

***Navisporus floccosus* causing heart rot in tropical trees**\*R.K. Verma<sup>1</sup>, Vimal Pandro<sup>2</sup> and Poonam Verma<sup>3</sup><sup>1</sup>Forest Pathology Discipline, Forest Protection Division,<sup>2</sup>Genetics and Tree Improvement Division,

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**Received :** 18.02.2020; **Accepted :** 12.04.2020**ABSTRACT**

*Navisporus floccosus* causing heart rot in tropical trees (*Dalbergia sissoo*, *D. latifolia*, *Ficus bengalensis*, *Pongamia pinnata* and *Shorea robusta*) is reported from Chhattisgarh, Madhya Pradesh and Odisha. Worldwide distribution of eight other species of the genus is also discussed.

Figures : 17

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KEY WORDS : Butterfly communities, Climatic factors, Pollution, Population dynamics, Species richness.

**Introduction**

Eight species of tropical poroid fungus genus, *Navisporus* (family Polyporaceae) are known. The genus was established by Leif Ryvarden with *Navisporus floccosus* as the type species. Earlier it was reported as *Trametes floccosa*<sup>3</sup> and was thought to have been originally collected in Tanzania<sup>12</sup>. Species of this genus have pale brown context and a dimitic hyphal system, meaning they have both generative and skeletal hyphae. The genus is very close to *Pseudopiptoporus* simultaneously with *Navisporus*, but with dextrinoid skeletal hyphae, lacking gloeopleurous hyphae. *Navisporus* spores are long, boat-shaped (navicular) and non-dextrinoid<sup>16</sup>. *N. terrestris* is the only species in the genus that has a fruit body with a stipe and also the only member of the genus that fruits on soil. All of the other species fruit as a stipeless (sessile) cap on dead wood, or alternately in effused-reflexed form *i.e.* a crust fungus with margins which form caps<sup>6</sup>. Another root-rot disease of *Dalbergia sissoo* caused by *Amauroderma niger* has been studied and reported. The pathogen has been described as a new record for India along with cultural characters. The pathogenicity has been established through artificial inoculation. The disease spreads from

tree to tree through root contact<sup>8</sup>. *Navisporus floccosus* also causing heart rot in *Alianthus excelsa*, the fungus decayed mostly heartwood of living tree and colonized the central portion of stem which begins decaying of wood and ultimately lead to death of infected tree<sup>10</sup>.

In the present article *Navisporus floccosus* causing heart rot in tropical trees of Chhattisgarh, Madhya Pradesh and Odisha is reported alongwith a report on worldwide distribution of eight other species of the genus.

**Materials and Methods****Study sites**

Specimens were collected from Chhattisgarh, Madhya Pradesh and Odisha. Five specimens were collected from Chhattisgarh and Madhya Pradesh, these include on stems of *Pongamia pinnata* and *Dalbergia sissoo* from Jabalpur, Madhya Pradesh; on *Ficus bengalensis* and *Dalbergia latifolia* from Gariabandh, Ballod, Bhilai Nagar and on *Shorea robusta* from Kondagao (Chhattisgarh). One specimen was collected on *Ficus bengalensis* from Natavega (Odisha).

**Collection of samples**

Samples were collected in paper bags; sun dried and brought to laboratory for study. A portion of fresh

