



## Fungal Infections on Plantation Crops of the Andaman Islands

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**ABSTRACT:** Three foliicolous fungal taxa on plantation crops from the Andaman Islands in the Bay of Bengal have been described with illustrations as new reports. It includes *Acroconidiellina arecae* (Berk. & Broome) M.B. Ellis on betel nut palm leaves (*Areca catechu* L.) from North Andamans, *Dysrhychnis palmicola* (Sydow) Arx on red oil palm leaves (*Elaeis guineensis* Jacq.) from the Little Andaman Island and *Oidium heveae* B.A. Steinm. on para rubber tree leaves (*Hevea brasiliensis* (Willd. ex A.Juss.) Müll.Arg.) from South Andamans.

**Key words:** Andaman Islands, Micro fungi, Plantation crops.

### INTRODUCTION

The splendid seascapes embark into lush green rainforests in the Bay of Bengal hallmark the Andaman and Nicobar Islands between the latitudes 6 to 14 North and the longitudes 92 to 94 East. This archipelago comprises roughly 556 islands and islets, cover an area of about 8249 sq km that simulating an arc lying in North-South direction stretching over an approximate length of 467 km and maximum width of 57 km (Anonymous, 2012). According to an official estimation, about 80.76% of the total landmass is covered with dense natural vegetation of the tropical lowland rainforests and around 6% of the total landmass is currently utilized for cultivation (Roy, 2015). The major manmade monoculture plantation crops cover an area of around 3.57% of the total landmass (Anonymous, 2009). According to forest statistics of the Andaman-Nicobar Administration, there are 38 human inhabited islands in this archipelago (Anonymous, 2009). The manmade vegetation among the inhabited islands cover an area of around 29427 ha of major plantation crops such as Coconut palms, Red oil palms, Betel nut palms, Para rubber trees and Cashew nut trees.

According to official website of the Andaman & Nicobar Administration, the agriculture history of Andaman Islands date backs to 100 years ago; nevertheless, the plantation crops such as coconut and arecanut palms of Nicobar Islands are said to be centuries old under cultivation (<http://www.andaman.gov.in/agriculture>-accessed on 01/03/2017). It was Lord Mayo, the 4<sup>th</sup> Viceroy of the British India in 1870, has taken remarkable efforts for initiating cultivation in and around Port Blair. Interestingly, the wild occurrence of coconut and arecanut palms has been reported from the uninhabited islands of the Andaman and Nicobar Islands, centuries ago by the British officials who have explored the islands during the latter part of the 19<sup>th</sup> century (Prain, 1890 & 1891, Kurz, 1876). The apparent wild occurrence of these popular cultivars among several uninhabited islands in this archipelago substantiates to suggest an interesting argument that these islands might be one of the centres of origin of coconut and betel nut palms. The wild occurrence of betel nut palms from the Great Nicobar Island was first reported by Kurz in 1876.

Establishment of Andaman and Nicobar Islands Forest & Plantation Development Corporation Ltd in 1972 by the Government of India, herald a new

era in the cultivation of plantation crops among various islands.

According to official statistics of the Andaman and Nicobar Administration, the major plantation crops of the islands comprise *Cocos nucifera* L., *Areca catechu* L., *Elaeis guineensis* Jacq., *Anacardium occidentale* L. and *Hevea brasiliensis* (Willd. ex A. Juss.) Müll. Arg. Coconut palms (*Cocos nucifera*) are the prime plantation crop of the Andaman-Nicobar Islands cover the maximum area of 21,800 ha with an annual production of 105MT (Anonymous, 2012). Andaman Betel nut (*Areca catechu*) is the second most important cash crop produce planted around 4220 ha with an annual turnover of about 5950MT (Anonymous, 2012). Red Oil Palm (*Elaeis guineensis*) cultivation in Little Andaman was initiated in 1975 by the Forest & Plantation Development Corporation Ltd which cover the area under plantation is presently about 1593 ha (Kharti, 2002) with an annual production of 1570MT (Anonymous, 2012). The insular rubber plantation (*Hevea brasiliensis*) initiated in 1930 by the British in South Andaman. According to basic statistics of Andaman & Nicobar Administration, the rubber plantations in these Islands presently cover an area of 614 ha in South Andamans and Katchal Island of the Nicobar group with an annual turnover of about 172 MT (Anonymous, 2012). However, the official website of the Rubber Board, Government of India had given a different statistics on insular plantation with a sum of 931 ha of landmass under rubber cultivation in Andaman and Nicobar Island. (<http://rubberboard.org.in/ManageScheme.asp?id=61> accessed on 01/03/2017). Cashew nut cultivation attains an annual turnover of 351MT within an area of 1200 ha (Anonymous, 2013). Interestingly, it is found that no systematic investigations on micro fungal flora co-existing with higher group of plants in Andaman-Nicobar Islands until the recent studies carried out by the authors. During the investigation on database preparation of foliicolous fungi of Andaman Islands, the authors have come across fungal infections on three plantation crops of the islands such as *Areca catechu* L. (North Andaman), *Elaeis guineensis* Jacq. (Little Andaman) and *Hevea brasiliensis* (Willd. ex A.Juss.) Müll.Arg. (South Andaman).

