Variation in populations of brown planthopper Nilaparvata lugens (Stål) - "biotypes" and sibling species

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N. lugens is a widely distributed and specific feeder on rice - *Oryza* species and their cultivars - in Asia and Australasia. Different populations may show distinct patterns of virulence to different varieties of rice. Such populations have often been termed biotypes. However, selection experiments suggest that such distinctions based on virulence patterns are very easily changed. These populations do not warrant a biotype terminology.

Geographical variation between allopatric populations is most readily demonstrated by differences in pulse repetition frequencies (PRF) of male calling signals. These differences are primarily responsible for hybridisation barriers found between some allopatric populations.

The recent discovery in the Philippines of populations morphologically indistinguishable from *N. lugens* which feed and breed on the common weed grass, *Leersia hexandra,* poses new problems. Such populations occur throughout the Philippines where they are sympatric with rice feeding populations. Rice feeding insects die rapidly when transferred to *Leersia* and conversely *Leersia* feeding insects die when put onto rice. Mate choice experiments show strong preferences for females to mate with males from the same host plant. When no choice is given hybrids between populations are relatively freely produced.

Calling signals of both sexes from the two host associated populations differ significantly in PRF. Hybrids are intermediate in PRF. No individuals that might be regarded as natural hybrids on a basis of PRF have been found. Populations widely throughout the Philippines maintain their characteristics and must be regarded as extreme sibling species.

We have also collected *Leersia* feeding populations of *N. lugens* from Australia. Preliminary results suggest that they also differ from sympatric rice feeding insects in PRF of male and female calls. Further work is necessary and populations must be studied from other regions of Asia. Supported by contract from the Tropical Development and Research Institute, London.

Immigration rates and population development of the brown planthopper Nilaparvata lugens in the tropics

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Nilaparvata lugens (STÅL) is a destructive pest of rice in both temperate and tropical Asia. Japanese studies have shown that annual reinvasion of the insect occurs from mainland China at the beginning of the rice growing season in

June-July (KISIMOTO, 1976) and that the level of the immigration can be used to predict control needs later in the season (HIRAO, 1979). The continuous presence of the insect and year-round cultivation of rice in the tropics present a more complex situation and the present work was undertaken to investigate the relationship between migration and population development under these conditions.

Detailed studies on flight activity and population development were undertaken in farmers fields in Laguna Province, Philippines over a five year period (PERFECT & COOK, 1983). A network of sampling sites was established, some in the rice basin around Lake Laguna de Bay where the terrain is flat, few trees are present and rice cultivation may be continuous for several hundred hectares, and some at higher elevation where rice cultivation forms ecological islands of only a few hectares surrounded by coconut trees. In all sites one plot was cultivated with a *N. lugens* susceptible rice variety and population development was monitored four times each season using a D-Vac suction sampler in the manner described by PERFECT *et al.* (1983). Immigration rates were measured using 15 yellow water traps at each site which were emptied twice-weekly and the experiment was continued over three growing seasons.

The effect of immigration rate on population development was examined by regression analysis of the rate of change of *N. lugens* density from consecutive D-Vac samples and the mean immigration rates over the preceeding period. No significant relationship was found inferring that other, within field factors are more important determinants of population size and of these natural enemy action seems to be the most significant. Flight activity of two heteropteran predators of *N. lugens, Microvelia atrolineata* BERGROTH (Veliidae) and *Cyrtorhinus lividipennis* REUTER (Miridae) are highly correlated with that of *N. lugens* but variation in immigration rates of the predators either singly or as ratios of prey : predator could not account for the variability in *N. lugens* population development.

Thus it seems unlikely that monitoring immigration rates in the tropics will be as useful as in temperate countries in predicting pest management needs. Forecasting short term changes in *N. lugens* population development may only be possible from direct observations of the pest and its natural enemies on the crop.

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