Effectiveness of egg-nymphal predation by a mirid bug, *Cyrtorhinus lividipennis* REUTER, for control of the brown planthopper

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벼멸구(Nilaparrata lugens STAL)의 卵 및 幼蟲에 對한 장님노린재 一種(*Cyrtorhinus lividipennis* REUTER)의 捕食效果

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本試驗은 1966年 필리핀에 있는 國際水稻硏究所에서 벼멸구의 生態에 關한 試驗을 爲하여 벼멸구를 大量으로 集團接種飼育하여 오던 중 cage內 갑자기 벼멸구의 密度가 줄고 장님노린재가 無數히 繁殖되고 있는 것을 觀察한 後 Hawaii에 있는 Bishop Museum, Dr. ASHLOCK氏에게 이 장님노린재에 對한 同定을 의뢰함과 同時에 벼멸구에 對한 捕食性을 調査한 結果 벼멸구의 捕食能力은 장님노린재를 産卵된 稻葉에 接種하였을 때 5日後 捕食卵率이 69.1%인데 對하여 벼멸구 若蟲에 對하여서는 接種 1日 후 61.4%, 2日 후 76.2%, 3日 후 91.0% 4日 후 93.3%의 捕食率로서 매우 놀라운 捕食能力을 보여주었다. 이 장님노린재는 벼멸구뿐만 아니라 다른 멸구類의 密度를 制壓할 수 있기 때문에 圃場條件下에서는 멸구類의 被害를 미연에 輕減시킬 수 있는 有利한 天敵이라고 생각되며, 今後 이의 實際的인 利用面에 對한 硏究가 期待된다.

The brown planthopper, *Nilaparvata lugens* STAL, is one of the most destructive insects on rice crop throughout most of rice growing countries of world. In several areas it infests the rice crop regularly, but occurs sporadically elsewhere, becoming abundant in favorable environment and ecological conditions. The insect prefers to feed and multiply near the base of the plant. Its population generally increases as the crop nears maturity, becoming particularly abundant during dry periods. It is capable of rapid multiplication a female lays 200 to 300 eggs which in about a week hatch into nymphs, becoming adults in 12 to 16 days.

The damage to the crop is caused by the nymphs and the adult planthoppers which feed by sucking the plant sap. When feeding in large numbers, they may cause complete drying of the crop, thereby inducing a condition generally referred to as 'hopper-burn'. In low numbers they reduce the general vigor of the crop which, if infested during earlier stages of plant growth, produces a low number of tillers; when attacked in later stages, the crop produces a high proprotion of unfilled grains. This species has periodically caused extensive losses in Japan and Korea (UENAGA and NAKATSUKA; 1958, SUENAGA; 1963, KISIMOTO; 1965), the Philippines (CENDANA and CALORA; 1964) and in Fiji (HINKLEY; 1963).

Besides causing damage by direct feeding, the in-

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** The authers express their sincere appreciation to Dr. P. D. ASHLOCK, Taxonomist, Bishop Museum, Honolulu, Hawaii, for identifying the predator, *Cyrtorhinus lividipennis* REUTER, of the brown planthopper.

sects are also capable of transmitting a virus called grassy stunt of rice (RIVERA et al.; 1966).

Host preference of this insect are being studied with 20 different varieties under large meter mesh cage condition at The International Rice Research Institute. In the study several thousand of brown planthoppers were released in a 25×3×3 meter screen cage.

A few days later, a small chance population of a mirid bug was observed in the cage. These bugs (Fig. 1), which were feeding on the planthopper eggs multiplied rapidly, and in about 10 days the young nymphal population of the planthoppers declined because most of the eggs were destroyed by the predator. Beyond this period, even the nymphs were attacked and in about 20 days the brown planthoppers population almost disappeared.

The present study is conducted for the predation of this mirid bug to further verify these interesting results.

I. Materials and Methods

1. Egg-predation test

Twenty adult females were introduced to a 25×200 mm test tube with a piece of rice stem which was cut off from about 60 days old plant of Taichung Native-1. The stem oviposited was taken out 48 hours after the introduction of females and then 10 adult mirids were placed in the test tube with the stems containing planthopper eggs. Another stems oviposited were placed in the test tube without any predator. All these tubes had 5cc of water for keeping freshs tems and 5 replications were made. Observations were made by dissecting the stems under a dissecting microscope day after placing mirids.

2. Nymphal predation test

Ten of adult mirids and 2nd to 3rd instar nymphs were placed in a 25×200mm test tube which was containing a piece of rice stems and 5cc of water. Five replications were made and placed under room condition. The rice stems were replaced 3 days later and records for mortality of nymphs were made at 24 hours interval up to 4 days after the introduction of nymphs and mirids.

II. Results and discussions

Specimens of this predator sent to the Bishop Museum in Hawaii were identified as *Cyrtorhinus lividipennis* REUTER, (Miridae: Hemiptera).

