

Some powdery mildews from Tamil Nadu, India

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An account is given of 13 anamorph of powdery mildews. *Oidium abutili*, *O. kydiae*, *O. moringae* and *O. passifloracearum* are new species; *O. abelmoschi*, *O. azadirachtae*, *O. clitoriae*, *Sphaerotheca crotonis* are described and illustrated in detail; *Oidium bixae* and *O. cassiae-hirsutae* are reported for the first time from India; *Erysiphe sikkimensis* and *Sphaerotheca balsaminae* are reported for the first time from southern India. The new name *Oidium ramakrishnanii* is proposed based on *O. phyllanthi* and a neotype is chosen.

Keywords: Ascomycetes, powdery mildews, anamorphs.

NARAYANASWAMY & RAMAKRISHNAN (1971) reported several powdery mildews from Coimbatore. These, however, were not studied in detail and they assembled morphologically similar species from taxonomically unrelated hosts (BRAUN, 1987). The anamorphs of some of those species have been found by the present author and studied in detail along with other less well-known and hitherto undescribed species.

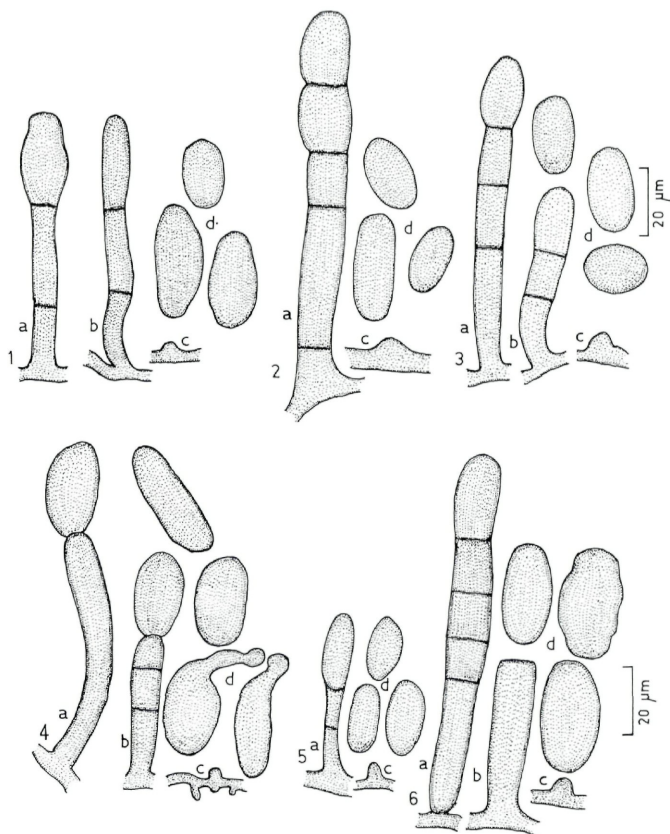
1. *Erysiphe sikkimensis* CHONA, KAPOOR & GILL. – Indian Phytopathol. 13: 72, 1960. – Plate 1, Fig. 1.

Anamorph: *Oidium*

Colonies amphigenous, mostly epiphyllous, dense, white, later becoming dusty white, confluent. – Hyphae straight to crooked, branched, septate, 4–8 µm wide. – Appressoria simple, mammelliform. – Conidiophores straight, erect, simple, 62–90 µm long; foot cells straight to flexuous, 25–53 x 6–9.3 µm, followed by 1–2 shorter or equal cells. – Conidia borne singly, ovoid, ellipsoidal to dolii-form, 28–37 x 15–18.5 µm.

Material examined. – On leaves of *Quercus* sp. (Fagaceae), Tamil Nadu, Udhagamandalam, Nilgiris, Govt. botanic garden, 25.12.1989, V.B. HOSAGOUDAR HClO 30352.

CHONA & al. (1960) reported this species from the Himalayas and it is reported here for the first time from Southern India.



Pl. 1. – 1. *Erysiphe sikkimensis*. – 2. *Oidium abelmoschi*. – 3. *Oidium abutili*. – 4. *Oidium azadirachtae*. – 5. *Oidium bixae*. – 6. *Oidium cassiae-hirsutae*. – a: conidiophore; b: foot cell; c: appressorium; d: conidia.

