

ENDOGENACEAE OF INDIA: TWO NEW SPECIES

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During studies on endomycorrhiza of forest trees in India (Thapar & Khan, 1973; Bakshi, 1974), two new species, one belonging to *Glomus* and the other to *Sclerocystis*, were found. The two new species which are herein described were isolated from the rhizosphere and soils under a variety of species by wet-sieving and decanting (Gerdemann & Nicholson, 1963). In view of the constant association of these fungi with the roots of specific trees in which typical endotrophic mycorrhizal infections occurred, mycorrhizal associations are presumed.

***Glomus multicaulis* Gerdemann & Bakshi**
sp. nov. (Figs. 1-4)

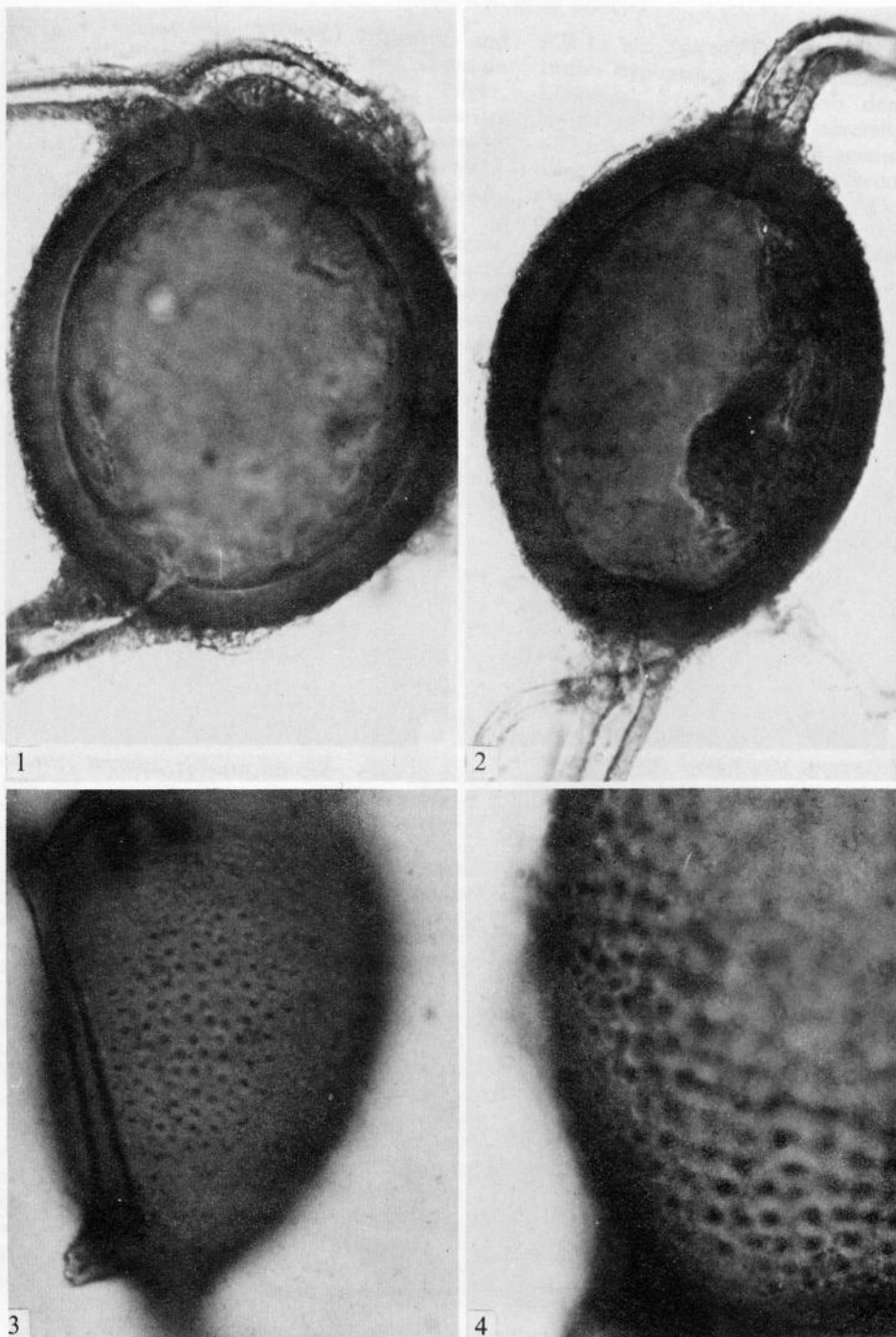
Sporocarpia ignota. Chlamydo-sporeae atrobunneae, 149-249 × 124-162 μm, ellipsoideae, late ellipsoideae, subgloboseae, vel nonnumquam triangulares, in puncto uno vel duobus, tribus vel quattuor hyphis adjunctae, plerumque in sporarum regionibus contrariis. Tunica sporarum 8.6-34 μm crassa, ubi hyphis adjuncta maxime incrassata, superficie a bossulis 1.2-3.7 μm altis ad intervalla aequa distributis ornata.

