Seasonal Changes of Lipid Content in Adult *Cletus punctiger* (Heteroptera: Coreidae)¹

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Cletus punctiger is a serious pest which sucks from developing rice grain and causes "pecky rice." The flight ability of the field-collected adult is higher in the post-hibernating period (generally May–June) and the pre-hibernating period (generally September–October) than in the reproduction period (generally July–August) (IRO, 1980). The post-hibernating adult also has tolerance to starvation (IRO, 1984).

Although lipid is known to be accumulated in various insects as the energy source permitting for survival during winter and the summer diapause or for flight fuel (e.g. MASAKI, 1980; PADGHAM, 1983), the nature of lipid in *C. punctiger* has not yet been studied. The present study was therefore undertaken to know the seasonal changes in the content of stored lipid in adult *C. punctiger* throughout a year.

Adults were collected every 2 weeks in the field at Yatabe, Ibaraki Prefecture from April to September in 1982. As it was difficult to collect bugs in winter, many adults were collected in October and kept in an outdoor cage. From October 1982

to April 1983 adult bugs were taken out of this cage once a month. Ten males and ten females were used as a mass in a lipid analysis. Bugs were killed in a freezer (−20°C) and then weighed within 10–20 min after being taken out from the freezer (= "fresh weight"). The specimens were dried in an oven at 70°C for 1–2 days until a constant weight (= "dry weight") was obtained. Dried specimens were ground to a fine powder in a glass tube. The lipid was extracted with a 2 chloroform: 1 methanol solution 3 times for a sample. A part of the extract was then dried in a draft chamber at room temperature until a constant weight was obtained.

Seasonal changes in fresh weight and dry weight are shown in Fig. 1. In the female, both weights increased rapidly after April and reached a peak in late May (fresh weight=52.5 mg/insect, dry weight=26.0 mg/insect). Thereafter, the weight decreased and then increased again in mid- or late July. Dry weight changes in and after October through March not as large. In the male, fluctuations in both weights throughout the year were not as great as in the female.

The seasonal changes of lipid content are shown in Fig. 2. In the female, contents were highest from mid-May through mid-June; maximum content was 49.4% of dry weight. The contents in September and November were the next highest, while the contents were low (25–30%) from July through mid-August. In the male, the seasonal change of lipid content was similar as in female, but the level of lipid content from mid-May through

Fig. 1. Seasonal changes of fresh weight (solid line) and dry weight (dotted line) in field-collected *C. punctiger* from April 1982 to April 1983. ○: female, ●: male.

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Fig. 2. Seasonal changes of lipid content in field-collected *C. punctiger* from April 1982 to April 1983. ○: female, ●: male.

mid-June was not so high as that of the female. The maximum content in this season was 33.5% of dry weight.

After migrating from their hibernating sites from April to June, adults are supposed to accumulate lipid by feeding on spring food plants. A similar phenomenon is observed in the rice water weevil, *Lissorhoptus oryzaophilus*, and the accumulated lipid is considered to provide the energy for subsequent survival, flight and reproduction (KNABKE, 1973). During the season studied, the flight ability and tolerance for starvation in *C. punctiger* adults were high and little difference was found between the sexes (ITO, 1980, 1984). The higher lipid content in females than in males may, therefore, be related to female oogenesis.

It is interesting that lipid content in females did not increase in July in spite of their body weight increase. In this season, new non-diapausing females emerge and begin oogenesis. This oogenesis process may be different in post-hibernating females and non-diapausing females, but details are not yet known.

Lipid contents of both sexes increased in September, and may be dependent on the physiological change accompanying diapause. The critical day-length for inducing diapause in the *C. punctiger* collected in Yatabe was between 13.5L–10.5D and 14L–10D at 25°C condition, and diapausing adults appeared in the field from late August (ITO, unpub-

lished).

Seasonal changes of lipid content from May through October coincided well with the pattern of flight activity reported previously (ITO, 1980).

In and after November through April, the lipid contents of both males and females decreased gradually, and there were no differences in the contents between the sexes during this season. Of the lipid accumulated in autumn, 41.9% and 37.5% were consumed by April in females and males, respectively. As hibernating *C. punctiger* adults rarely take food in winter, the quantity of lipid accumulation in autumn and lipid consumption in winter in relation to the weather condition must greatly contribute to the winter survival of this bug.

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