

Environmental Condition and Cypress Canker Disease

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Abstract – Cypress canker by *Seiridium cardinale* (Wag.) Sutt. & Gibson is a disease particularly harmful for cypress trees in Tuscany where the landscape value of this species is very important. The paper reports on the relationship among *S. cardinale* and environmental factors that may influence the spreading of the fungus using GIS technology. The study conducted in the neighbourhood of Florence recording the occurrence of the fungus on a sample of about 6900 trees, demonstrate that the damage by *S. cardinale* varied according to the environmental conditions of the area. The study showed that the fungus affects the trees under relatively high humidity and mild temperature that in Tuscany occur during the growing season and enhance Cypress susceptibility to the disease.

***Seiridium* / spreading / elevation / exposure / GIS**

Kivonat – Környezeti feltétel és a ciprusok kéregrákja. A ciprusok *Seiridium cardinale* (Wag.) Sutt. & Gibson okozta kéregrákja különösen ártalmas Toscana-ban, ahol e fafaj tájképi szerepének nagy jelentősége van. A dolgozat a *S. cardinale* gomba és a terjedését befolyásoló környezeti tényezők közötti kapcsolat vizsgálatát tartalmazza GIS technológia alkalmazásával. Firenze környékén, a gomba előfordulását mintegy 6900 faegyedet tartalmazó mintán felvevő tanulmány bizonyítja, hogy a *S. cardinale* okozta károk a terület környezeti feltételei szerint változnak. A vizsgálat kimutatta, hogy a gomba viszonylag magas nedvesség és enyhe hőmérséklet esetén támadja a fákat, e feltételek Toscana-ban a vegetációs idő alatt előfordulnak, és növelik a ciprusok fogékonyságát a betegségre.

***Seiridium* / terjedés / tengerszint fölötti magasság / kitettség / GIS**

1 INTRODUCTION

Cypress canker by *Seiridium cardinale* (Wag.) Sutt. & Gibson is a serious disease of *Cupressus sempervirens* that in Italy develops quite slowly and it is often related to environmental factors that may influence compartmentalization of infected tree tissue (Moriondo 1972, 1999). *S. cardinale* was recognised for the first time in 1927 in Monterrey, California on *Cupressus macrocarpa* and then it was spread in lots of part of the world (New Zealand, South America, Africa, France, Greece, Spain, Turkey and Portugal) probably by economical human activities (Moriondo 1972, 1999, Panconesi – Intini 1977, Panconesi – Ongaro 1982, Graniti 1998). In Tuscany *C. sempervirens* it's a very important landscape plant (about 17,500 ha) and it's a kind of symbol of this region. Its presence in the landscape and his health are two important goal for public administration that in the last ten years ago had financed and planned a Regional monitoring programme META (Monitoraggio Estensivo dei

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boschi della Toscana a fini fitosanitari, www.arsia.toscana.it/meta) to observe the occurrence of some important forestry disease (ARSIA 2003).

S. cardinale is a mitosporic fungus responsible of the Cypress bark canker disease which generally spread by conidia transported by the wind or vectored by bark beetles as *Phloeosinus spp.* and *Orsillus spp.* that favour infections of shoots and cones respectively (Tiberi – Battisti 1998, Masutti – Zangheri 2003).

It's possible to recognise infected trees by typical symptoms on the crown like: browning of the foliage, bark necrosis, resin flow around the infected area, dead of single branches. The disease develops quite slowly and thus most of the infected trees die after multiple infections or after root rot by opportunistic weak pathogenic fungi (Moriondo 1972, 1999).

2 MATERIALS AND METHODS

The goal of this study was to know the relationship between the occurrence of cypress canker disease and some environmental factors, following Tattar (1978), typical of Tuscany a region of central Italy, using GIS technology as tool to realize in the future a risk assessing map. In the first step of this study it was necessary to realize i) a special collecting data form where all information about an infected plant were recorded and ii) a photo album, showing cypress trees having different intensity of infection to give a mark to every type of canker observed during the field work.

Surveys were conducted in the neighbourhood of Florence in Chianti's and Mugello's areas following national roads. The transect was about 60 km and South-North oriented and had a 100 m side buffer. A total of 6936 plants were collected and all data registered in a form composed by two parts: the first noted spatial data and the second canker disease data related to the photo album.

In the second step all data were put in a database software and analyzed by using software GIS (Geographical Information System) (Chirici et al. 2002, Chudamani et al. 2004, Godone et al. 2003, Maselli et al. 2003)

It was possible to realize some specific maps (TIN, slope, exposition, Bartorelli 1967) to study the relationship between cypress canker and some environmental factors that were supposed to have some influence about the occurrence and the spreading of the fungus (Van Staden 2003).

3 RESULTS AND DISCUSSION

Data analysed showed that quite often infections were more frequent in sites characterized by mild and wet periods during growing season and less frequent in sites having cold winters periods.

After the survey percent of infected trees were 3.2 in Chianti area (southern of Florence) and 2.3 in Mugello area (northern ward). Generally these plants were forming small groves. Most of cypress observed were adult trees showing old infections, only rarely (0.4%) it was possible to register new cankers recently developed. That would mean that the pandemic development of the disease as thought during the '90ties by Graniti, (1998) has been probably concluded.

Related to spatial data, cankers were most commonly found on sites where trees were supposed to have better growing conditions like: i) elevation about 400-500 m a.s.l. on South-East and South-West exposures but also 300 m on Northern sites, ii) annual precipitation higher than 700 mm and distributed all along the year.

4 CONCLUSION

As already reported by the literature under the Italian environmental circumstances Cypress trees have never dormant habit but on the contrary they growth as quiescent species related with photoperiodic conditions (Gellini – Grossoni, 2001). Therefore long and mild winter periods may enhance the susceptibility of trees to the disease (Moriondo 1972, 1999).

From this study we found that damages by *S. cardinale* occur mostly in those sites characterized by relatively high humidity and mild temperature during winter-spring periods corresponding to the stage of the most susceptible period for the host plants.

Considering that in previous studies the pathogen population resulted genetically uniform and no differences in virulence were found, we could conclude that the occurrence of the disease is strongly related with environmental and climatic conditions. Therefore GIS technology utilized in this study confirmed to be an important and useful tool for research in forest pathology.

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