

Foliar fungi of Western Ghats found on the plants of sacred groves in Dakshina Kannada and Udupi districts of Karnataka

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Trees or a patch of the natural forest, protected in *toto* are worshipped in the name of local deity. These are called sacred groves. These groves are rich in endemic and threatened plants, source of non-wood forest produce and source of several medicinal plants. This rich treasure is depleting because of the commercialization and modernization. Hence, an attempt has been made here to correlate their association with the microbes : foliar fungal biotrophs. Of the 71 plants of sacred groves in Dakshina Kannada and Udupi districts of Karnataka State, 38 are trees, 1-bamboo, 18-climbers and 14-erect shrubs, under shrubs and herbs. Of these, 25-trees, 1-bamboo, 9-climbers, 8-erect shrubs were found infected with 65-biotrophic fungi. Host-parasite relation and their symbiotic parasitism are yet to be studied.

Key words : Microfungi, sacred groves, Karnataka

Worshipping of plants and idols in India is known since time immemorial. Plants and animals or patches of forest protected, based on certain religious practices are considered as sacred places or sacred groves and are protected in *toto* due to the faith or fear associated with the local deity (Shetty *et al.* 2002).

Sacred groves are immensely valued because they harbour endemic and threatened plants. Sacred groves are the source of non-wood forest products like edible fruits, fodder and other useful plant products. Since they harbour several plants of medicinal value, they are known as 'God's own pharmacies' (Shetty *et al.* 2002).

However, the sacred groves are being fast disappearing because of the commercialization of the sacred places with the appearance of modern buildings to facilitate the devotees. As the plants are getting depleted because of human interference, climatic changes, etc., the microorganisms associated with them are also fast disappearing, thereby denying a chance to study their relationship with the plants. The plants of sacred groves in Dakshina Kannada (Mangalore) and Udupi districts

(Fig. 1) also occur in other parts of Western Ghats. Hence, a review of the fungi identified from plants collected from the Western Ghats, which are also found in the sacred groves of Dakshina Kannada (Mangalore) and Udupi districts are presented here.



Fig. 1 : Sketch-map of southern Karnataka

Host-parasite association

Plants	Fungi	References
Trees		
<i>Alstonia scholaris</i> (L.) R. Br.	<i>Meliola alstoniae</i> Koord.	Hosagoudar, 1996
<i>Aporosa lindleyana</i> (Wight) Baillon	<i>Asterina aporusae</i> Hansf. <i>Phyllachora shettyi</i> Hosag.	Hosagoudar & Agarwal, 2003 Hosagoudar, 1987
<i>Artocarpus gomezianus</i> Willich ex Trecul ssp. <i>zeylanicus</i> Jarrett	<i>Meliola atocarp</i> Yates var. <i>indica</i> Hosag. <i>et al.</i>	Hosagoudar, 1996
<i>Artocarpus hirsutus</i> Lam. (Fig. 9)	<i>Phyllachora microcenta</i> (Berk. & Broome) Sacc.	Kamat <i>et al.</i> 1978 ; Hosagoudar, 1990



Fig. 9 : *Phyllachora microcenta* (Berk. & Broome) Sacc.

<i>Barringtonia recemosa</i> (L.) Sprengel	<i>Meliola indica</i> Sydow & Sydow	Hosagoudar, 2003a
<i>Carallia brachiata</i> (Lour.) Merr.	<i>Meliola anisophylleae</i> Hansf. & Deight. var. <i>caralliae</i> Hosag. <i>et al.</i>	Hosagoudar, 1996
<i>Careya arborea</i> Roxb. (Figs. 4 & 5)	<i>Meliola careyae</i> (Stev.) Hosag. <i>Meliola careyae</i> (Stev.) Hosag. var. <i>indica</i> Hosag.	Hosagoudar, 2003a

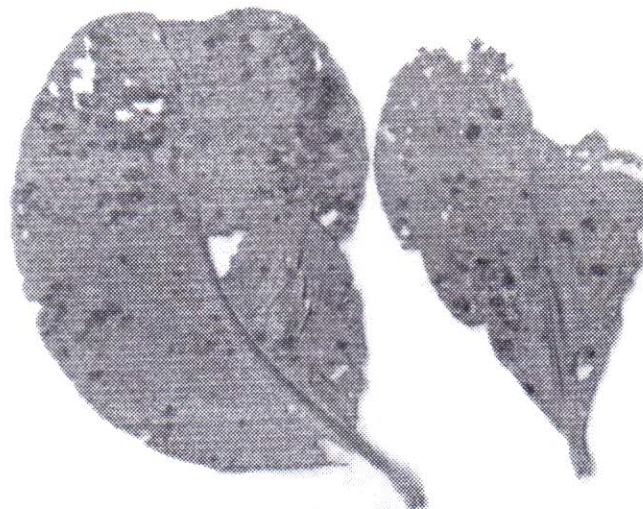


Fig. 4 : *Meliola careyae* (Stev.) Hosag. (Infected leaves)



