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Wood-decay fungi on trees of the city of Palermo (Sicily, Italy)

Abstract

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Nineteen taxa, belonging to 15 genera, included in 12 families of Basidiomycetes were observed on different living trees and stumps. Data on hosts and collection sites are reported together with notes on the causes of wood decay fungi attack and suggestions for solutions.

Key words: white-rot fungi, Basidiomycetes, Mediterranean Area.

Introduction

Wood-decay fungi are widespread and contribute to the recycling of organic matter. As pathogenic fungi, they damage native and ornamental species that grow within cities. The appearance of wood-decay fungi on trees is strictly related to the health conditions of the plants and pruning procedures.

In urban areas, it is necessary to pay attention to the fungi that settle on trees because a variation in the stability of trunks and crowns can put at risk the safety of citizens who use green spaces and pedestrian paths in the city (Cellerino & Gullino 1993). Tree crash damages are becoming increasingly common due to the weakening of trunks and branches in conjunction with progressively intense weather events.

In the urban environment, preventing the attack of fungal pathogens on trees is not easy due to the interaction of various predisposing factors such as root asphyxia, pollution, incorrect pruning, water shortages, etc.

Palermo is the Sicilian city with the highest number of historic parks and gardens (Bazan & al. 2005; Raimondo 2019) and is home to a wealth of both native and exotic dendroflora (Venturella & al. 1990, Raimondo & al. 1991).

With reference to a first mycological census carried out in the city of Palermo (Sicily, Italy), the most frequent wood-decay fungi on native and ornamental trees are here reported.

Materials and Methods

The presence of wood-decay fungi on native and ornamental trees in the urban area of the city of Palermo was observed throughout the year. The fungi were transferred to the Department of Agricultural, Food and Forest Sciences (SAAF) of the University of Palermo, and stored at - 4°C for up to 24 h before the morphological examination, which was carried out according to Bernicchia (2005). Observations on macro-morphological characters (pileus, cuticle, pores, stipe, context, etc.) were performed on fresh material, while microscopic characters (hyphal system, generative hyphae, basidia, sterigmata, cystidia, cystidioles, and basidiospores) were studied by using 3% potassium hydroxide and ammoniacal Red Congo under a Leica microscope.

Plant names are referred to The Euro+Med PlantBase - The information resource for Euro-Mediterranean plant diversity.

The herbarium samples are kept in the Herbarium SAF of the Department of Agricultural, Food and Forest Sciences of the University of Palermo.

Results

Nineteen taxa, belonging to 15 genera, included in 12 families of Basidiomycetes were observed on different living trees and stumps. The list of recorded taxa is included in Table 1 with information on hosts and collection sites.

A. biennis (Fig. 1) is a fungus causing white-rot of the central cylinder. This species can degrade as saprotroph many rotten stumps from spring to autumn.

Fig. 1. Basidiomata of *Abortiporus biennis* on a stump of *Styphnolobium japonicum*.

Table 1. List of wood-decay fungi observed in the city of Palermo.

Taxa	Family	Host/Substratum	Collection site
Abortiporus biennis (Bull.) Singer	*Podoscyphaceae*	Stump of *Styphnolobium japonicum* (L.) Schott	Dante street
Auricularia auricula-judae (Bull.) Quél.	*Auriculariaceae*	Cutten trunk of *Gleditsia triacanthos* L.	Leonardo da Vinci street
Auricularia mesenterica (Dicks.) Pers.	*Auriculariaceae*	Trunk of *Quercus ilex* L.	Favorita Park
Bjerkandera adusta (Willd.) P. Karst.	*Phanerochaetaceae*	Trunk of *Ailanthus altissima* (Mill.) Swingle	Alberto Amedeo street
Cerrena unicolor (Bull.) Murrill	*Cerrenaceae*	Stump of *Ailanthus altissima* (Mill.) Swingle	Fossa della Garofala
Coriolopsis gallica (Fr.) Ryvarden	*Polyporaceae*	Trunk of *Casuarina equisetifolia* L.	Villa Giulia
Cyclocybe cylindracea (DC.) Vizzini & Angelini	*Tubariaceae*	Stump of *Ailanthus altissima* (Mill.) Swingle and at the base of trunks of *Schinus molle* L.	Fossa della Garofala/La Loggia street
Fuscoporia torulosa (Pers.) T. Wagner & M. Fisch.	*Hymenochaetaceae*	Stump of *Quercus ilex* L.	Favorita Park
Ganoderma lucidum (Curtis) P. Karst.	*Polyporaceae*	Stump of *Quercus ilex* L.	Favorita Park
Ganoderma resinaceum Boud.	*Polyporaceae*	Stump of *Cedrus atlantica* (Endl.) Carrière	Department of Agricultural, Food and Forest Sciences

Table 1. continued.

