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Biodiversity of Xylariaceae (Ascomycota) and their hosts in protected areas from Tucumán (Argentina)

Esteban B. Sir [1, 2*], Adriana I. Hladki [1], María F. Parrado [3] & Andrea I. Romero [4]

[1] *Laboratorio Criptogámico, Fundación Miguel Lillo. Miguel Lillo 251, San Miguel de Tucumán (CP 4000), Tucumán, Argentina.*

[2] *CONICET.*

[3] *Laboratorio de Taxonomía Vegetal, Fundación Miguel Lillo.*

[4] *PRHIDEB-CONICET, Dep. de Biodiversidad y Biología Experimental, Facultad de Ciencias Exactas y Naturales (UBA), Ciudad Universitaria, Pabellón II, 4to. Pio, CP1428EHA Buenos Aires, Argentina.*

** Corresponding author: Sir E. B. sirestebanbenjamin@gmail.com*

Abstract

E. B. Sir, A. I. Hladki, M. F. Parrado & A. I. Romero. 2012. Biodiversity of Xylariaceae (Ascomycota) and their hosts in protected areas from Tucumán (Argentina). *Kurtziana* 37 (2): 35-48.

Fourty nine species belonging to the genera *Astrocystis, Biscogniauxia, Daldinia, Entonaema, Hypoxylon, Kretzschmaria, Phylacia, Poronia, Rosellinia, Stilbohypoxylon* and *Xylaria* were recorded in protected areas from Tucumán. The species are grouped in probably endemic, cosmopolitan, neotropical and pantropical. The biodiversity of *Xylariaceae* in this province is compared with those from other countries. Twenty-three host taxa are registered, most of them were dicots. *Cinnamomum porphyrium* and *Podocarpus parlatorei* were the two native hosts more colonized.

Key words: Argentina; Mycogeography; Xylariales; "Yungas"

Resumen

E. B. Sir, A. I. Hladki, M. F. Parrado & A. I. Romero. 2012. Biodiversidad de la familia Xylariaceae (Ascomycota) y sus hospedantes en áreas protegidas de Tucumán (Argentina). *Kurtziana* 37 (2): 35-48.

Se registran cuarenta y nueve especies pertenecientes a los géneros *Astrocystis, Biscogniauxia, Daldinia, Entonaema, Hypoxylon, Kretzschmaria, Phylacia, Poronia, Rosellinia, Stilbohypoxylon* y *Xylaria.* Las especies se agrupan, según su distribución, en endémica probablemente, cosmopolita, neotropical y pantropical. Se compara la biodiversidad de Xylariales de la provincia de Tucumán con la de otros países. Se identifican veintitrés hospedantes, la mayoría de ellos dicotiledóneas, siendo *Cinnamomum porphyrium* y *Podocarpus parlatorei* las especies nativas más colonizadas.

Palabras clave: Argentina; Micogeografía; Xylariales, "Yungas".

Introduction

Xylariaceae is the largest family of the order Xylariales and one of the largest families in Ascomycota. Although its distribution is cosmopolitan, its greatest diversity is found in the tropical and subtropical regions.

The knowledge on the family in the South Cone of South America is largely limited to the contributions made by Spegazzini (1880a, b, c,

1881, 1884, 1887, 1888a, b, 1889, 1891, 1898, 1899, 1902, 1908a, b, 1909, 1910, 1912, 1919, 1921, 1922). Part of his work is devoted to Xylariales of Argentina, Bolivia, Brazil, Chile and Paraguay. Later Theissen (1908, 1909a, b), Rick (1935), Chardon et al. (1940) described many species from Brazil and Dennis (1956, 1957, 1958, 1970) helped to clarify the nomenclatural and taxonomic status of the South American tropical Xylariales. Rogers et al. (1988) contributed valuable information to Venezuela, Laessøe (2002) conducted a survey of the family in Ecuador and new data for this country can be seen in http://www.mycokey.com/Ecuador.html. Hamme (1993), Hamme & Guerrero (1997, 2002), Pereira et. al (2008) and Trierveiler-Pereira et al. (2009) recently investigated presence of *Xylaria* Hill ex Schrank and *Kretzschmaria* Fr. in Brazil.

A total of 84 species were reported by Spegazzini (citations mentioned above) of the following genera from Argentina: *Anthostomella* Sacc. (11 spp.), *Daldinia* Ces. & De Not. (5 spp.), *Hypocopra* (Fr.) J. Kickx. f. (6 spp.), *Hypoxylon* Bull. (19 spp.), *Kretzschmaria* (2 spp.), *Poronia* Willd. (3 spp.), *Rosellinia* De Not. (13 spp.) and *Xylaria* (25 spp.). From Tucumán province *Hypoxylon notatum* (*Hypoxylon nectrioide* Speg.), *Rosellinia paraguayensis* Starbäck, *R. smilacina* Speg., *Xylaria arbuscula* Sacc., *X. gomphus* Fr., *X. ianthinovelutina* (Mont.) Fr., *X. macropoda* Speg., *X. smilacicola* Speg., *X. sordida* Speg., *X. torulosa* (Jungh.) Speg. and *X. venosula* Speg. were recorded. Dennis (1956, 1957, 1958) reported 14 species of the following genera from Tucuman: *Xylaria* (9 spp.), *Poronia* (2 spp.), *Phylacia* Lev. (1 sp.), with *X. ianthinovelutina, X. grammica* (Mont.) Mont., *X. smilacicola, Poronia punctata* (L.) Br. and *X telfairii* (Berk.) Sacc.

In order to know more about the biodiversity of the xylariaceous in Tucuman and their hosts, numerous investigations were carried out (Hladki 1997, 2001, 2004; Hladki & Romero 2001, 2003, 2005, 2006, 2007, 2009a, b, 2010; Sir et al. 2012). As a consequence of all the studies of the genera and species that have been carried out and are provided here as one of the aims of this article, we have been able to compare and discuss the composition of the local mycobiota with others from tropical, subtropical and temperate regions and the relation between each xylariaceous species and their identified hosts.

Materials and methods

Thirty seasonal mycological expeditions in protected areas of the Tucumán province (1-Provincial Park "The Cochuna", 1306 m. s.l.; 2-Reserva Provincial La Florida, 429 m.s.l.; 3-"Biological Park" Sierra de San Javier", 1153 m.s.l.) (Fig. 1) were made (Details in Hladki 2001, 2004; Hladki & Romero 2001, 2003, 2005, 2007, 2009b, 2010). Types and other collections from South America kept at BPI, C, FH, GZU, ICN, IMI, K, LPS, NY, PC, S, W, WSP (Thiers 2012) have been examined. In total 961 collections were gathered from the Tucumán province (LIL). Microscopic preparations and observations have been performed according to Ju & Rogers (1996). The results are organized in the following sections:

Composition of xylariaceous mycobiota in

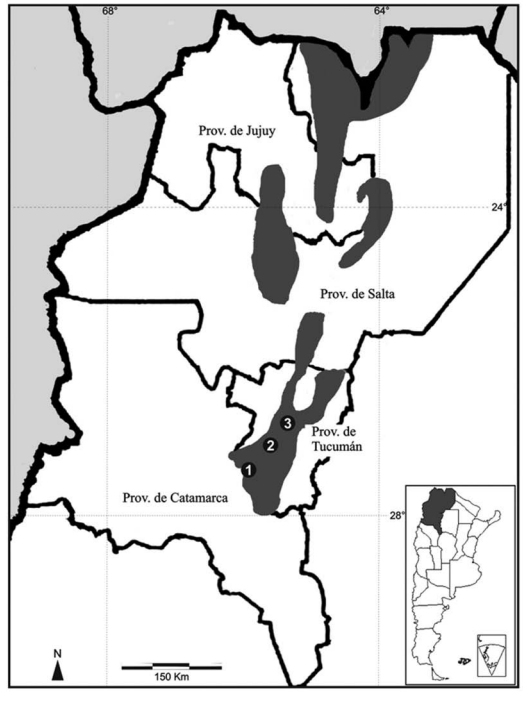

Fig. 1. Map "Las Yungas", Sampling Sites: 1, Provincial Park "The Cochuna". 2, Reserva Provincial La Florida. 3, "Biological Park" Sierra de San Javier.

