Journal of Biological Control, 26 (4): 373–375, 2012

Research Note

Mud wasp, *Sceliphron madraspatanum* (Fabricius) (Hymenoptera: Sphecidae): A threat or nature's regulation of spider fauna in the vegetable agroecosystem?

JAYDEEP HALDER,* A. B. RAI, M. H. KODANDARAM, T. M. SHIVALINGASWAMY[1] and DEBJANI DEY[2]

Crop Protection Division, Indian Institute of Vegetable Research, Varanasi 221 305, Uttar Pradesh, India

[1] *Present address: National Bureau of Agriculturally Important Insects, Bangalore 560 024, India*

[2] *Division of Entomology, Indian Agricultural Research Institute, New Delhi 110 012, India*

* *Corresponding author E-mail:* jaydeep.halder@gmail.com

ABSTRACT: The biology and behaviour of mud wasp, *Sceliphron madraspatanum* (Fabricius) and its possible role in insect pest management were studied under vegetable agroecosystem. The gravid female lays a single egg (2.75 ± 0.33 mm in length) in a mud chamber that is provisioned almost exclusively with orb-weaver spiders, wolf spiders and jumping spiders available in the vegetable agroecosystem. Total numbers of spiders provisioned in each cell was negatively correlated with their mean body weight. However, the wasps avoided provisioning of lynx spider, the most predominant spider in this ecosystem, due to its short and reduced abdomen and also the presence of large, strong and erect setae over its body. In the agroecosystem, mud wasp was found to constitute the third trophic level in the food chain comprising of the vegetable crops – insect pests – spiders – *S. madraspatanum* and thereby their role could be detrimental for the pest management.

KEY WORDS: *Sceliphron madraspatanum,* biology, prey spiders, tritrophic interactions

(Article chronicle: Received: 20-05-2012; Revised: 14-12-2012; Accepted: 24-12-2012)

The genus *Sceliphron* is a cosmopolitan wasp comprising of more than thirty species. They are commonly referred to as mud wasp or mud daubers. *Sceliphron madraspatanum* (Fabricius) has been reported widely from the Indian sub-continent. Billberg (1820) first reported this species as *Pelopaeus madraspatanus* from southern Malabar, India. Later, this species was also recorded from West Bengal and Nepal by Paiva (1907). Nurse (1914) documented it from Assam, India. More recently, the medicinal and aesthetic values of this species was reported from Panch Pargana area of Jharkhand, India (Kumari and Kumar, 2009). This wasp is locally called as Kunkal or Kumhar poka and its mud nest is used for folk medicine. The paste of the mud nest is applied on fore-head as a cure against migraine while for dyspepsia and frequent thirst, the paste is applied on the navel. These solitary wasps are strong fliers, generally not aggressive and do not sting unless mishandled or disturbed. However, there has been no information about its role in agriculture. Therefore, an effort was made to study the role of this mud wasp in agriculture more specifically in pest management, if any.

Occurrence and feeding behaviour of the mud wasps

During June to September, 2010 many such mud nests of *S. madraspatanum* were observed in and around the farm of Indian Institute of Vegetable Research, Varanasi, Uttar Pradesh, India. An attempt was made to study their biology and behaviour and their role as predators of spiders in the vegetable ecosystem. Numerous nests of these wasps were observed, mainly in shaded places of the farm. Interestingly, very few mud nests were recorded from the border trees. The adult female was observed to make around 10–13 round trips to construct each cell (2.38±0.19 cm x 0.975±0.083 cm) carrying soft mud collected mainly from frequently irrigated fields or nearby irrigation channels with their mandibles and fore legs. Initially, a single cell was constructed to which cells were added one by one on each side. Commonly each nest consists of 8-13 such cells. The wasp usually took about one to two days to construct a single cell and incompleted cells were closed temporarily before sunset and opened the very next day. Freeman and Johnston (1978) also observed that incompletely stored cells of *S. assimile* were closed with an externally concave

lamella of mud at the onset of rain or at 16.00 – 17.00 hours E.S.T. and never reopened the same day.

