In "Proceedings of the 8th Auchenorrhyncha Congress",
S.Drosopoulos, P.V.Petrakis, M.F.Claridge, P.W.F. de Vrijer [eds], Delphi, Greece, 9-13 Aug., 1993.

A quantitative field study on egg parasitism of the brown planthopper in Indonesia

Anja E. Steenkiste, Michael F. Claridge and John C. Morgan

School of Pure and Applied Biology, University of Wales, P O Box 915, Cardiff CF1 3TL, UK

The Brown Planthopper, *Nilaparvata lugens* (Stal), is among the important pests attacking rice in large parts of Asia. The resurgenge of BPH is connected with high technology rice production1, especially insecticide use [2,3]. Thus BPH is an important target species for research on alternative control strategies.

By using biological control of the major pest species as a component of Integrated Pest Management (IPM) insecticide use and the development of resistance can be decreased. Among the natural enemies of BPH predatory species in particular have been studied [2,3,4]. Parasitoids have received less attention, although some studies indicate that egg parasitoids in particular can cause substantial mortality [3,5] and the impact of this group of natural enemies may be underestimated6. In the study reported here, the impact of egg parasitoids of BPH was determined in a field study with the aim of assessing the potential use of parasitoids in biological control.

The study concerned mortality caused by parasitoids naturally occurring in rice growing areas. However, in order not to depend on naturally occurring BPH infestation, which is unpredictable in temporal and spatial distribution, the presence of BPH eggs in the experimental field was manipulated. Rice plants were infested in the laboratory by BPH females from a culture: 5 females per plant were allowed to oviposit for 24 hours. Subsequently, plants were placed in the paddy for 5 days at random positions at two weekly intervals. To mimic the clumped distribution of BPH infestations, infested plants were placed in plots of 4 plants each. To obtain a measure of BPH survival in the absence of parasitoid attack, a number of control plots contained plants protected by mylar cages. So far, the study included two rice growing seasons at two locations in Java. The numbers of plants used were: Purwokerto 1990 wet season: 48 exposed to parasitoids and 24 control, Sukamandi 1991 dry season: 48 exposed to parasitoids and 32 control. After field exposure the eggs were dissected from the plants and kept on filterpaper moistened with a fungicide solution in a petridish. Emergence of BPH nymphs and parasitoids were recorded daily. The porportion of eggs parasitised in exposed plants and the proportion of eggs hatched for both exposed and control plants were determined. The results were analysed using GLIM (Generalised Linear Interactive Modelling), with a binomial error distribution for proportional data.

Levels of parasitism, calculated as the proportion of eggs from which an adult parasitoid emerged, fluctuated considerably during the growing season at both locations. The two sites were similar in that the proportion of eggs parasitised was lower towards the end of the season. The mean values for parasitism were:
Purwokerto, 1990 wet season, 0.26 (SE 0.254-0.265), Sukamandi, 1991 dry season, 0.27 (SE 0.265-0.276).

The impact of parasitoids on BPH survival was assessed by comparing egg hatching in exposed and control plants. There was large variation within the season for each site, but on all occasions except one the reduction of BPH hatching in exposed plants was significant. The mean values of successful BPH hatching for the different sites (figure 1) were: Purwokerto, 1990 wet season: from 0.15 to 0.07,
Sukamandi, 1991 dry season: from 0.15 to 0.06.

The results show that in plants exposed to parasitoids, BPH egg hatching was on average 50% lower than in controls.

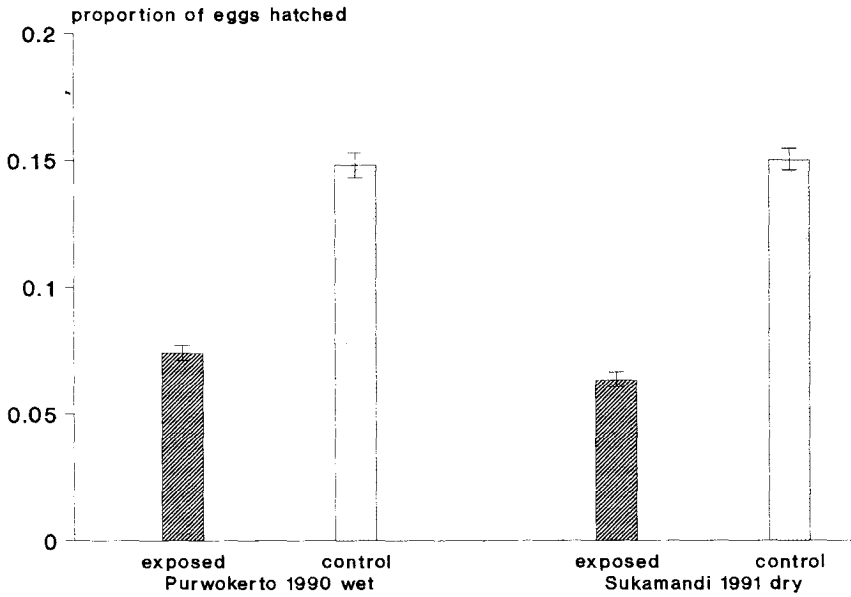

Fig.1 Hatching of BPH eggs in plants exposed to parasitoids compared to control plants (values are seasonal means with 95% CI)

The results obtained so far indicate that egg parasitoids cause substantial mortality at an early stage in the life cycle of the brown planthopper. To take account of seasonal variation the experiments will be extended to cover more seasons at both study sites. The preservation or augmentation of egg parasitoids may be a promising management tool in IPM of rice. Experiments are planned to investigate the effect of habitat enrichment on parasitoids and predatory natural enemies of BPH.

Acknowledgements. We like to thank all Indonesian collaborators for assistence with the field experiments.

References

1. NORTON, G.A., & WAY, M.J. In *Pest Management in Rice* (eds) Grayson, B.T., Green, M.B. & Copping, L.G.,pp 1-14, Elsevier Applied Science, London, (1990)
2. OOI, P.A.C. *Intl. Rice Res. Newsl.* 5, 13-14, (1980)
3. KENMORE, P.E., CARINO, F.O.,PEREZ, C.A., DYCK, V.A. & GUTIERREZ, A.P., *J. Plant Prot. Trop.*, 1, 19-37, (1984)
4. NAKASUJI, F. & DYCK, V.A., *Res. Pop. Ecol.*, 26, 134-149, (1984)
5. FOWLER, S.V., CLARIDGE, M.F., MORGAN, J.C., PERIES, I.D.R. & NUGALIYADDE, L., *Bull. Entomol. Res.*, 81, 161-167, (1991)
6. GREATHEAD, D.J. In *First international workshop on leafhoppers and planthoppers of economic importance*, (eds) Knight, W.J. et al., pp 371-383, Commonwealth Institute of Entomology, London, (1983)