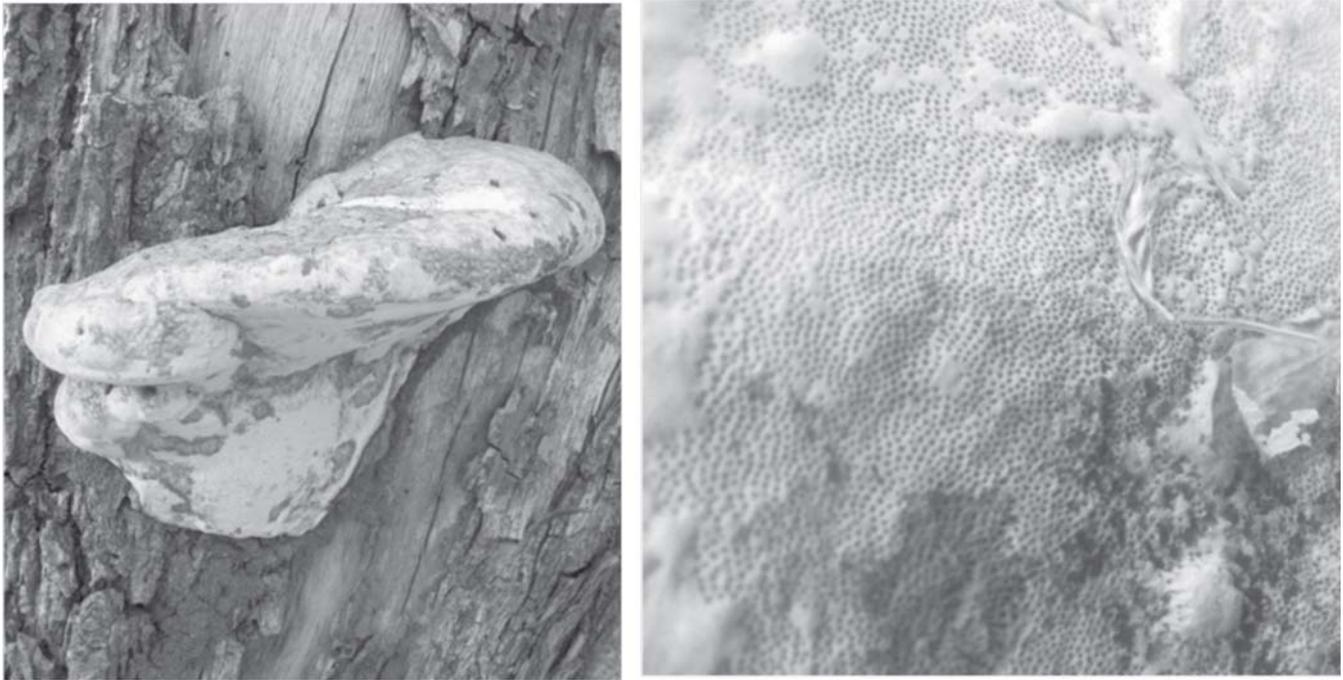
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**TABLE-1: Distribution of *Navisporus floccosus* on different tree species in central India**

