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**Research Article**

# The Incidence of Barley (*Hordeum vulgare* L.) Leaf Diseases in Central Anatolia Region of Turkey in 2020

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**ABSTRACT**

Barley (*Hordeum vulgare* L.) is one of the most important cereal crops that their grains are used in the malt and forage industry. Yield and quality losses occur in barley due to abiotic and biotic stress factors. Barley leaf diseases caused by fungal pathogens are common diseases leading to significant yield losses. Within the framework of environmentally-friendly integrated crop management, disease-resistant varieties should be developed together with a breeding program for sustainable agriculture. In disease resistance studies, the first and the most important step is to monitor the situation of the disease agent(s) in a region or country. For this purpose; In 2019-2020, barley leaf diseases survey in 54 barley fields was done in 5 provinces of Central Anatolia (Ankara, Eskişehir, Kırıkkale, Kırşehir, Yozgat). As a result of the surveys, the most common disease was determined as barley stripe disease (*Drechslera graminea*). Barley net spot disease (*D. teres* f. *maculata*, *D. teres* f. *teres*), Barley leaf spot (*Rhynchosporium commune*) and Barley powdery mildew (*E. graminis* f. sp. *hordei*) diseases followed in this order.

## 1. Introduction

Barley is an important cereal group, which is among the most planted plants in the world and in Turkey (Kün 1996, Geçit et al., 2009). It is used in animal feed and in fields such as malting production, and it is also used in small amounts of human food (Geçit 2016). For 2020, barley cultivation areas in our country are 30971625 da and production is 8300000 tons (TUIK, 2022). It is predicted that barley cultivation was first practiced in the fertile crescent region in our country (Geçit et al. 2009, Harlan 1979) and there are various types of barley. There are important biotic and abiotic factors affecting production in barley grown areas. Fungal factors, especially among biotic factors, can cause serious yield and quality losses. The main barley fungal diseases in Central Anatolia are barley scald (*Rhynchosporium commune*), stripe disease (*Drechslera graminea*) and barley smut diseases (*Ustilago nuda* fs.p. *hordei*, *Ustilago hordei*, *Ustilago nigra*). In our country, among these diseases, smut causes yield loss of 3-5% in barley, while it causes yield losses of 12% and 20% in striped leaf spot and leaf spot (Aktaş 2001).

The occurrence and severity of many diseases seen in barley cultivation areas in Central Anatolia have been reported. In the study carried out in the Bala district of Ankara in 2018, a total of 50 barley fields were examined and leaf spot (*Rhynchosporium commune*), striped leaf spot (*Drechslera graminea*), two forms of net blotch (*Drechslera teres* f. *maculate* and *Drechslera teres* f. *teres*) and barley powdery mildew (*Erysiphe graminis* f. sp. *hordei*) was detected (Ertürk et al., 2018). In 2016, 17 different lands were examined in the Çubuk district of Ankara, and leaf spot, striped leaf spot, two forms of net blotch, powdery mildew, and also barley rust (*Puccinia hordei*) were reported (İlgen et al., 2017).

The first issue to be considered in disease resistant breeding studies is that the status of diseases in the region or country should be well determined. In this study, with the aim of contributing to future barley breeding programs, barley cultivation areas in the Central Anatolia Region were examined and the status of barley diseases was reported.

## 2. Materials and Methods

Survey of barley disease was conducted between April and May 2020 in cropping season in five important barley-producing provinces (Ankara, Eskişehir, Kırkkale, Kırşehir and Yozgat) and surrounding areas of the Central Anatolia Region of Turkey.

A total of 54 barley (*Hordeum vulgare*) fields were assessed in the Central Anatolia Region of Turkey.

The systematic sampling method was used in the survey program. The surveys were conducted following the main

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roads and accessible routes in each survey district, and examinations were done in every 1-20 kilometers stops. Each field was surveyed following a W pattern in the field and at least 100 plants were examined (Aktaş 2001). Samples were taken at every 1-20 kilometers. At least 100 barley plants were inspected in each field, and percentages of diseases were calculated. For determination of mean disease prevalence, both diseased fields and non-diseased fields were considered.