Tucumán province

The total number of the identified species is shown and listed. In addition, the species were classified into groups according to the distributional patterns (Cosmopolitan, probably Endemic from Tucuman Yungas (YUT), Neotropical, Pantropical) and their percentages are shown graphically.

Local mycobiota compared with others from other regions

The local xylariaceous taxa are compared with other areas of different countries from neotropical, paleotropical and holartic kingdoms (Takhtajan 1986) through the species richness (n) per genus. The compared areas are arranged according to the size expressed in km^2, from the smallest (Tucuman) to largest (Europe); taking areas into account where exhaustive studied on the family were carried out independently if the area was a state, a country or a continent. Data for each country (from each studied area) were compiled from the reviewed literature. A total of 50 publications including papers, books, monographs and web pages, in which xylariaceous fungi have been cited were reviewed (Bitzer et al. 2007; Camino Vilaró et al. 2006; Carmona et al. 2009; Dennis 1961, 1963, 1970; Francis 1975; Granmo et al. 1999; Hellwing et al. 2005; Ju, & Rogers 1999; Lee & Crous 2003; Lu & Hyde 2000; Medel et al. 1999, 2008; Meijer 2006; Mühlbauer et al. 2002; Okane et al. 2008; Pereira et al. 2010; Pérez-Silva 1972, 1975; Poroca 1986; Quang et al. 2005; Rogers et al. 1987, 1988; Rogers & Ju 2012; San Martín & Lavin 1997; San Martin & Rogers 1989, 1993, 1995; San Martin et al. 1997; Stadler & Baumgartner 2001; Stadler et al. 2001a, b, c; 2002; 2004a, b, c; 2007; Taligoola & Whalley 1976, 1977; Triebel et al. 2005;Van der Gucht 1995, 1996; Vasilyeva & Stadler 2008; Whalley et al. 1988; Wollweber & Stadler 2001; http//:www.mykokey.com/ecuador; http//:www.cybertruffle.org.uk; http//:mycology.sinica.edu.tw/Xylariaceae, http://pyrenomycetes.free.fr). All these data are displayed through a table and are expressed graphically.

Hosts

The biogeographic province, "Las Yungas", has a subtropical climate and belong to the "Amazonic Dominion" (Phytogeographical region according to Cabrera & Willink (1980), being a Neotropical region. "Las Yungas" is distributed parallel to the Andes from Venezuela and Colombia to Catamarca state in Argentina (Cabrera & Willink, 1980; Hueck 1978). It is integrated by elements from the "Amazonic Dominion" -*Inga* Mill.*, Nectandra* Rottboell*, Ocotea* Aublet*, Citronella* D. Don*, Cedrela* P. Br.*, Phoebe* Ness*, Miconia* R. et P.- and being placed in the Andean corridor also has elements from Holartic -*Viburnum* L.*, Juglans* L.*, Rhamnus* L.*, Myrica* L.*, Alnus* Mill.*, Berberis* L.*, Rubus* L.*, Sambucus* L.*, Prunus* L.*, Ilex* L.- and "Gondwanic" -*Podocarpus* L'Hér.*, Gunnera* L.*, Fuchsia* L.*,* etc.- origin and also others elements in common with the south American mountain forest -*Oreopanax* Decaisne et Planchon*, Tabebuia* DC.*, Crinodendron* Molina*, Chusquea* Kunth- (Brown 1995).

In Argentina, "Las Yungas" covers a narrow strip, 2.700.000 hectares (23 - 29º S, 64 - 68º O) North-South, along Salta, Jujuy, Tucumán and Catamarca provinces, between 300 and 3000 m at above sea level (s.l.m.). Although "Las Yungas" represents a marginal ecosystem for Argentina (less of 0.1% of the territory) it has almost 50% of the Argentine biodiversity (Brown 1995; Brown et al. 1985; Brown & Ramadori, 1989; Brown et al. 2002).

The main plants of the Tucuman Yungas in the lowest altitudes (between 400 to 700 m.s.l.) are *Calycophyllum multiflorum* (Rubiaceae), *Phyllostylon rhamnoides* (Ulmaceae), *Handroanthus impetiginosus* (Bignoniaceae), among others (Brown 1995). In the range of 700 to 1500 m.s.l., it is dominated by *Ficus maroma* (Moraceae), *Alnus acuminata* (Betulaceae), *Cinnamomum porphyrium*, *Nectandra pichurim* and *Ocotea puberula* (Lauraceae), *Inga edulis*, *I. semialata*, *I. saltensis* y *Tipuana tipu* (Fabaceae) and *Blepharocalix salicifolius* (Myrtaceae). Finally up to 3000 m.s.l. it is found the *Podocarpus parlatorei* (Podocarpaceae) forest, *Roupala meisneri* (Proteaceae) and *Fuchsia boliviana*

(Onagraceae), *Alnus acuminata* (Betulaceae) among others (Brown et al. 2002)

The relationship between each species and the type of hosts (gymnosperms; angiosperms: monocots, dicots) will be shown through a table and the percentages of colonized hosts by the xylariaceous taxa are graphically presented.

Results

Composition of xylariaceous mycobiota

We recognized 49 taxa in protected areas of the province of Tucumán: *Astrocystis smilacicola* (Schwein.) Laessøe & Spooner, *Biscogniauxia capnodes* (Berk.) Y. M. Ju & J. D. Rogers, *Daldinia eschscholzii* (Ehrenb.) Rehm, *Entonaema liquescens* Möller, *Hypoxylon anthochroum* Berk. & Broome, *H. notatum* Berk. & M. A. Curtis, *H. rubiginosum* var. *microsporum* Whalley, *H. subrutilum* Starbäck, *Kretzschmaria argentinensis* Hladki & A. I. Romero, *K. clavus* (Fr.) Sacc., *K. deusta* (Hoffm.) P. M. D. Martin, *K. pavimentosa* (Ces.) P. M. D. Martin, *K. sandvicensis* (Reichardt) J. D. Rogers & Y. M. Ju, *K. sigmoidirima* Hladki & A. I. Romero, *Phylacia globosa* Lév., *Poronia oedipus* (Mont.) Mont., *P. punctata, Rosellinia necatrix* Berl. ex Prill., *R. paraguayensis*, *R. subiculata* (Schwein.) Sacc., *Stilbohypoxylon macrosporum* Hladki & A. I. Romero, *S. minus* Hladki & A. I. Romero, *Xylaria adscendens* (Fr.) Fr., *X. allantoidea* (Berk.) Fr., *X. apiculata* Cooke, *X. coccophora* Mont., *X. cubensis* (Mont.) Fr., *X. culicicephala* A. I. Romero & Hladki, *X. curta* Fr., *X. enteroleuca* (Speg.) P. M. D. Martin, *X. filiformioidea* Hladki & A. I. Romero, *X. fissilis* Ces., *X. globosa* (Spreng. ex Fr.) Mont., *X. gracillima* (Fr.) Fr., *X. grammica, X. ianthinovelutina, X.* aff. *ianthinovelutina, X. kretzschmarioidea* J. D. Rogers & Rossman, *X. luxurians* (Rehm) Lloyd, *X. melanura* Lév., *X. mellissii* (Berk.) Cooke, *X. microceras* var. *yungae* Hladki & A. I. Romero, *X. multiplex* (Kunze) Fr., *X. myosurus* Mont., *X. pseudoapiculata* Hamme & Guerrero, *X. stilbohypoxyloidea* Hladki & A. I. Romero, *X. telfairii, X. tucumanensis* Hladki & A. I. Romero and *X. xylarioides* (Speg.) Hladki & Romero. From the 49 species yielded 6 cosmopolitan species, 25 pantropical species, 9 neotropical species and 9 probably endemic (YUT) species. The percentages of species according to these distributional patterns are shown in Fig. 2.