Sporocarpia unknown. Chlamydo-spores dark brown 149-249 × 124-162 μm, ellipsoidal, broadly ellipsoidal, subglobose or occasionally triangular, with 1-4 hyphal attachments, attachments generally occurring at opposite ends of spores. Spore wall 8.6-34 μm, thickest at points of hyphal attachments, rounded projections 1.2-3.7 μm long regularly distributed over wall surface.

Type collection: F.R.I. No. 8273 (in lactophenol), compartment 10, Demonstration Forest, Forest Research Institute, alt. 690 m, Dehra Dun, Uttar Pradesh, India, hypogeous under *Diospyros peregrina*, (Gaertn.) Gürke, Sept., 1974. Also deposited in the herbarium, Oregon State University, U.S.A.

Distribution, habitat and season.: Hypogeous, collected under hardwood stands, Demonstration Forest, F.R.I. Dehra Dun, Uttar Pradesh, India. Generally found throughout the year, abundant from September to April.

Mycorrhizal associations: Chlamydo-spores most abundant in the rhizosphere and soil under the following species: *Diospyros peregrina* (Gaertn.)



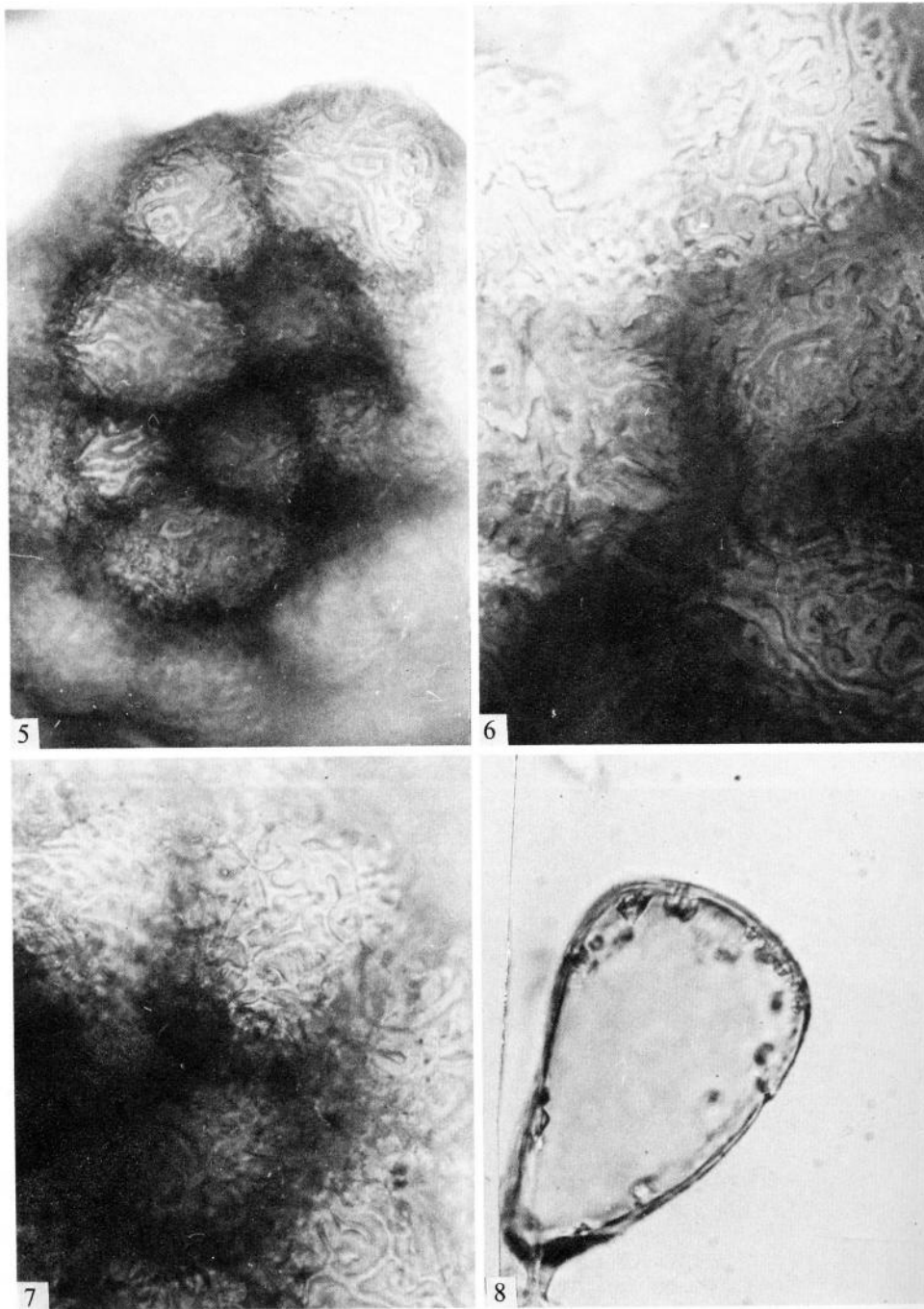
Glomus multicaulis

Fig. 1. Chlamydospore with three hyphal attachments ($\times 415$).