The identity of mud wasp encountered in the present study was confirmed as *S. madraspatanum* from the taxonomists of Division of Entomology, Indian Agricultural Research Institute, New Delhi and diagnosed by the following taxonomic characters, *viz*., body length 17 ± 3.5 mm; body black with yellow pattern on thorax; narrow slender waist yellow in colour; scape below except base, top of collar, tegulae, part of post scutellum, petiole, nearly apical half of fore and mid femora and basal half of hind femora, whole of fore and mid tibiae and basal two thirds of hind tibiae, first tarsomere of hind legs except base and apex above, and trochanters yellow; wings hyaline with a brownish tint (Fig. 1).

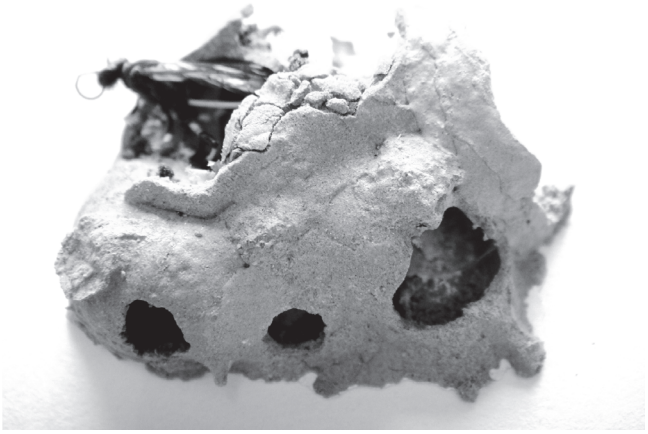
Critical observations revealed that female wasps practised mass provisioning the food substrate for their developing young ones. Each cell was provisioned with 9-13 dead or moribund immobile spiders gathered from the nearby vegetable fields. However, it was also observed that total numbers of spiders provisioned in each cell was negatively correlated with their mean body weight. Thereafter, the gravid female laid whitish grey eggs singly in each cell. The eggs measured 2.75 ± 0.33 mm in length and glued to the abdominal portion of one large spider and the cell was sealed with mud. The full grown wasp larva was about 8.5 ± 0.62 mm long, creamy white in colour with a peculiar hammer shaped head. The larva fixed its head to the abdomen of the spider's body and started feeding. Later, on the other body parts *viz*., legs, thorax etc., were devoured.

Composition of food substrate in mud wasp nests

The spiders collected from the mud wasp nests could be identified as *Neoscona odites* (Simon) (Araneidae) commonly known as orb-weaver spiders; *Lycosa* spp. (Lycosidae) or wolf spiders; and *Marpissa* spp. (Salticidae) or jumping spiders all of which were found abundantly in the vegetable ecosystem. Landes *et al*. (1987) from Missouri, USA reported that Araneidae was the most numerous spider family and exhibited a pattern of seasonal increase in abundance as prey of mud-dauber, *Chalybion californicum*. Interestingly, another predominant spider, *Oxyopes lineatipes* (Lynx spider) abundant in the okra and brinjal fields was not observed in the nest of the mud wasp. The probable reason for its absence can be linked to its morphology. It was observed that the abdominal portion of these spiders were proportionately smaller than the thorax which is the largest part of its body. Besides, the setae present on the body of this lynx spider were large, strong and erect which might keep its predators at bay. Since, it was observed that the *Sceliphron* grub preferred the swollen abdomen of its host, lynx spiders with its small sized abdomen and strong and erect setae over its body could be the probable reason for its non-preference as a suitable host by the mud wasp. Similar observation was also confirmed by Elgar and Jebb, (1999) that mud-dauber wasp, *S. laetum* generally avoided the provisioning of *Gasteracantha* spiders due to its hard integument that restricted the penetration by its larvae.

