

Sex-Dependent Fitness Improvement of Hercules Beetle Larvae by Amendment of Thermophile-Fermented Compost to Humus

Authors : Futo Asano, Yusuke Yatsushiro, Hirokuni Miyamoto, Hiroaki Kodama

Abstract : A thermophile-fermented compost is produced using small fishes, crabs, and shrimps under a high temperature (approximately 75°C) by fermentation-associated self-heating. This compost has been used as a feed additive for pigs and hens in Japan, and the fecundity of this livestock is enhanced. Firmicutes is a dominant phylum in the microbial composition of the compost. We first reported that improvement of female larval fitness of Hercules beetle can be achieved by amendment of this compost to the humus. When the 90-d-old larvae were reared for subsequent 72 days in the humus with this compost, the growth of female larvae was significantly enhanced when compared with the growth of female larvae in the humus without the compost. In contrast, the growth of male larvae in the compost-free humus was the same as the larvae grow in the compost-amended humus. The bacterial composition of the feces of larvae was determined at 0 days and 46 days after transfer to the humus with or without the compost. The most dominant bacterium in the feces was *Xylanimonas*. Interestingly, the growth improvement of female larvae was associated with an increased abundance of Mollicutes in the fecal samples. These results indicate that the compost act as a probiotic material for enhancing the female larvae growth by supporting Mollicutes. Here, we tried to isolate Mollicutes from the contents of the midgut and hindgut of the 3rd instar female larvae of the Hercules beetle. These gut contents were spread onto a selective agar medium for Mollicutes (PPLO agar broth, BD Difco, NJ, USA). Although we isolated none of the Mollicutes until now, several bacteria that are closely related to *Xylanimonas* and *Luteimicrobium* were isolated. These isolates have xylanase and glucanase (CMCase) activities. We show the gut bacterial profiles of larvae and discuss how the fitness of female larvae of the Hercules beetle is improved by the compost.

Keywords : compost, beetle, mollicutes, woody biomass

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