2. *Oidium abelmoschi* THÜMEN. – Grevillea 6: 102, 1877–78. – Plate 1, Fig. 2.

Syn.: *Acrosporium abelmoschi* (THÜMEN) SUBR. – Hyphomycetes, p. 838, 1971.

Colonies amphigenous, mostly epiphyllous, dense, confluent. – Hyphae branched, septate, 12–15.5 µm wide. – Appressoria nipple-shaped. – Conidiophores straight, erect,

52–155 x 12–15.5 μm ; foot cells cylindrical, straight, 18–37 x 12–15.5 μm , followed by 1–2 shorter cells. – Conidia in chains of 2–5, ovoid to ellipsoidal, 27–37 x 12–15.5 μm .

Material examined. – On leaves, stems and petioles of *Abelmoschus esculentus* (L.) MOENCH (Malvaceae), Tamil Nadu, Coimbatore, P.N. Pudur, 15.1.1988, V.B. HOSAGOUDAR HCIO 40599.

3. *Oidium abutili* V.B. HOSAGOUDAR, sp. nov. – Plate 1, Fig. 3.

Plagulae epiphyllae, densae, confluentes. Hyphae ramosae, septatae, 4–8 μm crassae. Appressoria mammaeformia. Conidiophora recta, erecta, 77–90 μm longa; cellula basalis recta vel curvata, 27–43.5 x 9–12.5 μm , cellula subsequens brevior. Conidia solitaria, cylindrico-ellipsoidea, 27–33 x 12–15.5 μm .

Colonies epiphyllous, dense, confluent. – Hyphae branched, septate, 4–8 μm wide. – Appressoria mammelliform. – Conidiophores straight, erect, 77–90 μm long; foot cells straight to curved, 27–43.5 x 9–12.5 μm , followed by 1–2 shorter cells. – Conidia formed singly, cylindric-ellipsoidal, 27–33 x 12–15.5 μm .

Material examined. – On leaves of *Abutilon ramosum* (Cav.) GUILL. & PERR. (Malvaceae), Tamil Nadu, Nilgiris, Sri Madurai, 24.1.1990, V.B. HOSAGOUDAR HCIO 30345 (Holotype).

Oidium abutili differs from *O. pavoniae* BAGYANARAYANA & BRAUN in having dense epiphyllous colonies, smaller foot cells, and smaller and cylindric-ellipsoidal conidia.

4. *Oidium azadirachtae* NARAYANASWAMY & K. RAMAKRISHNAN. – Madras Univ. J. 37–38: 90, 1971. – Plate 1, Fig. 4.

Colonies amphigenous, mostly epiphyllous, dense, confluent. – Hyphae septate, branched, 4–8 μm wide. – Appressoria nipple-shaped. – Conidiophores mostly curved, 68–93 μm long; foot cells straight, curved to flexuous, 28–56 x 6–9.5 μm , followed by 0–2 smaller cells. – Conidia formed singly, ovoid, ellipsoidal to cylindrical, 24–34 x 12–15.5 μm , germinating to produce a bulbous haustorium.

Material examined. – On leaves, stems and petioles of *Azadirachta indica* A. JUSS. (Meliaceae), Tamil Nadu, Coimbatore, in the garden of Botanical Survey of India, 20.1.1989, V.B. HOSAGOUDAR HCIO 30374.

5. *Oidium bixae* VIÉGAS. – Bragantia 4: 19, 1944. – Plate 1, Fig. 5.

Syn.: *O. erysiphoides* f. *bixae* YEN. – Cahiers du Pacifique 11: 88, 1967.

Infection restricted mostly to the younger leaves. Severe infection caused crumpling of leaves. – Colonies amphigenous, dense, 1–4 mm in diameter, confluent. – Hyphae branched, septate, 4–

8 μm wide. – Appressoria nipple-shaped. – Conidiophores straight, erect, simple, 30–48 μm long; foot cells straight, cylindrical, 18–28 $\times$ 6–8 μm , followed by 1–2 shorter cells. – Conidia formed singly, ovoid to doliform, 21–29 $\times$ 10–17 μm .

Material examined. – On leaves of *Bixa orellana* L. (Bixaceae), Tamil Nadu, Nilgiris, Thorepalli, 29.1.1990, V.B. HOSAGODAR HCIO 30346.

