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Evaluation of the response of some rice varieties to rice blast disease under growth room and field conditions

Bazı çeltik çeşitlerinin yetiştirme odası ve tarla koşulları altında çeltik yanıklık hastalığına tepkilerinin değerlendirilmesi

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ABSTRACT

Rice blast disease, caused by *Pyricularia oryzae*, is a significant fungal disease of rice worldwide. The disease significantly affects rice yield and quality, particularly in humid regions of Mediterranean countries. Effective control of rice blast is possible with the use of licensed fungicides. However, chemical control is often not very economical and may not be ecologically preferable. On the other hand, one of the most important approaches is the use of resistant varieties. This study aimed to evaluate the resistance of rice varieties to rice blast disease. A mixture of 10 rice blast isolates developed from single spores was used as inoculum. The study was conducted under grow room and field conditions. 49 rice varieties were observed, including two susceptible varieties. Rice blast reactions were evaluated according to a 0-5 scale at different growth stages of rice. In the study, Balaban and Aromatik-1 varieties were found to be immune both in the field and in the growth room; It was found that the Hamzadere variety is moderately resistant; the Kızıltan, Osmancık-97, Gönen, Altınyazı, Yavuz, Kırıl, Koral, Manyas Yıldızı and Mevlütbey varieties are moderately susceptible; and the Akçeltik, Karacadağ and Sarıçeltik varieties are susceptible to rice blast disease.

INTRODUCTION

Rice is a plant that thrives in hot climates. It ranks second in the world for cultivation area, following wheat. Rice is typically grown in flat areas with ample water supply, making it a staple crop. In Türkiye, rice is cultivated across all geographical regions, with significant production occurring in the Thrace-Marmara and Black Sea regions. The Thrace-Marmara region produces approximately 70% of Türkiye's rice, while the Black Sea region contributes around 25%.

Other regions account for the remaining production. The provinces with the highest rice production in Türkiye are Edirne, Samsun, Balıkesir, and Çanakkale. Currently, rice is cultivated on about 112.000 hectares in Türkiye, resulting in an annual production of around 900.000 tons. The average rice yield in the country is approximately 803 kg per decare (TÜİK 2024).

Rice blast disease, caused by the fungus *Pyricularia oryzae* (teleomorph: *Magnaporthe oryzae*), is one of the most significant fungal diseases affecting rice globally, including in Türkiye. This fungus belongs to the division Ascomycota and the family Pyriculariaceae. Its spores, which are pear-shaped, typically contain 1 to 3 segments. The disease presents several symptoms on rice plants, including leaf blast, node blast, collar rot, and panicle blast. Initially, it appears as spots on the leaves. The centers of these spots are gray-beige or straw yellow, surrounded by a brown halo. In susceptible rice varieties, these lesions can develop rapidly, potentially covering the entire leaf and causing it to dry out. The size of the lesions varies depending on the plant's age and its resistance to the disease (Bonman 1992, Anonymous 2020b). The fungus responsible for rice blast survives the winter as conidia or mycelium in rice seeds, plant residues left in the field after harvest, and in some weed species (Anonymous 2020a). *Pyricularia oryzae* primarily affects the leaves, leading to leaf blast during the plant's vegetative stage. The pathogen also causes neck blast, which occurs on the panicle and nodes (Bonman 1992). Rice blast is the most prevalent disease in rice-growing regions worldwide, resulting in annual crop losses ranging from 10% to 30%. A loss of just 10% is significant enough to impact the food supply for 60 million people in a given year (Skamnioti and Gurr 2009).

Rice blast disease has been reported in rice fields across Türkiye, particularly in the Black Sea region, where losses range from 25% to 75%. In the Mediterranean region, the loss was much more severe, reaching around 90% (Göbelez 1953, Tekinel et al. 1980). A study by Çopcu and Karaca in 1983 found that the average prevalence of rice blast disease in the Aegean region, specifically in the provinces of Balıkesir and Manisa, was 7.7%. However, research conducted by Ergün in 2017 indicated a significantly higher prevalence rate of 75.33% in the rice cultivation areas of Biga, Çanakkale, based on a survey from 2015. Further investigation by Seidi et al. (2020) in Edirne Province revealed that the highest prevalence of rice blast disease was found in Havsa, where it reached 100%. Other districts reported lower prevalences: Meriç at 71.43%, Uzunköprü at 69.15%, Keşan at 62.73%, İpsala at 33.66%, and Enez at 13.00%.