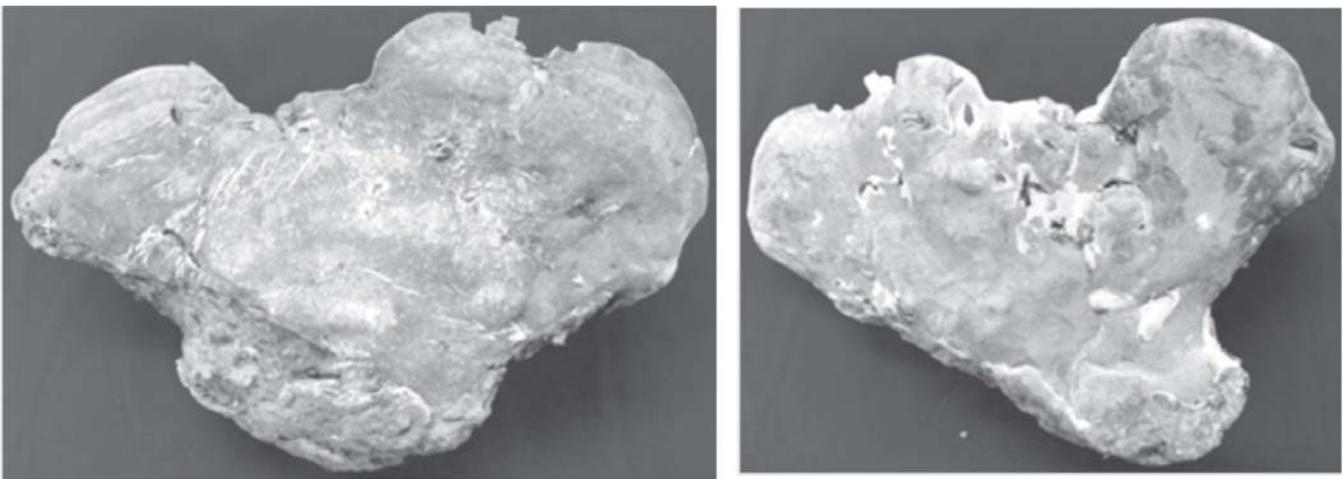
S.N.	Date of collection	Accession Number	Host	Locality
1.	07/07/1987	TF 990	<i>Pongamia pinnata</i>	Jabalpur, Madhya Pradesh
2.	01/10/2008	TF 1787	<i>Ficus bengalensis</i>	Gariabandh, Chhattisgarh
3.	3/10/2008	TF 1909	<i>Shorea robusta</i>	Kondagao, Chhattisgarh
4.	11/9/2009	TF 2434	<i>Ficus bengalensis</i>	Natavega, Bhanjnagar, Odisha
5.	19/08/2011	TF 3122	<i>Ficus bengalensis</i>	Ballod, Durg, Chhattisgarh
6.	21/10/2016	TF 3851	<i>Dalbergia sissoo</i>	Jabalpur, Madhya Pradesh
7.	04/2/2017	TF 4063	<i>Dalbergia sissoo</i>	Bhilai Nagar, Durg, Chhattisgarh
8.	05/2/2017	TF 4065	<i>Dalbergia latifolia</i>	Rajhara, Balod, Chhattisgarh



**Figs. 1-2 : *Navisporus floccosus* on dead tree of *Dalbergia sissoo*: fruit bodies attached to main stem in habit (TF 3851)**



**Figs. 3-4 : *Navisporus floccosus* on *Dalbergia sissoo*: fruit bodies attached to main stem in habit and details of pore surface (TF 4063)**



**Figs. 5-6 *Navisporus floccosus* on *Ficus bengalensis*, Gariabandh, CG (TF 1787)**

specimen was preserved in 70% alcohol in the field just after the collection for preparation of microscopic slides.

#### Identification of fungi

The slides were prepared in lactophenol and cotton blue and observed under advance Research Microscope, make Leica, Germany and photomicrographs were taken with a digital camera attached to the microscope. Identification of fungi was done with the help of literature<sup>1-3,6,7,10-12,16</sup>. The specimens were deposited in the Mycology Herbarium, Tropical Forest Research Institute, Jabalpur and got accession numbers.

#### Results

***Navisporus floccosus* (Bres.) Ryvarden** (Figures 1-17)

= *Fomes introstuppeus* Henn. *Bot. Jb.* 14: 343 (1891) [1892]

= *Ganoderma mollicarnosum* (Lloyd) Sacc. & Trotter [as '*molli-carnosum*'], *Syll. fung.* (Abellini) 23: 401 (1925)

= *Polyporus mollicarnosus* Lloyd *Mycol. Writ.* 4 (*Letter 60*): 11 (1915)

= *Trametes floccosa* Bres. *Annuaire. R. Ist. bot. Roma* 6: 179 (1896)

