MYCOFLORA ASSOCIATED WITH MELIOLACEOUS AND CAPNODIACEOUS FUNGI

V. GANJU and L. N. NAIR*

Department of Botany, Deshbandhu College, Kalkaji, New Delhi - 110 016, India. * Department of Botany, University of Poona, Pune411007, India.

Thirty nine fungal species growing in association with Meliolaceous and Capnodiaceous forms are reported. Out of the thirty nine species reported here, four belong to Zygomycetes, one to Ascomycetes, three to Coelomycetes and the rest are Hyphomycetes. Most of the Hyphomycetes are dematiaceous forms. Many of them are common to the two types of habitats investigated, inspite of the fact that they were collected from two different ecologically diverse habitats and also provided varying ecological niches for their growth. The ecological significance of the microbial associations in the present study has been discussed.

Keywords : Capnodiaceous fungi; Ecological significance; Meliolaceous fungi; Mycoflora.

Introduction

In tropical countries the Meliolaceous and Capnodiaceous fungi form a conspicuous part of mycological landscape. These include all dark or brown fungi growing superficially on the aerial parts, especially the leaves. Both the Meliolaceous (Meliolales) and Capnodiaceous (Sphaeriales) fungi belong to Pyrenomycetes. The phylloplane microflora has been investigated by Dickinson¹⁻³, Lamb and Brown⁴, Preece and Dickinson⁵, Apinis et al.⁶, Norse^{7.8}, Godfrey⁹, Stover¹⁰, Dickinson and Preece¹¹ and several others. Fraser¹²⁻¹⁴ reported the constant association of Cladosporium herbarum, Penicillium, Alternaria, Epicoccum, Asbolisia with sooty moulds. Friend¹⁵ also reported the occurrence of form like Cladosporium herbarum, Epicoccum, Alternaria, and Fusarium in association with the sooty moulds.

HOST

1	Canthium diococcum				
	(Gaerth.) Merr.				
2	Gymnosporia rothiana Laws				
3	Jasminum malabaricum Wight.				
4	Pavetta indica L.				

5 Litsea wightiana Benth

6

Memecylon umbellatum Burm.

However, till date, no systematic effort has been made to study the various saprophytic micro-organisms associated with the two types of sooty moulds. The Meliolaceous and Capnodiaceous fungi found in different climatic and geographic conditions awakened the interest to explore the phylloplane mycoflora associated with two types of sooty moulds so that their ecological significance could also be understood.

Materials and Method

The materials for the present study were collected from Mahabaleshwar, a hill station near Pune (altitude 1200-1500m above sea level, annual rainfall 620 cm) and also from the plains of Pune, Maharashtra (altitude 350m, annual rainfall 110 cm). The following species of *Meliola* were collected on various hosts from Mahabaleshwar during the winter months of December, January and February.

FUNGUS

Meliola coilicosa Nair and Kaul Meliola casaericola Hansf. Meliola jasminicola P. Henn. Meliola psychotriae Earle var. PAVETTAE Hansf. & Deight Meliola litseae Syd. var. rotundipoda Hansf. Meliola memecyli Syd.

Ganju and Nair

The following Capnodiaceous forms were collected from Pune during winter months on three hosts as given below:

HOST

Alstonia scholaris (Linn.) R. Br. 2 Cassia fistula Linn.

3 Gardenia gummifera Linn.

In both cases, the materials were collected in polythene bags and used for isolation on Potato dextrose agar, Kauffman's modified malt extract (Wright), Mycological agar, Sabouraud's agar and Bandonis MYP agar using dilute plating suspension method and leaf impression technique. For examining fungal forms, the leaves were bleached with chlorine, dehydrated and mounted in canada balsam. Another method used was to lift the colonies from the leaves using collodion and collodion was then dissolved using acetone.

Results and Discussion

Table 1 depicts the various saprophytic fungi isolated on species of Meliola and Capnodiaceae on their respective hosts in the two, quite distinct, habitats (hereafter referred to as Meliolaceaous and Capnodiaceous nabitats for easy reference for fungi collected from Mahabaleshwar and Pune respectively). The table clearly indicates the variation that exists in the number of fungi in the two types of habitats.

