

## STUDIES ON REPRODUCTION IN *GONAPODYA* SPECIES

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### ABSTRACT

Two aquatic fungi, namely, *Gonapodya prolifera* (Cornu) Fischer and *Gonapodya polymorpha* Thaxter growing on decaying pods of *Acacia nilotica* var. *arabica* L. in Lakaki pond of Pune have been isolated and their reproductive status studied and illustrated in detail. Rainy season favoured only asexual stage and summer season favoured asexual as well as sexual stages.

### KEYWORDS

*Acacia nilotica*, aquatic fungi, *Gonapodya polymorpha*, *G. prolifera*, reproduction

During the study of aquatic fungi in Lakaki lake of Pune, Maharashtra, the species of *Blastocladia* and *Gonapodya* were observed to form distinct pustules on one and the same substratum, namely, submerged decaying *Acacia* pods. Of these, the asexual and sexual stages of *Gonapodya prolifera* (Cornu) Fischer and *Gonapodya polymorpha* Thaxter are discussed in this paper.

### MATERIAL AND METHODS

Along with regular water sample collection, decaying submerged *Acacia* pods were collected from Lakaki pond to observe exogenous and endogenous growth of zoospore fungi. Pods were inoculated in sterile distilled water and maintained at laboratory conditions. Temperature and pH of water were recorded at the site using standard portable pH meter and thermometer. Concentration of dissolved oxygen was also recorded in the laboratory (APHA, 1992)

### OBSERVATIONS

#### *Gonapodya polymorpha* Thaxter (Figs. 1-9)

#### Material examined:

April 2002 - May 2002, February 2003 - June 2003, February 2004 - March 2004, on submerged pods of *Acacia nilotica* var. *arabica* L., Lakaki Pond, Pune, Maharashtra, coll. Anagha Kurne, deposited in P.G. Research Centre, Modern College of Arts, Science and Commerce (Catalogue No. AFMC7a).

Thallus eucarpic, polycentric, dichotomously branched, composed of irregular, long cylindrical segments with pseudosepta (Fig. 1), pseudoseptation with or without constriction; zoosporangia borne racemosely, solitary or in fascicle on rounded tip of hypha, pod like, pale yellowish-brown, 1-4 times proliferous, inflated below, distal portion elongated tapering gradually to a blunt apex (Figs. 2 & 3), constriction may or may not be present immediately below each sporangium, hyphal growth beyond the empty sporangium (Fig. 4), 46-66µm

x 33-50µm; zoospores variable in shape with refractive granules; female gametangia oval, spherical to subspherical (Figs. 5 & 6), 17-46µm in diameter, mostly 26-38µm, separated from rest of the hypha by pseudosepta, develop beak like papilla (Fig. 8) or apical discharge papilla (Fig. 9) to release gametes; female gametes spherical, 8-18 in number; male gametangia smaller than female gametangia, terminal, solitary or in small groups, elongate to ovoid, with short distal portion tapering to a blunt apex, 25 x 38µm; male gametes roughly round with refractive granules, 3-6µm in diameter, male and female gametangia sometimes observed on the same hypha (Fig. 7).

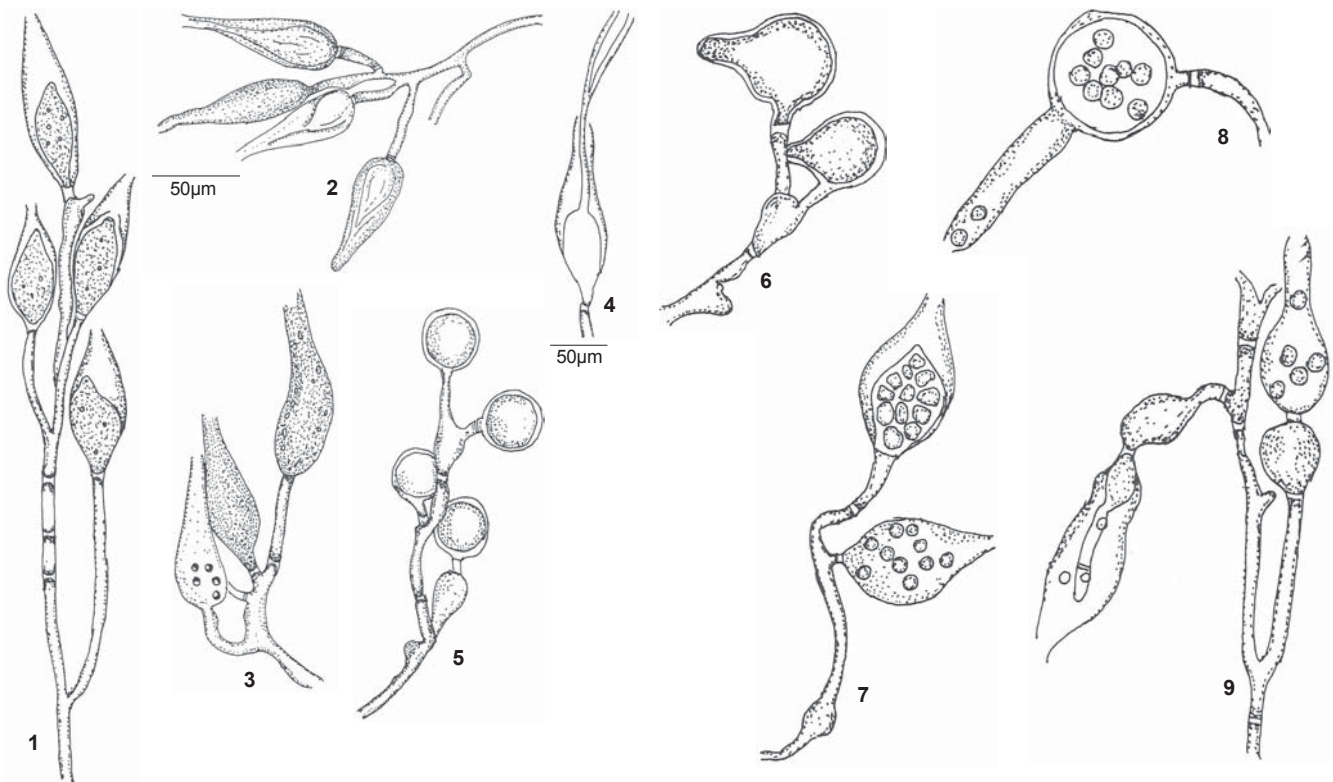
#### *Gonapodya prolifera* (Cornu) Fischer (Figs. 10-16)