The determinations of diseases severity were assessed using a 1-9 scale developed by Saari and Prescott (Saari and Prescott, 1975)The following format is used for scoring severity: 10% coverage = 1, 20% coverage = 2, 30% coverage = 3, 40% coverage = 4, 50% coverage = 5, 60% coverage = 6, 70% coverage = 7, 80% coverage = 8, 90% coverage 9.

## 3. Results and Discussion

Fifty-four barley fields were examined as a result of the surveys conducted in Ankara, Eskişehir, Kırıkkale, Kırşehir and Yozgat. In these fields, stripe disease of barley (*Drechslera graminea*), barley scald disease (*Rhynchosporium commune*), two forms of net blotch disease, spot form net blotch (*Drechslera teres* f. *maculata*) and net form net blotch (*Drechslera teres* f. *teres*), and barley mildew (*Blumeria graminis* f. sp. *hordei*) were determined.

Table 1
Barley (*Hordeum vulgare* L.) leaf diseases observed in Ankara, Eskişehir, Kırıkkale, Kırşehir, Yozgat province of Central Anatolia Regions of Turkey

| No | Province | District | Diseases situation | *Rc* Inc.(%) | *Rc*Sev. | Bgh Inc (%). | BghSev. | Dtm Inc. (%) | DtmSev. | Dtt Inc.(%) | DttSev. | Dg Inc.(%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Ankara | Bala | present | 15 | 3 | | | | | | | |
| 2 | Ankara | Bala | present | 7 | 3 | | | | | | | |
| 3 | Ankara | Bala | present | | | | | | | | | 15 |
| 4 | Ankara | Bala | present | | | | | | | 8 | 3 | |
| 5 | Ankara | Bala | present | | | | | | | | | 5 |
| 6 | Ankara | Haymana | present | | | | | | | | | 20 |
| 7 | Ankara | Haymana | present | | | | | | | | | 35 |
| 8 | Ankara | Haymana | present | | | | | | | | | 30 |
| 9 | Ankara | Haymana | present | | | | | | | | | 20 |
| 10 | Ankara | Yenimahalle | present | 5 | 3 | | | | | 2 | 3 | 10 |
| 11 | Ankara | Gölbaşı/ikizce | present | 30 | 7 | | | | | | | 10 |
| 12 | Ankara | Elmadağ | present | | | | | | | | | 5 |
| 13 | Ankara | Elmadağ | present | 5 | 3 | | | | | | | |
| 14 | Ankara | Polatlı | present | | | | | | | | | 5 |
| 15 | Ankara | Polatlı | present | 4 | 3 | | | | | | | 10 |
| 16 | Ankara | Polatlı | present | | | | | | | | | 5 |
| 17 | Eskişehir | Mihalıççık | present | 10 | 3 | 5 | 3 | | | | | |
| 18 | Eskişehir | Mihalıççık | present | 40 | 5 | 10 | 3 | | | 3 | 3 | |
| 19 | Eskişehir | Mihalıççık | present | | | | | 3 | 3 | 5 | 3 | |
| 20 | Eskişehir | Mihalıççık | present | 15 | 3 | | | | | | | |
| 21 | Eskişehir | Mihalıççık | present | | | | | | | 8 | 3 | |
| 22 | Eskişehir | Yunusemre | present | | | | | | | | | 15 |
| 23 | Eskişehir | Yunusemre | present | | | | | | | 5 | 3 | |
| 24 | Eskişehir | Yunusemre | present | | | | | | | 7 | 3 | 10 |
| 25 | Eskişehir | Beylikova | present | | | | | | | | | 5 |
| 26 | Eskişehir | Beylikova | absent | | | | | | | | | |
| 27 | Eskişehir | Beylikova | present | | | | | 10 | 5 | | | 8 |
| 28 | Eskişehir | Beylikova | present | | | | | | | | | 16 |
| 29 | Eskişehir | Beylikova | present | 13 | 5 | | | | | | | 20 |
| 30 | Eskişehir | Çifteler | present | | | | | | | | | 9 |
| 31 | Eskişehir | Çifteler | present | 2 | 3 | | | | | | | 10 |
| 32 | Eskişehir | Doğanlar | present | | | | | 3 | 3 | | | 17 |
| 33 | Eskişehir | Mahmudiye | present | | | | | | | | | 9 |
| 34 | Eskişehir | Mahmudiye | present | | | | | | | | | 4 |
| 35 | Eskişehir | Sivrihisar | present | | | | | 5 | 3 | | | |
| 36 | Eskişehir | Sivrihisar | present | | | | | 8 | 3 | | | |
| 37 | Eskişehir | Sivrihisar | present | | | | | | | | | 5 |
| 38 | Eskişehir | Sivrihisar | present | | | | | | | | | 6 |
| 39 | Eskişehir | Sivrihisar | absent | | | | | | | | | |
| 40 | Kırıkkale | Kesikköprü | present | 10 | 5 | | | | | 7 | 5 | |
| 41 | Kırıkkale | Kesikköprü | present | 10 | 5 | | | | | 6 | 5 | |
| 42 | Kırıkkale | Kesikköprü | present | | | | | | | | | 15 |
| 43 | Kırıkkale | Kesikköprü | present | 5 | 3 | | | | | | | |
| 44 | Kırıkkale | Çelebi | present | 8 | 3 | | | | | | | 4 |
| 45 | Kırkkale | Çelebi | present | | | | | | | | | 5 |
| 46 | Kırkkale | Merkez | present | | | 6 | 3 | | | | | |
| 47 | Kırkkale | Merkez | present | 10 | 5 | | | | | 10 | 3 | |
| 48 | Kırşehir | Kaman | present | | | | | | | | | 10 |
| 49 | Kırşehir | Kaman | present | 55 | 7 | | | | | | | 13 |
| 50 | Kırşehir | Kaman | present | | | | | | | | | 8 |
| 51 | Yozgat | Yerköy | present | | | | | | | 6 | 3 | |
| 52 | Yozgat | Yerköy | present | | | | | | | | | 10 |
| 53 | Yozgat | Sekili | present | | | | | | | | | 20 |
| 54 | Yozgat | Sekili | present | | | | | | | | | 15 |

