INTERNATIONAL JOURNAL OF RESEARCHES IN BIOSCIENCES, AGRICULTURE AND TECHNOLOGY
© VISHWASHANTI MULTIPURPOSE SOCIETY (Global Peace Multipurpose Society) R. No. MH-659/13(N)
www.vmsindia.org

STUDIES IN FUNGICOLOUS FUNGI

Anjali R. Patil[1#] and M. S. Patil[2]
[1]Department of Botany, Rajaram College, Kolhapur-416 004,(M.S),India
[2] Ex- Professor & Head, Department of Botany, Shivaji University, Kolhapur-416 004,(M.S),India
dhirajanj@gmail.com

Abstract:
Six species of three genera, *Acremonium*, *Cladobotryum* and *Papulaspora* are described in the present paper viz. *Acremonium lindtneri* (Kirschstein) Samuels & Rogerson on *Clavaria nigricans* Kundalkar & Patil; *Cladobotryum arnoldi* Rogerson & Samuels on *Ganoderma lucidum* (Leyss.) Karst.; *C. fungicola* (G.Arnold) Rogerson & Samuels on *Clavulinopsis nigricans* Kundalkar & Patil; *C. polypori* (Dearness & House) Rogerson & Samuels on *Trametes versicolor* (L.) Pilat; *C. clavisporum* (Gray & Morgan-Jones) Rogerson & Samuels on *Polyporus* sp.; *Papulaspora* state of *Hypomyces papulasporae* Rogerson & Samuels var. *papulasporae* on *Trichoglossum hirsutum* (Pers.: Fr.) Boudier. All are anamorphic forms of species of genus *Hypomyces* collected on ascocarps and basidiocarps of various taxa. Perfect states are not recorded. They make a new record to the fungi of India.
Keywords: Mycotaxonomy, *Acremonium*, *Cladobotryum*, *Papulaspora*, *Hypomyces*

Introduction

Mycoparasitic fungi are numerous and grow either on vegetative mycelium in or on reproductive structures, mostly fruiting bodies, in favourable conditions. They maybe host specific or show a wide host range, as ecological obligate parasites or opportunists. Studied extensively, they are sometimes used as biological control agents on a commercial scale. Conidial states of these fungi are predominant. However, perfect states of ascomycetous fungi are also commonly produced. Cultural studies correlate the perfect and imperfect states (Anamorphs and teleomorphs). Species of the genera viz. *Acremonium*, *Cladobotryum* and *Papulaspora* and their perfect states have been collected and studied widely by a number of workers like Cole & Kendrick 1971, Gams 1973, Nanaware, 2002, Poldmaa 1977; 1999; 2000; 2003, Rogerson & Samuels (1985 & 1993).

Material and Method

Mycological survey in different localities from the Western Ghats of Maharashtra, during rainy and post rainy seasons, led to collection of large number of fungi. The taxa were studied by routine mycological methods in laboratory with the help of up-to-date literature. The older collections which were erroneously identified and described were also corrected as revisionary study and these were deposited in National Fungal Culture Collection of India (NFCCI) at ARI, Pune, Maharashtra, India.

Result and Discussion

***Acremonium lindtneri* (Kirschstein) Samuels & Rogerson, *Mycologia* 85 (2):248-249, 1993.** (Text plate I- a, Plate I- b).

≡ *Septocylindrium lindtneri* Kirschstein, *Z. Pilz.* 15 : 118, 1936;

≡ *Moeszia lindtneri* (Kirschstein) G. Arnold, *Westfal. Pilzbriefe* 8(1):13, 1970;

≡ *Sibirina clavariae* S.D.Nanaware & M.S.Patil, sp. nov., in approved Ph.D. thesis, Shivaji University, Kolhapur (M.S.), 2002, 325 pp.

Habit: Overgrowing on basidiocarps of *Clavaria nigricans* Kundalkar & M. S. Patil (Clavariaceae), Panhala, Dist.-Kolhapur, Maharashtra, 27/07/1997, S. D. Nanaware, W.I.F. No. 1956.

