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Araştırma Makalesi

# *Puccinia* (*Pucciniales*) Species Determined on *Artemisia* members in Turkey

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**Abstract:**In the current study, two species belonging to genus *Puccinia* (*Puccinia abrotani* Fahrend. and *P. artemisiicola* P. Syd. & Syd.) are determinate on *Artemisia* and these species are new records for Turkish mycobiota. Containing the previously reported three *Puccinia* members recorded on *Artemisia* (*P. chrysanthemi* Roze, *P. dracunculina* Fahrend. and *P. tanaceti* DC.), an identification key was given for Turkish *Puccinia* determinate on *Artemisia*. Short descriptions of the newly reported species are provided together with macro and microphotographs and discussed briefly.

**Key words:** *Puccinia*, *Artemisia*, New records, Turkey.

## Türkiye'de *Artemisia* Üyeleri Üzerinde Belirlenen *Puccinia* (*Pucciniales*) Türleri

**Öz:**Mevcut çalışmada, *Puccinia* cinsine mensup iki tür (*Puccinia abrotani* Fahrend. ve *P. artemisiicola* P. Syd. & Syd.) *Artemisia* üzerinden belirlenmiştir ve bu türler Türkiye mikobiyotası için yeni kayıttır. Daha önceden rapor edilen ve *Artemisia* cinsi üzerinden kaydedilen üç *Puccinia* üyesi (*P. chrysanthemi* Roze, *P. dracunculina* Fahrend. ve *P. tanaceti* DC.,) de dahil edilerek, *Artemisia* üzerinden belirlenmiş Türkiye *Puccinia*'ları için bir teşhis anahtarı verilmiştir. Yeni kayıt olarak verilen türlere ait kısa tanımlamalar ile makro ve mikrografları verilerek kısaca tartışılmıştır.

**Anahtar kelimeler:** *Puccinia*, *Artemisia*, Yeni kayıtlar, Türkiye.

### Introduction

*Artemisia* L., belonging to the family *Asteraceae*, is a large a genus of small herbs and shrubs distributed in temperate climates, generally in dry or semiarid habitats. The genus includes more than 500 species that have ecological and economic importance (Tabur et al., 2012). Many species are used as food, medicine, forage, or soil stabilizers in disturb habitats, while some species are lethal or allergenic (Hayat et al., 2009). Tracing to literature (Kürşat and Civelek, 2011; Fırat, 2015), genus *Artemisia* is represented by 27 taxa (21 species, 3 subspecies and 3 varieties) in Turkey (Kürsat, 2012).

The rust fungi are obligate plant parasitic group of the order *Pucciniales* (*Basidiomycota*). The group contains approximately 7000 species within 168 genera and they cause diseases in economically important plant species including ferns, conifers and angiosperms (Cummins and Hiratsuka, 2003).

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*Puccinia* Pers. is the largest genus of this group that comprise more than 5000 widely distributed species and there are 27 species report on several *Artemisia* species (Farr and Rossman, 2016)

According to literature (Bahçecioğlu and Kabaktepe, 2012; Kabaktepe et al., 2015a; 2015b; 2015c; 2015d), *Puccinia chrysanthemi* Roze, *P. dracunculina* Fahrend. and *P. tanaceti* DC. are known as *Artemisia* host species, but there is not any record of *Puccinia abrotani* Fahrend. and *P. artemisiicola* P. Syd. & Syd. in Turkey.

The current study aims to make contribution to the mycobiota of Turkey.

**Materials and Methods**

Fungi samples were collected in 2007 from Turkey. The host specimens were prepared according to established herbarium techniques. Host plants identified use the Flora of Turkey and the East Aegean Islands (Cullen, 1975). Spores were scraped from dried host specimens and mounted in lactophenol. Macrophotographs were taken under a stereo microscope (Novex trinocular zoom stereo microscope RZT-SF). Microphotographs were taken under a light microscope (Noveks B series 1000). Analysis LS Starterwas software was used to measure. The current names of fungi are given according to www.indexfungorum.org. Names of host plants and families are given according to http://www.theplanlist.org. Voucher specimen are deposited in the Inönü University Herbarium (INU).

**Results**

Systematic enumeration of the reported species belonging to the genus *Puccinia* is provided below.

Key to species of *Puccinia* determinate on *Artemisia* in Turkey.

