Barley stripe, caused by the fungus *Drechslera graminea* Rab. Shoem. (teleomorph: *Pyrenophora graminea* S. Ito & Kuribay) reduces the yield and the quality of barley worldwide including Turkey (Mathre 1982, Aktaş 2001, Çetinsoy 1995). Yield losses due to this disease in Turkey range between %3.3-15 (Damgacı and Aktuna 1983, Aktaş 1984, Mamluk et al. 1997).

as minimizing pesticide use. In Turkey, reactions of 1216 barley lines to leaf stripe was tested under field conditions. Twenty-five and eight percent of these lines were found as resistant and moderately resistant, respectively (Albustan et al. 1999). However, *D. graminea* isolates vary pathogenically (Hammouda 1988, Tunalı 1992). Also recent status of the commonly grown barley cultivars in Turkey to barley stripe is unknown. Therefore, under greenhouse conditions, we have studied seedling reactions of 15 commonly grown Turkish barley cultivars to five *D. graminea* isolates.

Using resistant cultivars is the easiest and the most economical way of controlling the disease as well

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Materials and Methods

Fifteen barley cultivars were obtained from Central Research Institute for Field Crops (CRIFC)(Ankara, Turkey). Cultivars Tokak 157/37, Cumhuriyet 50, Yerçil 147, Bülbül 89, Tarm 92, Karatay 94, Orza 96, Sladoran, Çumra 2001, Aydanhanım and Sur 93 are 2-rowed and cultivars Erginel 90, Kiral 97, Çetin 2000 and Avcı 2002 are 6-rowed. In May and June of 2004, diseased barley leaves were collected from the following locations in Ankara province: Ankara University, Faculty of Agriculture Campus Research Area in Dışkapı (designated as Dg1 isolate); Ayaş (Dg2 isolate); Haymana (Dg3 isolate); Yenikent (Dg4 isolate); CRIFC experimental field, Yenimahalle (Dg5 isolate). Inoculations were made using single spore cultures with a modified sandwich test (Mohammad and Mahmood 1974). Fungal cultures were grown ten days at 22° C. Barley seeds were surface sterilized with 1% NaOCl for 3 minutes and then placed on the half of Potato Dextrose Agar plates. The other half of the agar was carefully inverted over the barley seeds under aseptic conditions. The seeds were incubated 72 hours at 22° C and an additional 5-7 days at 4° C. Ten seeds of each cultivar were sown into 10 cm in diameter plastic pots containing sand, animal manure and soil (v:v:v, 1:1:3). Each assay was repeated three times. Six weeks after inoculation evaluations were made following the Tekauz's procedure (1983) in which:

1. Resistant (% leaf stripe infection <5) = R
2. Intermediate (% leaf stripe infection 5-17) = I
3. Susceptible (% leaf stripe infection >17) = S.

Results and Discussion

Differences among the reactions of the cultivars to the isolates of the fungus were observed. The cultivars Çumra 2001 and Yerçil 147 were resistant to all five isolates (Table 1). The cultivars Erginel 90, Orza 96, Çetin 2000 and Aydanhanım were susceptible to three isolates of the fungus. The remaining cultivars showed reactions that varied between resistance and susceptibility depending on the isolate of the fungus. For example, Cultivar Sladoran showed a resistant reaction to isolates Dg1, Dg2, Dg3, and Dg4 but showed an intermediate reaction to the isolate Dg5. Cultivar Çetin 2000 showed a susceptible reaction to isolates Dg1, Dg2 and Dg3 but showed an intermediate reaction to isolates Dg4 and Dg5. Isolate Dg3 was the most virulent (mean disease percentage 39). Nine cultivars showed susceptible reactions to the isolate Dg3. On the other hand, no susceptible cultivar reaction was observed

with the isolate Dg5. It appears that genotypic differences exist among Turkish barley cultivars in resistance to *D. graminea*. Genotypic differences among the barley cultivars were reported by various authors (Tekauz, 1983; Kline, 1971; Kline, 1972). Also pathogenic variability among the isolates were evident. Pathogenic variability in *D. graminea* was also reported by different authors ((Hammouda 1988, Mohammad and Mahmood 1976, Tunalı 1992).

In Turkey, a study performed by Çetin et al (1995) showed that percentages of diseased plants in the cvs Tokak 157/37, Tarm 92, Bülbül 89, Orza 96 and Yerçil 147 were 20.3, 24.8, 36, 38.2 and 96.3, respectively. In our study, cv Yerçil 147 was found to be resistant to five isolates. Reactions of the other cultivars ranged between resistant and susceptible. Konak and Scharen (1994) observed a resistant reaction of the cv Tokak 157/37 with the isolates Mt-6 and Mt-10. Cultivar Cumhuriyet 50 showed a resistant reaction to isolate Mt-10 and a moderately resistant reaction to the isolate Mt-6. In our study, cv Tokak 157/37 showed a resistant reaction to isolates Dg4 and Dg5 and cv Cumhuriyet 50 showed a resistant reaction to isolate Dg 2.