## MATERIALS AND METHODS

Infected plant parts (leaves) of host species such as rubber trees, oil palm trees and betel nut palms were collected in polythene bags and given separate field numbers for future herbarium incorporation.

Original information on Infection pattern, locality, altitude, type of vegetation, date of collection, place of collection, name of the collector, additional information on host plant, if any etc. are recorded in the field book during exploration. Sample collections were processed according to standard norms of dry method of herbarium procedure. Plant materials were kept in blotting papers and pressed by using wooden herbarium press. In order to prevent further fungal infections, changing of blotting papers have been carried out every day until the materials becomes properly dried. Nail polish technique (Hosagoudar and Kapoor, 1985) has been performed for ectophytic fungi, in order to study them *in situ*, while sections were made for innate fungi. Herbarium materials have been deposited at JNTBGRI Herbarium (TBGT), Thiruvananthapuram, Kerala and Botanical Survey of India Herbarium (PBL), Andaman-Nicobar Circle, Port Blair.

## Taxonomic description

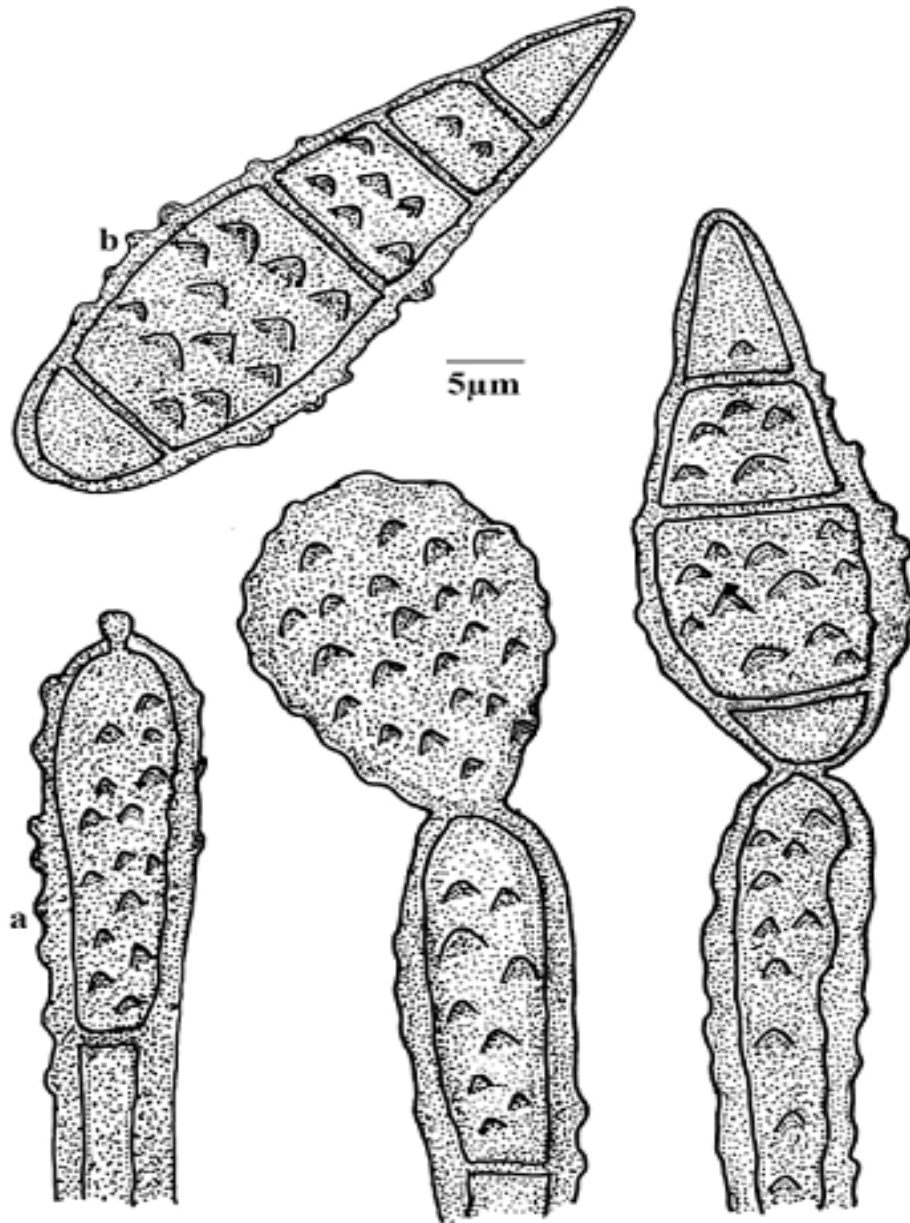
### 1. *Acroconidiellina arecae* (Berk. & Broome) M.B. Ellis