Cosmopolitan species: *Astrocystis smilacicola*, *Kretzschmaria deusta*, *Poronia punctata, Rosellinia necatrix, Xylaria apiculata, X. mellissii.*

Pantropical species: *Biscogniauxia capnodes, Daldinia eschscholtzii, Entonaema liquescens, Hypoxylon anthochroum, H. notatum, H. rubiginosum* var. *microsporum, H. subrutilum, Kretzschmaria clavus, K. pavimentosa, K. sandvicense, Poronia oedipus*, *Rosellinia subiculata, Xylaria adscendens, X. allantoidea, X. curta, X. enteroleuca, X. fissilis, X. globosa, X. gracillima, X. grammica, X. ianthinovelutina, X. multiplex, X. myosurus, X. telfairii* and *X. xylarioides.*

Neotropical species: *Phylacia globosa, Rosellinia paraguayensis, Xylaria* aff. *ianthinovelutina, X. coccophora, X. cubensis, X. kretzschmarioidea, X. luxurians, X. melanura, X. pseudoapiculata.*

Probably Endemic (YUT) species: *Kretzschmaria argentinensis, K. sigmoidirima, Stilbohypoxylon macrosporum, S. minus, Xylaria culicicephala, X. filiformioidea, X. microceras* var. *yungae, X. stilbohypoxyloidea, X. tucumanensis*.

Local mycobiota compared with those from other regions:

In Table 1 the species richness (n) per genus is shown comparing areas of different countries/ continents from neotropical, paleotropical and holartic kingdoms. In addition, the total number

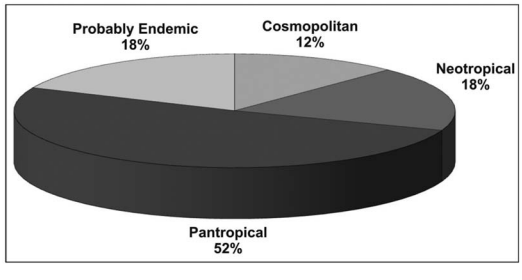

Fig. 2. Distributional Pattern (Cosmopolitan, probably Endemic from Tucuman Yungas –YUT-, Neotropical, Pantropical).

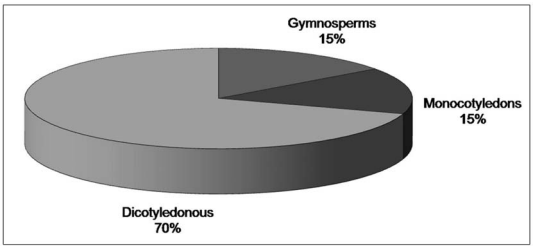

Fig. 3. Percentages of Hosts.

of species for the American countries and Tucuman (Argentina) is displayed through a graphic with a curve of the respective area of each country in Fig. 3. Brazil is not included because of the relation between the knowledge of the xylariaceous fungi and its large territory has not been an aim of a deeply exploration.

Hosts

Of all the species studied (49), two grow on dung and for 22 of them we were unable to identify the host. The identification of most of the hosts was difficult due to the advanced state of decomposition at the time of collecting. However, 23 taxa could be recognized and were 85% angiosperms with remarkable dominance of woody plants and 15% are gymnosperms (Fig 4). Classification according to The Plant List 2012 (http://www.theplantlist.org-accessed 27-07-2012):

a) ANGIOSPERMS

a.1)DICOTYLEDONS

Fam. Betulaceae: *Alnus acuminata* Kunth (=*A. jorullensis* var *spachii* (Regel)Winckler), "aliso"

Fam. Bignoniaceae: *Arrabidaea coralina* (Jacq.) Sandwith, *Jacaranda mimosifolia* D. Don

Fam. Cannabaceae: *Celtis* L., *Celtis tala* Gillies ex Planch. (= *Celtis ehrenbergiana (Klotzsch) Liebm.*)

Fam. Lauraceae: *Cinnamomum porphyrium* (Griseb.) Kosterm. (=*Phoebe porphyria* (Griseb.) Mez).

Fam. Fabaceae: *Anadenanthera* Speg., *Anadenanthera colubrina* (Vell.) Brenan var. *cebil* (Griseb.) Altschul., "cebil colorado", *Cailliea* Guill. & Perr., *Gleditsia* L., *Gleditsia triacanthos* L., *Mimosa* L., *Piptadenia* Benth, *Tipuana* Benth.

Fam. Malvaceae: *Ceiba insignis* (Kunth) P. E. Gibbs & Semir (= *Chorisia insignis* Kunth.), "palo borracho"

Fam. Myrtaceae: *Eugenia* L.

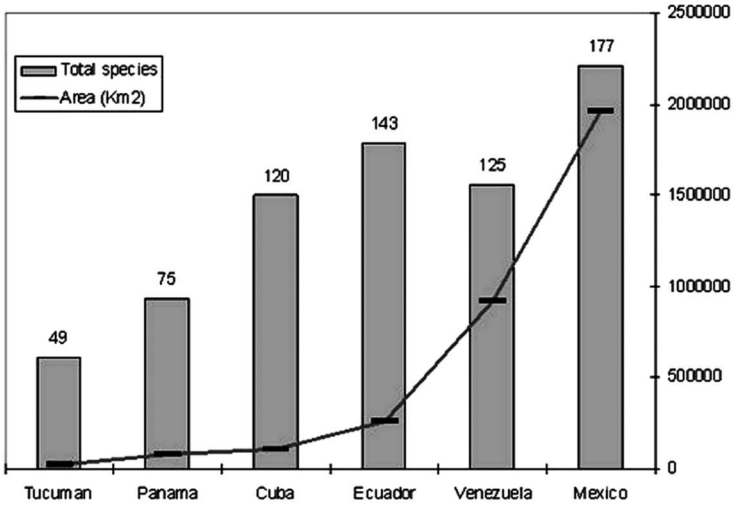

Fig. 4. Number species/areas of the countries.

Fam. Onagraceae: *Jussiaea* L.

Fam. Rhamnaceae: *Scutia buxifolia* Reissek

Fam. Rubiaceae: *Psychotria carthagenensis* Jacq.

Fam Rutaceae: *Citrus aurantium* L.

Fam. Sapindaceae: *Allophylus edulis* (A. St.-Hil., A. Juss. & Cambess.) Radlk.

Fam. Solanaceae: *Vassobia breviflora* (Sendtn.) Hunz.

Fam. Verbenaceae: *Duranta* L.

a.2) MONOCOTYLEDONS

Fam Arecaceae: *Syagrus* Mart.

Fam. Poaceae: *Saccharum officinarum* L.

Fam. Smilacaceae: *Smilax campestris* Griseb., "zarzaparrilla blanca"

b) GYMNOSPERMS

Fam. Pinaceae: *Pinus taeda* L.

Fam Podocarpaceae: *Podocarpus parlatorei*

Pilg., "pino del cerro"

The relationship between each species from Tucuman Yungas (Argentina) and their respective host species is shown in Table 2.

