FURTHER OBSERVATIONS ON OVIPOSITION OF *DIMARMUS VAGABUNDUS* TIMB. (PTEROMALIDAE: HYMENOPTERA)

Dimarmus vagabundus Timberlake is a common parasite of the larvae of different species of genus *Callosobruchus*[1,2], the notorious pests of stored pulses. The oviposition behaviour of this parasite has already been studied but contradictory statements have been made on the laying of eggs[3,4]. According to Chatterji[3] the female lays its eggs on the mature embroyos of the host before hatching of the eggs. Cheema and Misra[4], on the other hand, noted the female to insert its ovipositor through the larval hole of the host and lay the eggs on the surface of the larva within the seed. They further noted that the eggs laid at a time when bruchid larvae are very young, fail to complete development.

Detailed observations made on the oviposition behaviour of *D. Vagabundus* show that normally the female penetrates its sharp and pointed ovipositor through the surface of the seed and places the egg on the surface of the growing larva of the bruchid in the seed. The female sometimes inserts her ovipositor through the hole made by the bruchid larva, for the deposition of eggs. It is thus apparent that observations of Chatterji about the penetration by the ovipositor of the female is quite correct but this author failed to appreciate the time of oviposition and therefore, supposed the egg to be laid on the surface of the embryo. It may however, be added that such a mode of oviposition is rarely adopted by the female. The most common method of oviposition instead, constitutes the drilling of the tissue of the seed for reaching the contained larva. It has also been observed that the complete process of laying an egg in this manner requires about 2–3 minutes when the larva is fully grown and 5–7 minutes when the larva is at an early stage of development. The fully grown larvae were given distinct perference for oviposition.

With regard to the egg laying capacity of a female, oviposition data at different conditions of temperatures and relative humidities indicate that the number of eggs per female varies from 9 to 26 (Table I). Likewise the oviposition period under similar conditions ranged from 2·7 to 6·7 days.

TABLE I

*Average number of eggs laid and *average oviposition period of one female (ten observaions) under different conditions of temperature and relative humidity*

Relative Humidity	25° C	30° C	34° C	38° C
30%	9·0 (6·4)	18·4 (3·9)	20·6 (2·8)	8·8 (2·7)
50%	12·4 (6·6)	20·5 (4·0)	22·0 (3·2)	12·2 (2·7)
70%	14·0 (6·7)	25·0 (4·2)	26·4 (3·4)	9·8 (3·0)

* Average oviposition period shown within brackets

The parasite is thus a good agent for the biological control of bruchids but its limited fertility does not match the high rate of reproduction exhibited by the bruchids.

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NITROGEN CONTENT OF RHIZOSPHERE SOILS OF WILD WEEDS AND CULTIVATED RICE

RHIZOSPHERES of certain weeds and rice plants have been shown to possess demonstrable nitrogenase activity as revealed by the acetylene reduction method[1-5]. Apart from the inherent limitations of the method, research workers have often used data from laboratory estimations of nitrogenase activity of small samples for the calculation of nitrogen accretion in terms of kg N/ha. It was therefore considered worthwhile to find out the total nitrogen status of rhizosphere soils of some wild weeds and varieties of cultivated rice by means of a conventional procedure. Samples of rhizosphere and non-rhizosphere soils (10 g. each) from several weeds were collected from uncultivated fields in rural areas of Delhi. The number of aerobic bacteria capable of growing on Jensen's nitrogen-free medium was estimated by plating dilutions of soil samples and the total nitrogen was determined by Kjeldahl's method. In a similar way, samples of rhizosphere and non-rhizosphere soils of different varieties of rice from various places in India, from plots which had not received any inorganic source of nitrogen, were also collected and analysed for total nitrogen.

The amount of nitrogen in the rhizosphere varied, although seven weeds had more nitrogen in the rhizosphere than in the non-rhizosphere. However, the amount of nitrogen in the rhizosphere could not be correlated with the number of bacteria which could be grown on a nitrogen free medium (Table I).