(R. comm: *Rhynchosporium commune*, tm*: Drechslera teres* f. *maculata*, Dtt: *Drechslera teres* f. *teres*, Bgh: *Blumeria graminis* f. sp. *hordei*, *Drechslera graminea* : Dg, Inc.: Incidence, Sev.: Severity)

For Ankara, barley leaf diseases survey was carried out in 5 barley fields in Bala, 4 fields in Haymana, one field in Yenimahalle and Gölbaşı, 2 fields in Elmadağ and 3 fields in Polatlı. In total, 16 barley fields were examined. Stripe disease (*Drechslera graminea*) was detected in 12 fields of those. Barley scald disease (*Rhynchosporium commune*)

was detected in 6 fields out of 16 barley fields and the net form net blotch (*Drechslera teres* f. *teres*) in 2 barley fields (Table-1). In the examined areas, the rate of disease prevalence of stripe disease was detected as 5-35% (Tablo-1). On the other hand, the incidence for barley leaf spot disease in the examined areas was found between 4% and 30% and the severity of the disease was detected as 3 to 7 values. The area with the highest incidence of the disease was the 11th field of Gölbaşı, with a rate of 30% and severity of 7. Additionally, the percentage of net form of net blotch (*Drechslera teres* f. *teres*) was 8% in the 4th field of Bala. The incidence of the same disease in the 10th field of Yenimahalle was reported as 2% with the 3 out 9 severity.

For Eskisehir, 23 barley fields in total were surveyed, which 5 of them was in Mihalıççık, 3 fields in Yunusemre, 5 fields in Beylikova, 2 fields in Çifteler, one field in Doğanlar, 2 fields in Mahmudiye, and 5 fields in Sivrihisar. Stripe leaf disease (*Drechslera graminea*) was found in 13 of these fields whereas barley scald (*Rhynchosporium commune*) was recorded in 5 fields. As well, net form net blotch of barley (*Drechslera teres* f. *teres*), spot form net blotch (*Drechslera teres* f. *maculata*) and barley powdery mildew (*Blumeria graminis* f. sp. *hordei*) diseases was found in 5, 5 and 2 fields, respectively (Table-1). The incidence for stripe leaf disease in the examined areas was found between 4% and 20%. The highest rate of disease was reported in Beylikova, especially in the 29th field with 20%. The prevalence of barley scald was between 2-40% and the disease severity was between 3-5. Barley scald was observed in Mihalıççık in the 18th field with the maximum incidence of 40% and the severity was 5. Barley powdery mildew (*Blumeria graminis* f. sp. *hordei*) was observed with the rate of 5% and 10% in the 17th and 18th fields of Mihalıççık, respectively. Both fields had 3 out 9 in terms of severity. The net form net blotch disease (*Drechslera teres* f. *teres*) was detected in 3-8% prevalence with 3 disease severity. The incidence of the spot form net blotch disease (*Drechslera teres* f. *maculata*) was 3-10% and the severity of the disease was 3-5. The area where the spot form net blotch (*Drechslera teres* f. *maculata*) disease is the most common was determined as the 27th of Beylikova with 10% disease incidence and 5 disease severity.