Rice blast disease negatively affects both the yield and quality of rice. Host resistance is considered the most effective and economical method for controlling plant diseases (Hulbert et al. 2001). Therefore, breeding studies aim to incorporate resistance genes against blast disease into the genetic makeup of rice plants (Bonman et al. 1992). Understanding how different rice varieties respond to this pathogen is

crucial for practical purposes. In Türkiye, several studies have focused on addressing resistance to rice blast disease (Aktaş and Tunalı 1986, Gümüştekin and Akın 1997, Oran 1975, Seidi and Ünan 2015, Ünan et al. 2016a).

In this study, a spore suspension was prepared by mixing individual rice blast isolates obtained from rice blast-infected leaves and panicles collected from rice fields in the provinces of Çanakkale, Edirne, and Balıkesir. This suspension was then applied to several rice varieties cultivated in Türkiye, under both laboratory and field conditions. The objective of the research was to determine the resistance of these rice varieties to rice blast disease.

MATERIALS AND METHODS

Materials

A mix of 10 single-spore isolates of *Pyricularia oryzae* was collected from various rice production fields across Trakya, Türkiye, and used as the inoculum (Table 1). A total of 49 rice genotypes were screened (Table 2). Among these, two cultivars—Sarıçeltik and Karacadağ—were included as susceptible control varieties (Beşer et al. 2015, Ünan 2022). The field trial took place at the Thrace Agricultural Research Institute's rice experimental field in Edirne, Türkiye (Coordinates: 41° 38' 42.4"N, 26° 35' 57.1"E).

Table 1. Single spore isolates of *Pyricularia oryzae* used in this study

Isolate Code	Location (District, Province)
Mag 1	İpsala, Edirne
Mag 2	Enez, Edirne
Mag 3	Gönen, Balıkesir
Mag 4	Biga, Çanakkale
Mag 5	Paşaköy, Edirne
Mag 6	İpsala, Edirne
Mag 7	İpsala, Edirne
Mag 10	Gönen, Balıkesir
Mag 14	Biga, Çanakkale
Mag 15	Gönen, Balıkesir

Table 2. Rice genotypes used in this study

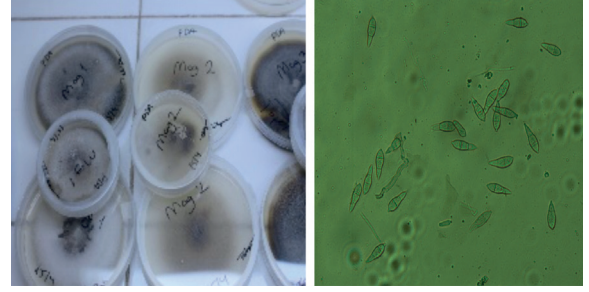
No	Variety Names	No	Variety Names
1	Kızıltan	26	Altınyazı
2	Kırkpınar	27	Demir
3	Tunca	28	Karacadağ
4	Neğış	29	Sarıçeltik
5	Gala	30	Karadeniz
6	Osmancık-97	31	Yavuz
7	Hamzadere	32	Kıral
8	Paşalı	33	Serhat-92
9	Halilbey	34	Koral
10	Edirne	35	Yatkın
11	Beşer	36	Tosya Güneşi
12	Şumnu	37	Manyas Yıldızı
13	Ece	38	Biga İncisi
14	Durağan	39	Küplü
15	Çakmak	40	Mis2013
16	Aromatik-1	41	Kale
17	Kargı	42	Sürek M711
18	Efe	43	Mevlütbey
19	Ergene	44	IR50
20	Sürek-95	45	HSC55
21	Trakya	46	Balaban
22	İpsala	47	Ülfet
23	Meriç	48	Sarhan
24	Gönen	49	Siyah-1
25	Akçeltik		

Methods

Growth room experiments

The cultivars Sarıçeltik and Karacadağ (Diyarbakır Yerli) were utilized as susceptible control varieties (Beşer et al. 2015, Ünan 2022). Rice cultivars, along with these susceptible varieties (Table 2), were planted in 300 ml plastic cups filled with a mixture of sand, soil, peat, and burnt barn manure in the ratio of 1:1:1/2:1/2. For each cultivar, 10-15 seeds were planted in a single cup, and the experiment included six

replications. After planting, the plastic cups were placed in a growth room maintained at a temperature of 26-28 °C and 50-60% relative humidity.