Remarks : The teleomorph of this species has been referred to *Hypomyces. chrysostomus* Berk. & Br. Along with its anamorphic state collected on Polyporaceae members viz. *Fomes*, *Ganoderma* and *Rigidoporus* from Ceylon, America, Canada, Yugoslavia, Brazil, Columbia, Venezuela & New Zealand.

The species is characterized by conidia, produced at tip of each conidiogenous cell in a single drop (gloeoid) of clear liquid and measure 2 - 4 (-5) x 11.5 - 20 (-27.5)µm; (0-) 1 (-3) septate. The present collection matches well with respect to above characters, except conidia which are longer & and less broad. *Clavaria nigricans* is an additional host.

***C. fungicola* (G.Arnold) Rogerson & Samuels, *Mycologia* 85 (2): 262-263, 1993.** (Text Plate I-b, Plate I-c).

≡ *Sibirina fungicola* G.Arnold, *Nova Hedwigia* 18: 300, 1970.

≡ *Sibirina indica* S.D .Nanaware & M. S. Patil, sp. nov., approved Ph.D. thesis, Shivaji University, Kolhapur (M.S.), 2002, 235 pp.

Habit: Overgrowing on basidiocarps of *Clavulinopsis nigricans* Kundalkar & M. S. Patil, (Clavariaceae), Shivaji University Campus, Kolhapur, Maharashtra, 10/11/1989, V. D. Chavan, W. I. F. No.1957.

Remarks : The teleomorph of this species viz. *Hypomyces semitranslucens* G.Arnold has been collected on fructifications of many polypores and other basidiomycetes viz. *Lenzites*,

Polyporus, *Stereum*, *Ganoderma*, *Auricularia*, *Cantherellus*, *Exidia* & *Tremella* from Russia, North America, Brazil, New Zealand and Switzerland. This species is characterized by oblong, cylindrical or clavate conidia, measuring (4-) 5-7 x (12-)13 - 19.8(-21) µm (in culture) & one septate. Present collection (natural) matches with respect to the conidial morphology & thus referred to it. *Clavulinopsis nigricans*, is a additional host.

***C. polypori* (Dearness & House) Rogerson & Samuels, *Mycologia* 85 (2): 250-251, 1993.** (Text plate I-c, Plate I-a).

≡ *Diplosporium polypori* Dearness & House, *N. Y. State Mus. Bull.* 266: 95, 1955;

≡ *Sibirina trameticola* S. D. Nanaware & M. S. Patil, in approved Ph.D. thesis, Shivaji University, Kolhapur (M.S.),2002, 235 pp.;

≡ *Dactylaria mycophila* Tubaki, *Nagaoa* 5: 17, 1955;

≡ *Sympodiophora mycophila* (Tubaki) Deighton & Pirozynski, *Mycol. Pap.* 128:71,1972;

≡ *Pseudohansfordia mycophila* (Tubaki) de Hoog, *Persoonia* 10: 60, 1978.

Habit: Overgrowing on basidiocarps of *Trametes versicolor* (L.) Pilat (Polyporaceae), Shivaji University Campus, Kolhapur, Maharashtra, India, 3/7/1997, S. D. Nanaware, W.I.F. No.1958.

Remarks: Two species of *Cladobotryum* have been reported on *Tramates* species viz. *C. polypori* & *C. clavisporum* (Gray & Morgan- Jones) Rogerson & Samuels with their teleomorphs viz. *Hypomyces mycophilus* Rogers. & Samuels & *H. polyporinus* Peck. In addition to *Tramates* spp., many members of Basidiomycetes viz. *Polyporus*, *Coriolus*, *Auricularia, Marasmium* & exceptionally *Bulgaria* (Discomycetes) from N. America, Canada, Japan and Germany are also parasitized.

The conidia in the present collection are one septate and measure 8-10 x 14-19 µm. Morphologically the conidiophores and conidia match with *C. polypori* thus referred to it.

***Cladobotryum arnoldi* Rogerson & Samuels, *Mycologia* 85(2): 258, 1993**. (Text plate I- d and Plate I-d)

≡ *Arnaldomyces macrospores* Samuels & Rogerson, *Supl. Act. Amazonica* 14 (1 & 2): 81, 1984. non *C. macrosporum* (Link) Schmalz.