In all 34 forms were found in association with the meliolaceous fungi. These Rhizopus include Mucor. and Cunninghamiella of the Zygomycetes, and Chaetomium of the Ascomycetes. The great majority of them belonged to the Hyphomycetes, which included species of Alternaria, Curvularia, Cladosporium, Cordana, Acroconidiella, Beltrania,

FUNGUS Polychaeton (Pers.) Lev Scorias spongiosa (Schw.) Fries Polychaeton (Pers.) Lev. Polychaeton (Pers.) Lev. Scorias spongiosa (Schw.) Fries

> Drechslera, Nigrospora, Torula, Paecilomyces, Pithomyces, Trichoderma, Trichothecium and Verticillium. Besides these. forms like Fusarium, Penicillium and Aspergillus also occurd. Coelomycetes like Pestalotiopsis and Phyllosticta were also found in association with species of Meliola.

> Saprophytes on Capnodiaceous fungi showed less diversity in comparison to those on species of Meliola, as only 21 species found in association with were Capnodiaceaous with fungi. Zygomycetous and ascomycetous forms were the same as those on Meliola species. Hyphomycetous forms included species of Alternaria, Curvularia, Cladosporium, Trichoderma, Gliomastix, Aspergillus, Fusarium. Paecilomyces, Setodochium, Scytalidium. Torula, Acromoniella, Diplodia, Phyllosticta and Pestalotiopsis, represented the Coelomycetes.

> Occurrence of a large number of saprophytes on *Meliola* species is possibly due to the fact that these sooty moulds restrict themselves to either circular sports or scatter sparsely on the host leaf, providing a lot of space for the saprophytic fungi to grow on the lead surface. Also, at the start of colonization, there are likely to be excess nutrients in the ecosystem leading to a diversity of species.

> The two groups of fungi were collected from two different habitats. Despite the different ecological conditions which prevail in the two different habitats, a number

116

1

J. Phytol. Res. 10 (1-2): 115-118, 1997

Table 1. Different Fungi found in association with Meliolaceous and Capnodiaceous fungi.

Pokkens N.J. Riphaesa L.Paia R.J. antick from C. 1983, Date St. Myrol. Soc. **B**7 155