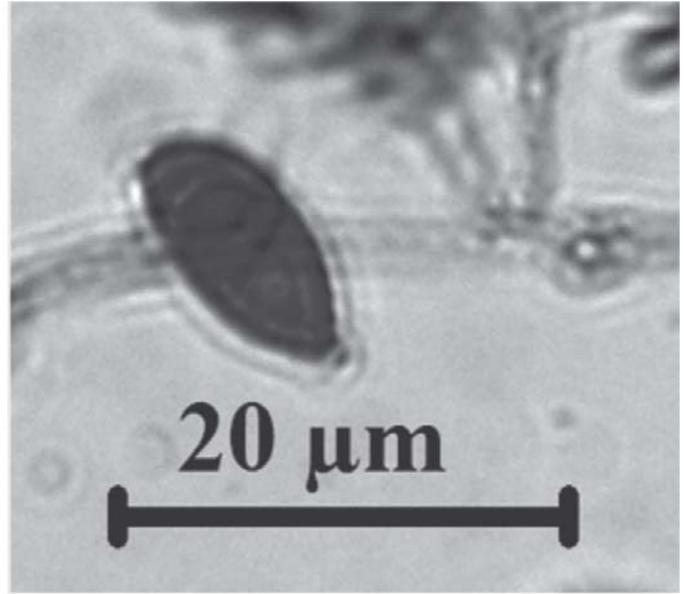
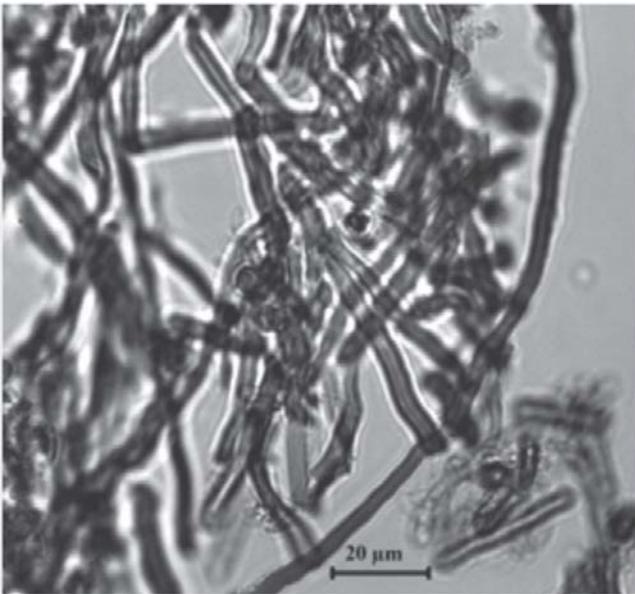
= *Tyromyces floccosus* (Bres.) A. Roy & A.B. De (as '*floccosa*') *Norw. JI Bot.* 27(4): 300 (1980)

#### Taxonomic Description:

Basidiome: annual, solitary, soft and fleshy when young coriaceous and punky when dry, sessile, pileate,