Fig. 5 : *Meliola careyae* (Stev.) Hosag. (Seedling)

Caryota urens L.

Meliola caryotae
Srinivasulu

Hosagoudar, 1996

Cinnamomum verum J. S. Presl
(Fig. 2)

Armatella cinnamomi
Hansf. & Thirum.

Hansford &
Thirumalachar, 1948

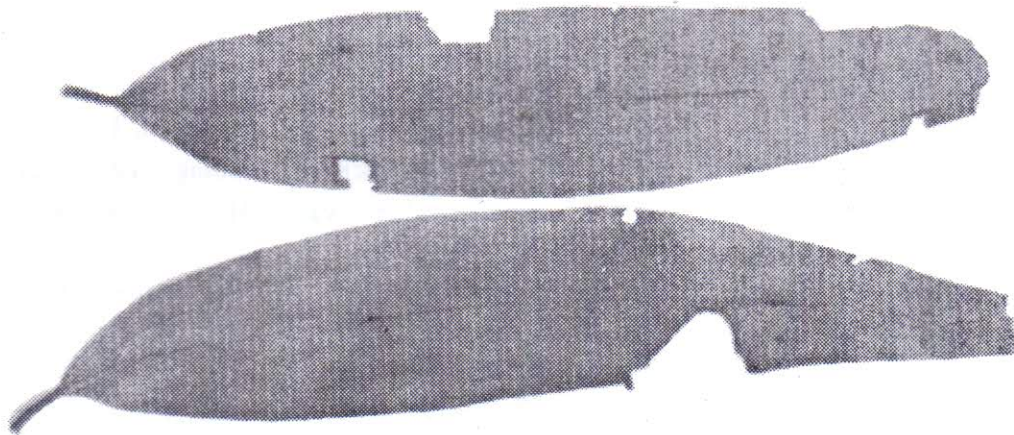


Fig. 2 : *Armatella cinnamomi* Hansf. & Thirum.

Diospyros candolleana Wight

Asteridiella eucleae Hansf. var.
microspora Hosag. & Raghu

Hosagoudar, 1996

Diospyros malabarica (Desr.) Kostel. *Meliola diospyri* Sydow
Ficus callosa Willd. *Phyllachora* sp.
Holigarna ferrugine Masrchand *Meliola holigarnae* Stev.
 (Figs. 6 & 7)

Hosagoudar, 1996
 Collected in Kerala State
 Hosagoudar, 1996 ; 2003c

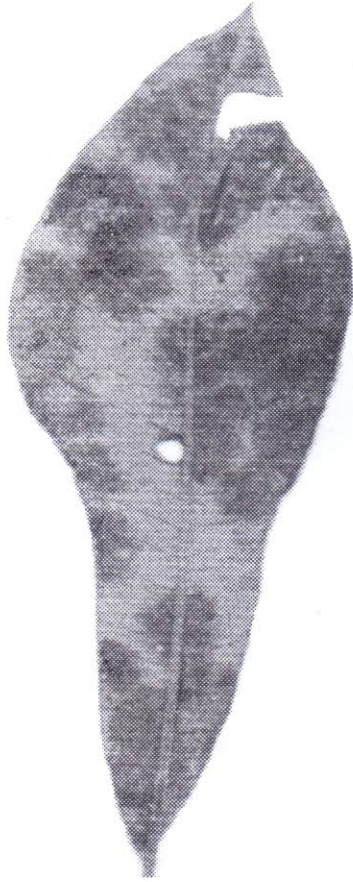


Fig. 6 : *Meliola holigarnae* (Stev.) (Infected leaf)



Fig. 7 : *Meliola holigarnae* Stev.
 (Close-up view of infected leaf)

Hopea parviflora Beddome
Hopea ponga (Dennst.) Mabb.
Hydnocarpus pentandra
 (Buch.-Ham.) Oken
Ixora brachiata Roxb.
Mallotus philippensis (Lam.)
 Muel.-Arg.

