

A STUDY ON THE PATTERN OF EXCRETION IN THE FRESH WATER BIVALVE *LAMELLIDENS CORRIANUS*

COMPARATIVELY very little attention has been focussed on nitrogen metabolism in lamellibranch molluscs^{1,2}. The available data indicate that the marine bivalves are ammonotelic with lesser amounts of urea and free amino acids also contributing to the total nitrogen of the urine. Since only scant data are available on this aspect in fresh water forms³, it was thought that an investigation on the pattern of excretion in the common fresh water mussel, *Lamellidens corrianus*, would yield useful information.

Specimens of *Lamellidens corrianus* were collected from fresh water streams near Kariavattom and were immediately used for the investigation. Since it was not possible to obtain urine samples directly, the 'bathing medium' of the animals was used for the estimation of the excretory products⁴⁻⁸. Specimens of almost the same size (6 to 7 cm shell length) and weight (15 to 16 g) were selected, their shells cleaned thoroughly and transferred to separate beakers containing 1000 ml of pond water, 24 hours prior to each estimation. 1000 units of penicillin G/ml were added to the water in order to minimise the bacterial action on the excretory products. Five ml portions of the filtered water were used for the estimation of ammonia, urea, uric acid and free amino acids. The ammonia levels were determined by employing the method of Seligson and Seligson⁹. Urea was assayed by conversion to ammonia with urease and later estimating the total ammonia¹⁰. Uric acid and free amino acids were estimated by following the techniques of Brown¹¹, and Lee and Takahashi¹² respectively. Blank and control estimations were carried out in all cases.

TABLE I

The pattern of excretion in *Lamellidens corrianus*.

The values denote mean \pm Standard Error and represent μ g of the substance excreted/total wet weight/24 hours by 15 animals. The numbers in parentheses indicate the % of nitrogen calculated from the total nitrogen of the identified compounds.

Ammonia	Free amino acids	Urea	Uric acid
738.9 \pm SE 22.0 (89.7)	152.0 \pm SE 6.9 (3.5)	28.2 \pm SE 2.0 (3.4)	69.1 \pm SE 3.9 (3.4)

Lamellidens corrianus was found to be predominantly ammonotelic. However, smaller amounts of free amino acids, uric acid and urea were also observed in the excreta.

Although formerly it was considered that the proportion of ammonia nitrogen to the total nitrogen excreted by bivalves is minimal³, subsequent investigators^{4-8,13} have stressed their ammonotelic nature. Thus, Lum and Hammen⁸ have recorded the ammonia output in *Modiolus demissus* to be 0.4 to 4.3 mg/100 g total wet weight/24 hours. In *Crassostrea virginica*, of the total 3.4 mg nitrogen excreted/100 g wet weight of tissue/24 hours, ammonia constituted 2.5 mg⁶. Emerson⁵ reported that *Mya arenarea* excreted 35 to 125 μ g ammonia/g dry weight/hour and *Macoma inconspicua*, 4.9 μ g/g dry weight/hour. Investigations by Allen and Garrett⁴ revealed that single specimens of *Mya arenarea* eliminated 3.22 mg ammonia/24 hours.

Urea was reported as being excreted by bivalves as early as 1899¹⁴. It has been shown that urea constitutes 13% of the total nitrogen output in *Crassostrea virginica*⁶ and 7% in *Mya arenarea*¹³. In *Lamellidens corrianus* only 3.4% of the total nitrogen of the identified compounds was found to be in the form of urea nitrogen.

The predominance of free amino acids in the excreta of bivalves has attracted considerable attention¹⁵. Investigations by Lent¹³ and Hammen⁷ on a number of marine bivalves indicated that the free amino acids constitute the second major excretory product in this group of molluscs. Comparable results have been obtained for *Lamellidens corrianus* also.

There are very few reports on the occurrence of purines in the urine of bivalves. Although Spitzer³ identified uric acid in the excreta of *Mytilus* and *Unio*, the only recent record on this aspect is that of Hammen¹⁶ on *Crassostrea virginica* in which uric acid amounted to 3% of the total nitrogen output. In *Lamellidens corrianus* 3.4% of the total nitrogen was found to be uric acid.

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A NOTE ON THE SEASONAL CHANGES IN THE INCUBATION TIME OF GROUNDNUT RUST

RUST of groundnut (*Puccinia arachidis* Speg.) is a serious disease¹⁻⁴. The period of incubation reveals the possible disease cycles in a single crop duration. For a proper understanding of the disease, changes in the duration of incubation period are continuously observed for one year, under two different conditions and the results are presented here.

On the 10th of every month, 4 pots, each with 2 plants of 10 days old, were inoculated with uredospore suspension, covered with polythene bags and left in the green house for two days. The bags were then removed and two pots were transferred to a shady region of the green house and the remaining two pots to full sunlight, outside the green house. The plants were observed for the first eruption of pustules.

The incubation period varied from 7 to 18 days under different conditions (Fig. 1). In the shade, the pustules develop one or two days earlier than in bright sunshine. In summer months of May and June incubation period was long, while in winter months (December and January) it was short.