For Kırıkkale, surveys were conducted in 8 barley fields where 4 of those were in Kesikköprü, 2 of those were in Çelebi and 2 of them were in the centre. Stripe leaf (*Drechslera graminea*) was detected in 3 areas, barley scald (*Rhyncosporium commune*) was found in 5 areas and net form net blotch disease (*Drechslera teres* f. *teres*) was seen 3 areas. Finally, barley powdery mildew (*Blumeria graminis* sp. *hordei*)was detected (Table 1). The incidence of stripe leaf disease was found between 4-15% in the areas examined. The incidence for barley scald was 5-10% with between 3 and 5 severity. The barley scald was seen the most the 40th and 41st region of Kesikköprü. The percentage of net form net blotch was stated as 6-10% and 3-5 severity. Finally, the incidence rate of mildew is determined as 6% with 3 severity in the 46th area in the centre of Kırıkkale.

In Kaman, the district of Kırşehir, barley stripe disease (Drechslera graminea) was founded in the 48th, 49th and 50th regions considering 3 barley survey. The incidences for this are 10%, 13% and 8 %, accordingly. Barley scald, with 55% incidence and 7 severity, was recorded in the 49th region of Kaman.

In Yozgat, 4 fields, two from Yerköy district and two from Sekili district, was examined and 3 of these fields was infected with stripe disease (*Drechslera graminea*). Net form net blotch (*Drechslera teres* f. *teres*) were found one of these areas. Barley stripe disease was observed in the 52nd region of Yerköy, the 53rd and 54th regions of Sekili with the rate of 10%, 20% and 15%, respectively. In the 51st area of Yerköy, net blotch disease, with the incidence of 6% and 3 out of 9 severity, was founded.

In the examination of 5 province in Central Anatolia region with 54 barley fields, 34 field of those was founded with barley stripe disease whereas 15 of those was recorded with the infection of barley scald. As well as, net blotch disease was determined in 16 fields, where 11 of them infected with net form net blotch and 5 of them was reported with spot form net blotch. The most prevalent disease was defined as barley stripe, following by net blotch and barley scald diseases, respectively.

This study shows the existence of barley leaf diseases in 5 provinces located in Central Anatolia Region (Ankara, Eskişehir, Kırşehir, Kırıkkale and Yozgat) with 54 barley (*Hordeum vulgare* L.) field. Stripe leaf disease was founded as the most widespread disease, and net blotch disease and barley scald was detected, respectively. Besides powdery mildew is the least common disease among the others.

These diseases are common diseases in our country and have been reported by other researchers from different regions of Turkey (Akan, 2006; Aktaş, 1987, 1997; Çelik ve Karakaya, 2015; Ertürk ve ark., 2018; İlgen ve ark., 2017; Karakaya ve ark., 2014, 2016; Mamluk ve ark., 1997; Özdemir ve ark., 2017; Yıldırım ve ark., 1999). Çelik and Karakaya (2015) in Eskişehir province Barley leaf in their survey in 2012 net spot (*Drechslera teres*),

Stripe diseases (*D. graminea*), scald disease (*Rhynchosporium secalis*), and powdery mildew (*Erysiphe graminis* f. sp. *hordei*) were determined. Of these diseases, net blotch and scald disease were found to be the most common diseases. Barley growing areas of Elazığ province of Turkey were surveyed during the period of May and June of 2018 and barley leaf diseases were determined. Spot form of net blotch and net form of net blotch were the most commonly encountered diseases (Saraç et.al., 2019) As a result, in this study, the same barley diseases (net blotch disease and barley scald) were found as the most widespread disease in the survey area.

