

Mushrooms Wear Sand Grains for Survival: A Strategy of *Marasmiellus mesosporus* on Beach

Wada, Shohei (School: Kobe Gakuin Unniversity High School)

Marasmiellus mesosporus Singer hosted by herbs thrive on the beaches throughout Japan. Considering their survival strategies, I observed them in 105 places from childhood. I noticed that many fruit-bodies were often found on small-grain beaches, and worn many small sand grains on a stipe like armor with their hyphae overspread them. In 2020 I hypothesize the mushrooms protect themselves from harsh external stimuli of beaches by wearing grains by themselves. I verify this hypothesis in this study. The grain sizes at 86 beaches, with and without fruit-bodies, were measured with strainers, and the weight percentage of grains smaller than 425 μm in diameter was calculated in each beach. The beaches were divided groups for percentage, and calculated rate of fruit-body appearance. As a result, the beach-groups with a higher percentage of small-grains had a higher fruit-body appearance. Fruit-body ripening was recorded by time-lapse videos focused on the stipe surface and specimens collected on beach were observed under biological microscopy. As a result, many terminal hyphae extend from stipe-epidermis, long outward at lower part, entangled tomentose at upper part. Hyphae spread mat over the grains on stipes. Some hyphae penetrate gap of grains and some roll hosts' hairs. As wearing large-grains is difficult, on large-grain beaches mushrooms cannot easily maintain their fruit-bodies, resulting reduce habitat. On small-grain beaches they entangle hyphae to catch grains bounced up by wind and rain, spread hyphae to fix grains like armor. These results support the hypothesis that *M. mesosporus* wear grains by themselves for survival.

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