The host is a native plant of America and has been introduced to India due to its economic importance as a source of dye. Along with the plant, *Oidium bixae* also appears to be introduced to India. This fungus was reported from South America, Africa and Taiwan by BRAUN (1987) but is reported here for the first time from India (BILGRAMI & al. 1979, 1981).

6. *Oidium cassiae-hirsutae* YEN, Rev. Mycol. 31: 284, 1966. – Plate 1, Fig. 6.

Colonies hypophyllous, dense, scattered, rarely confluent. – Hyphae branched, septate, 6–9.5 μm wide. – Appressoria mammelliform. – Conidiophores straight, erect, 90–110 μm long; foot cells straight, cylindrical, 37–46.5 $\times$ 9–12.5 μm . – Conidia in chains of 2–6, ovoid to doliform, 27–34 $\times$ 15–18.5 μm .

Material examined. – On leaves of *Cassia tora* L. (Caesalpiniaceae), Tamil Nadu, Coimbatore, Maruthamalai, 20.12.1988, V.B. HOSAGODAR HCIO 30351.

The present collection differs slightly from typical representatives of the species in having strictly hypophyllous colonies and conidiophores with flexuous foot cells.

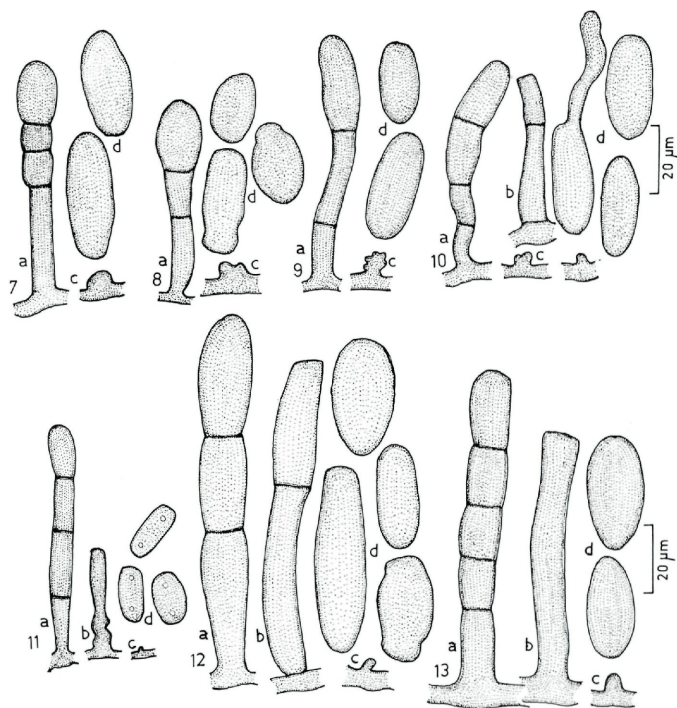
7. *Oidium clitoriae* NARAYANASWAMY & K. RAMAKRISHNAN. – Madras Univ. J. 37–38: 89, 1971. – Plate 2, Fig. 7.

Colonies amphigenous, often following the veins, confluent. – Hyphae branched, septate, 4–8 μm wide. – Appressoria nipple-shaped. – Conidiophores straight, erect, 52–80.5 μm long; foot cells straight, cylindrical, 30–40.5 $\times$ 5–6.5 μm , followed by 1–2 shorter cells. – Conidia formed singly, ovoid to ellipsoidal, 34–43.5 $\times$ 12–15.5 μm . – Germination by production of a long, bulbous haustorium.

Material examined. – On leaves, stems and petioles of *Clitoria ternatea* L. (Fabaceae), Tamil Nadu, Coimbatore, in the garden of Botanical Survey of India, 19.1.1987, V.B. HOSAGODAR HCIO 40604.

8. *Oidium kydiae* V.B. HOSAGODAR, sp. nov. – Plate 2, Fig. 8.