Discussion

Composition of xylariaceous mycobiota

Eleven genera were recognized. If we take only the number of species into account, the best represented genus was *Xylaria* (n=27). On the contrary, *Astrocystis, Biscogniauxia, Daldinia, Phylacia* and *Entonamea* were the genera represented by only one species. Nevertheless it is worthwhile mentioning that only five species of the genus *Xylaria* are probably endemic while *Kretzschmaria* (n=6) and *Stilbohypoxylon* (n=2) have higher percentages of endemism (33.33% and 100 % respectively).

Most of the genera with a known tropical and subtropical distribution (Rogers 2000; Stadler et al. 2010; Laessøe et al. 1989) are present in the studied area except for *Camillea* Fr. and *Thamnomyces* Ehrenb. It should be noted that *Camillea sulcata* (Starb.) Lloyd is found in the subtropical region of the Northeast of Argentina (Laessøe et al. 1989).

Among the taxa with a pantropical distribution, *Poronia oedipus* has a wide distribution in Argentina (Buenos Aires, Catamarca, Entre Ríos, Santiago del Estero and Tucumán provinces). However, there is no record of this fungus from the southern Cone of South America. It is probably due to the lack of expeditions in the neotropical region. Recently, Agüero et al. (2011) identified *P. punctata* (L.) Fr. in Catamarca province. This species is categorized as vulnerable by IUCN (http://www.iuncnredlist.org/soedfiles/poronia-punctata.pdf).

Annulohypoxylon and *Nemania* species are generally recorded with a worldwide distribution (Rogers 2000; Lodge 2001). However, species of these two genera were not found among the nine taxa classified with this kind of distribution in the Argentine explored area.

From all the genera listed in Table 1, *Phylacia* Lév. is the only one which could be limited to the neotropics (Rodrigues & Samuels 1989).

Kretzschmaria is a typical genus from tropical and subtropical areas. This can be demonstrated through the number of species in the neo- and paleotropical regions, in contrast to the low diversity in the temperate European region.

The 18% of the species could be classified as probably endemic for the phytographical region Argentine "Las Yungas", which represents one of the regional ecosystems of the mayor relevance because of its high diversity of vegetal resources (Brown 1995). This value is relatively high in comparison, for example with a Neotropical zone much explored as Mexico have a 6.1 % of endemic xylariaceous species (Lodge 2001).

Species of *Xylariaceae*		Host																					
		Gymnosperms		Angiosperms																			
Kingdon	Country/ Taxon	*Annulohypoxylon*	*Anthostomella*	*Astrocystis*	*Biscogniauxia*	*Camillea*	*Daldinia*	*Entonaema*	*Hypoxylon*	*Kretzschmaria*	*Kretzschmariella*	*Leprieuria*	*Nemania*	*Penzigia*	*Phylacia*	*Poronia*	*Rosellinia*	*Stilbohypoxylon*	*Thamnomyces*	*Whalleya*	*Xylaria*	Total
Neotropical	Tucumán·22524·Km^2	--	--	1	1	--	1	1	4	6	--	--	--	--	1	2	3	2	--	--	27	**49**
	Panama·75517 Km^2	3	1	--	5	8	3	1	15	3	--	--	1	1	3	1	1	--	--	1	28	**75**
	Cuba 110860 Km^2	--	5	1	2	5	7	-	25	8	--	--	1	--	4	2	5	--	--	--	55	**120**
	Ecuador·256370 Km^2	--	3	5	11	18	7	1	20	11	1	1	13	--	7	3	12	5	3	2	20	**143**
	Venezuela·916445 Km^2	--	2	--	7	--	1	2	46	5	--	--	--	--	4	2	6	--	--	--	47	**125**
	México·1964382· Km^2	--	2	--	16	--	3	3	23	8	--	--	--	--	--	3	10	--	--	--	109	**177**
	Brazil·8514877·Km^2	12	6	2	8	6	4	1	35	12	1	1	5	--	5	2	12	2	--	1	91	**206**
Paleotropical	Hawaii 16635 Km^2	6	9	--	5	--	1	--	32	5	--	--	14	2	--	--	12	1	--	--	25	**112**
	Taiwan 36000 Km^2	10	--	--	7	--	2	--	27	3	--	--	7	--	--	--	12	3	--	--	43	**114**
	Sulawesi 190000·Km^2	--	--	1	3	--	1	1	18	5	--	--	--	--	--	--	--	--	--	--	27	**56**
	Uganda·241000· Km^2	--	1	--	3	--	--	--	13	1	--	--	--	--	--	--	--	--	--	--	--	**18**
	Papua·463000 Km^2	--	2	--	12	--	3	--	22	6	--	--	--	--	--	--	--	--	--	--	43	**92**
	Tailandia·513115 Km^2	1	--	--	3	--	4	--	15	-	5	--	2	--	--	--	--	--	--	1	51	**82**
	Sudafrica·1219000 Km^2	--	13	1	9	--	2	--	26	3	--	--	--	--	--	--	--	--	--	--	23	**82**
	Zaire·2344885 Km^2	--	--	--	3	--	5	--	12	4	--	--	--	--	--	--	--	--	--	--	29	**53**
Holartic	Europa·10359358 Km2	4	115	-	11	--	22	1	35	1	--	--	16	--	--	-	23	4	--	--	45	**277**

Table 2

Xylariaceous species and their respective hosts

Species of *Xylariaceae*	**Host**		
	Gymnosperms	**Angiosperms**	
		Monocotyledons	**Dicotyledonous**
Astrocystis smilacicola	----------	*Smilax campestris*	----------
Daldinia eschscholzii	*Podocarpus parlatorei*	----------	*Cinnamomum porphyrium*
Hypoxylon anthochroum	----------	----------	*Citrus aurantium*
H. notatum	----------	----------	*Celtis* sp.
H. rubiginosum var microsporum	----------	----------	*Alnus acuminata*
Kretzschmaria clavus	----------	*Syagrus* sp.	*Anadenanthera colubrina* var. *cebil, Cinnamomum porphyrium*
K. deusta	*P. parlatorei*	----------	*Myrtaceae*
Phylacia globosa	----------	----------	*Ceiba insignis*
Rosellinia paraguayensis	----------	*Saccharum officinarum*	----------
Rosellinia subiculata	*P. parlatorei*	----------	----------
Xylaria aff. ianthino velutina	----------	----------	*Cinnamomum porphyrium*
X. apiculata	----------	----------	*Celtis tala*
X. curta	*Pinus taeda*	----------	*Cinnamomum* sp., *Duranta* sp., *Eugenia* sp., *Piptadenia, Tipuana* sp., *Celtis* sp.
X. enteroleuca	----------	----------	*Gleditsia triacanthos*
X. fissilis	----------	----------	*Cinnamomum porphyrium*
X. globosa	----------	----------	*Cinnamomum porphyrium*
X. grammica	*P. parlatorei*	----------	----------
X. ianthino velutina	----------	----------	*Anadenanthera colubrina* var. *cebil, Arrabidaea coralina, Jacarandá mimosifolia*
X. kretzschmarioidea	----------	----------	*Vassobia brevifolia*
X. luxurians	----------	----------	*Alnus acuminata*
X. melanura	----------	----------	*Cinnamomum porphyrium, Psychotria carthagenensis*
X. mellissii	*P. parlatorei*	----------	*Alnus acuminata, Allophylus edulis, Ceiba insignis, Cinnamomum porphyrium*
X. pseudoapiculata	*P. parlatorei*	----------	*Scutia buxifolia*
X. stilbohypoxyloidea	----------	----------	*Allophylus edulis*
X. telfairii	*Pinus* sp.	----------	*Cinnamomum porphyrium*
X. xylarioides	----------	*Smilax campestris*	*Jussiaea* sp.

