

## Two *Inonotus* species newly found in Japan, *Inonotus formosanus* and *Inonotus nodulosus*

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**ABSTRACT:** Two *Inonotus* species newly found in Japan were described. *I. formosanus* T.T. Chang & W.N. Chou was identified with the following characters; thin basidocarps with hispid when young and later the erect hyphae agglutinate to scrupose tuft, pore surface light yellow to rusty brown later, absence of setal hyphae, ventricose hymenial setae, and small ellipsoid, hyaline to yellowish basidiospores. *I. nodulosus* (Fr.) P. Karst. was identified with the following characters; basidocarps nodulose, wart-like shape, scrupose to warted by agglutinated hyphae, margin up to 5 mm, pore surface cinnamon to rusty brown when dry with a whitish or silvery shine, absence of setal hyphae, acute straight hymenial setae, ellipsoid to subglobose basidiospores, which are weakly dextrinoid in Melzer's reagent.

**KEYWORDS :** Basidocarps, Characters, Hyphae, Identify, *Inonotus* species

The genus *Inonotus* belongs to the family Hymenochaetaceae and causes white rot. Some species of the genus *Inonotus* are known as tree pathogenic fungi and sometimes occur on living trees of Sakura (*Prunus* sp.) (Dai, 2005; Nihon Ryokka Center, 2007; Shimizu et al., 2008). In another aspect some species of *Inonotus* fungi are used for a herbal medicine, such as *Inonotus obliquus* (Ach. ex Pers.) Pilát (Chaga, in Russian, Kabanoanatake in Japanese) (Shashkina et al., 2006). Identification of *Inonotus* species is essential for tree pathology and biological resources.

During field survey of macrofungi, the author collected some *Inonotus* species that could not be identified as the *Inonotus* species reported in Japan before. In this report, the author described two *Inonotus* species as *Inonotus formosanus* and *I. nodulosus* newly found in Japan.

*Inonotus formosanus* T.T. Chang & W.N. Chou: FB-38067 (CBM) (Fig.1.).

**Fruitbody.** Basidiocarp annual, pileate, sessile to dimidiate, single, more commonly in imbricate clusters, soft and fleshy when fresh, coriaceous and light of weight when dry. Pileus appanate, flabelliform, effused-reflexed or rosetted, up to 5 cm diam., up to 1 cm thick; upper surface cinnamon to rusty brown, at first coarsely tomentose to hispid, later the erect hyphae agglutinate to scrupose tuft, most erect near the base. Pore surface

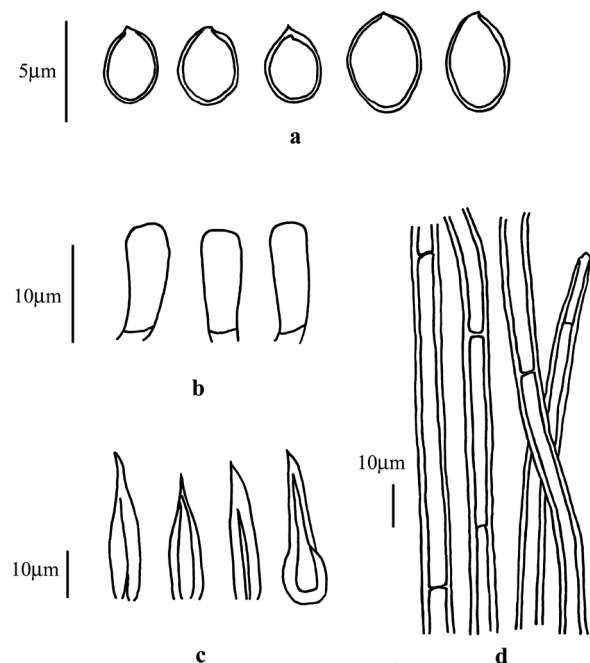


Fig. 1. Microscopic structures of *Inonotus formosanus*.  
a: Basidiospores, b: Basidia and basidoles,  
c: Hymenial setae, d: Hyphae from context.

in growing specimens light yellow and then immediately darker when bruised or touched, later cinnamon to rusty brown, pores round to slightly angular, 5–7 per mm, tubes up to 3 mm deep, context yellowish brown, dense, up to 2 mm thick at the base.

**Hyphal structure.** Hyphal system monomitic, hyphae hyaline, pale yellowish and thin-walled to dark brownish

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and thick-walled, with occasional to frequent branching, 4–5  $\mu\text{m}$  wide in the context. Setal hyphae absent. Hymenial setae abundant, straight, dark brown, ventricose, 20–35  $\times$  5–7.5  $\mu\text{m}$ . Basidia clavate 8–11  $\times$  3.5–5  $\mu\text{m}$ . Spore. Basidiospores broadly ellipsoid, smooth, 3–5  $\times$  3–4  $\mu\text{m}$ , hyaline to yellowish, negative in Melzer's reagent.