Plagulae epiphyllae, densae, dispersae, confluentes. Hyphae rectae vel flexuosae, septatae, ramosae, 6–8 μm crassae. Appressoria lobata. Conidiophora simplicia,



Pl. 2. – 7. *Oidium clitoriae*. – 8. *Oidium kydiae*. – 9. *Oidium moringae*. – 10. *Oidium passifloracearum*. – 11. *Oidium ramakrishnanii*. – 12. *Sphaerotheca balsaminae*. – 13. *Sphaerotheca crotonis*. – a: conidiophore; b: foot cell; c: appressorium; d: conidia.

recta, erecta, 68–77.5 µm longa; cellula basalis recta, cylindracea, 24–37 x 6–8 µm, cellula subsequens brevior. Conidia solitaria, ovoidea vel doliiformia, 24–37.5 x 15–18.5 µm.

Colonies epiphyllous, dense, scattered, confluent. – Hyphae straight to flexuous, branched, septate, 6–8 µm wide. – Appressoria lobed. – Conidiophores simple, straight, erect, 68–77.5 µm long; foot cells straight, cylindrical, 24–37 x 6–8 µm, followed by a shorter cell. – Conidia borne singly, ovoid to doliiform, 24–37.5 x 15–18.5 µm.

Material examined. – On leaves of *Kydia calycina* ROXB. (Malvaceae), Tamil Nadu, Nilgiris, Sri Madurai, 28.1.1990, V.B. HOSAGOUDAR HCIO 30347 (Holotype).

Oidium kydiae is similar to *O. schmiedeknechtii* BRAUN, reported on *Urena lobata* L. from Taiwan but differs in having dense epiphyllous colonies and ovoid to doliiform conidia.

9. *Oidium moringae* V.B. HOSAGODAR, sp. nov. – Plate 2, Fig. 9.

Plagulae epiphyllae, densae, raro confluentes. Hyphae rectae, ramosae, septatae, 6–8 μ m crassae. Appressoria lobata. Conidiophora recta, erecta, 52–84 μ m longa; cellula basalis recta, cylindracea, 15–53 x 6–9.5 μ m, cellulae subsequentes breviores. Conidia solitaria, ovoidea vel ellipsoidea, 30–37 x 12–15.5 μ m.

Colonies epiphyllous, dense, rarely confluent. – Hyphae straight, branched, septate, 6–8 μ m wide. – Appressoria lobed. – Conidiophores straight, erect, 52–84 μ m long; basal cells straight, 15–53 x 6–9.5 μ m, followed by 1–2 shorter cells. – Conidia formed singly, ovoid to ellipsoidal, 30–37 x 12–15.5 μ m.

Material examined. – On leaves of *Moringa pterygosperma* GAERTN. (Morinaceae), Tamil Nadu, Nilgiris, Moyar, 21.1.1990, V.B. HOSAGODAR, HCIO 30348 (Holotype).

HIRATA (1966) has merely mentioned *Oidium* species on this host genus from Israel and BRAUN (1987) did not name them either.

10. *Oidium passifloracearum* V.B. HOSAGODAR, sp. nov. – Plate 2, Fig. 10.

Plagulae epiphyllae, tenues vel densae, confluentes. Hyphae rectae, septatae, ramosae, 4–8 μ m crassae. Appressoria mammaeformia, lobata. Conidiophora recta, erecta, ad 80 μ m longa; cellula basalis recta vel flexuosa, 45–55 x 8–12 μ m, cellulae subsequentes breviores. Conidia catenulata, catenis 2–4 sporis, ovoidea vel ellipsoidea, 30–60 x 10–15 μ m.

Colonies epiphyllous, thin to dense, confluent. – Hyphae straight, branched, septate, 4–8 μ m wide. – Appressoria mammeliform, lobed. – Conidiophores straight, erect, up to 80 μ m long; basal cells straight to flexuous, 45–55 x 8–12 μ m, followed by 1–2 smaller cells. – Conidia in chains of 2–4, ovoid to ellipsoidal, 30–60 x 10–15 μ m.

Material examined. – On leaves of *Passiflora foetida* L. (Passifloraceae), Tamil Nadu, Salem, Yercaud, National Orchidarium of the Botanical Survey of India, 17.1.1990, V.B. HOSAGODAR HCIO 30375 (Holotype).

Leveillula taurica (LÉV.) ARNAUD and *Ovulariopsis passiflorae* SYDOW are the only two species previously reported on this host genus. *Oidium passifloracearum* differs from the former species in having ovoid conidia, and from the latter species by its shorter conidiophores and epiphyllous infection spots which are not discoloured. HIRATA (1966) has reported an unidentified *Oidium* species

on *Tasconia* from South America. *Tasconia* is not present in India and the two collections are unlikely to be conspecific.