Though there are chemical control methods for the detected diseases (seehttps://bku.tarimorman.gov.tr/), disease-resistant varieties must be developed and using the varieties need to be promoted since this is the most efficient and environmentally friendly approach. Using disease-free and certificated seeds, crop rotation, and cultural practices are the most effective methods in the control of these diseases. Furthermore, disease-resistant cultivars must be used for stripe disease (Ulus ve Karakaya 2007, Bayraktar ve Akan 2012, Çelik ve ark. 2016), net blotch, and barley scald (Mert and Karakaya 2004, Karakaya and Akyol 2006, Düşünceli et al. 2008, Taşkoparan and Karakaya 2009, Usta et al. 2014, Azamparsa et al. 2015, Yazıcı et al. 2015).

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## 5. References

Akan K, Çetin L, Albostan S, Düşünceli F, Mert Z (2006). İç Anadolu'da görülen önemli tahıl ve nohut hastalıkları. Tarla Bitkileri Merkez Araştırma Enstitüsü Dergisi 15 (1-2): 29-48

Aktaş H (1987). Untersuchungen Uber Die Physiologische Variationen von Drechslera teres (Sacc.) Shoemaker on der Mittelaratolien angebauten Gersten Und die Feststellung der Reaktionen der Gerstensorten gegen diesen Erreger. Journal of Turkish Phytopathology 16: 53-65.

Aktaş H (1997). Untersuchungen über die Netzfleckenkrankheiten (Drechslera teres Shoem. f. sp. teres Smedeg. D. teres Shoem. f. sp. maculata Smedeg.) an Gerste. Journal of Turkish Phytopathology 26 (1): 17-22

Aktaş H (2001). Önemli Hububat Hastalıkları ve Survey Yöntemleri Kitapçığı Tarım Ve Köyişleri Bakanlığı Tarımsal Araştırmalar Genel Müdürlüğü Bitki Sağlığı Araştırmaları Daire Başkanlığı, 80 sayfa, Ankara

Azamparsa MR, Mert Z, Karakaya A, Sayim İ, Ergün N, Aydoğan S (2015). Determination of the seedling reactions of some barley cultivars and advanced barley lines to Rhynchosporium commune. Bitki Koruma Bülteni 55(3): 247-252.

Balcı S, Karakaya A, Çelik Oğuz A, Ergün N, Sayım İ, Aydoğan S (2018). Bazı kavuzsuz arpa çeşit ve hatlarının Cochliobolus yaprak lekesi hastalığına karşı fide dönemi tepkilerinin değerlendirilmesi. *Plant Protection Bulletin* , 58 (4) , 221-226 . DOI: 10.16955/bitkorb.368467

Bayraktar H, Akan K (2012). Genetic characterization of Pyrenophora graminea isolates and the reactions of some barley cultivars to leaf stripe disease under greenhouse conditions. Turkish Journal Agriculture and Forestry 36: 329-339.

Çelik E, Karakaya A (2015). Eskişehir ili arpa ekim alanlarında görülen fungal yaprak ve başak hastalıklarının görülme sıklıklarının ve yoğunluklarının belirlenmesi. Bitki Koruma Bülteni 55 (2): 157-170.

Çelik Y, Karakaya A, Çelik Oğuz A, Mert Z, Akan K, Ergün N, Sayim İ (2016). Determination of the reactions of some barley landraces and cultivars to Drechslera graminea. Akdeniz Üniversitesi Ziraat Fakültesi Dergisi 29(2): 43-47.

Düşünceli F, Çetin L, Albustan S, Mert Z, Akan K, Karakaya A (2008). Determination of the reactions of some barley cultivars and genotypes to scald under greenhouse and field conditions, Tarım Bilimleri Dergisi (Journal of Agricultural Sciences) 14(1): 46-50.

Ertürk H, Karakaya A, Çelik Oğuz A (2018). Leaf diseases occurring on barley plants in Bala district of Ankara province, Turkey. *Ecological Life Sciences* 13 (4), 204-207. Retrieved from https://dergipark.org.tr/tr/pub/nwsaecolife/issue/39711/46147

Geçit HH Çiftçi CY, Emeklier Y, İkincikarakaya SÜ, Adak M S, Kolsarıcı Ö, Ekiz H, Altınok S, Sancak C, Sevimay CS Kendir H (2009). Tarla Bitkileri. Ankara Üniversitesi, Ziraat Fakültesi Yayınları, Yayın no: 1569, Ders Kitabı: 521.