Asterina hopiicola
 Hosag. & Abraham
Asterina hopeae Hosag. & Kumar.
Meliola hydnocarpi Hansf. var.
indica Hosag. & Kumar.
Meliola randiicola Hansf.
Asteridiella malloti (Hansf. &
 Thirum.) Hansf.
Asterina mallotica Hosag. et al.
Phyllachora malloti Ramakr.,
 T.S. *Phyllachora mallotica*
 Seshadri *Questieriella malloti*
 Hosag. & Biju

Hosagoudar &
 Abraham, 1998c
 Hosagoudar, 2002a
 Hosagoudar, 2002c
 Hosagoudar, 1996
 Hosagoudar, 1996
 Hosagoudar & Agarwal, 2003
 Kamat et al. 1978
 Hosagoudar, 2004

Mangifera indica L.

Meliola mangiferae Earle

Hosagoudar, 1996

Asterolibertia mangiferae
Hansf. & Thirum.

Hansford &
Thirumalachar, 1948

Pajenelia longifolia (Willd.)
Schumann

Meliola crescentiae Stev.

Hosagoudar, 1996

(Fig. 3)

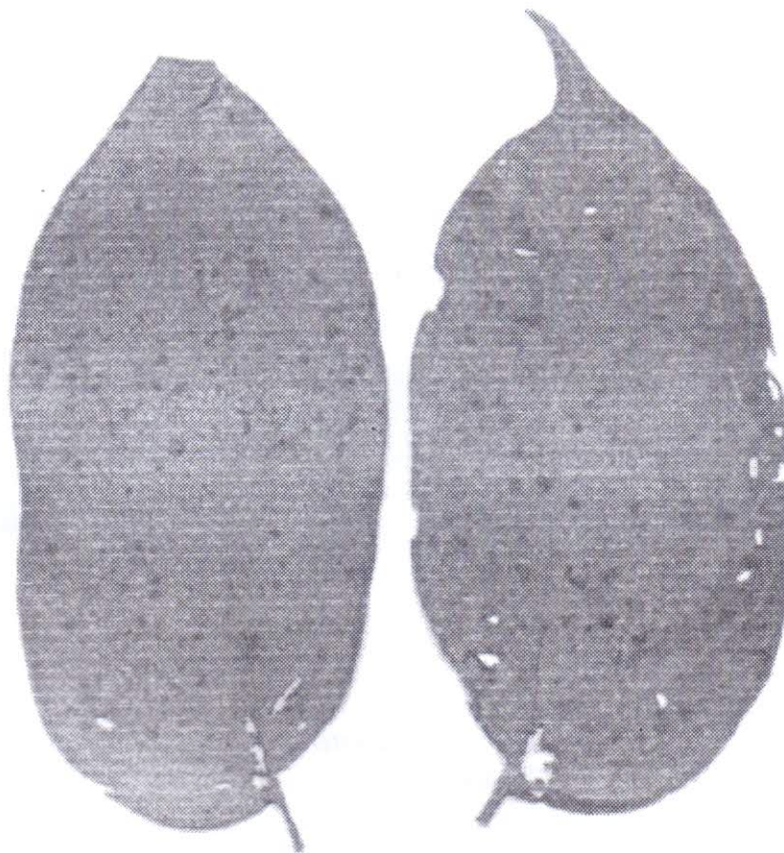


Fig. 3 : *Meliola crescentiae* Stev.

Pongamia pinnata (L.) Pierre

Meliola pongamiae Hosag. &
Abraham

Hosagoudar & Abraham, 1999

Phyllachora yapensis (Henn.)
Sydow ssp. *pongamiae* (Berk.
& Br.) Cannon

Cannon, 1991

Asperisporium pongamiae
(Sydow) Deight.

Ellis, 1976

Pterocarpus marsupium Roxb.

Meliola pterocarpi Yates

Hosagoudar, 1996, 2002d

Strychnos nuxvomica L.

Meliola petchii Hansf.

Hosagoudar, 1996

Meliola spigeliae Hansf.

Meliola strychnimultiflorae
Hansf.

Hosagoudar *et al.* 2003

Questieriella strychni Hosag.

Hosagoudar, 2004

Tabernaemontana heyneana Wallich

Meliola ervatamiae Hosag.