Habit: Overgrowing on basidiocarps of *Ganoderma lucidum* (Leyss.) Karst. (Polyporaceae), Barki, District Kolhapur, Maharashtra, India, 29/09/2012, Anjali Patil, deposited in NFCCI, AMH no. 9620.

Remarks: This species has been recorded on the basidiocarp of *Ganoderma applanatum* (Pers.) Pat. from Brazil (South America) by Rogerson & Samuels 1993 as *Hypomyces pseudopolyporinus* Samuels & Rogerson with anamorph *Cladobotryum arnoldii* Rogerson & Samuels. Two more species viz. *Cladobotryum fungicola* (G. Arnold) Rogerson & Samuels & *Acremonium lindtneri* (Kirschstein) Rogerson *et. al.* (in culture) have been collected on *Ganoderma* from Brazil (South America) & Yugoslavia, with the perfect state *Hypomyces chrysostomus* Berk. & Br. The morphology of conidiophores and conidia and septation in the present collection agrees well to this species, with the exception of more number of septa (upto 5) and thus referred to it.

***C. clavisporum* (Gray & Morgan-Jones) Rogerson & Samuels, *Mycologia* 85 (2): 252-258, 1993.** (Text Plate I - e and Plate I – e).

≡ *Arnoldiomyces clavispora* (Gray & Morgan-Jones) Morgan-Jones, *Mycotaxon* 11: 466,1980;

≡ *Arnoldia clavispora* Gray & Morgan-Jones, *Mycotaxon* 10:376,1980;

≡ *Symhodiophora polyporicola* Rogerson & Carey, *Bull. Torrey Cl.* 108:13, 1981.

Habit - overgrowing on both surfaces of the basidiocarp of *Polyporus* species, Patgaon, Dist. Kolhapur, Maharashtra, India, 22/09/2013, Anjali Patil, deposited in NFCCI, A.M.H. No.-9619.

Remarks: This is an anamorph of *Hypomyces polyporinus* Peck (≡ *Peckiella polyporina* (Peck) Sacc.) collected on *Tramates versicolor* (L.: Fr.) Pilat and *T. pubescens* (Schum.: Fr.) Pilat and *Polyporus* sp. occasionally also recorded on *Auricularia auricula- judae* (Bull. Ex St. Am.) Berk., studied by Rogerson & Samuels from North America and Germany (1993). Present collection matches morphologically well in almost all respects and thus referred to it. It is a new record to the fungi of India.

***Papulaspora* state of *Hypomyces papulasporae* Rogerson & Samuels var. *papulasporae*, *Mycologia* 77(5): 763-783, 1985.** (Text Plate I- f).

Habit- Overgrowing on ascocarps of *Trichoglossum hirsutum* (Persoon.:Fr.) Boud. (Geoglossaceae) Tillari, Sawantwadi, District Sindhudurg, Maharashtra, 16/9/2012, Anjali Patil and deposited in NFCCI, AMH No. 9624.

Remarks: Patil MS 1979 studied the hyperparasites growing on ascocarps of *Trichoglossum* sp. collected from different localities of Western Ghats of Maharashtra and described it as *Stephanoma tetrasporum*. Revision of the same collection and new collections shows that it belongs to genus *Papulaspora*. Two varieties of *Papulaspora* (perfect state- *Hypomyces*) have been recognised

by Rogerson & Samuels viz. *H. papulasporae* var. *papulasporae* & *H. papulasporae* var. *americanum* based on size of propagules and reported on species of *Geoglossum* & *Trichoglossum*. The propagules of the former species are 20-25µm in diameter, while in the later are larger upto 27-41µm. Present collections match with *Papulaspora* state of *Hypomyces papulasporae* var. *papulasporae* Rogerson & Samuels. *Stephanospora tetrasporum* is characterised by central cell bearing four tubercles and verrucose surface. However, in *Papulaspora* species central cell has many tubercles and smooth surface. The present variety has been reported from America and New Zealand on the same host. It makes new record to fungi of India.

