Dispersal of the Brown Planthopper, *Nilaparvata lugens* STÅL (Hemiptera : Delphacidae) in Relation to its Population Growth[1]

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The brown planthopper, *Nilaparvata lugens*, is a multivoltine insect and therefore its population growth in rice paddies is closely correlated with the seasonal environmental changes. The author carried out population studies of this species to investigate the reproductive process in the early generations. In this paper, the outline of the population growth is described in relation to dispersal.

The whole census was applied only to the adult population. In the initial immigrant generation, the census was conducted every day for first one week and every other day for the rest of the census period. The census was made by the direct sight counting of adults on all hills of rice plants in the census field. In the second generation, three plots which contained 100 hills of rice plants were chosen from total 2295 hills and all adults were counted every other day. In the third and fourth generations, the random sampling of twenty hills has been carried out. Two traps, a yellow pan water trap and a Johnson and Taylor's aerial suction trap, were set in the census field in order to investigate the invasion and exodus of this species. All the experiments were carried out at Kyushu Agricultural Station in 1974.

Fig. 1 shows the seasonal trends in the population densities of the brown planthopper. From this figure, four successive generations at about one-month intervals can be seen. The peaks of population density can be clearly distinguished from each other. Another characteristic aspect of the population growth of this species is that the population density is initially very low (about 0.08 per hill), but after three generations it grows about one thousand times as large as the initial one. These results suggest that the fecundity of this species may be very high and the adult longevity in the field may not be so long.

The population growth of the brown plant hopper in a rice paddy always begins with the sudden invasion of macropterous forms in early summer and ends with their exodus in the autumn

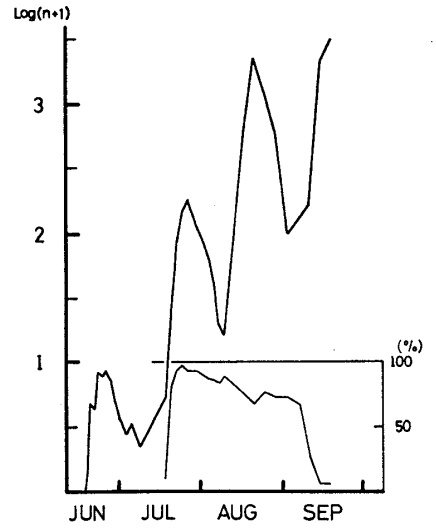

Fig. 1. Population growth of the brown planthopper in the rice paddy. The number of adults (n) is expressed as insects per 100 hills. The percentage of the brachypterous female is shown in the lower panel in this figure.

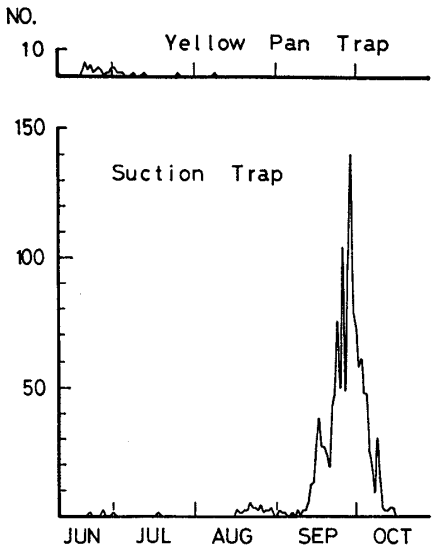

Fig. 2 Seasonal flight of *N. lugens* caught in a suction trap and in a yellow pan trap.

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(KISIMOTO, 1976). This phenomenon of the invasion and exodus by flight are well expressed in Fig. 2. This figure shows the seasonal changes of two trap catches. The Johnson and Taylor's suction trap could catch immigrants in June-July which might be very low density and a large number of emigrants from late August to October. On the other hand, the yellow pan water trap could catch only immigrants. It follows that, unlike immigrants, the emigrants may not be attracted to the yellow pan water trap because of their strong straightened-out flight.

The invasion and the exodus of this species are closely linked with wing dimorphism, i.e., with the proportion of macropterous form in the population. This is shown in the inner panel of Fig. 1. The initial immigrants were all macropterous forms. In the second generations, most of the females were brachypterous and macropterous females were quite few. In the third generation, the increase of the proportion of macropterous insects formed the slight exodus of late August in Fig. 2. The fourth generation consisted mostly of macropterous and resulted in a mass exodus in late September and early October from the rice paddy.

In this study, the pattern of population growth was the same as those reported by KISIMOTO (1965) and KUNO (1968). The invasion and the exodus of this insect was clearly detected by the Johnson and Taylor's suction trap.

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Sex Pheromone of the Tea Tortrix Moth: Isolation and Identification[1]

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The tea tortrix moth, *Homona magnanima* DIAKONOFF (Lepidoptera : Tortricidae), is a polyphagous leaf-feeding insect attacking tea, persimmon, citrus, pear, and Japanese chestnut. Recent increase in population of this insect has caused serious damage especially to tea plants. Production and release of a sex-attractant pheromone by females of this species were suggested by a field-trapping using a sticky trap baited with a virgin female. One virgin female of 2 to 4 days after emergence attracted 11.3 to 47.7 males per trap per night during the second flight season (June, 1974) of this insect in a tea plantation at Kanaya, Shizuoka Prefecture (TAMAKI, unpublished). A series of laboratory experiments on mating behavior also revealed the presence of female sex pheromone in this species, and a laboratory bioassay method based on male's stimulated behavior was established (NOGUCHI, 1979). Another species, *H. coffearia* NEITNER, which is not distributed in Japan but an important tea plant pest in South-east Asia, was also reported to secrete a sex-attractant pheromone (SIVAPALAN and VITARANA, 1975). Therefore, we tried to elucidate the chemical structure of active components of the sex pheromone of the tea tortrix moth, *H. magnanima*.

Insects were reared on an artificial diet by adding 0.8% (w/w) ascorbic acid to the diet of TAMAKI (1966). Abdominal tips of 2- to 4-day-old virgin females were immersed in CH_2Cl_2 and crude extract was obtained by filtration. Biological activity during purification process was monitored by a sexual stimulation bioassay based on lowering the temperature for activating the males (NOGUCHI, 1979). Results of preliminary trials such as saponification, acetylation, hydrogenation, and ozonolysis on partially purified active fraction from 100 virgin females suggested that the active compound(s) is unsaturated alcohol acetate(s).

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