Hosagoudar, 1996

(Fig. 8)

Meliola pepparaensis Hosag.

Hosagoudar & Abraham, 1998a

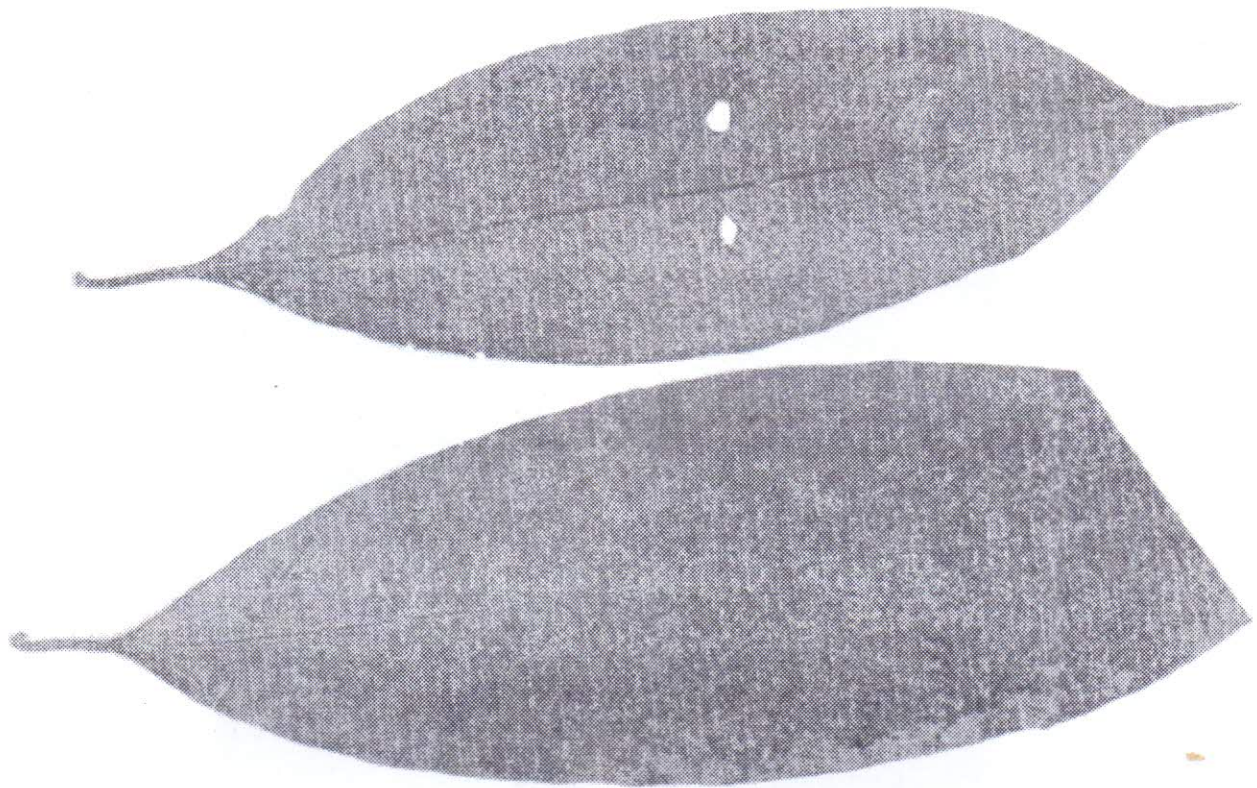


Fig. 8 : *Meliola pepparaensis* Hosag. & Abraham

<i>Vateria indica</i> L.	<i>Echidnodella vateriae</i> Hosag. & Kamar.	Hosagoudar, 2002b
Bamboos		
<i>Bambusa bambos</i> (L.) Voss	<i>Phyllachora bambusae</i> Sydow & Butler	Kamat <i>et al.</i> 1978
Climbers		
<i>Acacia sinuata</i> (Lour.) Merr.	<i>Meliola melanoxylonis</i> Hosag. & Pillai	Hosagoudar, 1996
<i>Alangium salvifolium</i> (L.f.) Wangerin	<i>Asterina balii</i> Sydow	Hosagoudar, 2002e
	<i>Asterostomella alangii</i> Hosag. & Mohanan	Hosagoudar, 2002e
<i>Calycopteris floribunda</i> Lam.	<i>Asteridiella combreti</i> (Stev.) Hansf. var. <i>leonensis</i> Hansf.	Hosagoudar, 1996
	<i>Asterina combreti</i> Sydow	Hosagoudar & Abraham, 1998b
<i>Cyclea peltata</i> (Lam.) Hook	<i>Meliola cycleae</i> Hosag.	Hosagoudar, 1996
<i>Gnetum ula</i> Brongn.	<i>Meliola gneti</i> Hansf.	Hosagoudar, 1996
<i>Hugonia mystax</i> L.	<i>Phyllachora hugoniae</i> Theiss. & Sydow	Kamat <i>et al.</i> 1978
	<i>Sarcinella hugoniae</i> Hosag. & Kama.	Hosagoudar, 2002f

