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Navisporus floccosus causing heart rot in tropical trees
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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.

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 and was thought to have been originally collected in Tanzania. 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. 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. 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. 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.

In the present article Navisporus floccosus causing heart rot in tropical trees of Chhattisgarh, Madhya Pradesh and Odisha is reported along with 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
# TABLE-1: Distribution of *Navisporus floccosus* on different tree species in central India

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

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 floccossus* on *Dalbergia sissoo*: fruit bodies attached to main stem in habit and details of pore surface (TF 4063)

Figs. 5-6 *Navisporus floccossus* 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\(^1\)-\(^3\),\(^6\)-\(^7\),\(^10\)-\(^12\),\(^16\). 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)


**Taxonomic Description:**

Basidiome: annual, solitary, soft and fleshy when young coriaceous and punky when dry, sessile, pileate,
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, scupose 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 µm wide. Basidia: clavate. Basidiospores: boat shape, hyaline, thin-walled, 9.0-12.0x 4.0-5.5 µm. 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*
Navisporus floccosus causing heart rot in tropical trees

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 Pradesh5,6,9,11. From central India it is reported from Chhattisgarh and Odisha17. 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 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, on Ficus bengalensis from Kondagoan and Balod, Chhattisgarh and on Pongamia pinnata. A similar fungus, Amauroderma niger causing root-rot disease in Dalbergia sissoo was reported from Dehradun. 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.

**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

<table>
<thead>
<tr>
<th>SN</th>
<th>Name of fungus</th>
<th>Habitat</th>
<th>Distribution</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td><em>Navisporus floccosus</em> (Bres.) Ryvarden = <em>Trametes floccosa</em> Bres.</td>
<td>Dead wood</td>
<td>Africa, Mexico; Cuba; South America and India (Darjeeling, Calcutta, West Bengal, Andhra Pradesh and central India)</td>
<td>Prasher and Lalita (2015); De (1996, 2006); Nagadgesi and Arya (2013) This article</td>
</tr>
<tr>
<td>7.</td>
<td><em>Navisporus sulcatus</em> (Lloyd) Ryvarden = <em>Trametes sulcata</em> Lloyd</td>
<td>On dead wood</td>
<td>Brazil, South America; French Antilles; United States</td>
<td>Lloyd (1983)</td>
</tr>
</tbody>
</table>

### References

2. Bose SR. Polyporaceae of Bengal X. *Journal of Department of Science* Calcutta University. 1934; **11**: 1-18.
Fig. 17 Navisporus floccossus on Dalbergia sissoo: boat shaped basidiospore (TF4063)