*Specimen examined.* FB-38067 (CBM) collected at Kyoto City on 2009. Other specimens were collected at Kyoto City on 2005 and 2010. The reasons that the examined specimens were identified to *I. formosanus* are the upper surface characters of pileus, pore size, absence of setal hyphae and size of basidiospores. The specimens were collected on the stumps of Konara (*Quercus serrata* Thunb. ex. Murray) in 2005, 2009 and 2010 and on the stump of Soyogo (*Ilex pedunculosa* Miq.) in 2009 and 2010. In the case of the occurrence on a Konara stump in 2009, *I. formosanus* may have inhabited on the Konara tree that had been alive because it occurred in the next year when the tree had been cut down. The species grows both from summer to autumn and from spring to summer.

*Inonotus nodulosus* (Fr.) P. Karst.: FB-38068 (CBM), KT08061514. (Fig. 2)

Bidr. Känned. Finl. Nat. Folk, 37, 73, 1882. Synonym *Polyporus nodulosus* Fr., Epicr., 474, 1838.

*Fruitbody.* Basidiocarps annual, nodulose-pileate with small and rounded pilei on an effused part, individual pilei up to 4 cm wide and 2 cm thick, broad hoof-shaped to triquetrous in section, upper surface scrupose to warted by agglutinated hyphae and dark brown, margin up to 5 mm, yellowish, pore surface cinnamon to rusty brown when dry with a whitish or silvery shine, pores angular, 5–6 per mm, in decurrent parts more irregular, tubes up to 7 mm deep, cinnamon in trama, pale inside the tubes, context hard, cinnamon to rusty brown, up to 1 cm thick at the base.

*Hyphal structure.* Hyphal system monomitic, generative hyphae hyaline to pale rusty brown, thin to slightly thick-walled, up to 5  $\mu\text{m}$  wide in the tomentum, narrower in context and trama. Setal hyphae absent. Hymenial setae abundant, always straight, acute, 16–33  $\times$  5–8  $\mu\text{m}$ , mostly bent at the base or sometimes with an elongated base or foot. Basidia clavate, 4-sterigmate, 8–10  $\times$  5–6  $\mu\text{m}$ . Spores. Basidiospores ellipsoid to subglobose, hyaline to pale yellow, darken yellowish in KOH, 4.5–5  $\times$  3.5–4

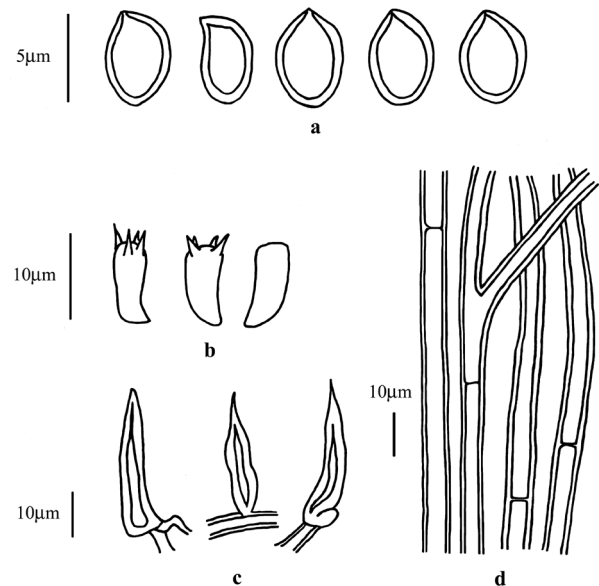


Fig. 2. Microscopic structures of *Inonotus nodulosus*. a: Basidiospores, b: Basidia and basidiales, c: Hymenial setae, d: Hyphae from context.

$\mu\text{m}$ , weakly dextrinoid in Melzer's reagent.

*Specimen examined.* FB-38068 (CBM) collected at Kyoto City on 2008.

The reasons that the examined specimens were identified to *I. nodulosus* were the upper surface characters of pileus, especially nodulose-pileate, pore size, the spore shape and size and reaction in Meltzer's reagent. The size of pileus is larger than that in description by Ryvar den (2005), but is similar to the range described by Breitenbach and Kränzlin (1986).

Ryvar den described the distribution of *I. nodulosus* eastward to Japan on 2000 (Núñez and Ryvar den, 2000), but revised it eastward to Caucasus and Turkey on 2005 (Ryvar den, 2005). Probably, the *Inonotus* species that had been identified as *I. nodulosus* in Japan was incorrect. Therefore, this is the first report that *I. nodulosus* was found in Japan.

The collected specimen occurred on a rotted tree of Soyogo (*Ilex pedunculosa* Miq.). It is unknown whether it occurred before the Soyogo tree had died. This species is described to be exclusively confirmed on *Fagus* trees, especially *Fagus sylvatica* (Breitenbach and Kränzlin, 1986; Ryvar den and Gilbertson, 1993; Ryvar den, 2005), but seemed to occur on other trees in China (Zhao and Zhang, 1992).

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