<i>Jasminum malabaricum</i> Wight	<i>Meliola jasmini</i> Hansf. & Stev. <i>Meliola gamblei</i> Hosag.	Hosagoudar & Biju, 2003
<i>Smilax zeylanica</i> L.	<i>Meliola salleana</i> Hansf. var. <i>smilacis</i> Hosag. <i>Meliola smilacis</i> Stev.	Hosagoudar & Biju, 2003 Hosagoudar, 2003d
<i>Wattakaka volubilis</i> (L.f.) Stapf	<i>Asterina travencorensis</i> Sydow & Sydow	Hosagoudar & Goos, 1996 ; Hosagoudar <i>et al.</i> 1996

Erect Shrubs, undershrubs and herbs

<i>Canthium parviflorum</i> Lam.	<i>Meliola canthii</i> Hansf.	Hosagoudar, 1996
<i>Cassia tora</i> L.	<i>Sarcinella cassiae</i> Butler	Hosagoudar, 2002g
<i>Catunaregam spinosa</i> (Thunb.) Tirven.	<i>Tretospora thitei</i> Hosag. <i>et al.</i>	Hosagoudar <i>et al.</i> 1998
<i>Clerodendrum viscosum</i> Vent.	<i>Asteridiella clerodendricola</i> Hosag. <i>Asteridiella vivekananthanii</i> Hosag.	Hosagoudar, 1996 Hosagoudar, 1996
<i>Helicteres isora</i> L.	<i>Meliola clerodendricola</i> Henn. <i>Irenopsis helicteridis</i> Hosag.	Hosagoudar, 1996 Hosagoudar, 1996
<i>Ixora coccinea</i> L.	<i>Meliola randiicola</i> Hansf. <i>Meliola ixorae-coccineae</i> Hosag. & Pillai <i>Meliola thwaitesiana</i> Hansf. <i>Meliola ixorae</i> Yates var. <i>macrospora</i>	Hosagoudar, 1996 Hosagoudar, 1996 Hosagoudar, 1996 Hosagoudar, 1996 Hosagoudar, 1996
<i>Memecylon umbellatum</i> Burm. f.	<i>Meliola memecyli</i> Sydow & Sydow	Hosagoudar, 1996
<i>Pandanus fascicularis</i> Lam.	<i>Vestergrenia pandani</i> Chavan & Hosag.	Chavan & Hosagoudar, 1984

DISCUSSION

These fungi are parasites on the leaves and are host specific. They never caused any appreciable symptoms on the host plants. Though these fungi get nourishment from the host plants, there must be a reciprocation of the nutrients from the fungi to the host plants also. Otherwise, host would have resisted and responded to the infection by producing the appreciable symptoms. Hence, these parasites are known as "Symbiotic parasites". Hence, a detailed study on the host-parasite relation and their mutualistic approach is awaited.

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REFERENCES

- Cannon, P. F. 1991. A revision of *Phyllachora* and some similar genera on the host family Leguminosae. *Mycol. Pap.* 163 : 1-302.
- Chavan, P. B. and V. B. Hosagoudar 1984. Three new fungi from Satara, Maharashtra, India. *J. Econ. Taxon. Bot.* 5 : 447-450.
- Ellis, J. L. 1976. *More Dematiaceous Hyphomycetes*. CMI,