**Figs. 7-8 *Navisporus floccosus* on *Dalbergia latifolia*: fruit body in habit and pore surface (TF 4063)**

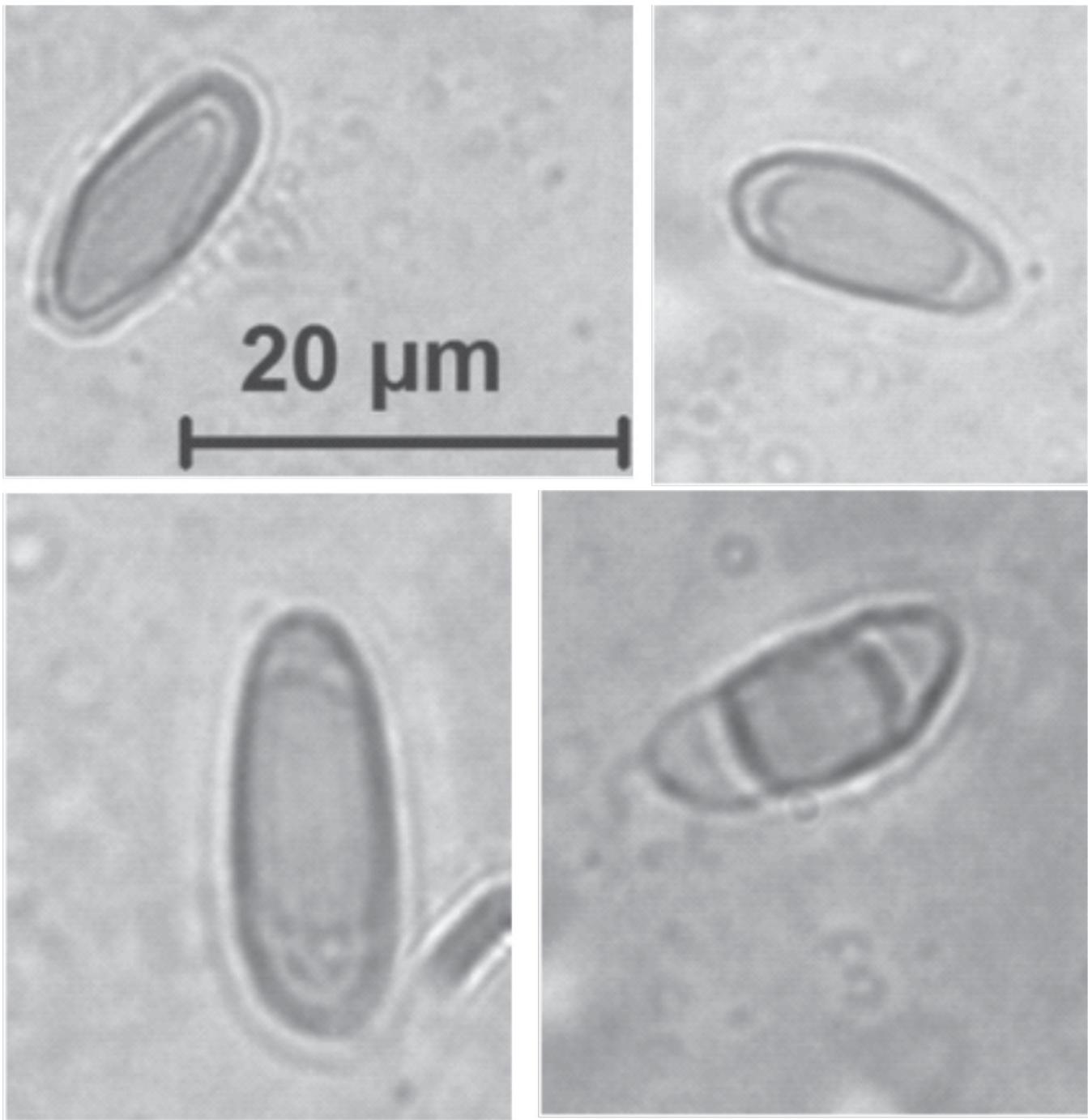


**Figs. 9-10 *Navisporus floccosus* on *Ficus bengalensis*: 1-2 Upper and hymenium surfaces of fruit body, 3 generative hyphae and 4 basidiospore**

dimidiate, applanate, 390 x 200 x 180mm, 20-50mm from the margin. Pileus ochraceous to brown when young changing dark brown with the age, soft and spongy, scrupose towards base, azonate. Context: light to sepia brown. Hymenium: cream to ochraceous, pores round to angular 2-3/mm. Hyphal system: monomitic, generative hyphae hyaline thin walled, clamped, up to 6.0  $\mu\text{m}$  wide.

Basidia: clavate. Basidiospores: boat shape, hyaline, thin-walled, 9.0-12.0x 4.0-5.5  $\mu\text{m}$ . The fungus is causing white fibrous rot in wood.

**Specimens examined:** On stem of *Pongamia pinnata*, Jabalpur, Madhya Pradesh; on *Ficus bengalensis*, Gariabandh and Ballod, Durg; on *Shorea robusta* Kondagoao, Chhattisgarh, on *Ficus bengalensis*



**Figs. 11-14 *Navisporus floccosus* on *Dalbergia sissoo*: boat shaped basidiospores in different views (TF 3851)**

Natavega, Odisha, on *Dalbergia sissoo* Jabalpur, Madhya Pradesh and Bhilai Nagar, Durg; on *Dalbergia latifolia*, Rajhara, Balod, Chhattisgarh; Mycology Herbarium, Tropical Forest Research Institute, TF 990, 1787, 1909, 2434, 3122, 3851, 4063 and 4065.

