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A correlation between the quantitative changes in l-methionine analogs, the ratio of d-serine/l-serine during the pupal stage, and metamorphosis was observed. The glycoside appearing at low blood sugar values during the pupal stage was isolated and characterized as d-glucosyl-l-tyrosine. ¹H-NMR indicated the appearance and increase of this glycoside, and Mirrorcle Ray CV4 equipment was used to take X-ray pictures of the pupal bodies. The results indicate that the pupal bodies. The results indicate that

**Note**

The high-resolution (HR) FD-MS data indicated a molecular ion composition of C₁₃H₁₁NO₂Na for the

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(M + Na)$^+$ ion (366.1164; 366.1172 calculated for C$_{15}$H$_{21}$NO$_8$Na). Taken together, these results in conjunction with a stereochemical analysis of the acid hydolysate (sugar moieties and amino acid) identified$^7,^8$ that the structure of the compound was β-d-glucosyl-O-tyrosine (GlcTyr; $^1$H- and $^{13}$C-NMR assignments of the structure are shown in Fig. 2).

This compound stimulated fatty acid $\beta$-oxidation in the silkworm$^9$ and appeared at 38d when the trehalose concentration in the blood was less than 3 mg/ml.
(Fig. 3). The amount of GlcTyr was maximal at the time of head (feeler) and wing disk formation (39d-old), just before ovary (egg) maturity (41d-old, Fig. 1). The silkworm reverted to a metabolism in which GlcTyr was formed in the specified term, and so-called pupal oil appeared newly again with the turn out-switches to the pupal stage and it could think about GlcTyr, which to be a characteristic ingredient in the pupa, and that mature larval stage (26d-old). Our results show GCDGlu metabolism and for organization/re-creation after the background, and they use blood sugar for basal absorption from large quantities of mulberries in the breeding case every other day (37–43d). Each pupa was placed in a sample tube and extracted with CHCl3–MeOH (10 ml) while shaking at room temperature for 7 days. Water (2.5 ml) was added to the mixture, and the solution was left for two more days. The extract was separated by centrifugation, and the supernatant (H2O including MeOH) was dried under N2 gas, yielding a yellow powder (ca. 35–70 mg). A standard NMR solvent (0.20% w/v, 3-(trimethylsilyl) propionic-2,2,3,3-2O) was added to each powdered sample in a fixed proportion to the weight of the living pupa (added 0.05% volume), and the sample solution for 1H-NMR was made. The 1H-NMR data for the quantitative examination were measured at 45 °C in a 5-mm Shigemi-001 sample tube,12) the solution being made up to 600 μl including a unification standard. The 1H-NMR signals of t-MSO2, t-MSO, trehalose, and GlcTyr were distinct from the signals of the impurities (e.g., glycine, δH 3.57, s; choline, δH 3.22, s). The amounts of t-MSO (δH 2.75, s), t-MSO2 (δH 3.12, s), GlcTyr (δH 5.12, d), and trehalose (δH 5.20, d) were calculated by using calibration curves (r = 0.997, 0.998, 0.994, and 0.984, respectively) from NMR sample standards treated with the same D2O solution (TSP-d4 as the internal standard, δH 0.00, s).

The d- and t-serine FDAA derivatives were prepared according to Marfey’s procedure as described previously. The ratio of d- to l-serine was calculated by using calibration curves from the FDAA derivative standards (r = 0.995 and 0.998, respectively).

X-Ray pictures of the pupal bodies were taken with Mirrorcle Ray CV4 equipment (Photon Production

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Laboratory, Shiga, Japan). This high-performance X-ray device could show a change in organization within 5 mm of the insect body. For the quantitative analysis of the water-soluble constituents, the organization of the insect body didn’t fix (trimmed, dehydrated, and embedded in paraffin etc.) in this study. Imaging plate was strage phosphor as an X-ray detector and the digital radiography systems were model FCRXL-1 made by Fuji Film. The experimental setup is shown in Fig. 1. The magnification rate was determined by the distance of the X-ray source from the sample, and the distance of the source from the detector. This arrangement enabled us to obtain 10× magnified and phase-contrast X-ray images. The phase-contrast images enhanced the edge effect, and the internal organs were visible in detail.

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References

10) Nutrition formation in dried 36d-old pupae was analyzed at Japan Food Research Lab. (Osaka).