Colonies hypophyllous, small, orbicular, often punctiform, numerous and close together, dark blackish brown, hairy. Mycelium almost all superficial and composed of a close network of branched and anastomosing, smooth, mid to dark brown, 3-7 µm thick hyphae, but each colony is anchored to the substratum by a narrow brown hypha which grown down through a stoma. The hyphae bear numbers of conidiophores and sometimes also setae. Conidiophores erect or suberect, straight or slightly flexuous, unbranched, mid to dark brown, rugulose or verrucose, thick walled, septate, up to 450 µm long, but usually shorter, 5-7 µm thick at the base, 10-15 µm at the apex. Setae erect, straight or flexuous, cylindrical to subulate, mid to dark brown, rugulose or verruculose, thick-walled, septate, up to 700 µm long, 6-9 µm thick. Conidia straight, obturbinate to obclavate, usually 3-4 septate, with central cells verrucose, mid-dark brown, cells at each end paler and smoother, 47-75 (58) µm long, 18-20 (18.6) µm thick in the broadest part.

Materials examined: On leaves of *Areca catechu* L. (Arecaceae); Billiground, Mayabandar, North Andaman, 16 December 2012, V.B. Hosagoudar & S. P. Mathew 6528 (TBGT & PBL).

### 2. *Dysrhynchis palmicola* (Sydow) Arx

Colonies hypophyllous, dense, velvety, run parallel along the veins, up to 2 mm in diam., confluent and cover an entire lower surface of the leaves.



**Fig. 1.** *Acroconidiellina arecae* (Berk. & Broome) M.B. Ellis

Hyphae sub straight to flexuous, branching irregular at wide angles, closely reticulate, cells 18-24 x 2-4 µm. Appressoria absent. Mycelial setae numerous, carbonaceous black, scattered, simple, straight, acute to obtuse at the tip, up to 200 µm long. Perithecia closely scattered, stipitate, globose, ovate, ostiolate, up to 100 µm in diameter; asci visible in mature perithecia, 2-4 in numbers, ovate to globose, octosporous, 30-60

µm in diameter; ascospores conglobate, oblong, pale brown, 1-septate, constricted at the septum, broadly rounded at both ends, 24-34 x 9-11 µm, wall smooth.

**Materials examined:** On the leaves of *Elaeis guineensis* Jacq. (Arecaceae), Krishna nalla, Little Andaman, 12 February 2014, S. P Mathew, C. K. Biju & H. Biju 6876 (TBGT & PBL).