- Kew, Surrey, England, pp. 507.
- Hansford, C. G. and Thirumalachar 1948. Fungi of South India. *Farlowia* **3** : 285-314.
- Hosagoudar, V. B. 1987. A new tar spot disease on *Aporusa lindleyana* (Wight) Baill. from Idukki, Kerala, India. *J. Econ. Taxon. Bot.* **11** : 185-187.
- Hosagoudar, V. B. 1996. Meliolales of India. Botanical Survey of India, Calcutta, pp. 363.
- Hosagoudar, V. B. 1990. Meliolales of India. Botanical Survey of India, Calcutta, pp. 363.
- Hosagoudar, V. B. and Goos, R. D. 1996. Some foliicolous fungi from southern India. *Mycotaxon* **59** : 149-166.
- Hosagoudar, V. B., Balakrishnan, N. P. and Goos, R. D. 1996. Some *Asterina* species from southern India. *Ibid.* **59** : 167-187.
- Hosagoudar, V. B. and Abraham, T. K. 1998a. Some Meliolaceae from Kerala, India. *Sydowia* **50** : 14-20.
- Hosagoudar, V. B. and Abraham, T. K. 1998b. Some interesting foliicolous thyrtotheceous Ascomycetes from Kerala. *Indian Phytopathol.* **51** : 389-392.
- Hosagoudar, V. B. and Abraham, T. K. 1998c. Four new foliicolous Ascomycetes from Kerala, India. *Mycol. Res.* **102** : 184-86.
- Hosagoudar, V. B., Nasim Ahmad and Sarbhoy, A. K. 1998. *Tretospora thetei* sp. nov. from Maharashtra. *Indian Phytopathol.* **51** : 387-388.
- Hosagoudar, V. B. and Abraham, T. K. 1999. Some interesting members of the Meliolaceae from Kerala, India. *Nova Hedwigia* **68** : 477-487.
- Hosagoudar, V. B. 2002a. Studies of foliicolous fungi—IV. A new species of *Asterina* and key to other species on Dipterocarpaceae. *Zoos' Print J.* **17** : 815-816.
- Hosagoudar, V. B. 2002b. Studies of foliicolous fungi—X. Five new species and a new record. *Zoos' Print J.* **17** : 943-948.
- Hosagoudar, V. B. 2002c. Meliolaceae of Kerala—XIV. *Zoos' Print J.* **17** : 747-751.
- Hosagoudar, V. B. 2002d. Meliolaceae fungi on rare medicinal plants in southern India. *Zoos' Print J.* **18** : 1147-1154.
- Hosagoudar, V. B. 2002e. Asterinaceae of India. *Zoos' Print J.* **18** : 1280-1285.
- Hosagoudar, V. B. 2002f. Studies of foliicolous fungi—V. Two new species and validation of *Sarcinella* species. *Zoos' Print J.* **17** : 835-838.
- Hosagoudar, V. B. 2002g. The genus *Schiffnerula* and its synanamorphs. *Zoos' Print J.* **18** : 1071-1078.
- Hosagoudar, V. B. 2003a. Meliolaceae of Kerala, India—XII. The genus *Meliola* on Lecythidaceae members in India. *Persoonia* **18** : 1-3.
- Hosagoudar, V. B. 2003b. Meliolaceae fungi on rare medicinal plants in southern India. *Zoos' Print J.* **18** : 1147-1154.
- Hosagoudar, V. B. 2003c. Endemic Meliolas and Meliolas on Endemic plants in the Western Ghats of peninsular India. *Zoos' Print J.* **18** : 1243-1252.
- Hosagoudar, V. B. 2003d. Meliolaceae of Kerala, India—XVII. New species, new variety and new records. *Zoos' Print J.* **18** : 1061-1064.
- Hosagoudar, V. B. and Agarwal, D. K. 2003. Studies on foliicolous fungi—IX. *Indian Phytopathol.* **56** : 98-101.
- Hosagoudar, V. B. and Biju, H. 2003. Host range of *Meliola Jasmini* Hansf. & Stev. *New Botanist* **30** : 153-162.
- Hosagoudar, V. B., Biju, C. K., Abraham, T. K. and Agarwal, D. K. 2003. Meliolaceae of Kerala, India—XI. *Indian Phytopathol.* **58** : 102-104.
- Hosagoudar, V. B. 2004. Studies of foliicolous fungi—VIII. *J. Econ. Taxon. Bot.* **28** : 196-201.
- Kamat, M. N., Seshadri, V. S. and Pande, A. A. 1978. A Monographic study of Indian species of *Phyllachora*. UAS Hebbal, Bangalore.
- Shetty, B. V., Kaveriappa, K. M. and Gopalakrishna Bhat, K. 2002. *Plant Resources of Western Ghats and Lowlands of Dakshina Kannada and Udupi Districts*. Pilikula Nisarga Dhama Society Moodushedde, Mangalore, pp. 264.

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