Mc Vey (1965)⁵ reported that infection appeared 8 to 10 days after inoculation as whitish flecks, Ramakrishna and Subbayya (1973)⁴ reported that the secondary infection readily took place and produced uredosori within 8 days and Bhama (1972)² reported that symptoms appeared on the 7th day after inoculation. Present study supports the above observations and further shows that the incubation period changes with the season. That there are seasonal changes in the incubation period of plant diseases is also shown by Jenkyn (1973)⁶ who reported seasonal changes in the incubation time of *Erysiphe graminis* f. sp. *hordei* on barley.

Field observations on the incidence of groundnut rust shows that it appears abundantly in July, with the onset of rains, steadily increases upto January

and then decreases. From April to June rust incidence is meagre. When the incubation period is short, the rust is widely prevalent and when the period is larger, the incidence of rust is less. Raghunathan and Ramakrishnan (1970)⁷, who studied seasonal distribution of rust fungi in Tamil Nadu, also reported a similar trend.

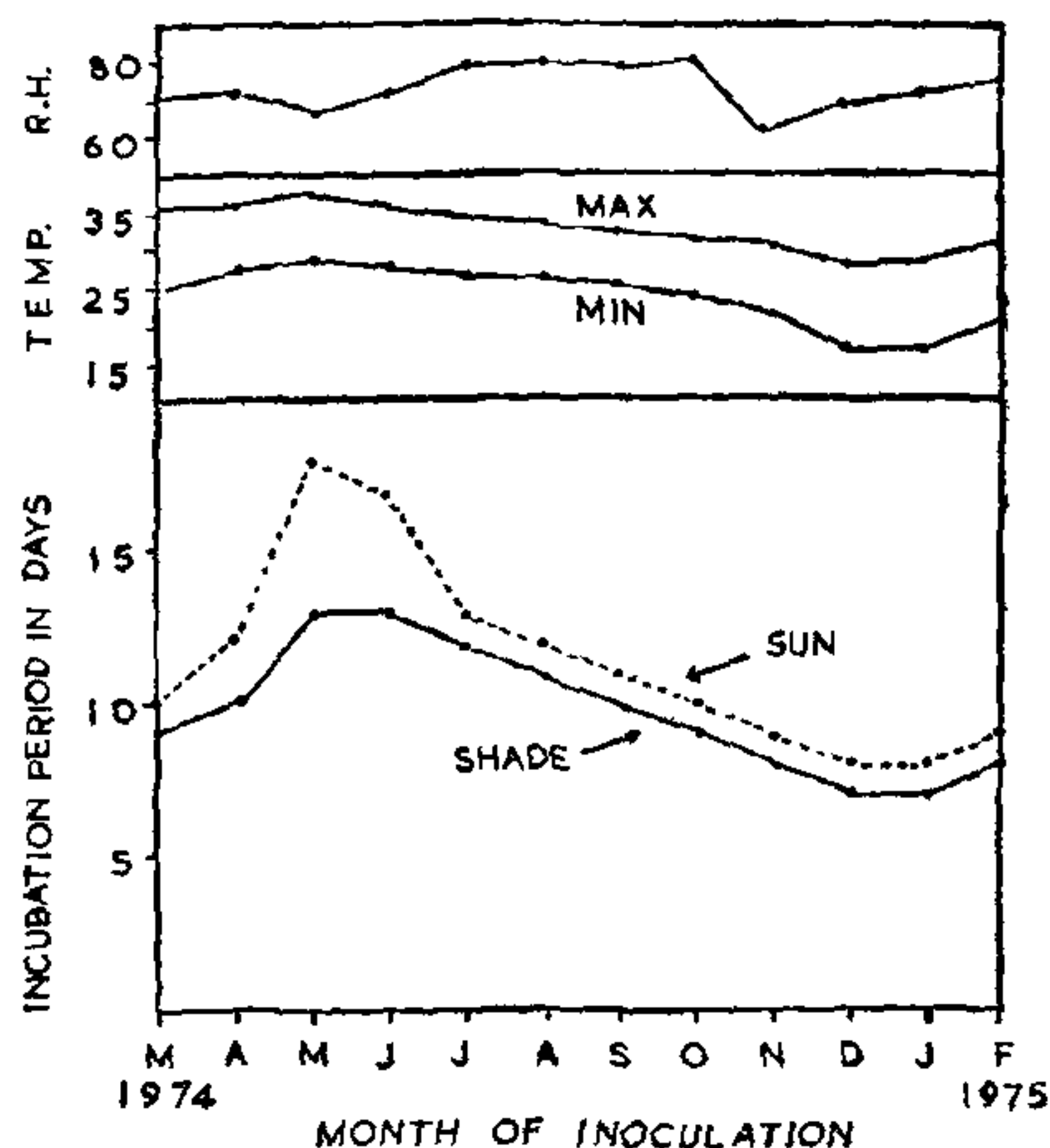


FIG. 1. The temperature and relative humidity recorded at outside the green house area are expressed as monthly means.

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