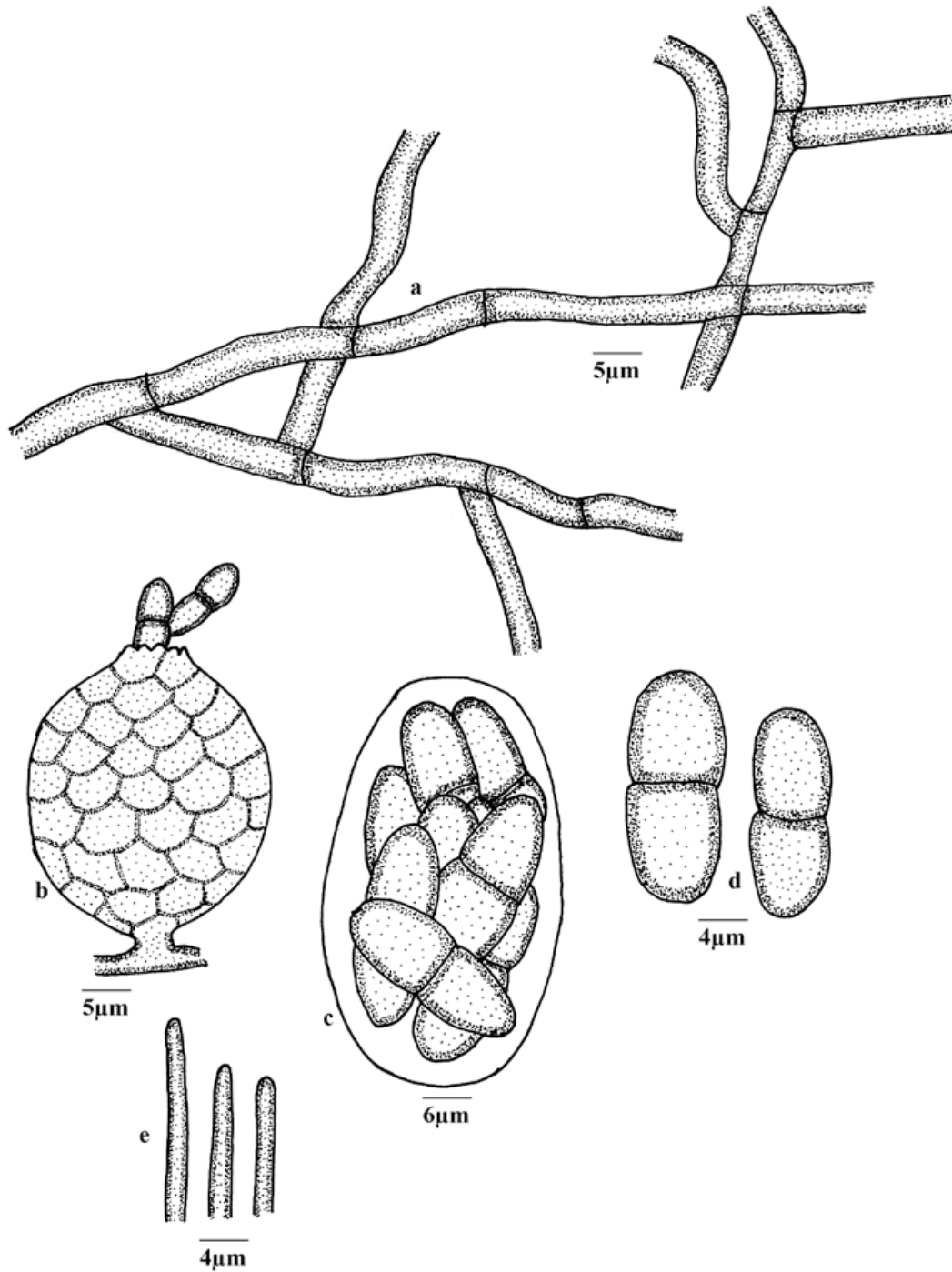


Fig. 2. *Dysrhyinchis palmicola* (Sydow) Arx.

### 3. *Oidium heveae* B.A. Steinm.

Infection foliicolous, cause chlorosis. Colonies epiphyllous, 2-3 mm in diameter, rarely confluent, persistent. Hyphae branched, septate, 3.5-7.5  $\mu\text{m}$  wide. Appressoria opposite and lobed. Conidiophores erect, straight, 71-93.5  $\mu\text{m}$  long; foot cells straight, erect, cylindrical, 22-42 x 5-7.5  $\mu\text{m}$ , followed by a single cell. Conidia solitary,

obovoidal, ellipsoidal to doliiform, 22-38 x 15-22  $\mu\text{m}$ . Germ tube apical, simple.

**Materials examined:** On leaves of *Hevea brasiliensis* (Willd. ex A.Juss.) Müll.Arg. (Euphorbiaceae), Guptapara, South Andaman, 10 February 2014, S. P. Mathew C. K. Biju & H. Biju 6877 (TBGT & PBL).

