

## *Heterobasidion annosum* Complex in Turkey

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**Abstract** – Presence of *Heterobasidion annosum* in Turkey has been known at least for seventy-five years. During this period information on host species and distribution has accumulated. The host range includes four *Abies* taxa, three species of pine, and *Picea orientalis*. The known distribution covers roughly the whole zone of forests surrounding the dry Central Anatolian plateau, i.e. the coastal regions of Black Sea, Aegean Sea, and Mediterranean Sea. However, there is very little information about the pathogenicity and damage caused by *Heterobasidion* species. The current knowledge about the known distribution of members of *H. annosum* complex, and pathogenicity on different hosts in Turkey is reviewed.

**forestry / root and butt rot / conifer / host range / distribution**

**Kivonat** – A *Heterobasidion annosum* komplexum Törökországban. A *Heterobasidion annosum* törökországi előfordulása legalább hatvanöt éve ismert. Ezen idő alatt felhalmozódtak a gazdanövény fajokra és a gomba elterjedésre vonatkozó információk. A gazdanövénykört négy *Abies* taxon, három *Pinus* faj és a *Picea orientalis* képezi. Az ismert előfordulási területek a száraz Közép-Anatóliai fennsíkot övező erdők, a Fekete-tenger, Égei-tenger és Földközi-tenger partvidékei. Nagyon kevés információnk van a *Heterobasidion* fajok patogenitásáról és az okozott károkról. A dolgozat a *H. annosum* komplex jelenleg ismert törökországi előfordulására és a különböző gazdákkal szembeni patogenitására vonatkozó ismeretek revízióját tartalmazza.

**erdészet / gyökér- és tőkorhadás / fenyő / gazdanövénykór / elterjedés**

### 1 INTRODUCTION

Species belonging to the *Heterobasidion annosum* -complex cause economically important root and butt rot of conifers in the northern boreal and temperate zones.

In Eurasia, three species of *Heterobasidion* have been identified: *Heterobasidion parviporum* Niemelä & Korhonen, *Heterobasidion annosum* (Fr.) Bref. sensu stricto, and *Heterobasidion abietinum* Niemelä & Korhonen (Niemelä – Korhonen 1998). *H. parviporum* occurs mainly in spruce and fir forests of northern and eastern Eurasia, whereas *H. annosum* s. s. grows mostly in pine forests and has mainly western distribution. The known distribution area of *H. abietinum* is smaller: it lives on several native species of *Abies* occurring in southern and central Europe, and Asia Minor (Korhonen – Dai 2005, Doğmuş-Lehtijärvi et al. 2006).

Presence of *H. annosum* sensu lato in Turkey (Asia Minor) has been known at least for seventy-five years. The first survey of Turkish macrofungi was done by Pilat (1932) who

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found *H. annosum* s.l. to occur on *Abies nordmanniana* ssp. *bornmülleriana* (Mattf.) Coode & Cullen in the Ilgaz Mountains north of Ankara. Since that date information on host species and distribution has accumulated. The aim of this paper is to briefly summarize the current knowledge about the host range and distribution of the members of *H. annosum* complex, as well as their pathogenicity on different hosts in Turkey.

## 2 DISTRIBUTION AND HOST RANGE IN TURKEY

### 2.1 Distribution

In Turkey, forests are located on the slopes of the mountain ranges that run parallel to the coast lines of the Black Sea and the Mediterranean Sea, while the dry inner part of the country is mainly grassland. The known distribution of *H. annosum* s.l. covers approximately the whole area of coniferous forests; records are missing mainly from pine forests near the Aegean coast. (Figure 1). In southern Turkey *H. annosum* s.l. has been recorded from the provinces of Antalya, Isparta, Konya, Mersin, Adana, and Hatay (Selik 1973, Kotlaba 1976, Doğmuş-Lehtijärvi et al. 2006, Y. Balcı, Morgantown, 2007, personal communication, Lehtijärvi, unpublished data). In northern Turkey the distribution extends from Kazdağı Mountains in the Aegean part of Balıkesir province to Artvin near Georgian border (Pilat 1932, Lohwag 1957, Selik 1973, Balcı 1998, Doğmuş-Lehtijärvi et al. 2006, Doğmuş-Lehtijärvi et al. (in press), Y. Balcı, Morgantown, 2007, personal communication).