Comparison of the local mycobiota with others regions

As it can be expected when the xylariaceous mycobiotas from different spots (Table 1) is confronted, the neotropical kingdom is where the members of this family reach the highest diversity on Earth. This fact has been pointed out by several workers (Rogers 2000).

Vasilyeva et al. (2012) pointed out two tropical centers of biodiversity of pyrenomycetous fungi can be identified. The Western Hemisphere is the region in and around the Caribbean Sea and the Gulf of Mexico, whereas in the Eastern Hemisphere occurs in Southeast Asia.

The Western Hemisphere encompasses the neotropical region which shows the major diversity of xylariaceous fungi even in its southernmost part, as it is the area objective of the present study.

In Fig 4, it can be observed that the countries close to the center of biodiversity Caribbean Sea and the Gulf of Mexico like Panamá, Cuba, Ecuador, Venezuela and México have a larger surface than Tucumán. However the diversity of species does not increase proportionally in relation to their size. For example, Panama triples in surface Tucuman but the relation between the studied species do not increase in the same proportion (49 species in Tucumán *vs* 75 species in Panama).

The high diversity in Tucumán could indicate the existence of a centre of diversity of Xylariaceae in South America. Although the Brazilian data seem not to support this hypothesis, it is necessary to say that the exhaustive studies on this family have began in recent years (Pereira et al. 2010)

These data should be cautiously interpreted, because the site covered in each study substantially differs, for example, while mycobiotic studies in Venezuela (Dennis, 1970; Rogers *et al.,* 1988) and Mexico (Pérez-Silva 1972, 1975; Medel et al. 1999, 2008, 2010; San Martín & Lavin, 1997; San Martin & Rogers 1989, 1993, 1995) cover large areas, researches in Sulawesi (Rogers et al. 1987), Papua New Guinea (Van der Gucht 1995, 1996) and Tucumán are limited to small areas, although heavily sampled. Similar situation occurs in Uganda (Taligoola & Whalley 1976, 1977, Whalley et al. 1988) where the research was restricted to hypoxiloid species of forest areas. Zaire has a low biodiversity due probably to the fact that Dennis (1961, 1963) based his studies on specimens donated by other researchers who collected probably larger and more colorful stromata.

In Brazil main researches were concentrated in the south-Minas Gerais, Paraná, Rio Grande do Sul, Santa Catarina, São Paulo states, where many collections were made and the list of species present was presented by Poroca (1986) and Meijer (2006).

Hosts

Among the dicots, Fabaceae is remarkable as a host for xylariaceous species because six of its genera (*Anadenanthera, Cailliea, Gleditsia, Mimosa, Piptadenia, Tipuana*) are colonized by *Hypoxylon subrutilum* and *Xylaria enteroleuca. H. subrutilum* seems to be host specific with members of Fabaceae, as it was recorded by Ju & Rogers (1996), in Bolivia occurring on wood of *Mimosa* spp. and in Hawaii on *Acacia koa* A. Gray; on the contrary, *X. enteroleuca* seems not be host specific as it has been registered on *Macadamia* sp. -Fam. Proteaceae- by Callan & Rogers (1990), on *Gleditschia triacanthos* -Fam. Fabaceae- by Spegazzini (1898) and on *Betula* sp. -Fam. Betulaceae- by Martin (1970).

Cinnamomum porphyrium (Lauraceae), an endemic (Argentina-Bolivia) species, was a host colonized by 8 different species (*Daldinia eschscholtzii*, *Kretzschmaria clavus*, *Xylaria globosa, X.* aff. *ianthino-velutina, X. fissilis, X. melanura, X. mellissii* and *X. telfairii*). Members of this family are not common hosts for xylariaceous species, the previous record is *Hypoxylon anthochroum* growing on *Ocotea veraguensis* (Meisn.) Mez (Carmona et al. 2009), *Daldinia macaronesica* in *Ocotea foetens* and *D. palmensis* in *Laurus azorica* (Stadler et al. 2004c); and *Hypoxylon canariense* in *Erica arborea* (Stadler et al. 2008).

In Gymnosperms: *Podocarpus parlatorei* (endemic in Argentina-South Bolivia) was colonized by more species (7: *Daldinia eschscholzii, Kretzschmaria deusta, Rosellinia subiculata, X. grammica, X. mellissii* and *X. pseudoapicu-*

lata) than *Pinus* L. (2: *X. curta* and *X. telfairii*). Among these species *R. subiculata* (Petrini 2003), *X. curta* and *X telfairii* (Hladki & Romero 2007) were the only ones which previously registered on gymnosperms. This amount of species (7) on a Gymnosperm is remarkable taking into account that teleomorphs of Xylariaceae occur very rarely on this group of plants in temperate areas where they are however dominating.

We identified three families of monocots: Arecaceae with *Kretzschmaria clavus,* Poaceae with *Rosellinia paraguayensis* and Smilacaceae which was colonized by *Astrocystis smilacicola* (= *R. smilacina*) and *Xylaria xylarioides*. Our results agree with those provided by San Martin et al. (1998) who pointed out most of the tropical species of *Rosellinia* tend to grow mainly on monocots. Another coincidence is the relation between *Xylaria* species and monocots as they are known to be endophytes of monocots (Petrini & Petrini 2005). On the other hand, *K. clavus* has a large range of hosts.

San Martin & Rogers (1995) studied the host relationship with Mexican species of the genera *Xylaria*, proved that most of the host were dicots (76%). Our results agree with those data from Mexico. They did not find any species growing on gymnosperms, although *X. curta*, *X. grammica, X. mellissii* (as *X. arbuscula)* and *X. telfairii* are present in the Mexican mycobiota but growing on dicots.

K. clavus is the etiological agent of the rot root of *Macadamia* being one important disease in Hawai (Ko et al. 1977). Hladki & Romero (2001) have recorded it for Argentina (Buenos Aires, Misiones and Tucumán) where *Cinnamomum porphyrium* and *Anadenanthera colubrina* (Vell.) Brenan are attacked by this species.

K. deusta is a pathogen on woody angiosperms from temperate zones of the Northern hemisphere (Rogers & Ju 1998), but in Argentina it was found on a native gymnosperm (*Podocarpus parlatorei*) and on an unidentified Myrtaceae. In addition, it was observed decline and death of plants of *Citrus paradisi* Macfad in a commercial farm in Salta, Argentina by *K. deusta* (Palacio et al. 2008).

Xylaria mellissii and *X. curta* were the two species that colonized highest number of hosts, wood of angiosperms and gymnosperms.

The Xylariaceae family is very well represented in this small area studied in Argentina where fourty nine species belonging to the genera *Astrocystis, Biscogniauxia, Daldinia, Entonaema, Hypoxylon, Kretzschmaria, Phylacia, Poronia, Rosellinia, Stilbohypoxylon* and *Xylaria* were recorded. In comparison with other similar neotropical regions, La Yungas shows to have a xylariaceous mycobiota with high diversity. Twenty-three host taxa are registered, mostly of them were dicot but two native trees, *Cinnamomum porphyrium* and *Podocarpus parlatorei*, and with an endemic distribution (Argentina-Bolivia) were the hosts more colonized.

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References

Agüero A. N., A. I. Hladki & M. M. Dios. 2011. El género *Poronia* (Xylariaceae) en la provincia de Catamarca, Argentina. *Lilloa* 48: 66-70.

Bitzer J., T. Læssøe, J. Fournier, V. Kummer, C. Decock, H.V. Tichy, M. Piepenbring, D Peršoh. & M. Stadler. 2007. Affinities of *Phylacia* and the daldinoid Xylariaceae, inferred from chemotypes of cultures and ribosomal DNA sequences. *Mycol. Research* 112: 251-270.