**Figure 1.** Rice blast fungus in Petri dishes (left), and conidia of *Pyricularia oryzae* (right)

Ten single spore isolates were obtained from rice blast-infected leaves and panicles (Table 1). These *P. oryzae* isolates were incubated for 7 to 15 days in 90 mm diameter plastic Petri dishes containing either Potato Dextrose Agar (PDA) or Oatmeal Agar (OA) (Figure 1). One milliliter of water was added to each Petri dish, and the contents were scraped using a spatula. The mixture was then covered with cheesecloth. After filtering through the cheesecloth, the suspension was poured into a 1-liter beaker. To this, two drops of Tween 20 were added. This method resulted in a spore suspension prepared by mixing ten single-spore *P. oryzae* fungal isolates in the same beaker. Artificial inoculation was performed on rice seedlings growing in plastic cups at the 3-4 leaf stage. A 25 ml mixture of the spore suspension, with a concentration of 10×10^4 spores/ml, was prepared for each rice variety using the 10 *P. oryzae* isolates. The seedlings were inoculated using a hand sprayer (Tuite 1969, Aktaş and Tunalı 1986, Sehly and Bastawisi 1997, Hayashi et al. 1998, Hayashi et al. 2009, Odjo et al. 2014). After inoculation, the plants were placed in a humidity chamber for 24 hours at 95% relative humidity. Following this period, the plants were transferred to a plant growth cabinet maintained at a temperature of 26-28 °C. Additionally, the seedlings in the growth cabinet were manually sprayed with water every morning to maintain humidity until evaluation.

The evaluation of rice seedlings was conducted 7 days after inoculation, as reported by Goto and Yamanaka (1968), Mackill and Bonman (1992), Urashima et al. (1993), Hayashi et al. (2009), Abdul Rahim et al. (2013), and Odjo et al. (2014). This assessment utilized a 0-5 scale, as outlined by Mackill and Bonman (1992) and Hayashi et al. (2009) (see Table 3). In this scale, values from 0 to 2 were classified as resistant, while values from 3 to 5 were categorized as susceptible, according to Liu et al. (2015).

Table 3. The 0-5 scale used in the seedling evaluation of rice cultivars to *Pyricularia oryzae* (Mackill and Bonman 1992, Hayashi et al. 2009)

Scale Value	Disease Severity and Type of Reaction
0	Healthy, no symptoms
1	Uniform or scattered brown spots on leaves less than 0.5 mm in diameter, no sporulation.
2	Small lesions, about 0.5-1 mm in diameter, with a light brown center and a distinctly darker brown margin, No sporulation.
3	Round to elliptical spots 1-3 mm. diameter, gray center, brown bordered, lesions may sporulate.
4	Typical spindle-shaped blast lesions capable of sporulation, 3 mm or longer gray-centered necrosis and brown central, small or unfused lesions with a water-soaked appearance.
5	Lesions are as in disease scale value 4, lesions on one or both leaves combine to kill the leaf.

Field studies

The field study was conducted using a randomized block design with three replications over the years 2015 and 2016. A total of 49 rice varieties (Table 2) were planted in the rice field located at the Thrace Agricultural Research Institute in Edirne Province, Türkiye (Coordinates: 41° 38' 42.4" N, 026° 35' 57.1" E, elevation: 43 m). The row spacing between the rice varieties was set at 20 cm, and each row was 100 cm in length. To enhance the study, Sarıçeltik and Karacadağ rice cultivars, which are known to be susceptible to rice blast were included as control cultivars. The planting of all rice varieties and the susceptible control cultivars was done by hand. In the experimental setup, three replications were implemented. Additionally, the susceptible Sarıçeltik and Karacadağ cultivars were planted every 10th row and around the perimeter of the field to promote the infection of rice blast disease (Beşer et al. 2015). To prevent the entry of different blast spores into the trial area and to maintain high humidity, the entire rice experimental field was covered with completely transparent nylon.

For the field studies, the inoculum was prepared in the same way as for the seedling experiments. Artificial inoculation was applied when the rice plants had reached 6 to 7 leaf stages

(Koutroubas et al. 2009). A second artificial inoculation was performed 10 to 15 days after the first inoculation. To maintain humidity in the experimental area, water was sprayed every morning. Rice blast disease was evaluated using a scale from 0 to 5 in the field (Table 4 (Anonymous 2020a)). The assessments took place at 60, 72, and 90 days after inoculation in 2015, and at 80 and 100 days after inoculation in 2016. Scale values 0, 1, 2, 3, 4, and 5 indicate immunity, resistance, moderate resistance, moderate susceptibility, susceptibility, and high susceptibility, respectively.