Key to the species studied:

1 Conidia 0-1 septate; subiculum white or pale yellow in 10% KOH solution…… 2

1' Propagules stalked, tuberculate and smooth ……..*Papulaspora* state of *Hypomyces papulasporae* var *papulasporae*

1" Conidia mostly 1 – 4 septate; subiculum as above …….. 3 2 Conidiogenous locus terminal and conidia measure 5 -7 x 10 -20µ ……*Cladobotryum fungicola*

2' Conidiogenous locus terminal and intercalary; conidia measure 8 -10 x 14 -19 µ ……*C. polypori*

3 Conidia produced in gloeoid head; conidia 1-3 septate and measure 7 x 15- 30 µ ……*Acremonium lindtneri*

3' Conidia produced singly in dry heads; conidiogenous locus terminal and intercalary; conidia measure 8 – 11 x 20 – 29 µ ……. *Cladosporium arnoldi*

3" Conidia produced as above but measure (15-)18-28(-40) x (4-)6-8(-12)µ and (0-)1-2(-3) septate …….. *C. clavisporum*

References

Cole CT, Kendrick WB. 1971- Conidial ontogeny in Hyphomycetes – Development & morphology of *Cladobotryum*. Canadian Journal of Botany 49, 59-599.

Gams W, 1973 - Phialides with solitary conidia. Persoonia 7, 161-169.

Nanaware SD, 2002 - "Taxonomical studies in the Fungi of South Western Ghats of Maharashtra". Approved Ph.D. thesis, Shivaji University, Kolhapur (M.S.), 235pp.

Patil MS, 1979 - Fungi of South- Western Maharashtra, an approved Ph.D. thesis, Pune University, Poona, Maharashtra, India, 302pp.

Poldmaa K, 1999 - The genus *Hypomyces* and allied fungicolus fungi in Estonia I. Species growing on Aphyllophoralean Basidiomycetes. Folia Crytogamiica Estonica 34, 15-31.

Poldmaa K, 2000 - Generic delimitation of the fungicolous Hypocreaceae. Studies in Mycology 45, 83-94.

Poldmaa K, 2003 - Three species of *Hypomyces* growing on Basidiomata of Stereaceae. Mycologia 95(5), 921-933.

Poldmaa K, Samuels, GJ., Jean Lodge D. 1997 - Three new Polyporicolous species of *Hypomyces* and their *Cladobotryum* anamorph. Sydowia 49, 80-93.

Rogerson CT, Samuels GJ. 1985 - Species of *Hypomyces* and *Nectria* occurring on Discomycetes. Mycologia 77(5), 763-783.

Rogerson CT, Samuels GJ. 1993 - Polyporicolous species of *Hypomyces*. Mycologia 85 (2), 231-272.

FIGURE LEGENDS

Text Plate I

a- *Acremonium lindtneri* (Kirschstein) Samuels and Rogerson on *Clavaria nigricans* Kundalkar & M. S. Patil;
b- *Cladobotryum fungicola* (G. Arnold) Rogerson & Samuels on *Clavulinopsis nigricans* Kundalkar & M. S. Patil;
c- *Cladobotryum polypori* (Dearness and House) Rogerson & Samuels on *Trametes versicolor* (L.) Pilat;
d- *Cladobotryum arnoldi* Rogerson & Samuels on *Ganoderma lucidum* (Leyss.) Karst.;
e- *Cladobotryum clavisporum* (Gray & Morgan) Rogerson & Samuels on *Polyporus* sp.;
f- *Papulaspora* state *of Hypomyces papulasporae* Rogerson and Samuels var. *papulasporae* on *Trichoglossum hirsutum* (Pers.: Fr.) Boud.

Plate I

a- *Cladobotryum polypori* (Dearness & House) Rogerson & Samuels, on basidiocarps of *Trametes versicolor* (L.) Pilat;
b- *Acremonium lindtneri* (Kirschstein) Samuels & Rogerson, on basidiocarps of *Clavaria nigricans* Kundalkar & M. S. Patil;
c- *Cladobotryum fungicola* (G.Arnold) Rogerson & Samuels, on basidiocarps of *Clavulinopsis nigricans* Kundalkar & M. S. Patil;
d- *Cladobotryum arnoldi* Rogerson & Samuels, on basidiocarps of *Ganoderma lucidum* (Leyss.) Karst.