Brown A. D. 1995. Las selvas de montaña del noroeste de Argentina: problemas ambientales e importancia de su conservación. In: Brown AD, Grau HR (eds.): Investigación, conservación y desarrollo en las selvas subtropicales de montaña. Laboratorio de Investigaciones Ecológicas de las Yungas, UNT, Tucumán. Argentina, pp 9-18.

Brown A. D. & E. D. Ramadori. 1989. Patrón de distribución, diversidad y caracterización ecológicas de especies arbóreas de las selvas y bosques montanos del noroeste de la Argentina. *Anales VI Congreso Forestal Argentino*: 177-181.

Brown A. D., S. C. Chalukian. & L. Malmierca. 1985. Estudio florístico estructural de un sector de la selva semidecidua del noroeste argentino. I. Composición florística, densidad y diversidad. *Darwiniana* 26: 27-41.

Brown A. D., A. Grau, T. Lomáscolo & N. I. Gasparri. 2002. Una estrategia de conservación para las selvas subtropicales de montaña (Yungas) de Argentina. *Ecotropicos* 15: 147-159.

Cabrera A. L. & A. Willink. 1980. Biogeografía de América Latina. Monografía 13: 1-122. OEA Serie Biología. Washington, DC.

Callan B. E. & J. D. Rogers. 1990. Teleomorph-anamorph connections and correlations in some *Xylaria* species. *Mycotaxon* 36: 343-369.

Camino Vilaró M., J. Mena Portales & D. W. Minter. 2006. Hongos de Cuba. www.cybertruffle.org.uk/cubafung.

Carmona A., J. Fournier, C. Williams & M. Piepenbring. 2009. New records of Xylariaceae from Panama. *North American Fungi* 4(3): 1-11.

Chardon C. E., J. H. Miller & A. S. Muller 1940. Ascomycetes from the State of Minas Geraes (Brazil). *Mycologia* 32: 172-204.

Dennis R. W. G. 1956. Some *Xylarias* of Tropical America. *Kew Bull.* 3: 401-444.

Dennis R. W. G. 1957. Notes on Tropical American Xylariaceae. *Kew Bull*. 2: 320-325.

Dennis R. W. G. 1958. Ascomycetes en Bolivia and North Argentina. *Kew Bull*. 13: 153-154.

Dennis R. W. G. 1961. Xylarioideae and Thamnomycetoideae of Congo. *Bull. du Jardin Bot. de l État Bruxelles* 31: 109-154

Dennis R. W. G. 1963. Hypoxyloideae of Congo. *Bull. du Jardin Bot. de l État Bruxelles* 33: 317-343

Dennis R. W. G. 1970. Fungus flora of Venezuela and adjacent countries. *Kew Bull.,* add. ser. 3: 1-531.

Francis S. M. 1975. *Anthostomella* Sacc. (Part I). *Mycol. Papers* 139: 1-197.

Granmo A., T. Laessøe. & T. Schumacher. 1999. The genus *Nemania* s. l. (*Xylariaceae*) in Norden. *Sommerfeltia* 27: 1-96.

Hamme M. S. 1993. Contribucao aõ estudio biosistematico de especies do genero *Xylaria* Hill ex Schrank (Xylariaceae-Ascomycotina) para o Rio Grande do Sul. Brasil. Tesis doctoral. Universidad de Rio Grande do Sul, Brasil.

Hamme M. S. & R. T. Guerrero. 1997. *Xylaria pseudoapiculata* and *Xylaria montagnei*: two new taxa from South Brazil. *Mycotaxon* 64: 195-202.

Hamme M. S. & R. T. Guerrero. 2002. Contribucão aõ estudio biossistemático de espécies do gênero *Xylaria*. *Iheringia*, ser. Bot. 57: 135-201.

Hellwig V., Y. M. Ju, J. D. Rogers, J. Fournier & M. Stadler. 2005. Hypomiltin, a novel azaphilone from *Hypoxylon hypomiltum*, and chemotypes in *Hypoxylon* sect. *Hypoxylon* as inferred from analytical HPLC profiling. *Mycol. Progress* 4: 39–54.

Hladki A. I. 1997. Contribución al Estudio de las Xylariaceae (Xylariales-Ascomycotina) de la República Argentina. I. El género *Poronia*. *Lilloa* 39: 35-41

Hladki A. I. 2001. *Xylaria enteroleuca* (Xylariaceae), nuevo registro para el Noroeste de la Argentina. *Lilloa* 40: 209-214.

Hladki A. I. 2004. Contribución al estudio de las Xylariaceae de la República Argentina II). Los géneros *Daldinia*, *Entonaema* y *Phylacia* para Tucumán. *Lilloa* 41: 37-47

Hladki A. I. & A. I. Romero. 2001. The genus *Kretzschmaria* from Tucumán (Argentina). *Mycotaxon* 79: 481-496.

Hladki A. I. & A. I. Romero. 2003. Two new species of *Stilbohypoxylon* and the taxonomic positions of *Hypoxylon cyclopicum*, *H. chionostomum*, and *Anthostoma chionostoma*. *Sydowia* 55: 65-76.

Hladki A. I. & A. I. Romero. 2005. Contribución al estudio de las Xylariaceae de la República Argentina III). Nuevos registros del género *Xylaria*. *Lilloa* 42: 47-68.

Hladki A. I. & A. I. Romero. 2006. Revisión de las especies de *Hypoxylon* Bull. propuestas por Spegazzini. *Lilloa* 43: 45-60.

Hladki A. I. & A .I. Romero. 2007. Primeras citas del género *Xylaria* (Ascomycota- Xylariaceae) para la República Argentina. *Darwiniana* 45: 28-44.

Hladki A. I. & A. I. Romero. 2009a. Taxonomic and nomenclatural aspects of *Hypoxylon* taxa from Southern South America proposed by Spegazzini. *Mycologia* 101: 733-744.

Hladki A. I. & A. I. Romero. 2009b. Novedades para los géneros *Annulohypoxylon* e *Hypoxylon* (Ascomycota-Xylariaceae) en la República Argentina. *Darwiniana* 47: 278-288.

Hladki A. I. & A. I. Romero. 2010. A preliminary account of *Xylaria* in the Tucumán province, Argentina, with a key to species from the Northern Provinces. *Fungal Diversity* 42: 79-96.

Hueck K. 1978. Los bosques de Sudamérica. Sociedad Alemana de Cooperación Técnica. Eschborn, Alemania. pp 476.

Ju Y. M. & J. D. Rogers. 1996. A revision of the genus *Hypoxylon*. *Mycologia* Memoir Nº 20. St. Paul. APS Press.

Ju Y. M. & J. D. Rogers. 1999. The Xylariaceae of Taiwan (excluding *Anthostomella*). *Mycotaxon* 73: 343-440

Ko W. H; W. C. Ho & I. Macedo. 1977. Root decay caused by *Kretzchmaria clavus*: its relation to Macadamia decline. *Phytopathology* 67: 18-21.

Læssøe T., J. D. Rogers & A. J. S. Walley. 1989. *Camillea*, *Jongiella* and light-spored species of *Hypoxylon*. *Mycol. Res.* 93: 121-155.

Læssøe, T. 2002. The Xylariaceae of Ecuador - an update. - International Mycological Congress VII (Oslo), abstracts (contributed symposium).

Lee S. & P. W. Crous. 2003. New species of *Anthostomella* on fynbos, with a key to the genus in South Africa. *Mycol. Res.* 107: 360-370.