RESULTS AND DISCUSSION

The growth room study revealed varying levels of resistance among different rice varieties. Aromatik-1, Balaban, and Siyah-1 were found to be immune to rice blast disease. The Şumnu, Durağan, Efe, Ergene, and İpsala varieties exhibited resistant reactions. Kırkpınar, Hamzadere, Beşer, Ece, Çakmak, Meriç, Demir, Halilbey, Küplü, IR50, and Sarhan were classified as moderately resistant. Rice cultivars Kızıltan, Neğış, Tunca, Gala, Osmancık-97, Paşalı, Kargı, Sürek-95, Trakya, Gönen, Altınyazı, Karadeniz, Yavuz, Kırıl, Koral, Yatkın, Tosya Güneşi, Manyas Yıldızı, Mis-2013, Kale, Mevlütbey, Ülfet, and HSC55 were in the moderately susceptible category. The susceptible varieties

Table 4. The 0-5 scale used for assessing rice blast disease in the field (Anonymous 2020a)

Scale Value	Disease Severity and Reaction Type
0	No symptoms (Immune-I)
1	Very small 1-2 mm long brown slightly elongated necrotic gray lesions, less than 1% of leaf area, (Resistant-R)
2	1-2 cm long typical blast lesions with brown margins, covering 2-10% of leaf area, (Moderately Resistant-MR)
3	Typical blast lesions covering 11-25% of leaf area, (Moderately Susceptible-MS)
4	Typical blast lesions, covering 26-50% of leaf area, (Susceptible-S)
5	Typical blast lesions covering more than 50% of leaf area, dead plants, (Very Susceptible-VS)

included Edirne, Akçeltik, Karacadağ, Sarıçeltik, Serhat-92, Biga İncisi, and Sürek M711 (Table 5, Figure 2). The disease had a greater impact during the late growth stages, with the severity of rice blast increasing from levels 2 to 3. In similar research conditions, Seidi and Ünan (2015) identified the Çakmak, Hamzadere, and Şumnu cultivars as resistant, while the Edirne variety was found to be susceptible. These findings align closely with our results.

Table 5. The results of rice blast disease assessment using artificial inoculation in a growth room. For evaluation, a scale of 0 to 5 was used, The assessment of rice blast disease was conducted using artificial inoculation in a growth room. For evaluation, a scale of 0 to 5 was applied.

No	Variety Names	The Mean Scale Value	No	Variety Names	The Mean Scale Value
1	Kızıltan	3	26	Altınyazı	3
2	Kırkpınar	2	27	Demir	2
3	Tunca	3	28	Karacadağ	4
4	Neğış	3	29	Sarıçeltik	4
5	Gala	3	30	Karadeniz	3
6	Osmancık-97	3	31	Yavuz	3
7	Hamzadere	2	32	Kıral	3
8	Paşalı	3	33	Serhat-92	4
9	Halilbey	2	34	Koral	3
10	Edirne	4	35	Yatkın	3
11	Beşer	2	36	Tosya Güneşi	3
12	Şumnu	1	37	Manyas Yıldızı	3
13	Ece	2	38	Biga İncisi	4
14	Durağan	1	39	Küplü	2
15	Çakmak	2	40	Mis2013	3
16	Aromatik-1	0	41	Kale	3
17	Kargı	3	42	Sürek M711	4
18	Efe	1	43	Mevlütbey	3
19	Ergene	1	44	IR50	2
20	Sürek-95	3	45	HSC55	3
21	Trakya	3	46	Balaban	0
22	İpsala	1	47	Ülfet	3
23	Meriç	2	48	Sarhan	2
24	Gönen	3	49	Siyah-1	0
25	Akçeltik	4			



