

Volicitin and Nitrogen Metabolism in Lepidopteran caterpillars

Naoko Yoshinaga, Takako Aboshi, Koji Noge, Chihiro Ishikawa, Ritsuo Nishida and Naoki Mori
Graduate School of Agriculture, Kyoto University
Kitashirakawa, Sakyo, Kyoto 606-8501, Japan
Tel/Fax: 075-753-6307/6312, E-mail: nyossie@kais.kyoto-u.ac.jp

Most lepidopteran caterpillars have evolved physiological and biochemical mechanisms to achieve their explosive growth during larval stages.

Fatty acid amides (FAAs) found in the gut lumen of many Lepidopteran species only during their larval stages have gained topicality as one of the unique compounds. However, the physiological role(s) of FAAs for caterpillars themselves has remained unknown. Our hypothesis that these FAAs might play an important role in the nitrogen metabolism for caterpillars was based on the fact that all the FAAs were preferentially synthesized with glutamine, an universal nitrogen donor. Introducing the stable isotope tracer method into the bioassays with common cutworm, *Spodoptera litura*, the FAAs were suggested to be involved in the ammonia detoxification and nitrogen recycling. Furthermore, the metabolic dynamics of FAAs indicated that these FAAs might be an effective form to reserve the glutamine that was excessively synthesized by the ammonia assimilation. On the other hand, the imaging analysis using ^{14}C -labelled compounds with autoradiography clearly showed the active and drastic uptake of glutamine from the diet in *S. litura* larvae. Interestingly, the additional fatty acids on the diet further improved the absorption efficiency of nitrogen from glutamine-enriched diet. These results suggest that the FAAs enable the effective utilization of nitrogen source to achieve astounding growth during the larval stages of these species. The study elucidating the physiological significance of FAAs was first triggered by the discovery of volicitin. Volicitin, one of the FAAs originally identified from beet armyworm, induced damaged corn leaves to release odorant compounds that enable parasitic wasps to locate their host caterpillars. Our findings might answer the question why the caterpillars have volicitin despite this adverse activity.