Lodge D. J. 2001. Diversidad mundial y regional de Hongos. In: Hernández H M et al. (eds). Enfoques contemporáneos para el estudio de la biodiversidad. Instituto de Biología, UNAM. Mexico, pp 291-304.

Lu B. & K. D. Hyde. 2000. A world monograph of *Anthostomella*. *Fungal Diversity Res. Ser.* 4: 1–376.

Martin P. 1970. Studies in the Xylariaceae VIII: *Xylaria* and its allies. *J.S. African Bot*. 36: 73-138.

Medel R., G. Guzmán & S. Chacón. 1999. Especies de macromicetos citadas de México. IX. Ascomycetes parte III: 1983-1996. *Acta Bot. Mex.* 46: 57-72.

Medel R., R. Castillo & G. Guzmán. 2008. Las especies de *Xylaria* (Ascomycota, Xylariaceae) conocidas de Veracruz, México y discusión de nuevos registros. *Rev. Mex. Micol.* 28:1-12.

Medel R., G. Guzmán & R. Castillo. 2010. Adiciones al conocimiento de *Xylaria* (Ascomycota, Xylariales) en México. *Rev. Mex. Micol.* 31: 9-18

Meijer A. R. 2006. Preliminary list of the macromycetes from the Brazilian State of Paraná. *Bol. Mus. Bot. Mun.* 68: 1-55.

Mühlbauer A., D. Triebel, D. Peršoh, H. Wollweber, S. Seip & M. Stadler. 2002. Macrocarpones, novel metabolites from stromata of *Hypoxylon macrocarpum* and new evidence on the chemotaxonomy of *Hypoxylon*. *Mycol. Prog.* 1: 235-248.

Okane I., P. Srikitikulchai, K. Toyama, T. Læssøe, S. Sivichai, N. Hywel-Jones, A. Nakagiri, W. Potacharoen & K. Suzuki. 2008. Study of endophytic Xylariaceae in Thailand: diversity and taxonomy inferred from rDNA sequence analyses with saprobes forming fruit bodies in the field. *Mycoscience* 49: 359–372.

Palacios J., A. I. Hladki, L. D. Ploper & N. V Canton. 2008. Plantaciones cítricas afectadas por *Kretzschmaria deusta* en la provincia de Salta (Argentina). *Lilloa* 45: 83-85.

Pereira J., J. L. Bezerra & L. Costa Maia. 2008. *Kretzschmaria albogrisea* sp. nov. and *K. curvirima* from Brazil. *Mycotaxon* 106: 237-241.

Pereira J., R. M. Borges da Silveira, L. Trierveiler Pereira & C. L. Leite. 2010. Xylariales. in Campostrini Forzza et al. (eds): *Catálogo de plantas e fungos do Brasil*. vol 1. Andrea Jakobsson Estúdio: Instituto de Pesquisas, Jardim Botânico do Rio de Janeiro. pp. 160-168.

Perez-Silva E. 1972. El género *Phylacia* (Pyrenomycetes) en México. *Bol. Soc. Mex. Micol.* 6: 9-15.

Perez-Silva E. 1975. El género *Xylaria* (Pyrenomycetes) en México, I. *Bol. Soc. Mex. Micol.* 9: 31-52.

Petrini L. E. 2003. *Rosellinia* species of the temperate zones. *Sydowia* 44: 169-281.

Petrini L .E. & O. Petrini. 2005. Morphological studies in *Rosellinia* (Xylariaceae): the first step towards a polyphasic taxonomy. *Mycol. Res.* 109: 569-580.

Poroca D. J. M. 1986. Revisão histórica das Xylariaceae do Brasil. *Bol. Micol*. 3: 41–53.

Quang, D. N., T. Hashimoto, Y. Nomura, H. Wollweber, V. Hellwig, J. Fournier, M. Stadler & Y. Asakawa. 2005. Cohaerins A and B, azaphilones from the fungus *Hypoxylon cohaerens*, and comparison of HPLC-based metabolite profiles in *Hypoxylon* sect. Annulata. *Phytochemistry* 65: 797-809.

Rick J. 1935. Monographia das Xylariaceas Riograndenses. *Arch. Museu. Nacional* (Río de Janeiro) 36: 40-71.

Rodrigues K. & G. J. Samuels. 1989. Studies in the genus *Phylacia* (Xylariaceae). *Mem. N. York. Bot. Gar*. 49: 290-297.

Rogers J. D. 2000. Thoughts and musing of tropical Xylariaceae. *Mycol. Res.*104: 1412-1420.

Rogers J. D. & & Y.-M. Ju. 1998. The genus *Kretzschmaria. Mycotaxon* 68: 345-393.

Rogers J. D., B. E. Callan & G. J. Samuels. 1987. The Xylariaceae of the rain forests of North Sulawesi (Indonesia). *Mycotaxon* 29: 113-172.

Rogers J. D., B. E. Callan, A. Y. Rossman & G. J. Samuels. 1988. *Xylaria* (Sphaeriales, Xylariaceae)

from Cerro de la Neblina Venezuela. *Mycotaxon* 31: 103-153.

Rogers, J. D., and Ju, Y.-M. 2012. The Xylariaceae of the Hawaiian Islands. *North American Fungi* 7: 1-35.

San Martín F. & P. A. Lavin. 1997. Datos sobre los géneros *Entonaema* y *Ustulina* (Pyrenomycetes, Xylariaceae). *Acta Bot. Mex.* 40: 25-35.

San Martín F. & J. D. Rogers. 1989. A preliminary account of *Xylaria* of México. *Mycotaxon* 34: 283-373.

San Martín F. & J. D. Rogers. 1993. *Kretzschmaria*, *Leprieuria* and *Poronia* in México. *Mycotaxon* 68: 179-191.

San Martín F. & J. D. Rogers. 1995. Notas sobre la historia, relaciones de hospedante y distribución del género *Xylaria* (Pyrenomycetes, Sphaeriales) en México. *Acta Bot. Mex*. 30: 21-40.

San Martín F., J. D. Rogers & P. Lavin. 1997. Algunas species de *Xylaria* (Pyrenomycetes, Sphaeriales) habitantes en hojarasca de bosques mexicanos. *Rev. Mex. Micol.* 13: 58-69.

San Martín F., P. Lavin & E. Perez Silva. 1998. Xylariaceae fimicolas: *Xylaria* sp. nov y nuevos registros mexicanos de *Xylaria pileiformis* y *Poronia erici. Acta Bot. Mex.* 42:15-23.

Sir E. B., T. C. Perera, A. I. Romero & A. I. Hladki. 2012. Novedades para el género *Rosellinia* (Ascomycota-Xylariaceae) en el Noroeste de la República Argentina. *Bol. Soc. Arg. de Bot.* 47 (3-4): 311-321.

Spegazzini C. L. 1880a. Fungi Argentini. *An. Soc. cient. argent.* 9: 158-192.

Spegazzini C. L. 1880b. Fungi Argentini. *An. Soc. cient. argent.* 10: 13-14.

Spegazzini C. L. 1880c. Fungi Argentini. *An. Soc. cient. argent.* 10: 122-142.

Spegazzini C. L. 1881. Fungi Argentini additis nonnullis brasilensibus montevideensibusque. *An. Soc. cient. argent.* 12: 97-117.

Spegazzini C. L. 1884. Fungi Guaranitici. Pugillus I. *An. Soc. cient. argent.* 18: 263-286.

Spegazzini C. L. 1887. Fungi Patagonici. *Bol. Acad. nac. Cienc. Córdoba* 11: 5-64.

Spegazzini C. L. 1888. Fungi Guaranitici. Pugillus II. *An. Soc. cient. argent.* 26: 5-74.