1.Mesospores not seen .....2
1.* Mesospores seen .....3
2.Teleutospores smooth .....*P. dracunculina*
2.* Teleutospores finely verruculose at upper cell ..... *P. tanaceti*
3.Teleutospores smooth .....*P. artemisiicola*
3.*Teleutospores verruculose .....4
4.Teleutospores chestnut brown and up to 46 µm.....*P. chrysanthemi*
4.*Teleutospores dark brown and up to 62 µm .....*P. abrotani*

**1. *Puccinia abrotani*** Fahrend.,Annls mycol. 39(2/3): 181 (1941). Figure 1.

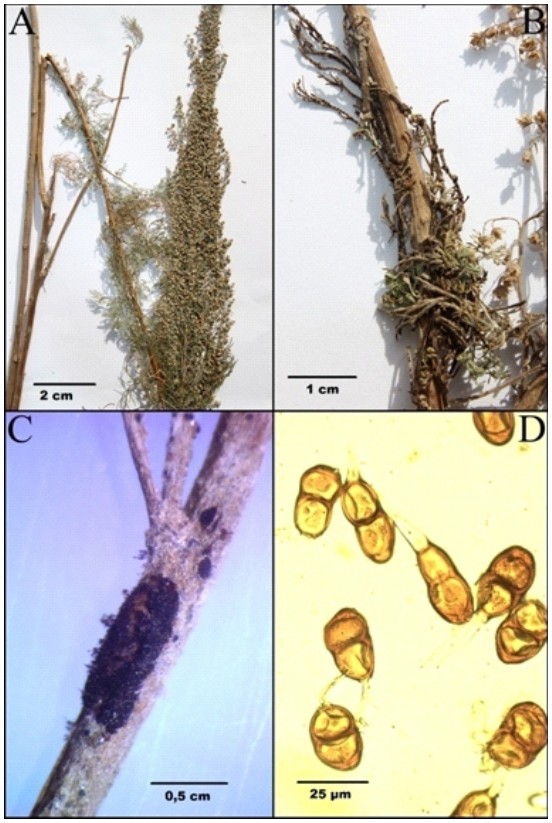


**Figure 1.** *P. abrotani* on *Artemisia abrotanum*
A-dried herbarium specimen;
B- infected plant leaves
C-stereo microscope view of *P. abrotani* on stem surface;
D- LM view of Teleutospores.

Uredinia generally hypophyllous, on irregular, pallid-yellow or brownish, scattered or in clusters, 1-1,5 mm, pulverulent, snuff brown. Urediniospores globoid-ellipsoid, 22-39 × 23-32 µm, wall echinulate, brown with 3 equatorial pores.

Teleutosori mixed with uredinia. Teleutospores ellipsoid or oblong, rounded at the both ends or slightly thickened above or slightly attenuate downwards, scarcely constricted on septa, 29-62 × 19-34 µm, wall delicately verruculose, dark brown, 1,5-2,5 µm, at apex up to 9 µm, pore in upper cell apical, pedicels up to 80 µm, hyaline, persistent. Mesospores subgloboid or pyriform, 32-37 20-21 µm, dark brown.

**Specimen examined:** Muş, on *Artemisia abrotanum* L., 1266 m., N 38º 47.423, E 41º 29.795, 23.11. 2007, M. Kurşat 1044.

**2. *Puccinia artemisiicola*** P. Syd. &Syd., Monogr. Uredin. (Lipsiae) 1(1): 14 (1902). Figure 2.

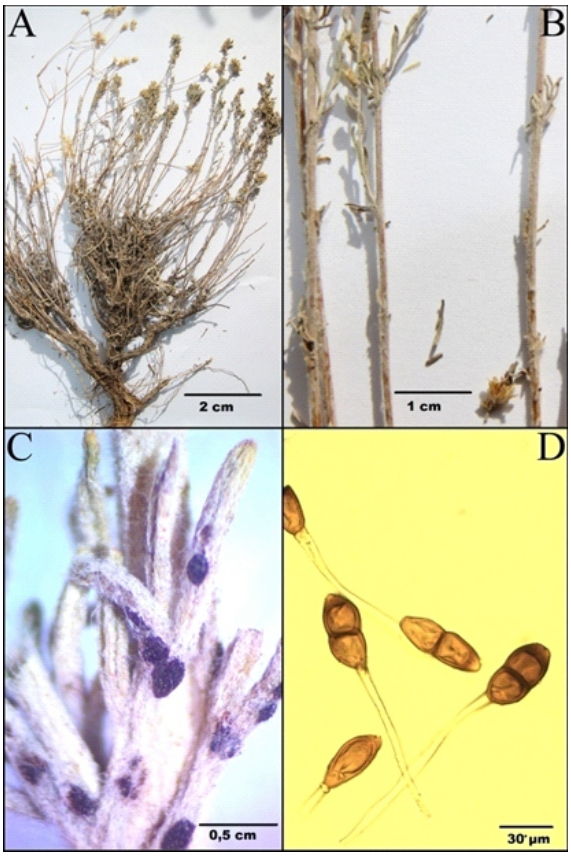


**Figure 2.** *P. artemisiicola* on *Artemisia taurica*
A-dried herbarium specimen;
B- infected plant leaves
C-stereo microscope view of *P. artemisiicola* on stem surface;
D- LM view of Teleutospores.