Fungus Meliola caesari- cola on Gymnosporia rothiana	Meliola coili- cosa on Canthium diococcum	Meliola jasminicola on Jasmi- num Mala bar icum	Meliola litseae on Litsea wight iana	Meliola memecyli on Meme- cylon umbellatum	Meliola psychotrial Earle on Pavetta indica	Capnodi- aceae on Atstonia scholaris	Capnodi- Capnodi- aceae on aceae on Cassia Gardenia fistula Gumm- ifera
thorecan this analysis is	2	3	4	01000 ⁽⁵	1.1.6	1000 m	
Acremoniella atra (Corda) Sacc.	no goia	(iz) -	-1A (19 1)	attanyo -	id of b r i	ioi ere-	+ minaning
Acroconidiella tropaeoli (Bond) -	isterio 1	Self an - I	" verman	10 20	Hand Ball	Spatial in	the same time
Lindquist & Alippi				A Section 1	Section B. A.	ate into delle	tes harmelle revere
Alternaria phargospora van Emden	i na state si	A State State State		1. SP (*	artika atr + . Manakari	62,44, 9,33, 37,2 5 9 1,101,101,101,101	ning sanatan ta sama t
Alternaria raphani Meier, Drechs & Eddy -	on situti	and read	. Mitida	d anoat	UNATER.	CALL SHE	and others out
Alternaria radicina Gover & Skolko -	A. S. Sand State	and the second	Time Red	ta sectore -	a ada da <u>a</u> d	Print Court	
Aspergillus flavus Link ex Fries +	anna an ann an an an an an an an an an a		a statistica -	enterenter -	an and an an area		and the second
Aspergillus phoenicis (Corda) Thom. +	01 05	ober 🖓	- usun D	1000 000	om va	ana sa	all surgesting
Beltrania rhombica O. Penzig	renet chirr		- All and a second	aratala		mos .	a bhuilthint
Chaetomium seminuaum Ames	an survey a			+		-	
Claaosporium chiorocephaium (riesell)	<u>acsport</u>		576 185	1911 (11) 21	990J38(863)		301140.20104048
Mason & Ellis	Hereiter						Dickare The
de Vrieg				+	+	-	ala contre compare
Cladesnorium orusporum Berk & Curt -	e nomen.	1000	+	(n aw <mark>.</mark>	200 - 202 +	imana 1	+ + +
Cuminghamella chinulata Thaxter -	even to the state of the	1.07 ÷	ALC: NO	666 TA 🗣	onsone	isb odi u	40vfrcenteept
Cupularia brachyspora Boediin		+	Caster +	naniya ili kara k	and here to	Sector Hickory	and the set of the second
Curvularia pallescens Boediin +	100.083	+	+	+	+	+	- +
Curvularia leonensis Ellis	Wasque in the	- A.	+	skagen i	的如何的	e bada para	a sub pastero a
Cordana musae (Zimm.) Hohnel +	niskati 🙀	988	See. det	in in the second	a and a	(Allibert	Fauntehleor
Diplodia sp. Fr.	SA (18) .	-	-	- the second	•		+
Drechslera austral liensis (Bugnicours)				on statute			
Subram & Jain +	+		deterret	reit.sour	Column,	enderlig	oxist in Mainteb
Drechslera State of Coahiliobolus						Section Reported States	
spicifer Nelson +	alando -	-	100-	a Maria a Maria	and the second	1. 19 (19 (19 (19 (19 (19 (19 (19 (19 (19	AN HAT BE 117
Drechslera erythrospila (Drechsl)						alesser1	comparatively
Showmaker -	+	1000	AND AND A	+	Mana ake	de vedere e	1.26
Fusarium oxysporum Schl. ex Fries -	4.00 H	+ 100 http://		- 11.11.11.11.11.11.11.11.11.11.11.11.11.		+	aware analyzet
Gilimastix novaezelandiae Hughes &				ionque la	o rextan	a s wa	the Reported at
Dickinson	調整の格容	80. S	. State	e contrart	arrena ar	the state of	warre of island
Mucor hiemalis Wehmer	servit +		11 12 14		entre se entre se tre tre tre tre tre tre tre tre tre tr	anne sea ar sei -	Training and the
Nigrospora sphaerioa (Sacc.) Mason -	1966D ·	+	3130 70	1 mation	ai oldar	ne a our	voud on Annue
Paecilomyces varioti Bainier -	10000	1651	· Mar Star		A SHOW	and the b	A CONTRACTOR
Penicillium citrinum Thom. +	merrillaris.	s []]	- Service	Contraction of the			and a state of the second second
Pestalotiopsis +	276	T		istoria d	ans san	ente a prese	ensina ji jing parendara
sydowiana (Bresadola) Sution		· ·	· 5115 7 5		的成本型	and the la	iscomergian's liss
Phyllasticia Sp. (Pers.)		05	averation -	an bah Belan	alatania ma + a	- Stransport-	manning alde
Punomyces crurturum				n Breit van Section	20,200,0440, 102,070	en en normalis	and second stands and an one
Phizonus nigricans	- 125 ASS 425 -	- 1 A	TEROSE		a tobassis		a su suction de
Fbrenherg						service by	
Rhizopus orvzae +	198671	· · ·	Constraint an an an	And some of the	+	1944 - DOLL	- +
Went of Gerlings		4			S. 1. 4. 7		olaring di daha
Scytalidium lignicola Pesante -	assessed	- 1319	disatosi-	Statica:	inquisie	eianau e	it to bate in the for the
Setodochium sp. Bat. & Cif.	station .	- 10		and the second		NY ST.	+
Torula ellisi Vadav & Lal	disch -	-	+	ARANA -	no de la seda	AND A STATE	100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100
Torula herbarum (Pers.) Link ex Gray +	Marsh -	· 161 ·	- oberte-	the bast	adoc 14	gnibsvn	terv species i
Trichothecium roseum (Pres.) Link	e official.				A Martine		basiest hidrog
ex Fries		+	1710	9-34 H	+ 10	10000	A Marganet and Mar
Trichoderma vivide (Pers.) Fries +		(B)	1 3V 31+	99,0002 +	-and 1048-	ALL DE LE	W 10 #30039
Verticillum luteo album (Link ex Fries)			Aler.	Sept.		Mei 19	to eardine
Subran +	101/03/803.31 m 2		The state	h name	Min maker	internation.	and the second

batwitten Altershirt and Physicial and also

Ganju and Nair

of fungi like Torula herbarum, Phyllosticta sp., Pestalotiopsis sydowiana, Fusarium oxysporum, Curvularia variota, Alternaria phragmospora, A. radicina, Cladosporium oxysporum, Cunninghamiella echinulata, Rhizopus oryzae and Chaetomium seminudum, were found to be common. At the same time, however, some of the forms were found only in the Meliolaceous habitat, and others only in the Capnodiaceous habitat.