#### Material examined:

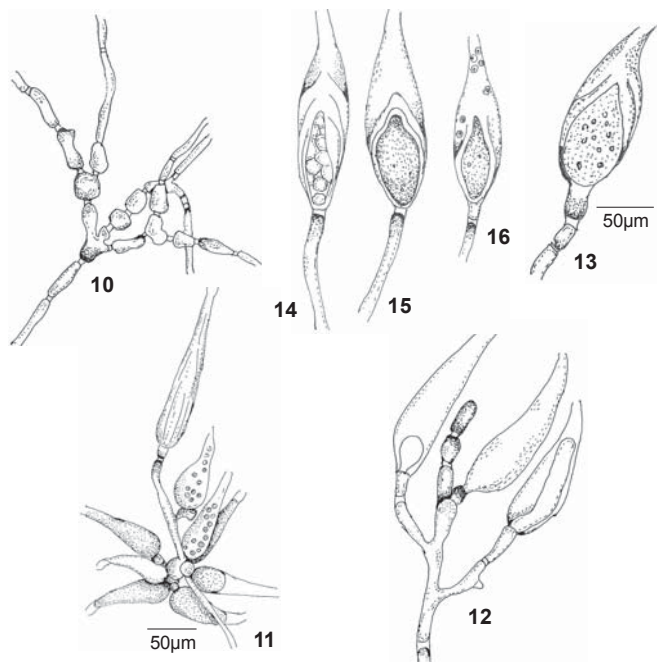
April 2002 - May 2002, Feb 2003 - June 2003, Feb 2004 - March 2004, on submerged pods of *Acacia nilotica* var. *arabica* L., Lakaki Pond, Pune, Maharashtra, coll. Anagha Kurne, deposited in P.G. Research Centre, Modern College of Arts, Science and Commerce (Catalogue No. AFMC7b).

Thallus eucarpic, polycentric, with irregularly and dichotomously branched hyphae, composed of short oval or elliptical to long clavate segments with pseudosepta associated with distinct constrictions (Fig. 10); zoosporangia terminal, solitary or 3-4 in cluster on rounded tip of hypha (Fig. 11), pod like, dark brown to pale yellowish-brown, 1-4 times proliferous (Fig. 13), inflated below, with elongated distal portion which tapering gradually to a narrow apex (Fig. 12), constriction always present immediately below each sporangium, 50-135µm x 17-25µm; zoospores ovoid with many refractive granules; sexual reproduction by gametangia; female gametangia terminal, elongate, tapering gradually to a blunt or narrow apex (Fig. 14), inflated below, pod like, 53-97µm in length, basal diameter 19-26µm, apical diameter 6-9µm, 2-4 times proliferous, each gametangium is separated from the rest of the hypha by pseudoseptum with constriction; female gametes globose, 10-15 in number, 9µm in diameter; oospores not observed; male gametangia often smaller than female gametangia, terminal, solitary or in small groups, elongated (Fig. 15 & 16), 50-95 x 19-29µm, separated from the rest of the hypha by pseudoseptum with constriction; male gametes roughly round with many refractive granules, 3-7µm in diameter.