Details of specimens collected and studied in the present study are presented in Table 1.

Eight species of *Navisporus* including *Navisporus floccosus* are reported from the World (Table 2). In India

it was reported from Darjeeling, Calcutta, West Bengal and Andhra Pradesh<sup>5,6,9,11</sup>. From central India it is reported from Chhattisgarh and Odisha<sup>17</sup>. From Madhya Pradesh is being reported for the first time on *Pongamia pinnata* and *Dalbergia sissoo* in this article.

### Discussion

Eight species under genus *Navisporus* are known which are reported from different regions of the world. *Navisporus africanus* was reported on dead hardwoods



**Fig. 15 : *Navisporus floccosus* on *Pongamia pinnata*: boat shaped basidiospores (TF990)**



**Fig. 16 : *Navisporus floccosus* on *Dalbergia latifolia*: boat shaped basidiospore (TF4065)**

from Democratic Republic of the Congo<sup>13</sup>. *N. minutus* was reported on dead hardwood log from Cameroon<sup>14</sup>. *N. floccosus* was reported from Africa, Mexico, Cuba, South America and Darjeeling, West Bengal<sup>11</sup>. *Navisporus ortizii*

was reported on trunk of *Licaria jamaicensis* from Cuba<sup>1</sup>. *N. perennis* was reported on hardwood log from Venezuela<sup>15</sup>. *N. reflexus* on dead hardwood log from Central African Republic<sup>14</sup>. *N. sulcatus* was reported on dead wood from Brazil, South America; French Antilles and United States and *N. terrestris* on soil near *Caesalpinia echinata* from Brazil<sup>7</sup>.

From India, *Navisporus floccosus* was reported on different hosts including *Aegle marmelos*, *Artocarpus integrifolia*, *Casuarina equisetifolia*, *Dalbergia sissoo*, *Ficus religiosa*, *F. bengalensis*, *Mimusops elengi*, *Saraca indica*, *Shorea robusta*, *Tamarindus indica* and *Terminalia arjuna*, from West Bengal<sup>2,4,5</sup>; on *Ficus bengalensis* from Kondagoan and Balod, Chhattisgarh and on *Pongamia pinnata*<sup>17</sup>. A similar fungus, *Amauroderma niger* causing root-rot disease in *Dalbergia sissoo* was reported from Dehradun<sup>8</sup>. *N. floccosus* causing heart rot in living trees of *Ailanthus excelsa* was reported along with cultural characters of fungus. The fungus decayed mostly heartwood of living tree by colonizing the central portion of trees ultimately lead to death of trees. Fruiting bodies of the fungus was produced outside the trunk after falling of affected trees<sup>9</sup>.