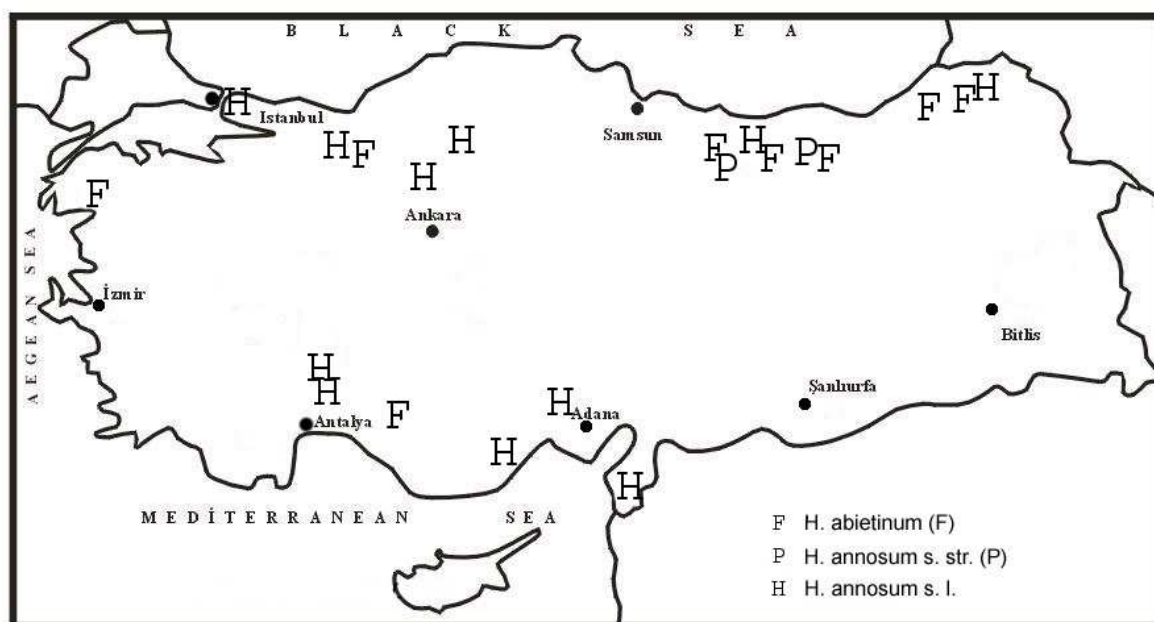


Figure 1. Distribution map of *Heterobasidion* in Turkey

### 2.2 Host range

The known host range of *H. annosum* s.l. in Turkey includes four *Abies* taxa, three species of *Pinus*, and *Picea orientalis* (L.) (Table 1). These conifers are economically important and make up approximately 75% of the area of high forests in Turkey. So far *H. annosum* s.l. has not been reported from broadleaved trees.