Inocutis tamaricis (Pat.) Fiasson & Niemelä	*Hymenochaetaceae*	Trunk of *Tamarix arborea* (Ehrenb.) Bunge	Foro Italico Umberto I
Inonotus hispidus (Bull.) P. Karst.	*Hymenochaetaceae*	Trunk of *Styphnolobium japonicum* (L.) Schott	Marchese Ugo street
Laetiporus sulphureus (Bull.) Murrill	*Laetiporaceae*	Trunk of *Styphnolobium japonicum* (L.) Schott	Botanical garden
Pleurotus dryinus (Pers.) P. Kumm.	*Pleurotaceae*	Trunk of *Ceiba speciosa* (A.St.-Hil., A.Juss. & Cambess.) Ravenna	Botanical garden
Pleurotus opuntiae (Durieu & Lév.) Sacc.	*Pleurotaceae*	Trunk of *Yucca gigantea* Lem.	Pier Santi Mattarella Garden
Pleurotus ostreatus (Jacq.) P. Kumm.	*Pleurotaceae*	Trunk of *Quercus ilex* L.	Department of Agricultural, Food and Forest Sciences
Schizophyllum commune Fr.	*Schizophyllaceae*	stump of *Ceratonia siliqua* L.	Botanical garden
Schizopora paradoxa (Schrad.) Donk	*Schizoporaceae*	Trunk of *Phoenix dactylifera* L.	Botanical garden
Stereum hirsutum (Willd.) Pers.	*Stereaceae*	Trunk of *Quercus ilex* L.	Villa Giulia

Auricularia auricula-judae (Fig. 2) grows as saprotroph in groups on rotting deciduous wood. It fructifies in conditions of high humidity from the beginning of September and can still be found throughout the winter. *A. mesenterica* (Fig. 3) is a fairly common saprotrophic species, growing on rotting bark all year round.

Bjerkandera adusta (Fig. 4) is a rather slow-growing parasitic fungus that then acts as a saprotroph after the plant has died while *Cerrena unicolor* (Fig. 5) causes canker rot and decay on broad-leaved trees. Both species mainly grow in autumn.

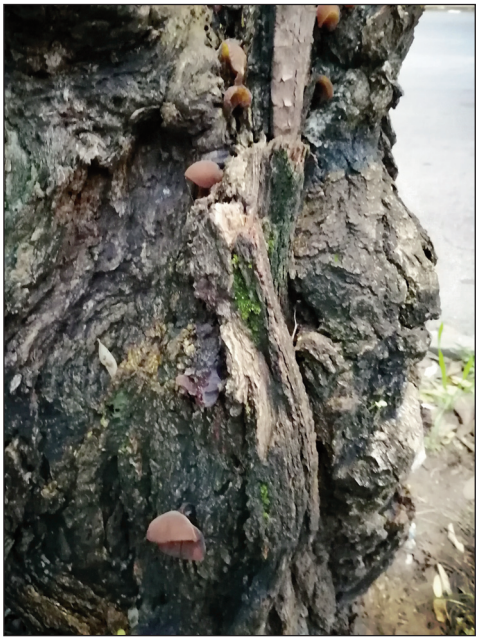

Fig. 2. *Auricularia auricula-judae* on cutten trunk of *Gleditsia triacanthos*.

Fig. 3. *Auricularia mesenterica* on bark of *Quercus ilex*.

Fig. 4. Basidiomata of *Bjerkandera adusta* on a trunk of a living plant of *Ailanthus altissima*.

Fig. 5. *Cerrena unicolor* on a stump of *Ailanthus altissima*.

Coriolopsis gallica (Fig. 6) is a saprotrophic species growing on dead hardwoods and exotic trees all year round.

Cyclocybe cylindracea (Fig. 7) settles on plants as a saprotroph or parasite, in the latter case rapidly leading to the death of the tree. It grows in autumn and spring.

