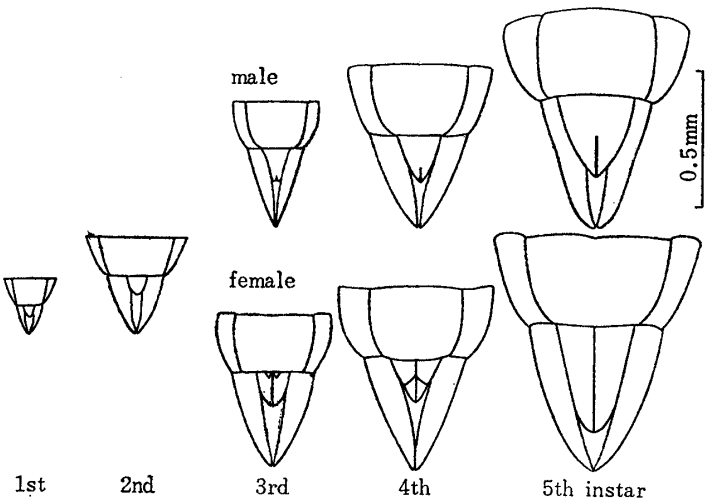

Fig. 2. Ventral view of the terminal two abdominal segments of the lst to 5th instars.

natural enemies. No. 5. *Ent. lab., Dept. Agric., Kyushu Imp. Univ., Fukuoka* 40 pp. + 3 pls. (In Japanese).

LINDBERG, H. (1939) *Acta Zool. Fenn.* **22** : 5-179.

MOCHIDA, O. (1963) *Delphax* No. 6 : 4. (In Japanese).

NASU, S. (1961) *Ibid.* No. 3 : 6. (In Japanese).

POLLARD, H. N. (1962) *Ann. ent. Soc. Amer.* **55** : 141.

WEBER, H. (1931) Biologie der Tiere Deutschlands unter Mitwirkung zahlreicher Fachleute bearbeitet und herausgegeben von Dr. P. SCHULZE., **34** : 71-208.

Osamu MOCHIDA

Kyushu National Agricultural Experiment Station, Izumi, Chikugo-City, Fukuoka-Pref., Japan

Received October 21, 1969

REFERENCES

ESAKI, T. and S. HASHIMOTO (1934) Report on the leafhoppers injurious to the rice plant and their

A Device for Collecting Planthopper and Leafhopper Eggs (Hemiptera : Delphacidae and Deltocephalidae)[1]

The capacity to lay eggs on artificial media is a prerequisite for successive rearing of insects on synthetic diets. It is well known that some lepidopterous insects can lay their eggs on paper. Howerver, in the case of planthoppers and leafhoppers it seems almost hopeless to expect any oviposition on paper, although *Macrosteles fascifrons* STÅL has been reported to lay eggs on the surface of the host plant or on the surface of glass occasionally (MITSUHASHI and MARAMOROSCH, 1963). Artificial rearing of hemipterous insects has been attempted for more than 30 years, but little effort has been made to obtain eggs on artificial media. The only report available on this is the oviposition of a froghopper, *Aeneolamia varia saccharina* (DISTANT) on an artificial medium (HAGLEY, 1967).

In the present report, a method to let planthoppers and leafhoppers lay their eggs on artificial media is described. The experiments were carried out mainly with the red-eye strain of the smaller brown planthopper, *Laodelphax striatellus* FALLÉN, which had been maintained for years in this

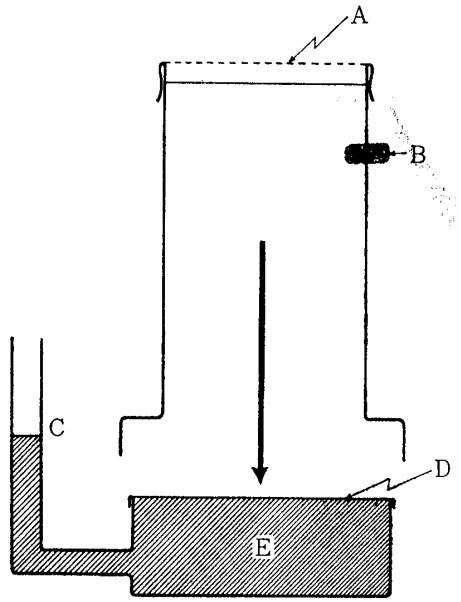

Fig. 1. Schematic representation of an oviposition cage. The insect cage is fixed to the medium container by means of Scotch tape. The upper part : insect cage; the lower part : medium container; A : screen mesh; B : a hole for introducing insects with a cotton plug; C : a side arm; D : stretched Parafilm M; E : medium.