Fig. 2. Chlamydospore with two hyphal attachments ($\times 415$).

Fig. 3. Surface of a chlamydospore showing the regular distribution of protuberances on the wall ($\times 390$).

Fig. 4. Surface of a chlamydospore showing protuberances on the wall ($\times 666$).



Sclerocystis sinuosa

Fig. 5. Sporocarp showing a peridium composed of thick-walled hyphae covering the chlamydospores ($\times 375$).

Figs. 6-7. A peridium enlarged. The thick structures form from the close union of walls of adjacent hyphae ($\times 640$).

Fig. 8. Chlamydospore from a sporocarp ($\times 640$).

Gürke, *Fraxinus uhdei* (Wenz.) Lingelsh. and *Lagerstroemia speciosa* (L.) Pers.; less common under the species *Podocarpus gracilior* Pilger, *Acrocarpus fraxinifolius* Wight & Arn, *Aleurites fordii* Hemsl., *Albizia odoratissima* Benth., *Dendrocalamus strictus* Nees, *Michelia champaca* L., *Syzygium cumini* (L.) Skeels, *Tectona grandis* L. f.

This species is unique in normally having more than one hyphal attachment. Multiple attachments occasionally occur on chlamydospores of *Glomus mosseae* (Nicol. & Gerd.) Gerd. & Trappe and *G. fasciculatus* (Thaxter) Gerd. & Trappe (Gerdemann & Trappe, 1974) but they are relatively infrequent. It is also distinguished by its extremely thick wall, over which rounded protuberances are evenly dispersed.

The spores of *G. multicaulis*, particularly those with attachments at opposite ends, are suggestive of zygospores. However, the resemblance is probably superficial. The attachments are thick-walled and closely resemble those formed by other *Glomus* species. They do not resemble gametangia or suspensors. A study of spore development would be highly desirable.

Sclerocystis sinuosa Gerdemann & Bakshi sp. nov. (Figs. 5-8)

Sporocarpium brunnei, 248-412 μm diam, globosi, subglobosi vel pulvinati, frequenter e sporis protrusis tuberculati. Peridia 6.2-19.7 μm , arcte sporocarpos investientia, e hyphis crasse tunicatis, sinuosis composita. Chlamydosporae 45-118 \times 30-83 μm , obovatae, ellipticae, fusiformi-ellipticae, vel clavatae, stratum unum e globo intertexto centrali hypharum radiatum constituentes. Tunicae chlamydosporarum brunneae, 1.3-4.9 μm crassae, plerumque prope basim maxime incrassatae.

Sporocarps brown, 248-412 μm diam, globose, subglobose to pulvinate, often tuberculate from protruding spores. Peridia 6.2-19.7 μm , tightly enclosing sporocarps, composed of thick-walled sinuous hyphae. Chlamydospores 45-118 \times 30-83 μm , obovate, elliptical, fusiform-elliptical to clavate, radiating out in a single layer from a central plexus of hyphae. Chlamydospore walls brown, 1.3-4.9 μm thick, generally thickest near spore base.

Type collection. F.R.I.: No. 8274 (in lactophenol), compartment 8, Demonstration Forest,

F.R.I., alt. 690 m, Dehra Dun, Uttar Pradesh, India: hypogeous under *Fraxinus uhdei* (Wenz) Lingelsh., Sept. 1974. Also deposited in the herbarium, Oregon State University, U.S.A.

Distribution, habitat and season: Hypogeous, common under conifer and hardwood stands in the Demonstration Forest, F.R.I., Dehra Dun and Nainital, Uttar Pradesh; Rajahmundry, Andhra Pradesh; Godhra, Gujarat; Kulu and Sawra, Himachal Pradesh; Amarkantak and Bori, Madhya Pradesh, India. Generally found throughout the year, abundant during August-September in the New Forest.

Mycorrhizal associations: Sporocarps were found in the rhizosphere and soils under the following species: *Agathis robusta* (C. Moore) F. M. Bailey, *Cupressus torulosa* D. Don, *Podocarpus gracilior* Pilger, *Acrocarpus fraxinifolius* Wight & Arn., *Juniperus procera* Hochst., *Albizia odoratissima* Benth., *Cinnamomum camphora* (L.) Nees & Eberm., *Diopyros peregrina* (Gaertn.) Gürke, *Fraxinus uhdei* (Wenz.) Lingelsh., *Litsea glutinosa* (Lour.) C. B. Robinson, *Syzygium cumini* (L.) Skeels, *Dalbergia sissoo* Roxb., *Tectona grandis* L. f., *Taxodium mucronatum* Tenore, *Cryptomeria japonica* D. Don and *Salix fragilis* L.

The thick-walled sinuous hyphae that tightly enclose the sporocarps easily distinguish *S. sinuosa* from all other *Sclerocystis* species. The internal projections in spores (Fig. 8) are probably formed in response to parasitic attack by other soil microorganisms.

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