Spegazzini C. L. 1889. Fungi Puiggariani. *Bol. Acad. nac. Cienc. Córdoba* 11: 381-622.

Spegazzini C. L. 1891. Fungi Guaranitici novi vel critici. *Rev. argent. Hist. nat.* 1: 398-432.

Spegazzini C. L. 1898. Fungi Argentini novi vel critici. *Anal. Mus. Nac. Buenos Aires* 6: 81-365.

Spegazzini C. L. 1899. Fungi Argentini novi vel critici. *An. Mus. nac. B. Aires* 6: 81-365.

Spegazzini C.L. 1902. Mycetes Argentinenses. *An. Mus. nac. B. Aires* 8: 51-190.

Spegazzini C.L. 1888a. Fungi Fuegiani. *Bol. Acad. nac. Cienc. Córdoba* 11: 135-311.

Spegazzini, C. L. 1908a. Fungi aliquot Paulistani. *Rev. Mus. La Plata* 15 (2): 7-48.

Spegazzini C. L. 1908b. Hongos de la yerba mate. *An. Mus. nac. B. Aires* 17: 111-141.

Spegazzini C. L. 1909. Mycetes Argentinenses. *An. Mus. nac. B. Aires* 19: 257-458.

Spegazzini C. L. 1910. Fungi Chilenses. *Rev. Fac. Agron. Vet. La Plata* 6: 1-205.

Spegazzini C. L.1912. Mycetes Argentinenses. *An. Mus. nac. B. Aires* 23: 1-146.

Spegazzini C. L. 1919. Los hongos de Tucumán. *Primera Reunión Nac. Soc. Arg. Cs. Nat. Tucumán*: 254-274.

Spegazzini C. L. 1921. Mycetes Chilenses. *Bol. Acad. nac. Cienc. Córdoba* 25: 1-124.

Spegazzini C. L. 1922. Fungi Paraguayensis. *An. Mus. nac. B. Aires* 31: 355-450.

Stadler M. & M. Baumgartner. 2001. Three new *Daldinia* species with yellowish stromatal pigments. *Mycotaxon* 80: 179-196.

Stadler M., H. Wollweber, A. Mühlbauer, T. Henkel, H. Wollweber, Y. Asakawa, T. Hashimoto, J.D. Rogers, Y. M. Ju, H. G. Wetzstein & H. V. Tichy. 2001a. Secondary metabolite profiles, genetic fingerprints and taxonomy of *Daldinia* and allies. *Mycotaxon* 77: 379-429.

Stadler M., H. Wollweber, A. Mühlbauer, Y. Asakawa, T. Hashimoto, J. D. Rogers, Y.M. Ju, H. G. Wetzstein & H. V. Tichy. 2001b. Molecular chemotaxonomy of *Daldinia* and other Xylariaceae. *Mycol. Res.* 105: 1191-1205.

Stadler M., M. Baumgartner, H. Wollweber, J. D. Rogers & Y. M. Ju. 2001c. *Daldinia decipiens* sp. nov. and notes on some other European *Daldinia* spp. inhabiting Betulaceae. *Mycotaxon* 80: 167-177.

Stadler M., M. Baumgartner, K. Ide, A. Popp & H. Wollweber. 2002. Importance of ascospore ornamentation in the taxonomy of *Daldinia*. *Mycol. Progress* 1: 31-42.

Stadler M., Y. M. Ju & J. D. Rogers. 2004a. Chemotaxonomy of *Entonaema*, *Rhopalostroma* and other Xylariaceae. *Mycol. Res.* 108: 239-256.

Stadler M., H. Wollweber, W. Jäger, M. Briegert, G. Venturella, J. M. Castro & H. V. Tichy. 2004b. Cryptic species related to *Daldinia concentrica* and *D. eschscholtzii*, with notes on *D. bakeri*. *Mycol. Res.* 108: 257-273.

Stadler M., T. Læssøe, J. A. Simpson & H. Wollweber. 2004c. A survey of *Daldinia* species with large ascospores. *Mycol. Res.* 108: 1025-1041.

Stadler M., J. Fournier, D. N. Quang & A. Akulov. 2007. Metabolomic studies on the chemical ecology of the Xylariaceae (Ascomycota). *Nat. Prod. Comm.* 2: 287-304.

Stadler M., J. Fournier, E. Beltrán-Tejera & A. Granmo. 2008. The "red Hypoxylons" of the Northern Hemisphere. In a festschrift in honor of professor Jack D. Rogers (eds DA Glawe, JF Ammirati). *North American Fungi* 3: 73-125.

Stadler M., J. Fournier, T. Læssøe, A. Chlebicki, C. Lechat, F. Flessa, G. Rambold & D. Peršoh. 2010. Chemotaxonomic and phylogenetic studies of *Thamnomyces* (Xylariaceae). *Mycoscience* 51:189–207.

Takhtajan A. 1986. Floristic Regions of the World. (translated by T.J. Crovello & A. Cronquist). University of California Press, Berkeley.

Taligoola H. K. & A. J. S. Whalley. 1976. The genus *Hypoxylon* in Uganda forests. *Trans. Br. Mycol. Soc.* 67(3): 517-519.

Taligoola H. K. & A. J. S. Whalley. 1977. *Hypoxylon megannulatum* sp.nov. A new species of *Hypoxylon* from Uganda. *Trans. Br. Mycol. Soc.* 68: 298-300.

Theissen F.1908. Novitates riograndenses. *Ann. Mycol*. 6: 531-535

Theissen F. 1909a. Xylariaceae austro-brasilienses I. *Xylaria*. *Denkschr. Math.- Kl. d. k. Akad. Wiss. Wien* 83: 47-86.

Theissen F.1909b. Fragmenta brasilica. I. *Ann. Mycol*. 7: 1-18

Thiers B. 2012. *Index Herbariorum*.A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. http://sweetgum.nybg.org/ih/2012

Triebel D., D. Peršoh, H. Wollweber & M. Stadler. 2005. Phylogenetic relationships among *Daldinia*, *Entonaema* and *Hypoxylon* as inferred from ITS nrDNA sequences. *Nova Hedw.* 80: 25-43.

Trierveiler-Pereira L., A. I. Romero, J. Marcon Baltazar & C. Loguercio-Leite. 2009. Addition to the knowledge of *Xylaria* (Xylariaceae, Ascomycota) in Santa Catarina, Southern Brazil. *Mycotaxon* 107: 139-156.

Van der Gucht K. 1995. Illustrations and descriptions of xylariaceous fungi collected in Papua New Guinea. *Bull. Jard. Bot. Nat. Belg.* 64: 219-403.

Van der Gucht K. 1996. *Xylaria* species from Papua New Guinea: cultural and anamorphic studies. *Mycotaxon* 60: 327-360.

Vasilyeva L. N. & M. Stadler. 2008. Pyrenomycetes of the Russian Far East 3. Three new *Daldinia* species (Xylariaceae). *Mycotaxon* 104: 284-296.

Vasilyeva L. N., S. L. Stephenson, K. D. Hyde & A. H. Bahkali. 2012. Some stromatic pyrenomycetous fungi from the Northern Thainland. 1 *Biscogniauxia*, *Camillea* and *Hypoxylon* (Xylariaceae). *Fungal Diversity* doi: 10.1007/s13225-011-0150-9.

Whalley A. J. S., D. Hammelev & H. K. Taligoola. 1988. Two new species of *Hypoxylon* from Nigeria. *Trans. Br. Mycol. Soc.* 90: 39-141.

Wollweber H. & M. Stadler. 2001. Zur Kenntnis der Gattung *Daldinia* in Deutschland und Europa. *Zeitschrift für Mykologie.* 67: 3-53.

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