Fuscoporia torulosa (Fig. 8) is a very common white-rot parasite species, which easily leads to the rapid disintegration of the wood after the death of the tree, as saprotroph. It grows all year round.

Ganoderma lucidum (Fig. 9) is a common white-rot species that grows as saprotroph at the base of the trees and on stumps. *G. resinaceum* Boud. (Fig. 10) is a parasitic white- rot fungus growing on the trunks of living broad-leaved trees. The basidiomata persist throughout the year.

Inocutis tamaricis (Fig. 11) is a common white-rot parasitic species growing on different species of the genus *Tamarix* L. At a later stage, it takes on the role of saprotroph on trunks and stumps. This is the first finding on *Tamarix arborea*. The basidiomata persist throughout the year.

Inonotus hispidus (Fig. 12) is a fungus causing white-rot of the central cylinder that grows all year round.

Laetiporus sulphureus (Fig. 13) may be a saprotroph or a parasite that continues to fructify after the death of the host. It grows on stumps and deciduous plants in spring-autumn.

Pleurotus dryinus (Fig. 14) is a white rot saprotrophic species on dead wood and can also be a weak parasite of trees. The basidiomata appear in autumn. *P. opuntiae* (Fig. 15) is a rare white rot species with double fructification in autumn and spring. *P. ostreatus* (Fig. 16) is a rare infrequent white rot species in the trees of the cities.

Schizophyllum commune (Fig. 17) is a very common white rot species that grow on dead or living logs and stumps, all year round.

S. paradoxa (Fig. 18) is a saprotrophic species, responsible for fibrous white rot. The basidiomata grows throughout the year.

Stereum hirsutum (Fig. 19) is a very common white rot species typically forming multiple brackets on dead wood all year round.

All species surveyed have broadly similar wood degradation mechanisms.

Conclusions

The study of wood decay fungi in Italian cities has been addressed by several authors (Giordano & Gonthier 2016; Giordano 2017).

The state of health of street trees and urban greenery in the city of Palermo is rather critical. The main causes are pruning carried out at the wrong time of year and the high level of pollution, which gradually weakens the plants and exposes them to attack by various pathogens.

The main action to avoid wood rot is to reduce invasive tree intervention. Decay fungi actively penetrate trees through wounds caused at the collar by mowing or sucker removal tools or by pruning. When a tree is topped and branches are cut, there is an absolute certainty that fungal spores will reach the cutting surface and the germination process will begin, with the fungal hyphae invading the wood.

Fig. 6. Basidiomata of *Coriolopsis gallica* on dead trunk of *Casuarina equisetifolia*.

Fig. 7. Basidiomata of *Cyclocybe cylindracea* on a stump of *Ailanthus altissima.*

Fig. 8. *Fuscoporia torulosa* on a stump of *Quercus ilex*.

Fig. 9. Basidioma of *Ganoderma lucidum* at the base of a living plant of *Quercus ilex.*

Fig. 10. *Ganoderma resinaceum* on a stump of *Cedrus atlantica*.

Fig. 11. Basidiomata of *Inocutis tamaricis* on living plant of *Tamarix arborea.*

Fig. 12 *Inonotus hispidus* on living plant of *Styphnolobium japonicum*.

Fig. 13. Basidiomata of *Laetiporus sulphureus* on living plant of *Styphnolobium japonicum*.

Fig. 14. *Pleurotus dryinus* on *Ceiba speciosa*.

Fig. 15. Basidiomata of *Pleurotus opuntiae* on trunk of *Yucca gigantea* .

Fig. 16. Basidiomata of *Pleurotus ostreatus* on living plant of *Quercus ilex.*

Fig. 17. Basidiomata of *Schizophyllum commune* on stump of *Ceratonia siliqua*.

Fig. 18. *Schizopora paradoxa* on trunk of *Phoenix dactylifera*.

Fig. 19. Basidiomata of *Stereum hirsutum* on *Quercus ilex* .

The branch is not able to form the callus quickly and the compartmentalization phenomena are not sufficient to stop the advance of the fungus which, within a few years, creates irreversible damage to the tree.

In a survey in Piedmont, it was found that about two years after pruning different trees, about 50% of the trees were colonized by wood decay fungi (Giordano 2017).

Therefore, specific items in the municipal budget are needed to improve the health of street trees and public gardens. An important contribution can be made by setting up a school for gardeners to create a specialized staff with training provided by universities.

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