Teleutosori amphigenous, on petioles, on stems, scattered or in groups, elongated on stems, covered by the epidermis, dark brown. Teleutospores ellipsoid, oblong, rounded above and slightly attenuate downwards, constricted on septa, 33-63 × 12-25 µm, wall smooth, brownish, 1,5-2,5 µm, at apex up to 14 µm, pore in upper cell apical, pedicels up to 70 µm, hyaline or yellowish, deciduous. Mesospores ellipsoid-globoid, 22-40 12-23 µm, wall brownish, smooth, 1,5-2,5 µm, at apex up to 6 µm.

**Specimen examined:** Van, Kuzgun Koran pass, on *Artemisia fragrans* Willd., 2142 m, N 38º23.367, E 42º 47.319, 19.09.2007, Ş. Civelek-M. Kurşat 1049; Ankara,Çubuk Dam Lake, Karaman village, on *Artemisia taurica* Willd., 1130 m., N 40º 17.583, E 33º 01.018, 10.09.2007, M. Kurşat 1027; Kayseri, Amanos pass, 1121 m, N 38º 43. 377, E 35º 04.811,22.10.2007, M. Kurşat 1089.

**3. *Puccinia chrysanthemi*** Roze, Bull. Soc. mycol. Fr. 16: 92 (1900).

**Specimen examined:** Ağrı, on *Artemisia absinthium* L. Doğubeyazıt, Suluçem,northern slopes of Zor mountain, 2054 m, N 39º 42.476, E 43º 51.399, 22.09.2007, Ş. Civelek, M. Kurşat 1063; Bitlis, on *Artemisia incana* (L.) Druce, Adilcevaz-Ahlat pass, 1720 m, N 38º 47.855, E 42º 43.000, 23.09.2007, Ş. Civelek, M. Kurşat 1075; Malatya, Sivas, on *Artemisia austriaca* Jacq. and *Artemisia taurica* Willd. (Bahçecioglu and Yıldız, 2001; 2005).

**4. *Puccinia dracunculina*** Fahrend. Annls mycol. 39(2/3): 181 (1941).: Şanlıurfa, on *Artemisia dracunculus* L. (cultivated species) (Kavak and Bilgili, 2015).

**5. *Puccinia tanaceti*** DC., in Lamarck & de Candolle, Fl. franç., Edn 3 (Paris) 2: 222 (1805).

**Specimen examined:** Hakkari, on *Artemisia haussknechtii* Boiss., Hakkari- Van pass,1624 m, N 37º 34.873, E 43º 54.148, 21.09.2007, Ş. Civelek, M. Kurşat 1059;

Van,on *Artemisia splendens* Willd., Gürpınar, Sopa konak village ,2692 m, N 38º 12.533, E 43º 37.055, 21.09.2007, Ş. Civelek, M. Kurşat 1060; Kahramanmaraş, on *Artemisia campestris* L. (Bahçecioglu et al., 2006); Kars, Ardahan; on *Artemisia campestris* L. var. *marschalliana* (Spreg.) Poljak. (given as *Artemisia marschalliana* Spreng.) (Bahçecioglu and Kabaktepe, 2012); Ardahan, Kahramanmaraş, Kars, on *Artemisia vulgaris* L. (Bahçecioglu et al., 2006; Bahçecioglu and Kabaktepe 2012).

**Discussion**

*P. abrotani* and *P. artemisiicola* resemble other rust species growing on *Artemisia* due to their general appearance. *P. abrotani* can easily be separated from other *Puccinia* species growing on *Artemisia* by its larger and darker teliospores while *P. artemisiicola* by its smooth teliospores and mesospores.

*P. abrotani* has been reported from Belarus, Germany, Lithuania, Poland and Romania on *Artemisia abrotanum* L. (Braun, 1982; Girilovich et al., 2003; Ignataviciute and Minkevicius, 1993; Savulescu, 1953). The records of *P. artemisiicola* have been given on *Artemisia* campestris L. in Finland, Lithuania and Romania on *Artemisia japonica* Thunb. in Japan and Russia, on *Artemisia scoparia* Waldst. & Kit., in Romania, on *Artemisia stolonifera* (maxim.) V.I. Komarov, in Japan and Korea, on *Artemisia vulgaris* L. in Bulgaria and Czech Republic (Azbukina, 1984; Cho et al., 2004; Denchev, 1995; Dietrich, 2005; Ignataviciute and Minkevicius, 1993; Ito, 1950; Liro, 1908; Savulescu, 1953).

Tracing to literature on Turkish *Puccinia* (Bahçecioğlu and Kabaktepe, 2012; Kabaktepe et al., 2015a), 215 taxa (205 species and 10 varieties) have previously been reported from Turkey.

With the current study, *Puccinia abrotani* Fahrend. and *P. artemisiicola* P. Syd. & Syd. are recorded for Turkish *Puccinia* for the first time and number of Turkish *Puccinia* taxa increase to 217. Among them, 5 species are determinate on *Artemisia* species.

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