Figure 2. Leaf symptoms of rice blast after inoculation of rice seedlings

The 2015 field study revealed that the cultivars Aromatik-1, Kargı, IR50, Balaban, and Siyah-1 were immune to the disease. Neğış, Gala, Hamzadere, Paşalı, Durağan, Çakmak, Efe, İpsala, Küplü, Mis-2013, Kale, Sürek M711, Ülfet, Sarhan, Halilbey, Şumnu, and Serhat-92 were classified as moderately resistant. In contrast, Kızıltan, Kırkpınar, Tunca, Osmancık-97, Edirne, Beşer, Sürek-95, Trakya, Meriç, Gönen, Altınyazı, Demir, Karadeniz, Yavuz, Kıral, Koral, Yatkın, Manyas Yıldızı, Biga İncisi, Ergene, and Mevlütbey were deemed moderately susceptible. The Ece, Tosya Güneşi, Akçeltik, and HSC55 cultivars were identified as susceptible, while Karacadağ, and Sarıçeltik were classified as very susceptible. Additionally, it was noted that the Karacadağ, and Akçeltik cultivars eventually collapsed under severe disease pressure (Table 6).

As a result of the field study conducted in 2016, the Çakmak, Aromatik-1, Efe, IR50, and Balaban cultivars were found to be immune to the disease. However, very small limited lesions were observed on Aromatik-1 cultivar at 100 days after inoculation. The İpsala, Sarhan, and Siyah-1 cultivars were classified as resistant. The Hamzadere, Paşalı, Şumnu, Durağan, Sürek-95, Trakya, Karadeniz, Serhat-92, Yatkın, Tosya Güneşi, Halilbey, Kale and Sürek M711 cultivars exhibited moderate resistance, while the Kızıltan, Neğış, Gala, Osmancık-97, Edirne, Beşer, Kargı, Meriç, Gönen, Demir, Yavuz, Kıral, Altınyazı, Koral, Manyas Yıldızı, Küplü, Mis-2013, Mevlütbey, HSC55, Ülfet, and Biga İncisi cultivars were considered moderately susceptible. Furthermore, the Kırkpınar, Ece, Ergene, and Akçeltik cultivars were identified as susceptible, and the Karacadağ and Sarıçeltik cultivars were determined to be very susceptible (Table 6). It was observed that the disease progressed over time in both years.

Our current study assessed the resistance status of commonly grown rice cultivars in Türkiye. Previous research has also examined the resistance of rice cultivars in this region. Beşer

Table 6. The results of rice blast disease assessment using artificial inoculation the field. For evaluation, a scale of 0 to 5 was used

No	Variety Names	2015			2016	
		60 days following inoculation	72 days following inoculation	90 days following inoculation	80 days following inoculation	100 days following inoculation
1	Kızıltan	2	3	3	3	3
2	Kırkpınar	3	3	3	4	4
3	Tunca	2	3	3	3	3
4	Neğış	2	2	3	3	3
5	Gala	1	2	3	3	3
6	Osmancık-97	2	3	3	3	3
7	Hamzadere	2	2	2	2	2
8	Paşalı	0	3	3	1	3
9	Halilbey	2	2	2	2	2
10	Edirne	3	3	4	3	3
11	Beşer	2	4	4	3	4
12	Şumnu	2	2	2	2	2
13	Ece	3	4	4	3	4
14	Durağan	1	2	2	2	2
15	Çakmak	2	2	2	0	1
16	Aromatik-1	0	0	0	0	1
17	Kargı	0	1	0	3	3
18	Efe	0	2	3	0	0
19	Ergene	2	4	4	4	4
20	Sürek-95	2	3	4	1	3
21	Trakya	2	3	3	2	2
22	İpsala	1	3	3	1	1
23	Meriç	3	3	3	3	3
24	Gönen	2	4	4	3	3
25	Akçeltik	3	5	5	4	4
26	Altınyazı	2	3	3	3	3
27	Demir	3	3	4	3	3
28	Karacadağ	4	5	5	5	5
29	Sarıçeltik	4	5	5	4	5
30	Karadeniz	2	3	3	2	2
31	Yavuz	3	3	3	3	3
32	Kıral	3	3	4	3	4
33	Serhat-92	1	3	3	1	3
34	Koral	2	4	4	3	4
35	Yatkın	2	4	4	1	3
36	Tosya Güneşi	3	4	4	1	3
37	Manyas Yıldızı	2	3	3	3	3
38	Biga İncisi	3	3	3	3	3
39	Küplü	2	2	2	3	3
40	Mis-2013	1	2	3	3	3
41	Kale	1	3	3	2	2
42	Sürek M711	1	2	3	2	2
43	Mevlütbey	3	3	3	3	3
44	IR50	0	0	1	0	0
45	HSC55	3	4	4	3	3
46	Balaban	0	0	0	0	0
47	Ülfet	2	2	3	3	3
48	Sarhan	2	2	2	1	1
49	Siyah-1	0	0	0	1	1
	Mean	2	3	3	2	3

