BİTKİ KORUMA BÜLTENİ 2015, 55(3): 247-252
ISSN 0406-3597

Determination of the seedling reactions of some barley cultivars and advanced barley lines to *Rhynchosporium commune*

Mohammad Reza AZAMPARSA[1] Zafer MERT[2] Aziz KARAKAYA[1]
İsmail SAYİM[2] Namuk ERGÜN[2] Sinan AYDOĞAN[2]

Bazı arpa çeşitlerinin ve ileri kademe arpa hatlarının *Rhynchosporium commune*'a fide dönemi tepkilerinin belirlenmesi

ÖZ

Yirmibeş ileri kademe arpa ıslah hattı ve 5 arpa çeşidinin *Rhychosporium commune*'nin virülent bir izolatına karşı fide dönemi tepkileri sera şartlarında tespit edilmiştir. Avcı 2002 çeşidi yüksek derecede dayanıklı bulunurken Kalaycı 97 ve Bülbül 89 çeşitleri hassas olarak bulunmuştur. Karatay 94 ve Efes 3 çeşitleri ise yüksek derecede hassas olarak bulunmuşlardır. İleri kademe arpa hatları içerisinde 9 numaralı hat en dayanıklı hat olarak görülmüş olup, 3, 7 ve 11 numaralı genotipler orta derecede dayanıklı reaksiyon sergilemişlerdir. İleri kademe arpa hatlarından 1, 2, 4, 6, 10, 13, 16, 18, 19, 20, 24 ve 25 numaralı genotipler hassas olarak bulunurken, 5, 8, 12, 14, 15, 17, 21, 22 ve 23 numaralı genotipler *R. commune* izolatına yüksek derecede hassas olarak bulunmuşlardır. Avcı 2002 arpa çeşidi ve 3, 7, 9 ve 11 numaralı ileri kademe arpa hatları dayanıklılık kaynağı olarak kullanılabilir.

Anahtar kelimeler: *Rhynchosporium commune*, *Rhynchosporium secalis*, arpa, hastalıklara dayanıklılık, Türkiye

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[1] Ankara University, Faculty of Agriculture, Department of Plant Protection, Dışkapı, Ankara, 06110, Turkey
[2] Central Research Institute for Field Crops, Yenimahalle, Ankara, Turkey
Sorumlu Yazar (Corresponding author) e-mail: karakaya@agri.ankara.edu.tr
Alınış (Received): 01.02.2015, Kabul Ediliş (Accepted): 03.08.2015

ABSTRACT

Seedling reactions of 25 advanced barley lines and 5 barley cultivars to one virulent isolate of *Rhychosporium commune* were determined under greenhouse conditions. Cultivar Avcı 2002 was found highly resistant and cvs Kalaycı 97 and Bülbül 89 were found susceptible. Barley cultivars Karatay 94 and Efes 3 exhibited a highly susceptible reaction to *R. commune*. Among the advanced lines, 9 was the most resistant genotype. Barley lines 3, 7, and 11 showed a moderately resistant reaction to the isolate. Genotypes 1, 2, 4, 6, 10, 13, 16, 18, 19, 20, 24, and 25 were susceptible and genotypes 5, 8, 12, 14, 15, 17, 21, 22, and 23 were highly susceptible to the *R. commune* isolate. Cultivar Avcı 2002 and advanced barley lines 3, 7, 9, and 11 could be used as resistance sources.

Keywords: *Rhynchosporium commune*, *Rhynchosporium secalis*, barley, disease resistance, Turkey

INTRODUCTION

Barley scald caused by the fungus *Rhynchosporium secalis* (Oudem.) J. J. Davis is an important disease of barley both in the World and in Turkey (Shipton et al. 1974, Zhan et al. 2008, Karakaya et al. 2014). Zaffarona et al. (2011) named the *Rhynchosporium* isolates infecting cultivated barley and other *Hordeum* spp. and *Bromus diandrus* as *R. commune*. *R. secalis* is retained for *Rhynchosporium* isolates infecting rye and triticale.

Barley scald could be transmitted to the next year crop by barley seeds and plant debris. The barley scald disease is present in all barley growing countries especially in temperate zones with semi humid and cooler environments. Distinctive disease symptoms could be seen on leaves, leaf sheaths and ears. These symptoms generally observed in the beginning as oval shapes and pale grey and bluish color. Later on, edges of these lesions become dark brown with light gray, tan or white centers (Avrova and Knogge 2012, Mathre 1982).

Generally yield losses of 10-70% have been seen due to barley scald (Mathre 1982, Shipton et al. 1974, Sheikh Jabbari 2008). Barley scald is controlled by means of chemical, agronomical and biological measures. Destruction of sources of primary infection and use of resistant cultivars are important control measures (Avrova and Knogge 2012, Mathre 1982). Turkey which is located in the Fertile Crescent region has long been known as a barley gene reserve area (Kün 1996). Introducing new sources of resistance to barley cultivars as well as releasing new resistant varieties in region can lead to safe and economic agricultural practices. This might eliminate use of chemical measures against barley scald. Planting a resistant variety is important in disease control. In this study, seedling resistance status of 5 barley cultivars and 25 advanced barley lines to a virulent isolate of *Rhynchosporium commune* were determined under greenhouse conditions.