Species richness, a measure of diversity, gives insight into the ecological functioning of a community. Unfortunately studies on the ecological aspects on fungi are meagre. The present study has, nonetheless, very clearly brought out the role of environment of the development of microbial communities, and the interactions operating between the host and the fungal populations. Favourable conditions for the growth of *Meliolia* sp. and various saprohytes seem to exist in Mahabaleshwar, while Pune, favoured the growth of Capnodiaceous members, and comparatively a lesser number of saprophytes.

As to why these sooty mould fungi, in general allow a number of saprophytic fungi to grow on them, is perhaps due to their ability to provide a suitable medium for the growth of these saprophytes. A physiological factor of great importance which is shared by all sooty mould forming fungi is that they are able to make use of the intermittent moist conditions of the atmosphere. The sooty mould fungi form thick mycelial mat. The mycelia have a gelatious matrix which is a source of nutrients for the transient fungi as also pointed out by Reynolds¹⁶. In addition, success of a new species invading a colonized subtrate would depend on the competitive ability, the amount of inoculum, and the competitive abilities of the established microflora. Also, antagonism may be existing. Antagonism between Alternaria and Fusarium and also between Cladosporium and Spirococcum and Chaetomium and Curvularia, Chaetomium, and Cladosporium has been reported^{17,18}. The present study also confirms the antagonistic relationship between Alternaria and Fusarium. However, this antagonism is existing on species of Meliolia only and it is not found on Capnodiaceae members. Studies have shown that infection of wheat leaves by Septoria nodorum or Cochiliobolus sativus was stimulated when aphid honey dew was added to the inoculum. Simultaneous inoculation with three yeast like fungi and Cladosporium herbarum decreased this stimulation. These saprophytes thus acted as biocontrol agents19.

References

- 1. Dickinson C H 1967, Can. J. Bot. 45 915
- 2. Dickinson C H 1973a, Pesticide Science 4 563
- 3. Dickinson C H 1973b, Trans. Brit. Mycol. Soc. 60 423
- 4. Lamb R J and Brown, J F 1970, Trans, Brit. Mycol. Soc. 60 383
- 5. Preece T I and Dickinson C H (eds.) 1971, Ecology of Leaf Surface Microoganism. Academic Press, London.
- 6. Apinis A E, Chester C G C and Taligoola H K 1972, Nova Hedwigia 23 113
- 7. Norse D 1972a, Trans. Brit. Mycol. Soc. 59 261
- 8. Norse D 1972b, Ibid. 58 515
- 9. Godfrey B E S 1974, Trans. Brit. Mycol. Soc. 62 305
- 10. Stover R.H. 1975, Trans. Brit. Mycol. Soc. 65 328
- 11. Dickinson CH and Preece TI 1976, Microbiology of Aerial Plant Surface Academic Press, New York.
- 12. Fraser L 1933, Proc. Linn. Soc. N.S.W. 58 375
- 13. Fraser L 1934, Ibid. 59 123
- 14. Fraser L 1937, Ibid. 62 35
- 15. Preece T I and Dickinson C H (eds.) 1971, Ecology of Leaf Surface Micro-organisms Academic Press, London.
- 16. Reynolds D R 1975; Nova Hedwigia. 26 179
- 17. Magan N and Lacey J 1984, Trans. Br. Mycol. Soc. 82 305
- 18. Wicklow D T and Carron G C 1981, The fungal community : Its Organisation and Role in the Ecosystem Marcel Dekker, New York.
- 19. Fokkema N J, Riphagen I, Poot R J and de Jong C 1983, Trans. Br. Mycol. Soc. 81 355