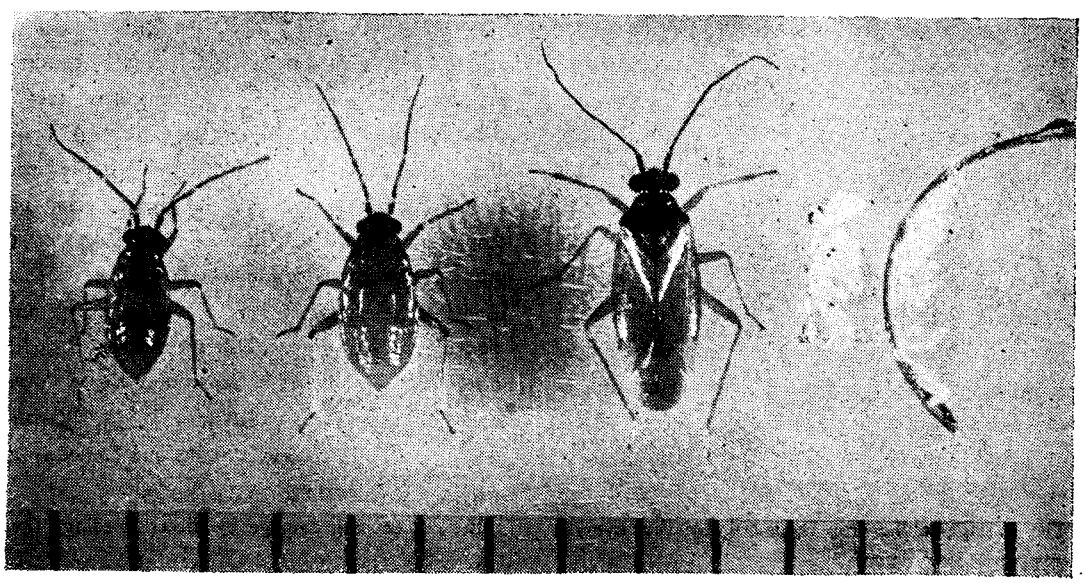

Fig. 1. The nymphs and the adult mirid bug, *Crytorhinus lividipennis* REUTER, together with brown planthopper eggs destroyed by their feeding, The damaged eggs get shrive and do not hatch. Note also a few healthy eggs (with black eye spot and not shrivelled) in the picture.

The insect has been recorded from Great Nicopar, Formosa, Java, Ceylon, Burma, Sumatra, Japan, Philippines, China, Southern India, Samoa, New Guinea, Fiji, Mariana Islands, Caroline Islands, New Hebrides, and Guam (USINGER;, 1946, SWEZEY;1946). It has been recorded feeding on the eggs of the corn leafhopper *Peregrinus maidis* (ASHMEAD) (USINGER; 1946), the brown planthopper and the white back planthopper, *Sogatella furcifera* HORVATH(SUENAGA; 1963, HINCKLEY; 1963).

However, no record of its activity as a predator on the nymphs of the planthoppers was found in the literature.

In observations made by dissecting stems 5days later, 98.4% of eggs caged without mirid predators showed normal egg development in contrast to 30.9 % normal eggs when caged with predators (Table 1).

Table 1. Predation effect of *Cyrtorhinus lividipennis* REUTER on the eggs of rice brown planthopper, *Nilaparvata lugens* STAL.

No. of predator, *C. lividipennis*	No. of the eggs of *N. lugens*	Days after introduction	Accumulative mortality of eggs of *N. lugens*(%)
0	630	5	1.6
50	695	5	69.1

Also, further studies made by caging brown planthopper nymphs with and without the predator confirmed that the predator was feeding on the nymphs. The mortality in the test tube with predator showed that 61.4, 76.2, 91.0 and 93.3% were recorded at 1, 2, 3 and 4 days respectively after introduction, in contrast to 3.6, 9.0, 14.4 and 19.8% in the test tube without predator (Fig. 2, Table 2.).

Table 2. Predation effect of *Cyrtorhinus lividi pennis* REUTER on the eggs of rice brown planthopper, *Nilaparvata lugens* STAL.

No. of predator	No. of nymphs of *N. lugens*	Mortality of nymphs of *N. lugens* after introduction			
		1	2	3	4
0	56	3.6	9.0	14.4	19.8
50	88	61.4	76.2	91.0	93.3

It appears from the present studies that since *Cyrtorhinus lividipennis* feeds on both eggs and nymphs, it may be an effective predator of the brown planthopper as well as other relative planthoppers for effectively controlling both nymphal and egg population under field condition. Further studies on its population dynamics in the rice environment, and its introduction to areas where its occurrence has not been recorded, merit favorable consideration.

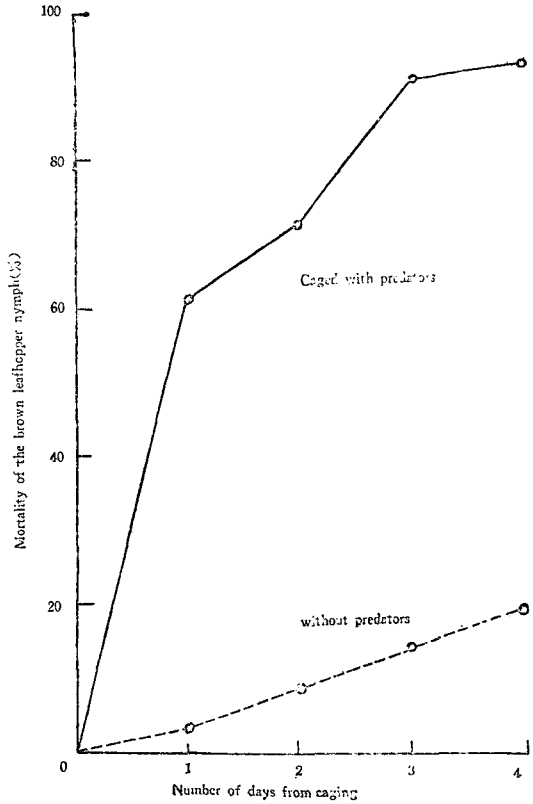

Fig. 2. The brown planthopper nymphs when caged with the mirid bug suffered more than 90% mortality after 3 days compared to about 15% mortality when caged without the predator.

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