MATERIALS AND METHODS

This research was conducted at the greenhouse of Central Research Institute for Field Crops, Ankara, Turkey. Five barley cultivars and 25 advanced barley lines were obtained from Central Research Institute for Field Crops, Ankara, Turkey. Barley cultivar Avcı 2002 is 6 rowed and cultivars Efes 3, Bülbül 89, Karatay 94 and Kalaycı 97 are 2 rowed. For inoculation, a virulent single spore isolate obtained from a barley field located in Midyat district of Mardin province, Turkey was used. Isolation and inoculation procedures were similar to those as described previously (Mert and Karakaya 2004). Five replications were used in the experiment. Eighteen days after inoculation, evaluations were made on the first leaves, using a 0-4 scale (El-Ahmed 1981). A scale value of 0 was considered as a highly resistant reaction and scale values 0.1–1.0, 1.1–2.0, 2.1–3.0 and 3.1–4.0 were considered as resistant, moderately resistant, susceptible and highly susceptible reactions, respectively.

RESULTS

Resistance differences among the barley cultivars and advanced lines to *R. commune* isolate were observed (Figure 1 and Table 1). Barley cultivar Avcı 2002 was found highly resistant to *R. commune.* Cultivars Karatay 94 and Efes 3 were highly susceptible and cultivars Bülbül 89 and Kalaycı 97 were susceptible to *R. commune*. Barley line 9 was resistant and lines 3, 7 and 11 were moderately resistant. Lines 1, 2, 4, 6, 10, 13, 16, 18, 19, 20, 24 and 25 were susceptible and lines 5, 8, 12, 14, 15, 17, 21, 22 and 23 were highly susceptible to *R. commune*.

Figure1. Barley scald disease symptoms on line 21 (left) and cultivar Karatay 94 (right).

Table 1. Seedling reactions of 5 barley cultivars and 25 advanced barley lines to a virulent isolate of *Rhynchosporium commune* based on 0-4 scale.

Lines and cultivars	Replication 1	Replication 2	Replication 3	Replication 4	Replication 5	Mean
1	3	4	3	3	3	**3**
2	3	3	3	3	3	**3**
3	1	2	2	2	1	**2**
4	3	4	4	3	3	**3**
5	3	4	4	4	4	**4**
6	3	4	3	4	3	**3**
7	2	2	2	2	2	**2**
8	4	4	3	4	3	**4**
9	1	1	1	0	0	**1**
10	3	4	3	3	3	**3**
11	2	2	2	2	2	**2**
12	4	4	4	4	3	**4**
13	3	2	3	3	3	**3**
14	4	4	4	4	3	**4**
15	3	4	4	4	3	**4**
16	1	3	3	4	3	**3**
17	4	4	4	4	3	**4**
18	4	4	3	3	3	**3**
19	3	3	3	4	4	**3**
20	3	4	3	4	3	**3**
21	3	4	4	4	3	**4**
22	4	4	4	3	3	**4**
23	4	4	4	4	4	**4**
24	3	3	4	3	3	**3**
25	2	4	4	3	4	**3**
Karatay 94	3	4	4	4	3	**4**
Kalaycı 97	3	4	4	3	3	**3**
Efes 3	3	4	4	4	4	**4**
Bülbül 89	3	4	3	3	3	**3**
Avcı 2002	0	0	0	0	0	**0**

DISCUSSION

Variation in the response of barley lines and cultivars to a virulent isolate of *R. commune* was found. Although resistant cultivar and lines were found, most of the cultivars and lines showed susceptible reactions.

In a previous study performed by Mert and Karakaya (2004), cultivar Avcı 2002 was found highly resistant to 5 *Rhynchosporium secalis* isolates and their mixture.

This 6 rowed cultivar is also found highly resistant to isolate used in our study. Cultivars Efes 3 and Karatay 94 showed highly susceptible reactions to 5 isolates and their mixture. Cultivars Kalaycı 97 and Bülbül 89 showed highly susceptible reactions to 4 isolates and their mixture. These cultivars showed a susceptible reaction to one isolate.

In another study performed by Düşünceli et al. (2008), cultivar Avcı 2002 showed a highly resistant reaction to a *R. secalis* isolate both in the greenhouse (seedling) and field (adult plant) conditions. Cultivars Bülbül 89, Efes 3, Kalaycı 97, and Karatay 94 showed a highly susceptible reaction to *R. secalis* isolate under greenhouse (seedling) conditions. Field reaction of these cultivars to *R. secalis* isolate ranged between susceptible-highly susceptible during the 3 year period. In this study, among the 683 barley genotypes tested 44% and 39% were found to be resistant to moderately resistant in the seedling and adult plant stage, respectively. In the genotype resistance study, a significant (P= 0. 0001) correlation was found between the seedling resistance and adult plant resistance (r= 0.53). In our study, most of the advanced barley lines showed susceptible to highly susceptible reactions to the *R. secalis* isolate used. However, resistant genotypes were also found. Among the genotypes, 9 was the most resistant genotype. Genotypes 3, 7 and 11 showed a moderately resistant reaction to the isolate.

Kavak (1998) determined under natural and experimental conditions in the field the reactions of 20 barley cultivars to *R. secalis* isolates collected from Şanlıurfa, Turkey. In this study, cv. Efes 3 was found to be resistant.

Turkey is one of the gene centers of barley (Kün 1996). Variation in resistance among the barley cultivars and lines was observed in our study. It appears that resistance to *R. commune* is present in Turkish barley cultivars and advanced lines. Cultivar Avcı 2002 and barley lines # 3, 7, 9 and 11 could be used as resistance sources. Introducing new sources of resistance to barley cultivars will greatly help for obtaining disease resistant barley cultivars.

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