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EFFECTS OF RICE GENETICALLY ENGINEERED WITH A TOXIN GENE FROM *Bacillus thuringiensis* Berliner ON THE BROWN PLANTHOPPER, *Nilaparvata lugens* (Stål), AND ITS PREDATOR, *Cyrtorhinus lividipennis* Reuter

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ABSTRACT

CARMENCITA C. BERNAL, University of the Philippines, Los Baños, March 2000. Effects of Rice Genetically Engineered with a Toxin Gene from *Bacillus thuringiensis* Berliner on the Brown Planthopper, *Nilaparvata lugens* (Stål), and its Predator *Cyrtorhinus lividipennis* Reuter

Major Advisers: Dr. E.N. Bernardo and Dr. M.B. Cohen

Greenhouse and laboratory studies were conducted to investigate the effect of Bt-transformed rice on the brown planthopper (BPH), *Nilaparvata lugens* (Stål), and its predator, *Cyrtorhinus lividipennis* Reuter, at the International Rice Research Institute, Philippines. Five Bt rice lines were used in the experiments, all with the *cryIAb* toxin gene, but each with a different promoter.

There was significantly lower leaffolder (*Cnaphalocrosis medinalis* Guenée) survival on leaves coated with honeydew from the Bt line with the CaMV35S promoter than on leaves treated with honeydew from the control line, with some dead larvae showing signs of poisoning. Leaffolder larval weight was significantly lower on Bt lines with CaMV35S promoter and pith-specific promoter than on the control line. These results suggest the presence of Bt toxin in the honeydew of BPH that fed on some of the Bt lines. However, said presence was not detected by the conventional alkaline phosphatase detection system, suggesting that the amount was probably below the detection limit of this system.

In two cases (with CaMV35S and pith-specific promoters), there was significantly bigger amount of honeydew produced on the Bt lines than on the control lines, but no

similar trend on the others. Likewise, the trend in differences in the survival rate, developmental period or body weight gain of BPH reared on Bt and control plants were not consistent. Nonetheless, the generally slower nymphal development of the females indicates that the Bt lines with CaMV35S and pith-specific promoters had slightly enhanced resistance to the BPH. The reverse trend for the males, in general, cannot be explained. Consumption by *C. lividipennis* of Bt-fed BPH prey had no significant effect on the predator's survival and nymphal development.

Overall, the results do not indicate possible strong adverse effect of the *cryIAb*-transformed rice lines evaluated on the brown planthopper or on *C. lividipennis*. Thus, complementation of host plant resistance through incorporation of Bt toxin in rice varieties and use of insect predators to protect the crop from lepidopterous pests and BPH appears feasible. However, more research is needed to establish the level of Bt toxin present in the feeding sites and its availability for ingestion by BPH in relation to the promoters used.