Tunalı (1992) using a virulent strain of *D. graminea* found that cvs Bülbül 89, Erginel 90, and Cumhuriyet 50 were resistant while cv Tokak 157/37 showed an intermediate reaction and cv Yerçil 147 showed a susceptible reaction. In another study (Tunalı, 1995), cv Yerçil was inoculated with two single spore isolates of *D. graminea*. Percentage of leaf stripe was found as 11.7 and 0 for the isolates A and B, respectively. The reaction of cv Yerçil was listed as intermediate. In our study, cv Yerçil 147 was found to be resistant to the all five isolates tested and cv Erginel 90 showed a susceptible reaction to the isolates Dg1, Dg2, and Dg3, intermediate reaction to isolate Dg4 and resistant reaction to isolate Dg5. Cultivar Bülbül 89 showed a susceptible reaction to isolate Dg3, resistant reaction to isolates Dg2 and Dg4 and intermediate reaction to isolates Dg1 and Dg5. Cultivar Cumhuriyet 50 showed a susceptible reaction to isolates Dg1 and Dg3, resistant reaction to isolate Dg2 and intermediate reaction to isolates Dg4 and Dg5. Cultivar Tokak 157/37 showed a susceptible reaction to isolate Dg2, intermediate reaction to isolates Dg1 and Dg3 and resistant reaction to isolates Dg4 and Dg5.

The reactions of these cultivars to barley stripe should also be determined under field conditions.

Pathogenic variability in the Turkish *D. graminea* populations indicates that the variability of a comprehensive collection of isolates from all or

Table 1. Mean seedling response of 15 Turkish barley cultivars to five *Drechslera graminea* isolates under greenhouse conditions. For evaluation a 1-3 scale developed by Tekauz (1983) was used (1. R: Resistant (< 5.0% leaf stripe); 2. I: Intermediate (5.0% to 17.0% leaf stripe); 3. S: Susceptible (>17% leaf stripe). Numbers are mean of three replications.

Number	Barley cultivars	Isolates										
		Dg1 (Agricultural Faculty Campus)		Dg2 (Ayaş)		Dg3 (Haymana)		Dg4 (Yenikent)		Dg5 (Yenimahalle)		Mean
		Mean Disease Percent	Scale value	Mean Disease Percent	Scale value	Mean Disease Percent	Scale value	Mean Disease Percent	Scale value	Mean Disease Percent	Scale value	
1	TOKAK 157/37	7.50	2 (I)	41.26	3 (S)	13.24	2 (I)	2.77	1 (R)	0.00	1 (R)	12.95
2	CUMHURİYET 50	35.53	3 (S)	0.00	1 (R)	88.85	3 (S)	8.58	2 (I)	6.66	2 (I)	27.92
3	YERÇİL 147	0.00	1 (R)	0.00	1 (R)	0.00	1 (R)	0.00	1 (R)	0.00	1 (R)	0.00
4	BÜLBÜL 89	16.11	2 (I)	3.33	1 (R)	53.84	3 (S)	3.03	1 (R)	6.66	2 (I)	16.59
5	ERGİNEL 90	25.28	3 (S)	88.88	3 (S)	80.60	3 (S)	12.55	2 (I)	3.70	1 (R)	42.40
6	TARM 92	14.07	2 (I)	35.00	3 (S)	52.05	3 (S)	2.77	1 (R)	3.33	1 (R)	21.44
7	KARATAY 94	23.33	3 (S)	2.56	1 (R)	12.17	2 (I)	3.03	1 (R)	6.36	2 (I)	9.35
8	ORZA 96	27.03	3 (S)	70.39	3 (S)	41.11	3 (S)	0.00	1 (R)	0.00	1 (R)	27.80
9	KIRAL 97	4.16	1 (R)	55.55	3 (S)	8.33	2 (I)	15.45	2 (I)	0.00	1 (R)	16.69
10	SLADORAN	0.00	1 (R)	0.00	1 (R)	0.00	1 (R)	0.00	1 (R)	6.66	2 (I)	1.33
11	ÇETİN 2000	43.93	3 (S)	85.18	3 (S)	65.99	3 (S)	7.03	2 (I)	6.66	2 (I)	41.75
12	ÇUMRA 2001	0.00	1 (R)	0.00	1 (R)	0.00	1 (R)	0.00	1 (R)	0.00	1 (R)	0.00
13	AYDANHANIM	76.66	3 (S)	64.10	3 (S)	69.44	3 (S)	8.09	2 (I)	13.33	2 (I)	46.32
14	SUR 93	16.36	2 (I)	0.00	1 (R)	40.60	3 (S)	42.30	3 (S)	6.66	2 (I)	21.18
15	AVCI 2002	3.33	1 (R)	0.00	1 (R)	58.92	3 (S)	0.00	1 (R)	0.00	1 (R)	12.45
	General Mean	19.39		29.48		39.00		7.03		4.00		19.87

significant regions of Turkey should be determined to assist breeding programs in developing effective screening protocols.

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