

gradually become unfavorable for their habitats. That is to say, in this season we can capture only sexually immature moths in the teneral stage before dispersal. It also agrees with this hypothesis that most of the moths are newly emerged and that the mating status is strongly influenced by the growing stages of the host plant.

In disregard of emigration, the density of moths in the paddy field generally increases remarkably in autumn. This may be due to the great increase in the number of moths which emerge there as the generation advances. In fact, the number of moths observed was much lower than we had been led to expect by the density of healthy pupae. Moreover, we observed numerous immigrants in grassy fields in autumn (WADA et al., 1980). These facts suggest mass dispersal of moths from the paddy field, too.

There is a slight increase in the proportion of mated females from the end of October through the rest of the season. Most of the mated moths in this season have poor body fat and look lean and exhausted. This increase is possibly because a few more mated moths out of the numerous moths emerging in autumn tend to stay in the paddy field as compared with virgin females.

In November, moths newly emerged in the paddy field decrease greatly in number, which results in an increase in the proportion of mated females in the population.

The phenomenon of seasonal fluctuation in the mating status and sexual maturity of the adult population owing to dispersal or migration has been reported for some Lepidopterous insects (LOPEZ et al., 1978; OKU and KOBAYASHI, 1978). In the case of the rice leaf roller, it is here clearly shown that the changes in these population characteristics depend on the growing stage of the host plant. So, inversely, these population characteristics seem to be a good index of adult dispersal in a field.

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Changes in Size and Weight during Development of *Tribolium freemani* HINTON (Coleoptera : Tenebrionidae)¹

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HINTON (1948) described *Tribolium freemani* from a female adult which was collected in the 1890s in Kashmir in India. Since then no specimen of this species had been found until three

years ago when a few adults were collected in Japan. NAKAKITA et al. (1981) studied some biological characters of this species and concluded that it was a sibling species of *Tribolium castaneum* and a potential pest of stored-products. In the present paper the development in body size and weight of this species was studied.

Stock culture has been reared on wheat-feed supplemented with brewer's yeast in a darkroom maintained at $32.5 \pm 0.5^\circ\text{C}$ and $70 \pm 8\%$ R.H. All experiments were carried out under these environmental conditions. Medium was a mixture of 19 parts of wheat flour to one part of brewer's yeast by weight and the mixture was conditioned for a fortnight under the experimental conditions. Eggs were obtained over 24 hours from groups of adults collected from stock culture

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