

Fistulina hepatica (Schaeff.) With. belonging to the family *Fistulinaceae* in Nagaland, India

Beef steak fungus or ox tongue fungus was first described in 1784 by Jacob Christian Schaeffer and named as *Boletus hepaticus*. Later in 1792, William Withering gave its present scientific name¹. *Fistulina hepatica* (Schaeff.) With. belongs to the family of *Fistulinaceae*, order *Agaricales* and class *Agaricomycetes*². It is usually saprotroph but sometimes parasitic that causes a brown heart rot of oak. This fungus is found commonly growing on hardwoods such as *Quercus* and *Castanea* trees, and on very rare occasion they are also found on *Acer*, *Alnus*, *Betula*, *Eucalyptus*, *Fagus*, *Juglans* and *Ulmus* trees. This mushroom usually appears during summer to late autumn. Basidiomata occur on the tree trunks, roots (sometimes seemingly on the ground), and also inside tree hollows and on tree stumps^{3,4}. The Global IUCN Red List of Threatened Species is an initiative taken by the global mycological community to facilitate and coordinate a concerted effort to get at least 300 species of threatened fungi assessed and classified as globally red-listed because of the almost 20,000 globally red listed species, all but three are animals and plants. *Fistulina hepatica* is red-listed as endangered species in India as it is endemic to the northeast India⁵. It is a rare mushroom in Nagaland. This species has also been recorded from Assam, Meghalaya, Mizoram and Sikkim with an identified host plant. The local and ethnic tribes of Nagaland are mycophilic (those person/people who show special enthusiasm for edible mushrooms)⁶⁻⁹. According to the latest report, a total of 52 species of wild mushrooms are recorded to be edible from Nagaland¹⁰. This indicates the importance of wild edible mushrooms as food for the tribals and ethnic groups in Nagaland. But till date, the locals are not aware of *Fistulina hepatica* as edible. The present study reports that this new species is edible which will also pave the way for conservation. Nagaland falls in the transitional zone between the Indo-Malayan and Indo-Chinese bio-geographical regions which serve as the key for many of India's flora and fauna and is one of the biodiversity hotspots. It is situated between 25°06'N and 27°04'N lat. and

93°20'E and 95°15'E long. and covers an area of 16,579 sq. km.

The state records an average annual rainfall between 2000 and 2500 mm. The temperature during summer ranges from 16°C to 31°C and drops as low as 4°C during winter. The suitable climate and geographical conditions of the state support the growth of many wild mushrooms. The survey was done in the forest of eight districts (Dimapur, Kohima, Peren, Mon, Phek, Tuensang, Wokha and Tuensang) of Nagaland periodically from June 2017 to November 2018. The sample was collected, photographed, its macroscopic features and concise description of the

fresh specimen were examined. Identification of the sample is done according to standard macroscopic and microscopic characteristics through consultation with relevant literature^{11,12}. The specimen was air dried and deposited in the herbarium, Department of Botany, Nagaland University with the accession no. NU/BOT/GLO-98. The locality of *Fistulina hepatica* situates in the forest of Old Riphym village (Wokha) and the other in Lumami village (Zunheboto). The fungus located (26°10'21.007"N, 094°15'8.026"E) from Old Riphym village was found in June 2018 on the tree trunk of *Quercus* sp. at an altitude of 1055 m asl. Whereas the fungus located (26°12'06.9"N, 094°28'16.4"E) from Lumami village was found in November 2018 on the tree trunk of *Quercus* sp. at an altitude of 947 m asl. *Fistulina hepatica* (Schaeff.) With: Cap diameter ranges from 9–20 × 12–25 cm to 2–5 cm thick. A large fleshy, soft tongue, upper surface spongy, gelatinous when wet; flesh with alternating light and dark streaks and



Figure 1. *Fistulina hepatica* (Schaeff.) With.



Figure 2. The pore surface on the underside of the specimen.



Figure 3. A section of *Fistulina hepatica* showing thick pinkish to reddish meat-like fleshy layer with paler streaks.



Figure 4. Lower surface of *Fistulina hepatica* with reddish juice oozing out of the cap.

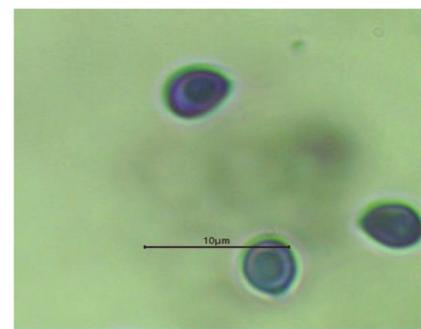


Figure 5. Spore of the species as observed under Motic microscope at 100× magnification.

juicy. Flesh red, 'bleeds' a reddish juice when squeezed. Pores are circular, whitish cream to yellowish, often with guttation drops. Taste is rather acidulous than sweet. Spores are pinkish-brown, globose, $4-5.5 \times 3-4 \mu\text{m}$. *Fistulina hepatica* is an unusual bracket fungus which is commonly found in Britain but can be seen in North America, Australia, North Africa, Southern Africa and the rest of Europe. The Nagaland specimen of *Fistulina hepatica* agree macroscopically with the descriptions given earlier for identification^{11,12}. Microscopically, the species from Nagaland shows some differences in the size of the spores from the measurements presented earlier. These discrepancies are probably due to the different sampling sizes. As the name suggests, when cut through it looks exactly like a slice of prime beef. But the taste is not as good as it looks. It is slightly acidic than sweet. It is globally known to be an edible species¹³ and can be eaten as raw in a salad or with a sauce of parsley and garlic and also reported to be sold in several markets¹⁴. Studies indicate that *Fistulina hepatica* is rich in protein and carbohydrate, has low-fat content and moderate in crude fiber. It is enriched with a good source of essential amino acids and essential minerals. Considering all these values of this mushroom, it can be safely consumed by a person suffering from various ailments. The mushroom also possesses significant antioxidant activity that can be used for the prevention and control of several diseases¹⁵. So far, there is no indication in Nagaland that its edibility is known and in the present scenario, the fungus is

unlikely to be collected for food by the locals and mushroom hunters.

The present study documented an unreported wild edible species from Nagaland. This new addition to the state resource will boost the economy of the state. It has been found out that the local and indigenous people of Nagaland possess a good traditional knowledge of wild edible mushrooms, which are yet to be fully documented. This study will not only impart knowledge on the new species but will also help in educating the local collectors of this mushroom and its endemic nature, thereby giving a chance for promoting conservation of the species and simultaneously achieving food security.

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