### Conclusion

Distribution of *Navisporus floccosus*, a macro-fungus, causing heart

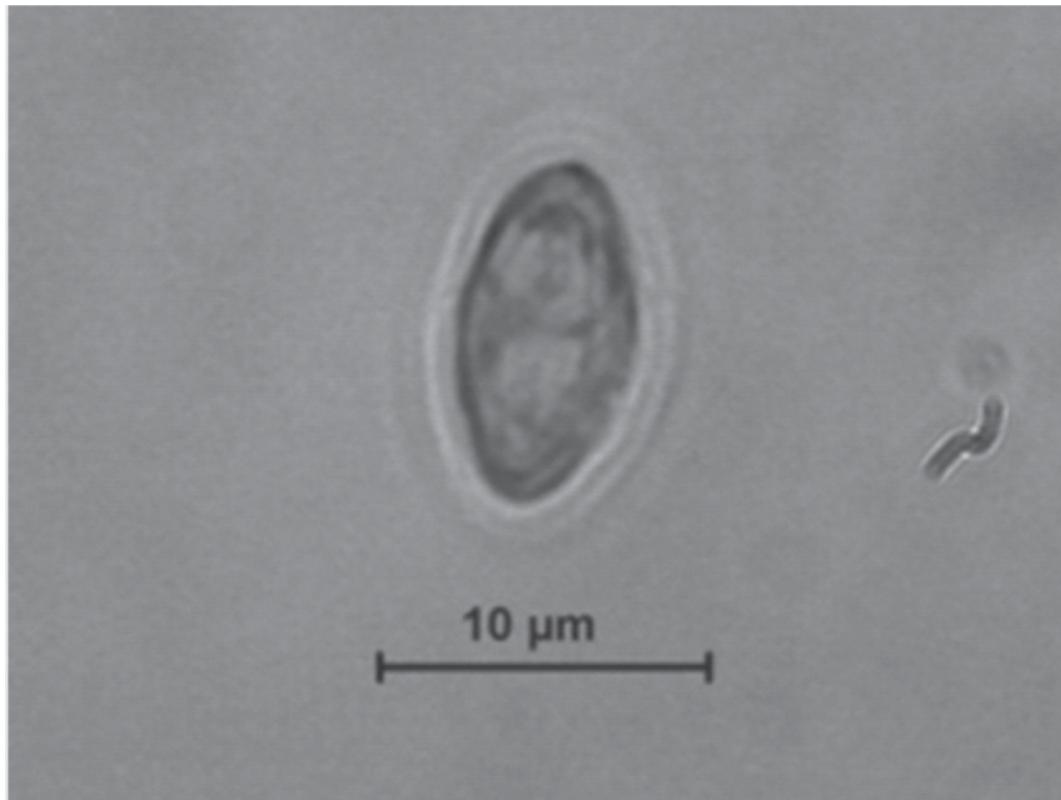
rot in tropical trees (*Dalbergia sissoo*, *D. latifolia*, *Ficus bengalensis*, *Pongamia pinnata* and *Shorea robusta*) in Chhattisgarh, Madhya Pradesh and Odisha is given alongwith worldwide distribution of eight species of the genus, *Navisporus*.

TABLE-2 : World-wide distribution of known species of *Navisporus* from world

SN	Name of fungus	Habitat	Distribution	Reference
1.	<i>Navisporus africanus</i> Ryvarden	On dead hardwoods	Democratic Republic of the Congo	Ryvarden (2000)
2.	<i>Navisporus floccosus</i> (Bres.) Ryvarden = <i>Trametes floccosa</i> Bres.	Dead wood	Africa, Mexico; Cuba; South America and India (Darjeeling, Calcutta, West Bengal, Andhra Pradesh and central India)	Prasher and Lalita (2015); De (1996, 2006); Nagadesi and Arya (2013) This article
3.	<i>Navisporus minutus</i> Ryvarden	On dead hardwood log	Cameroon	Ryvarden (2018)
4.	<i>Navisporus ortizii</i> S. Herrera & Bondartseva	On trunk of <i>Licaria jamaicensis</i>	Cuba	Bondartseva, and Errera (1989)
5.	<i>Navisporus perennis</i> Ryvarden & Iturr.	On hardwood log	Venezuela	Ryvarden and Iturriaga (2003)
6.	<i>Navisporus reflexus</i> Ryvarden	On dead hardwood log	Central African Republic	Ryvarden (2018)
7.	<i>Navisporus sulcatus</i> (Lloyd) Ryvarden = <i>Trametes sulcata</i> Lloyd	On dead wood	Brazil, South America; French Antilles; United States	Lloyd (1983)
8.	<i>Navisporus terrestris</i> Gibertoni & Ryvarden	On soil near <i>Caesalpinia echinata</i>	Rio Grande do Norte, Brazil	Gibertoni et al. (2004)

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**Fig. 17 *Navisporus floccosus* on *Dalbergia sissoo*: boat shaped basidiospore (TF4063)**

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