[1] Appl. Ent. Zool. **5**(1) : 47-49 (1970)

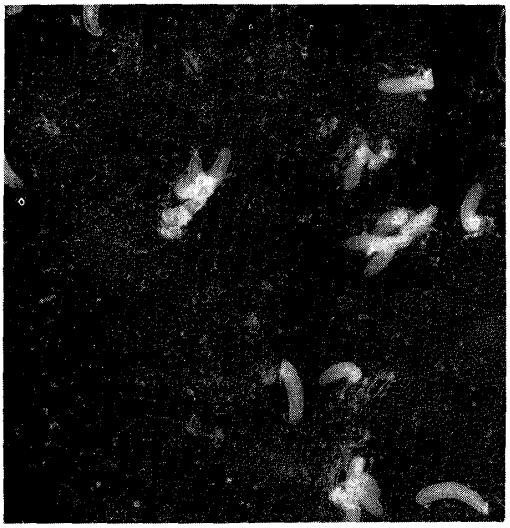

Fig. 2. Eggs of *Laodelphax striatellus* laid on an artificial medium, showing eggs hanging on to the stretched Parafilm M membrane. The photograph was taken through the Parafilm M membrane. (×10).

laboratory.

The oviposition cage used was essentially the same as the feeding cage for leafhoppers designed by FULTON and CHAMBERLIN (1934) (Fig. 1). The stretched Parafilm M was used to separate the insects from the liquid media. The liquid medium was introduced to the medium container through the side arm after fixing the stretched Parafilm M to the top of the container. Insects were put into the cage after the whole assembly was completed. During the oviposition period the insects were kept at 25°C under 16 hr of light per day. The insects suck the medium through the Parafilm M, and also lay their eggs which are carried through the Parafilm M. Some eggs were directly delivered into the media and sank to the bottom of the container, while others hang on to the Parafilm M singly or in clusters (Fig. 2).

For the collection of eggs, the insects were first removed from the top of the cage or from the bottom of the cage after the separation of the insect cage from the medium container. The eggs that hung on to the Parafilm M were forced to sink by pushing them down with a needle. The eggs in the medium were then transferred into water by means of a pipette. The eggs of planthoppers and leafhoppers can complete their embryogenesis normally in water, but it was observed that a high density of eggs in water caused a delay in the growth of the embryos or even killed some of them. Hatching occurred normally if the eggs were transferred from water onto a moistened filter paper 1 day before hatching.

Various media were examined for their efficiency on oviposition (Table 1). The numbers of eggs laid on artificial media were far smaller than that on rice seedlings. However, eggs as many as a thousand could be collected easily on sucrose solutions. It is strange that no eggs were laid on a synthetic diet on which *L. striatellus* could complete its whole life cycle. Distilled water was less efficient than sucrose solutions. Sucrose solution at a concentration of 10 % seems to be a better medium for oviposition than 5 % sucrose, but the difference was statistically not significant ($p=0.05$).

Table 1. OVIPOSITION OF *Laodelphax striatellus* ON VARIOUS ARTIFICIAL MEDIA

Media	Number of insects used[a]	Number of eggs laid by a female per day[b]
Rice seedlings (control)	225	21.4±3.9
5 % Sucrose	240	3.8±2.2
10 % Sucrose	268	6.2±4.9
MED-4[c]	256	0
Distilled water	152	1.5±1.4

[a] The age of the insects were between 9 and 18 days after the final moult (the maximum oviposition period).

[b] Mean ± standard error (confidence limit = 95%).

[c] Synthetic diet for *L. striatellus* (MITSUHASHI and KOYAMA, unpublished).

The above mentioned method was applied to the other species of planthoppers and leafhoppers. *Psamotettix striatus* LINNÉ and *Macrosteles horvathi* WAGNER oviposited on 5 % sucrose, exhibiting similar good egg laying characteristics as *L. striatellus*. *Nilaparvata lugens* STÅL oviposited fewer eggs than the above species. *Sogatella frucifera* HORVÁTH occasionally laid very few eggs. All the eggs obtained from these species completed their embryogenesis in water and hatched normally on moistened filter paper. The species which did not oviposit on 5 % sucrose through Parafilm M were *Nephotettix cincticeps* UHLER, *Balclutha viridis* MATSUMURA, *Tettigella viridis* LINNÉ, *Doratulina*

japonica MATSUMURA, and *Sogatella elegantissima* (ISHIHARA). It may be possible to lead these non-ovipositing species to oviposition by improving the medium or the environmental conditions.

No difference was found between eggs laid on natural host plants and on artificial media. This method is, therefore, useful not only for artificial and/or aseptic rearing but also for the studies that need a large number of eggs as material.

REFERENCES

FULTON, R. A. and J. C. CHAMBERLIN (1934) *Science* **79** : 346-348.

HAGLEY, E. (1967) *Nature* **213** : 414-415.

MITSUHASHI, J. and K. MARAMOROSCH (1963) *Contrib. Boyce Thompson Inst.* **22** : 165-173.

Jun MITSUHASHI

Division of Entomology,
National Institute of Agricultural Sciences,
Nishigahara, Kita-ku, Takyo, Japan

Received November 30, 1969