

Cultivating matsutake, valuable edible fungi

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Supplementary Fig. S2. Three *T. matsutake* specimens used for the spore inoculation experiment. a: 2141006_Toyooka_#8; b: 2141006_Toyooka_#12; c: 2140929_Kita-aiki_#1.

Three *T. matsutake* specimens used for the spore inoculation experiment. Credit: © 2021, Akiyoshi Yamada et al., under exclusive license to Springer-Verlag GmbH Germany, part of Springer Nature

Costing anywhere from 15 to 70 dollars per mushroom depending on the quality, matsutake mushrooms are some of the most valuable edible fungi in the world. Revered for their delicate scent, matsutake mushrooms are cooked in rice or soups as an Autumn celebration delicacy in Japan. However, there is no way to cultivate matsutake mushrooms, and naturally occurring habitats are decreasing with fewer forests conducive to their growth with the changing climate.

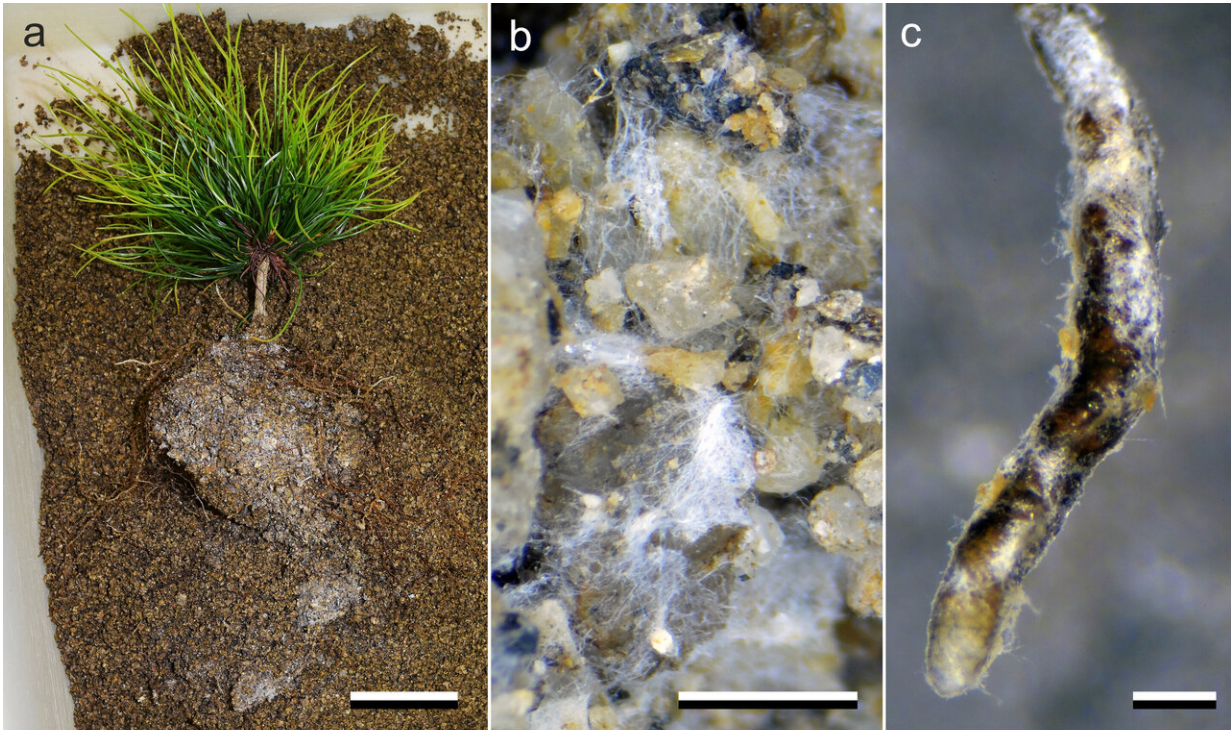
Corresponding author Professor Akiyoshi Yamada of Shinshu University's Department of Agriculture, Department of Bioscience and

Biotechnology, and Institute for Mountain Science with 9 other researchers set out to present concrete evidence that matsutake spores germinate, reach the roots of the host, and coexist to produce offspring that starts a new symbiosis.

When matsutake spores germinate, mycelia in the soil corresponding to their parents induce germination and form a genetically diverse population on the root system of the host. It is therefore hypothesized that the next generation can be created while maintaining a diverse pool.

With this novel experiment, matsutake mushrooms and Japanese red pine were cultured in a vessel, and spores collected from the fruiting bodies of matsutake mushrooms collected outdoors were inoculated to germinate in order to successfully establish a new hypha in the roots of Japanese red pine.

The researchers were successful in germinating the spore of matsutake by proving that artificially controlling the phenomenon of generational change of matsutake mushrooms in the natural world. They hope to establish an artificial cultivation technique for matsutake mushrooms in the forest.



Supplementary Fig. S4. Developed ectomycorrhizal root system and shiro structure in the non-axenic 4.1-L jar system.

This pine seedling was first inoculated with isolate #84 of *T. matsutake* and then with basidiospores (seedling ID: #84-31S). **a:** A seedling that grew showed a shiro structure >10 cm in diameter at the central region of the root system in the upper soil depth and two small shiro structures in the acropetal position of the root system at the lower soil depth.

b: Extraradical mycelium at the outer surface area of the shiro structure. **c:** External features of an ectomycorrhizal root tip. Bars 5 cm (**a**), 0.2 mm (**b**, **c**).

Developed ectomycorrhizal root system and shiro structure in the non-axenic 4.1-L jar system. **a:** A seedling that grew showed a shiro structure > 10 cm in diameter at the central region of the root system in the upper soil depth and two small shiro structures in the acropetal position of the root system at the lower soil depth. **b:** Extraradical mycelium at the outer surface area of the shiro structure. **c:** External features of an ectomycorrhizal root tip. Bars 5cm (**a**), 0.2 mm (**b**, **c**).

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Since this study introduces fresh matsutake [spores](#) into the experimental

system, it is difficult to carry out without a supply of matsutake nearby. In other words, it can be said that this research finding best utilized the location of the Faculty of Agriculture, Shinshu University to germinate the spore of matsutake, the most valuable wild edible [mushrooms](#) in the world.

More information: Yuka Horimai et al, Spore germination and ectomycorrhizae formation of *Tricholoma matsutake* on pine root systems with previously established ectomycorrhizae from a dikaryotic mycelial isolate of *T. matsutake*, *Mycorrhiza* (2021). [DOI: 10.1007/s00572-021-01028-3](#)

Provided by Shinshu University

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