11. *Oidium ramakrishnanii* V.B. HOSAGOUDAR, nom. nov. – Plate 2, Fig. 11.

Bas.: *Oidium phyllanthi* NARAYANASWAMY & K. RAMAKRISHNAN. – Madras Univ. J. 37–38: 88, 1971. (non YEN, Cahiers du Pacifique 11: 106, 1967).

Colonies amphigenous, cauliculous, covering the entire aerial parts of the host and rarely causing hypertrophy. – Hyphae branched, septate, cells 4–6 μm wide. – Appressoria nipple-shaped. – Conidiophores straight, erect, 62–103.5 μm long; foot cells straight to flexuous, 31–34 x 4–6.5 μm . – Conidia in chains of 2–6, ovoid to cylindrical, guttulate, 15–18.5 x 7–12.5 μm .

Material examined. – On leaves, stems and petioles of *Phyllanthus amarus* SCHUM. (Euphorbiaceae), Tamil Nadu, Coimbatore, in the garden of the Botanical Survey of India, 5.10.1988, V.B. HOSAGOUDAR HClO 30373 (Neotype).

NARAYANASWAMY & RAMAKRISHNAN (1971) and YEN (1967) have both published the name *Oidium phyllanthi* for collections on *Phyllanthus* spp. Although they are homonyms, the collections are taxonomically different. The Indian collection differs from *O. phyllanthi* YEN in having smaller conidiophores, foot cells and conidia with guttules. The type material of *O. phyllanthi* NARAYANASWAMY & K. RAMAKRISHNAN is not available in the Tamil Nadu Agricultural University Herbarium. Hence, a collection from the type locality has been designated as a neotype.

This species is named in honour of late Prof. K. Ramakrishnan for his notable contributions to mycology.

12. *Sphaerotheca balsaminae* (WALLR.) KARI. – Ann. Univ. Turkuensis A, 2, 23: 99, 1957. – Plate 2, Fig. 12.

Anamorph: *Oidium*

Colonies amphigenous, dense, confluent. – Hyphae branched, septate, 4–6 μm wide. – Appressoria nipple-shaped, elongated. – Conidiophores erect, simple, 114–155 μm long; foot cells straight to slightly curved, 18–49.5 x 10–12.5 μm . – Conidia in chains of 4–6, ellipsoidal to doliiform, 31–34(–56) x 12–18.5 μm .

Material examined. – On leaves, petioles, flowers and fruits of *Impatiens chinensis* L. (Balsaminaceae), Tamil Nadu, Coimbatore, in the garden of the Botanical Survey of India, 28.12.1989, V.B. HOSAGOUDAR HClO 30353.

The anamorph of this species has been reported from Nagapur, Maharashtra (BILGRAMI & al., 1979; 1981). This is the first record from southern India on a new host species.

13. *Sphaerotheca crotonis* (PONNAPPA) BRAUN. — Mycotaxon 20: 484, 1984. — Plate 2, Fig. 13.

Syn.: *Kokkalera crotonis* PONNAPPA, Sydowia 23: 5, 1970.

Anamorph: *Oidium*

Colonies foliicolous, mostly hypophyllous, dense, confluent. — Hyphae septate, branched, 6–8 µm wide. — Appressoria mammelliform. — Conidiophores straight, erect, simple, 139–233 µm long; foot cells straight, cylindrical, 46–74.5 x 12–14 µm. — Conidia in chains of 6–10, ovoid to ellipsoidal, 20–40.5 x 15–18 µm.

Material examined. — On leaves of *Croton bonplandianum* BAILL. (Euphorbiaceae), Tamil Nadu, Coimbatore, P.N. Pudur, 8.8.1988, V.B. HOSAGUDAR HClO 40602.

PONNAPPA (1970) described *Kokkalera crotonis* on this host from Bangalore, Karnataka. After examination of the type, BRAUN (1984) synonymized *Kokkalera* PONNAPPA with *Sphaerotheca* LÉV. because of the catenate conidia and perithecial appendages. BRAUN (1987) stated that the original description of this taxon is insufficient and misleading.

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