Table 1. Records of *Heterobasidion annosum* s.l. on different hosts in Turkey

| Host species  | Province                                       | References   |
|---|--|--|
| <i>Abies cilicica</i><br>(Ant. & Kotschy) Carr.   | Adana<br>Antalya<br>Isparta<br>Mersin<br>Konya | Selik 1973<br>Doğmuş-Lehtijärvi et al. 2006<br>Y.Balcı (2007 pers. comm.)<br>Y.Balcı (2007 pers. comm.), Lehtijärvi<br>(unpublished) |
| <i>A. nordmanniana</i> ssp. <i>equi-trojani</i><br>Syn: <i>A. equi-trojani</i><br>Aschers. et Sint.                           | Balıkesir                                      | Balcı 1998, Doğmuş-Lehtijärvi et al. 2006  |
| <i>A. nordmanniana</i> ssp. <i>bornmülleriana</i><br>Syn: <i>A. bornmülleriana</i><br>Mattf.                                  | Çankırı /<br>Kastamonu<br>Düzce<br>Bolu        | Pilat 1932, Y.Balcı (2007 pers. comm.)<br>Selik 1973<br>Selik 1973, Doğmuş-Lehtijärvi et al. 2006                                    |
| <i>A. nordmanniana</i> (Steven)<br>Spach ssp. <i>nordmanniana</i>   | Artvin, Giresun,<br>Gümüşhane, Ordu,<br>Rize   | Doğmuş-Lehtijärvi et al. (in press)  |
| <i>Picea orientalis</i> (L.) Link   | Giresun  | Selik, 1973, Doğmuş-Lehtijärvi et al.<br>(in press)  |
| <i>Pinus</i> cf. <i>brutia</i><br><i>P. brutia</i> Ten.<br>Syn: <i>Pinus halepensis</i> var.<br><i>brutia</i> (Ten.) A. Henry | Hatay<br>–                                     | Kotlaba, 1976<br>Y.Balcı (2007 pers. comm.)  |
| <i>Pinus sylvestris</i> L.  | Ankara   | Selik, 1973  |
| <i>Pinus nigra</i> Arn. ssp.<br><i>pallasiana</i> (Lamb.) Holmboe   | Antalya, Balıkesir                             | Lehtijärvi (unpublished)   |

Most of the records are based on morphological identification of basidiocarps of *H. annosum* s.l. Only recently mating tests have been used to identify the members of the *H. annosum* complex to species level. We found *H. abietinum* to be the dominating *Heterobasidion* species on *Abies cilicica* and all three subspecies of *A. nordmanniana* occurring on Asia Minor (Doğmuş-Lehtijärvi et al. 2006, Doğmuş-Lehtijärvi et al. in press). While *H. abietinum* has been found in several locations in western and north-eastern Turkey, *H. annosum* s.s. has been found so far only in two locations in north-eastern Turkey. We found basidiocarps of the latter species on stumps of *A. nordmanniana* ssp. *nordmanniana* in pure fir stands in Gümüşhane and Ordu provinces (Doğmuş-Lehtijärvi et al. in press). Most probably the distribution area of *H.annosum* s.s. in Asia Minor is fairly large as the species occurs not only in the north-eastern Turkey but also in neighbouring countries Bulgaria, Greece, and Cyprus (Tsopelas – Korhonen 1996, La Porta et al. 1998, Tsopelas – Nikolaou 2005). Moreover, some harvested pines in Turkey show typical symptoms of *H annosum* s.l. infections (Y. Balcı, Morgantown, 2007, personal communication).

### 3 PATHOGENICITY

There is very little information about the pathogenicity and damage caused by *Heterobasidion* in Turkish forests. Most of the studies on *Heterobasidion* in Asia Minor have been mycological surveys and the basidiocarps found on stumps or fallen trees (e.g. Selik 1973, Kotlaba 1976, Doğmuş-Lehtijärvi et al. 2006). Nevertheless, Selik (1973) states that decay can spread up to 6 m in infected stems of *A. nordmanniana* ssp. *bornmülleriana*.

Basidiocarps can be found on both standing and windthrown firs (Doğmuş-Lehtijärvi et al. 2006, Y. Balcı, Morgantown, 2007, personal communication). Basidiocarps were most common on *A. nordmanniana* ssp. *equi-trojani* in Kazdağı Mountains in Balıkesir, less common on *A. nordmanniana* ssp. *bornmülleriana* in Ilgaz Mountains in Kastamonu, and very rare on *A. silicica* in Mersin and Konya region (Y. Balcı, Morgantown, 2007, personal communication) found. Demirel (1999) found basidiocarps “on living conifers” in Artvin province. Observations on harvested pines have revealed typical signs of *Heterobasidion* infestation (Y. Balcı – Morgantown, 2007, personal communication). In short, field observations indicate that *H. annosum* s.l. is pathogenic on several hosts in Asia Minor although the matter has not been investigated thoroughly and there is no data about infection frequencies.

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