*Gonapodya prolifera* and *Gonapodya polymorpha* were observed on the pods of *Acacia nilotica* in separate colonies but were very close to each other. However, prominent segmentation of hyphae and pseudosepta always associated



**Figures 1-9. *Gonapodya polymorpha* Thaxter**  
 1 - Hyphae divided into segments by pseudoseptae; 2 & 3 - Zoosporangia and zoospores;  
 4 - Hyphal growth beyond the zoosporangial apical perforation; 5 & 6 - Spherical female gametangia;  
 6 - Female gametangia at rounded tip; 7 - Female and Male gametangia on one branch;  
 8 & 9 - Female gametangium with beak like papilla



**Figures 10-16. *Gonapodya prolifera* (Cornu) Fischer**  
 10 - Hyphae with distinct constrictions; 11 - Cluster of sporangia; 12 - Zoosporangia; 13 - Proliferating zoosporangium with zoospores; 14 - Proliferating female gametangium; 15 & 16 - Male gametangia

with constrictions in *G. prolifera*, distinguishes it from *G. polymorpha*.

**DISCUSSION**

*Gonapodya* occurs on different substrata like various types of submerged twigs and fruits especially fleshy and berry types (Thaxter, 1895; Das-Gupta & John, 1953; Johns & Benjamin, 1954; John, 1958; Perrott, 1960; Sparrow, 1960; Bhargava & Singh, 1965; Manoharachary *et al.*, 1983; Misra & Dwivedi, 1987; Usha Kiran & Dayal, 1992). In the present work, *Gonapodya* species were isolated from submerged decaying pods of *Acacia nilotica* L. (Lomentum fruit) which is a new substratum record for *Gonapodya*. *Gonapodya* did not show any growth on opium baits, commonly used for the isolation of zoosporic fungi.

Both asexual and sexual stages of *Gonapodya* were recorded when dissolved oxygen in the lake was low (0.28-2.76mg/l) and the temperature range was 24.8-30.3°C. However, only asexual stages were recorded when dissolved oxygen level in the lake increased (5.6-8.12mg/l) with a temperature range of 28.3-30°C. It was also noted that during rainy season, when temperature of the lake falls and humidity in the atmosphere increases, asexual stages with empty female gametangia were frequently recorded. Such seasonal observations were not reported by other research workers (Thaxter, 1895; Das-Gupta & John, 1953; Johns & Benjamin, 1954; John, 1958; Perrott, 1960; Sparrow, 1960;

Manoharachary *et al.*, 1983; Misra & Dwivedi, 1987; Usha Kiran & Dayal, 1992; Fuller, 1993; Khulbe, 2001).

The dark brown to pale yellowish-brown colouration in the thallus of both the species of *Gonapodya* including reproductive structures may be due to the alkaloids present in *Acacia nilotica*, whereas, Das-Gupta and John (1953) reported white to dark brown thallus of *G. prolifera* and John (1958) reported pale grey colour of the thallus of *G. polymorpha* on submerged fruits like guava.

In the present investigations we have noted that female gametangia of *G. polymorpha* are ovoid, spherical to subspherical while that of *G. prolifera* are only elongated, pod like. According to Johns and Benjamin (1954) male gametangia of *G. prolifera* are elongate - ovoid and female gametangia with only one discharge papilla, while *G. polymorpha* has characteristically sub-spherical male gametangia and female gametangia with more than one discharge papilla.

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#### ACKNOWLEDGEMENTS

The authors are grateful to the authorities of Modern College, Pune for providing laboratory facilities during this work.



## THREE RECORDS OF *AHAETULLA NASUTA* VAR. *ISABELLINUS* FROM RAJASTHAN

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**web supplement**

According to Daniel (2002), Whitaker and Captain (2004) the Common Green Whip Snake *Ahaetulla nasuta* is a peninsular species, widely distributed except in the northwest and much of the Gangetic basin. The map shown by Whitaker and Captain (2004) reveals that *A. nasuta* is absent in Rajasthan. This snake has been reported from forests of southern Rajasthan. Two colour forms of this species (green and brown) occur in Rajasthan. The green form has been recorded by Sharma (1995a, b; 1997; 2001) from southern Rajasthan (Udaipur, Shirohi, Rajsamand and Pali districts).

The brown form (*isabellinus*) of *Ahaetulla nasuta* is sympatric with the green form (*nasuta*) in southern Rajasthan. In the last 10 years, two specimens of variety *isabellinus* have been seen by me at Mount Abu and near Malgarh Cenotaph, Kumbhalgarh Wildlife Sanctuary respectively. Recently, on March 5, 2005 one specimen was seen crossing the road near Bhader Basoi in Phulwari Wildlife Sanctuary (Image 1<sup>w</sup>). Brown colour, pointed snout consisting of a single grooved scale, oblique blackish lines visible on the dorsal aspect of the midbody and black dots on various head scales are characteristic of *A. nasuta* var. *isabellinus*. Black dots were also present on outer lateral edges of the anterior 15 ventrals. Data on the snake caught in Phulwari are: Midbody scales in 15 rows; ventrals 200; paired subcaudals 168; snout-vent length 410mm; tail 250mm; dorsum brown; throat white, venter almond coloured; tongue whitish-pink.

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#### ACKNOWLEDGEMENTS

Author is very thankful to R.P. Kapoor, PCCF, Rajasthan; Jagdeesh Rao and Dinesh Reddy of FES, Anand; Brijpal Singh and Bhopal Singh Rathor for facilities.

<sup>w</sup> See Image 1 in the web supplement at [www.zoosprint.org](http://www.zoosprint.org)