et al. (2015) evaluated the reactions of various rice cultivars to rice blast disease under natural conditions in the field. They found that the Şumnu cultivar exhibited the highest resistance, followed by the Halilbey and Osmancık-97 cultivars, while the Ece cultivar was identified as susceptible. Similarly, in our study, we also classified the Ece cultivar as susceptible. Sürek and Beşer (1997) reported the Akçeltik cultivar as susceptible and the Sarıçeltik cultivar as very susceptible. These findings are consistent with the results of our study.

Our study revealed that under field conditions both in 2015 and 2016, rice cultivars IR50, Balaban and Aromatik-1 were immune to the disease; Kale, Sürek M711, Hamzadere, Paşalı, Durağan, Halilbey, Şumnu and Serhat-92 were moderately resistant; Kızıltan, Osmancık-97, Edirne, Beşer, Meriç, Gönen, Altinyazı, Demir, Yavuz, Kırıl, Koral, Mevlütbey, Manyas Yıldızı and Biga İncisi were moderately susceptible; Ece and Akçeltik were susceptible; Karacadağ, Sarıçeltik were very susceptible to rice blast (Figure 3).

Our study revealed that under field conditions both in 2015 and 2016, rice cultivars IR50, Balaban and Aromatik-1 were immune to the disease; Kale, Sürek M711, Hamzadere, Paşalı, Durağan, Halilbey, Şumnu and Serhat-92 were moderately resistant; Kızıltan, Osmancık-97, Edirne, Beşer, Meriç, Gönen, Altinyazı, Demir, Yavuz, Kırıl, Koral, Mevlütbey, Manyas Yıldızı and Biga İncisi were moderately susceptible; Ece and Akçeltik were susceptible; Karacadağ, Sarıçeltik were very susceptible to rice blast (Figure 3).

In both field and growth room studies, it was found that the Balaban and Aromatik-1 cultivars were immune to rice blast. The Hamzadere cultivar was classified as moderately resistant, while the Kızıltan, Osmancık-97, Gönen, Altinyazı, Yavuz, Kırıl, Koral, Manyas Yıldızı, and Mevlütbey cultivars were considered moderately susceptible. In contrast, the Akçeltik, Karacadağ, and Sarıçeltik cultivars were deemed susceptible to rice blast.

Tekinel et al. (1980) reported that the Sarıçeltik cultivar was susceptible to the rice blast pathogen, which aligns with our findings. Additionally, Oran (1975) indicated that both the Sarıçeltik and Karacadağ cultivars were highly susceptible to *P. oryzae*. Our study also found these cultivars to be susceptible to rice blast. Sürek and Beşer (1997) observed that the Serhat-92 and Sürek-95 cultivars were moderately resistant, while Ergene and İpsala cultivars were moderately susceptible. In our research, we noted that in 2015, the İpsala and Serhat-92 cultivars were moderately resistant, while the Ergene and Sürek-95 cultivars were moderately susceptible. However, in 2016, the İpsala cultivar was resistant, while Serhat-92 and Sürek-95 remained moderately resistant, and

the Ergene cultivar was found to be susceptible. The findings from Sürek and Beşer (1997) regarding the Serhat-92 and Ergene cultivars were consistent with our results. Beşer et al. (2015) reported that the Sarıçeltik and Karacadağ cultivars were very susceptible, whereas the Şumnu, Halilbey, and Osmancık-97 cultivars showed greater resistance. In our study, we found the Şumnu cultivar to be moderately resistant, while the Ece cultivar was observed to be susceptible, which aligns with Beşer et al. (2015)'s findings. In their field study, Ünan et al. (2016a) found the Balaban variety to be resistant to rice blast disease; Osmancık-97 and Mevlütbey varieties to be moderately resistant; and Kızıltan, Sarıçeltik, and Karacadağ varieties to be susceptible. In our study, the Balaban variety was resistant, whereas the Karacadağ and Sarıçeltik varieties were susceptible, consistent with the study by Ünan et al. (2016a). However, in our study, Kızıltan and Osmancık-97 rice varieties showed a moderately susceptible reaction. In another study, 13 rice varieties were planted at three different sowing dates and evaluated for leaf rice blast disease under Edirne, Türkiye conditions. The sowing was conducted with 20-day intervals, categorized as early, regular, and late (April 30, May 20, and June 10). The results indicated that the early sowing date had the lowest rice blast scores, while the late sowing date resulted in the highest scores. The rice cultivars Hamzadere and Osmancık-97 exhibited moderate symptoms (Ünan et al. 2016b), which is consistent with our findings.