Among the 20 plots sampled for rice, 10 showed increase in nitrogen content in the rhizosphere and the maximum accretion was observed with the

TABLE I

Total nitrogen content and population of bacteria capable of growing on nitrogen-free Jensen's medium in the rhizosphere soils of several wild weeds (mean values of duplicate samples)

Locations	Sl. No.	Name of the weed	N mg/100 g soil	Bacteria capable of growing on N free medium 10^3/g (Figures in parenthesis indicate R : S ratios)
1	2	3	4	5
A	1	Non-rhizospnere (control)	84	26·6
	2	*Cyperus difformis* (Cyperaceae)	101	44·0 (1·65)
	3	*Scirpus* sp. (Cyperaceae)	72	21·0 (0·79)
	4	Non-rhizosphere (control)	99	26·3
B	5	*Ammania sevegalensis*	65	17·6 (0·67)
	6	*Solanum xanthocarpus*	172	44·0 (1·67)
C	7	Non-rhizosphere (control)	134	16·3
	8	*Croton sparsiflorus* (Euphorbiaceae)	99	20·5 (1·25)
D	9	Non-rhizosphere (control)	67	17·3
	10	*Xanthium stumarium* (Compositae)	226	18·3 (1·05)
E	11	Non-rhizosphere (control)	40	18·3
	12	*Asphodelus tenuifolius* (Liliaceae)	32	22·9 (1·25)
	13	*Vicia sativa* (Leguminosae)	34	23·6 (0·88)
	14	*Trigonella incisa* (Leguminosae)	32	31·9 (1·19)
	15	*Spergula arvensis* (Caryophyllaceae)	29	45·7 (1·71)
	16	*Fumaria indica* (Fumoroideae)	32	25·2 (0·94)
	17	*Sisymbrium iris* (Cruciferae)	58	40·6 (1·52)
	18	*Cenchrus ciliaris* (Gramineae)	74	94·0 (3·52)
F	19	Non-rhizosphere (control)	43	4·6
	20	*Parthenium hysterophorus* (Compositae)	46	5·2 (1·13)
G	21	Non-rhizosphere (control)	38	4·3
	22	*Eclipta alba* (Compositae)	40	3·0 (0·69)
H	23	Non-rhizosphere (control)	48	61·0
	24	*Tephrosia purpurea* (Leguminosae)	32	0·3 (—)
	25	*Ocimum americar um* (Labiatae)	30	2·3 (0·037)
I	26	Non-rhizosphere (control)	51	2·9
	27	*Dichanthium annulatum* (Gramineae)	47	3·9 (1·34)
J	28	Non-rhizospnere (control)	37	9·0
	29	*Leucas cephalotes* (Labiatae)	33	4·0 (0·44)
K	30	Non-rhizosphere (control)	53	17·3
	31	*Convolvulus arvensis* (Convolvulaceae)	36	9·3 (0·53)

variety 'Madhu,' at Bangalore (Table II). Depletion of nitrogen in the rhizosphere was characteristic of other varieties from the remaining 10 plots and the maximum decrease was observed in the rhizosphere soil of Sona variety at Delhi.

Earlier workers have pointed out consistent increase in the nitrogenase activity in the rhizosphere of weeds and rice but our results indicate that accumulation of nitrogen in the rhizosphere was not a consistent feature, the reason for which may be denitrification processes in the rhizosphere, the inability of bacteria to fix nitrogen in the rhizosphere or the uptake of nitrogen by plants.

TABLE II

Total nitrogen content in rhizosphere (R) and non-rhizosphere (NR) soils of rice plants from various places in India from plots which had not received inorganic N fertilizer (mean of 2 or more replicate samples, 10 g each)

Sl. No.	Place	Variety	Age in days	N (mg/100 g soil)		
				R soil	NR soil	Difference between R and NR soils
1.	Cuttack	Supriya	53	77	64	+ 13
2.	Cuttack	Supriya	120	69	61	+ 8
3.	Pantnagar	IR–24	40	108	98	+ 10
4.	Pantnagar	Pusa	20	102	102	0
5.	Karnal	2–21*	15	44	47	− 3
6.	West Bengal	Local	60	82	73	+ 9
7.	Delhi	Sona*	60	84	181	− 97
8.	Delhi	Sona*	120	100	81	+ 19
9.	Deoria	Jaya*	90	38	69	− 31
10.	Varanasi	Sona*	90	56	69	− 13
11.	Varanasi	Ratna*	90	56	62	− 6
12.	Jabalpur	..	..	40	26	+ 14
13.	Bangalore	Madhu*	40	206	88	+118
14.	Lucknow	T_9	30	44	47	− 3
15.	Lucknow	Sal et 4	45	41	56	− 15
16.	Lucknow	T_{26}	45	67	62	+ 5
17.	Lucknow	Saket 4	60	64	78	− 14
18.	Hyderabad	Rajhansa	90	97	88	+ 9
19.	Hyderabad	5 varieties	100	73	50	+ 23
20.	Trivandrum	Jaya	110	149	212	− 63

* Single sample.

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