Geçit HH (2016). Serin İklim Tahılları (Buğday, Arpa, Yulaf, Triticale). Ankara Üniversitesi Ziraat Fakül-tesi Yayınları, Yayın No:1640. Ankara.

Harlan JR (1979). On the origin of barley. In: Barley: origin, botany, culture, winter hardiness, genetics, utilization, pests. Agriculture Handbook 338, Unites States Department of Agriculture, Washington, D.C., 10-36 p

İlgen MZ, Karakaya A, Oğuz AÇ (2017). Leaf diseases occurring on barley and wheat fields in Çubuk District of Ankara, Turkey. Radovi Poljoprivrednog Fakulteta Univerziteta u Sarajevu\Works of the Faculty of Agriculture University of Sarajevo, 62(67 (2)), 210-215

Karakaya A, Mert Z, Çelik Oğuz A, Çetin L (2016). Distribution of barley stripe disease in Central Anatolia, Turkey. Selcuk Journal of Agriculture and Food Sciences 30 (2): 58-61.

Karakaya A, Mert Z, Çelik Oğuz A, Azamparsa MR, Çelik E, Akan K, Çetin L (2014). Current status of scald and net blotch diseases of barley in Turkey. IWBLD – 1st International Workshop on Barley Leaf Diseases. 03-06 June 2014, Salsomaggiore Terme, Italy.

Karakaya A, Akyol A (2006). Determination of the seedling reactions of some Turkish barley cultivars to net blotch. Plant Pathology Journal 5(1):113- 114.

Kün E (1996). Tahıllar - I (Serin iklim Tahılları). Ankara Üniversitesi, Ziraat Fakültesi Yayınları, Yayın No: 1451, Ankara, 332 s.

Mamluk OF, Çetin L, Braun HJ, Bolat N, Bertschinger L, Makkouk KM, Düşünceli F (1997). Current status of wheat and barley diseases in the Central Anatolia Plateau of Turkey. Phytopathologia Mediterranea 36: 167-181.

Mert Z, Karakaya A (2004). Assessment of the seedling reactions of Turkish barley cultivars to scald. Journal of Phytopathology 152(3): 190-192.

Özdemir HY, Karakaya A, Çelik Oğuz A (2017). Kırıkkale ilinde buğday ve arpa ekim alanlarında görülen fungal yaprak hastalıklarının belirlenmesi. Bitki Koruma Bülteni 57 (2): 89–112

Ulus C, Karakaya A (2007). Assessment of the seedling reactions of some Turkish barley cultivars to barley stripe. Tarım Bilimleri Dergisi (Journal of Agricultural Sciences) 13(4): 409-412.

Usta P, Karakaya A, Çelik Oğuz A, Mert Z, Akan K, Çetin L (2014). Determination of the seedling reactions of twenty barley cultivars to six isolates of *Drechslera teres* f. *maculata*. Anadolu Tarım Bilimleri Dergisi (Anadolu Journal of Agricultural Sciences) 29(1): 20-25.

Saari EE, Prescott JM (1975). A scale for appraising the foliar intensity of wheat diseases. Plant Disease Report, 59: 377-380.

Taşkoparan H, Karakaya A (2009). Assessment of the seedling reactions of some barley cultivars to *Drechslera teres* f. *maculata*. Selçuk Tarım ve Gıda Bilimleri Dergisi 23(50):60-62.

TÜİK (2022). Bitkisel Üretim İstatistikleri. https://data.tuik.gov.tr/Kategori/GetKategori?p=tarim-111&dil=1 (Erişim tarihi: 18.1.2022)

Yazıcı B, Karakaya A, Oğuz AÇ, Mert Z (2015). Determination of the seedling reactions of some barley cultivars to *Drechslera teres* f. *teres*. Bitki Koruma Bülteni 55(3): 239-245.

Yıldırım AF, Kınacı E, Hekimhan H, Çeri S (1999). Konya, Karaman, Niğde ve Aksaray yörelerinde tahıllarda önemli hastalıkların durumu ve bunlara dayanıklılık kaynaklarının araştırılması. Orta Anadolu'da Hububat Tarımının Sorunları ve Çözüm Yolları Sempozyumu. 8-11 Haziran 1999, Konya, 404-413.