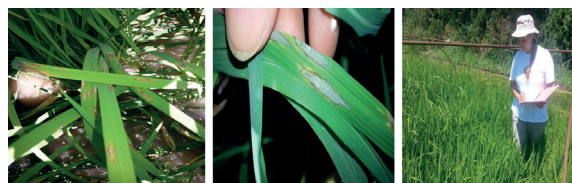


Figure 3. Symptoms of rice blast disease on leaves after inoculation in the field

Rice blast disease affects rice plants in approximately 85 countries across all continents where rice is cultivated. While environmental factors significantly influence this disease, it is widely regarded as one of the most serious threats to rice plants globally (Ou 1985, Kato 2001).

This study summarizes the response of rice cultivars grown in Türkiye to a mixture of rice blast isolates. Cultivating resistant varieties will not only be beneficial for farmers but also reduce the need for fungicide applications, making it a more sustainable option for rice production.

Pyricularia oryzae is responsible for causing rice blast disease, a significant fungal disease affecting rice worldwide. One of the primary methods for controlling this disease

is the use of blast-resistant rice varieties. This study found that both the Balaban and Aromatik-1 cultivars exhibited immunity to the disease in both field and growth room conditions. The Hamzadere cultivar showed moderate resistance, while the cultivars Kızıltan, Osmancık-97, Gönen, Altınyazı, Yavuz, Kırıl, Koral, Manyas Yıldızı, and Mevlütbey were identified as moderately susceptible. In contrast, the Akçeltik, Karacadağ, and Sarıçeltik cultivars were deemed susceptible to rice blast disease. The severity of the disease increased during the later growth stages, reaching a scale level of 3. The resistant cultivars identified in this study can be recommended to rice farmers for improved disease management.

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ÖZET

Çeltik yanıklık hastalığına sebep olan *Pyricularia oryzae*, çeltiğin dünya çapında önemli bir fungal hastalığıdır. Hastalık, özellikle Akdeniz ülkelerindeki nemli bölgelerde, çeltiğin verimini ve kalitesini önemli ölçüde etkilemektedir. Ruhsatlı fungusitlerin kullanımıyla çeltik yanıklığının etkili bir şekilde kontrol edilmesi mümkündür. Ancak kimyasal mücadele, genellikle çok fazla ekonomik olmayabilir ve ekolojik olarak da tercih edilmeyebilir. Diğer taraftan, en önemli yaklaşımlardan biri bu hastalığa dayanıklı çeşitlerin kullanılmasıdır. Bu çalışma, çeltik çeşitlerinin Çeltik yanıklık hastalığına karşı dayanıklılığını değerlendirmeyi amaçlamıştır. İnokulum olarak, tek sporlardan geliştirilen 10 çeltik yanıklık izolatının karışımı kullanılmıştır. Çalışma, yetiştirme odası ve tarla koşulları altında yürütülmüştür. İki hassas çeşit de dahil olmak üzere 49 çeltik çeşidi gözlemlenmiştir. Çeltik yanıklık reaksiyonları, çeltiğin farklı büyüme aşamalarında 0-5 skalasına göre değerlendirilmiştir. Çalışmada hem tarlada hem de yetiştirme odasında Balaban ve Aromatik-1 çeşitlerinin immün olduğu; Hamzadere

çeşidinin orta derecede dayanıklı olduğu, Kızıltan, Osmancık-97, Gönen, Altınyazı, Yavuz, Kırıl, Koral, Manyas Yıldızı ve Mevlütbey çeşitlerinin orta derecede hassas olduğu ve Akçeltik, Karacadağ ve Sarıçeltik çeşitlerinin çeltik yanıklık hastalığına karşı hassas olduğu ortaya çıkmıştır.

Anahtar kelimeler: Çeltik yanıklık hastalığı, *Magnaporthe oryzae*, *Pyricularia oryzae*, Hastalıklara dayanıklılık, çeltik

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