In the vegetable agroecosystem, *S. madraspatanum* was found to constitute the third trophic level in the food chain comprising of the vegetable crops (*i.e.,* okra / brinjal) – insect pests (jassids / whitefly / neonate larvae

A



B

Fig. 1: A. Adult mud wasp (Sceliphron madraspatanum F.) and B. Nest of mud wasp with emerging holes.

of fruit borer) spiders – *S. madraspatanum*. In natural biological control, spiders play an important role in controlling many insect pests. In a parallel study it was estimated that in unsprayed brinjal and okra plots the spider populations were 2.90 and 2.54 per plant, respectively. Further, a single spider can prey about 53 to 86 jassids per day under confined condition. Our present observation also is in conformity with the observation that a single wolf spider can eat up to 20 brown plant hoppers [*Nilaparvata lugens* (Stål)] adults a day in the rice ecosystem (Rajan and Shukla, 1996). Sahu *et al*. (1996) studied the feeding potential of wolf spider (*Lycosa pseudoannulata*) in rice ecosystem and confirmed that they preyed more on green leaf hopper (43.3%) followed by rice hispa (6.67%), stem borers (3.3%) and rice leaf folder (3.3%). In the cotton ecosystem, a spider consumed cotton aphid, *Aphis gossypii* Glover, cotton fleahopper, *Pseudatomoscelis seriatus* (Reuter) through out its growing period (Nyffeler *et al.,* 1989) and consumed 5 or 6 worms per day, halting infestation early. Another American study revealed that wolf spiders, jumping spiders, and crab spiders, have lessened pest damage up to 70% over vegetable fields (Rajan and Shukla, 1996). There is growing awareness about conservation of these tiny creatures. China had already adopted extensive use of spiders to control pests in cotton and rice (Sunderland, 1999).

Literature indicated that there are very few insects which devour spiders for their survival. So far, preying mantis, flies (Acroceridae), daddy long-leg (*Pholcus phalangioides*) in rice ecosystem (Jackson, and Brssington 1987) and spider wasp (Pompilidae) have been reported to feed on spiders. But, the present studies concluded that the mud wasp, *S. madraspatanum* is a predator of spiders.

ACKNOWLEDGEMENT

The authors are thankful to Dr. P. A. Sebastian, Division of Arachnology, Department of Zoology, Sacred Heart College, Thevara, Cochin, Kerala for identifying some of the species of spiders.

REFERENCES

Elgar MA, Jebb M. 1999. Nest provisioning in the mud-dauber wasp *Sceliphron laetum* (F. Smith): Body mass and taxa specific prey selection. *Behaviour* **136**: 147–159.

Freeman BE, Johnston B. 1978. The biology in Jamaica of the adults of the sphecid wasp *Sceliphron assimile* Dahlbom. *Ecol Ent*. **3**(1): 39–52.

Jackson RR, Brssington RJ. 1987. The biology of *Pholcus phalangioides* (Araneae, Pholcidae): predatory versatility, araneophagy and aggressive mimicry. *J Zool.* **211**(2): 227–238.

Kumari B, Kumar S. 2009. An insight into the ethno-zoology of Panch Pargana area of Jharkhand, India. *J Thr Taxa* **1**(8): 441–443.

Landes DA, Martin S Obin, Cady, AB, Hunt JH. 1987. Seasonal and latitudinal variation in spider prey of the mud dauber *Chalybion californicum* (Hymenoptera: Sphecidae). *J Arachn.* **15**(2): 249–256.

Nyffeler M, Dean DA, Sterling WL. 1989. Prey selection and predatory importance of orb-weaving spiders (Araneae: Araneidae, Uloboridae). *Texas Cotton Env Ent*. **18**(3): 373–380.

Rajan V, Shukla AN. 1996. Towards ecological farming in India for poverty alleviation, environmental regeneration, and political stabilization. *J Sust Agric.* **6**(4): 61–96.

Sahu S, Singh R, Pawan K. 1996. Host preference and feeding potential of spiders predaceous on insect pests of rice. *J Ent Res.* **20**(2): 145–150.

Sunderland K. 1999. Spiders for pest control. *Pesticide Outlook* **4**: 82–85.