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Biology and Life Support Technology, Beihang University, ChinaREARING TENEBRIO MOLITOR L. (COLEPTERA: TENEBRIONIDAE) IN THE “LUNAR PALACE
1” DURING A 105-DAY MULTI-CREW CLOSED INTEGRATIVE BLSS EXPERIMENT**Abstract**

Rearing yellow mealworm (*Tenebrio Molitor* L.) in a bioregenerative life support system (BLSS) by in-situ use of plant wastes can produce animal protein while at the same time increase system closure. In this study, *T. molitor* was involved in a 105-day multi-crew closed integrative BLSS experiment for a tentative rearing study. A group of *T. molitor* larvae were reared in an open environment as control. The results showed that the overall bioconversion rate (ratio of *T. molitor* gained to total feed consumed) of *T. molitor* reared in the closed system was 8.13%, while 78.43% of the feed was excreted as frass. *T. molitor* reared in the closed system had a good nutritional composition. The eight essential amino acids (EAAs) in *T. molitor* larvae accounted for 41.30% of its total amino acids, and most EAA contents were higher than the suggested amino acid pattern recommended by the FAO/WHO. Compared with *T. molitor* reared in the open environment, larvae reared in the closed system grew slower. With the course of time t , the growth rate of *T. molitor* in the open environment was $0.839\exp(0.017t)$ times of that of larvae in the closed system.

The impact of the closed environment of BLSS on symbiotic microbial community of *T. molitor* was studied by 16S rRNA gene sequencing on the Illumina MiSeq platform. Differences in symbionts of the BLSS group and the control group, and their relationships with the microbial community in the feed were analyzed. Possible metabolic and immune effects of the above differences in symbiotic microbial communities on larval growth were discussed. Aiming at improving the rearing efficiency of *T. molitor* in BLSS, follow-up study would focus on microbial isolation from the midgut of *T. molitor* for the preparation of probiotics as well as measures of microbial pathogen control.

Keywords: Bioregenerative life support system, bioconversion, symbiotic microbial community, *Tenebrio molitor*, Illumine-MiSeq