

Effects of the Resource Distance on the Decisions of Mycelial Behavior

Kaho ISHII¹ and Yu FUKASAWA²

¹Faculty of Agriculture, Tohoku University, Japan

²Graduate School of Agricultural Science, Tohoku University, Japan

Cord-forming basidiomycetes develop large mycelial networks and play a major role in organic matter decomposition and nutrient cycling in forest ecosystems. Fungal mycelia alter their foraging and migrating behavior flexibly in response to the presence of outer resource and their nutritional status. Previous studies showed that, when a mycelium extending from a wood block (inoculum) finds a new piece of wood (bait), the mycelium makes a decision whether or not to move from the inoculum to the bait depending on the bait size and the timing of bait placement. For example, relatively larger baits tend to induce mycelial migration from inoculum wood to bait wood more frequently than smaller ones. This suggests that mycelia may decide to move out based on the size of the wood resources and their own nutritional status. However, the influence of other factors, such as distance from the inoculum to the bait, on the decision to move out is not clear. We hypothesized that, if the distance from the inoculum is longer, mycelia might move to the baits even with smaller size, because maintaining the hyphal connection between the inoculum and the bait at a longer distance might be energetically more expensive than that in a shorter distance. Therefore, this study examined the effects of distance from the inoculum to the bait and the size of the bait on the decision-making of mycelial migration.

A beech wood block (0.5 cm³), incubated with a basidiomycete *Phanerochaete velvina* for 1 month on 2% malt extract agar medium for colonization, was put onto a corner of a tray (24 cm × 24 cm) filled with soil ca. 5 mm depth (Fig. 1). When mycelium grew at least 15 cm from the inoculum, a bait wood block was placed 1 cm or 15 cm away from the inoculum and incubated at 20°C in the darkness for 50 days. We prepared two sizes of bait wood blocks (4 cm³ and 8 cm³). After incubation, inoculum wood blocks were retrieved from the tray, surface cleaned, transferred to new soil trays, and incubated at 20°C in the darkness for 8 days to check the re-growth of mycelium and its direction. Trays were photographed every 3 days during the experiment. We measured hyphal coverage by ImageJ. Inoculums and baits were dried at 70°C and weighed before and after incubation to check their weight loss during incubation. The dry weight of 40 inoculums at the time of bait placement was estimated by creating a regression line from the dry weight and mycelial area of 73 inoculums removed at that time.

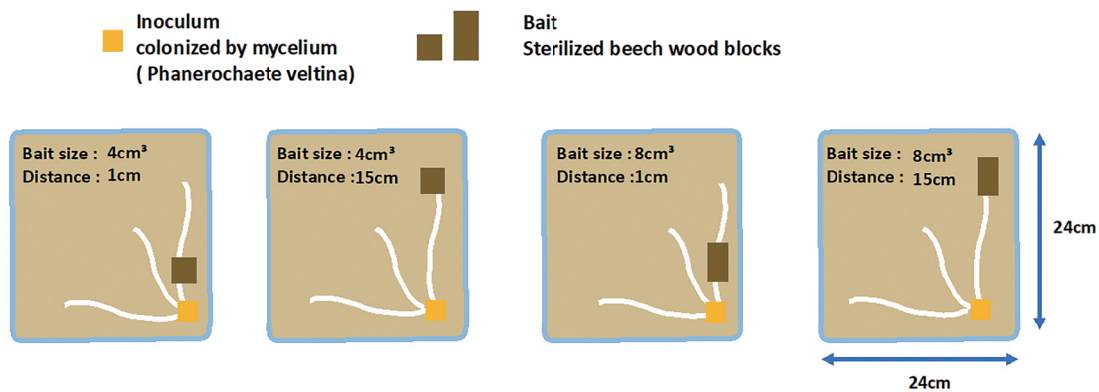


Figure. Experimental design of microcosm