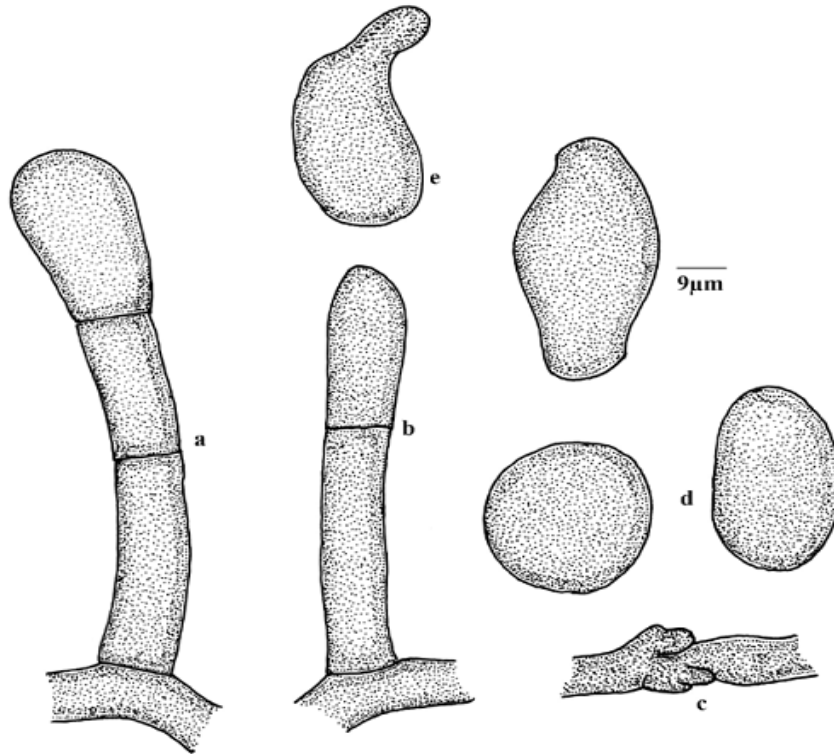


Fig. 3. *Oidium heveae* B. A. Steinm.

### DISCUSSION

Coconut plantations (*Cocos nucifera* L.) Betel nut plantations (*Areca catechu* L.), African oil palm or Red oil palm plantation (*Elaeis guineensis* Jacq.), Rubber plantations (*Hevea brasiliensis* Willd. ex A. Juss. Müll.Arg.) and Cashew nut plantations are the five major cash crop plantations in Andaman-Nicobar Islands. It covers an approximate area of 29427 ha of the total landmass of the islands. Interestingly, it is found that the systematic studies on micro fungal flora of Andaman Islands has been initiated recently by Hosagoudaer and Mathew (2000). The recent investigation on insular micro fungal flora from 2012 to 2015 had enumerated 113 taxa from various islands of the Andaman group (Hosagoudaer and Mathew, 2000; Hosagoudaer *et al*, 2014; Sabeena *et al* 2017).

During the investigations, the authors have come across infrequent infections of *Dysrhynchis palmicola* on Red oil palms at the Little Andaman plantation. It appears in black dense colonies on palm leaves. This fungal taxon has already been reported on the same host from Africa (Muller & Arx, 1962; Bilgrami *et al*. 1991) as well as from the Peninsular India (Hosagoudaer & Thomas, 2009). Occurrence of *Dysrhynchis palmicola* (Sydow) Arx on Red oil palms in Little Andaman is a new report for Andaman-Nicobar Islands. Black leaf mould of betel nut palms caused by *Acroconidiellina arecae* (Berk. & Broome) M.B. Ellis on *Areca catechu* L. was occasionally found among the plantations of North Andamans. It appears dense black lesions on upper surface of the palm leaves.

Sometimes it may cover the entire leaf surface and cause interference to photosynthesis. *Acroconidiellina arecae* (Berk. & Broome) M.B. Ellis has earlier been recorded from Indonesian islands on same host species (French, 2006; while the occurrence of *Acroconidiellina arecae* (Berk. & Broome) M.B. Ellis is a new record for Andaman Islands. *Oidium heveae* Steinm. is a common pathogen causing powdery mildew disease found among the various *Hevea* species such as

*Hevea brasiliensis* (Willd. ex A. Juss.) Müll. Arg., *H. spruceana* (Benth.) Müll. Arg. and *H. guianensis* Aubl. This infectious fungus has already been reported from various regions of Congo, India, Indochina, Java, Malaya, Sri Lanka and Tanganyika (Spaulding, 1961). According to available data, *Oidium heveae* Steinm. is reporting for the first time from the Andaman and Nicobar Islands.



**Fig. 4.** 1. *Dysrhyrchis palmicola* (Sydow) Arx on Red oil palm leaves. 2. *Acroconidiellina arecae* (Berk. & Broome) M.B. Ellis on Betel nut palm leaves 3. *Oidium heveae* B. A. Steinm on Rubber tree leaves.

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