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Conceptual Paper

Bethylids: A Living Weapon to Endopterygotan Pests

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Introduction

In the order Hymenoptera, family Bethylidae belongs to the superfamily Chrysidoidea together with other six families, viz. Chrysididae, Dryinidae, Embolemidae, Sclerogibbidae, Scolebythidae and Plumariidae. Bethylids are ant-like small, nimble wasps that are readily recognized by their strong flattened body and prognathus head. Bethylidae is represented by about 2216 nominal species in 97 genera of 7 subfamilies [1]. The estimated number of world Bethylid fauna is 6000 species, with only less than 30% of them described at present. In India, 98 species in 23 genera under 4 subfamilies are known. Hence, among the members of the super family Chrysidoidea [2] Bethylidae represents the most diversity rich group to be explored.

Seetharama [3] revealed that the female wasp of *Apenesia sahyadrics* (Azevedo and Waichert) laid 53.64 ± 3.06 eggs (10 - 123 eggs). The female wasp lived for a period of 66.48 ± 3.66 days (11 - 128 days). In the case of male, the average longevity was 7.96 ± 0.30 days (5 - 15 days).

Elahe., *et al.* [4] indicated that the maximum numbers of eggs of *G. swirskiana* on larvae of *Batrechedra amydraula* (Meyrick) were laid on the 5th lateral segment and there were not a single egg on the first segment of abdomen and the last segment of abdomen. The female deposited about 71, 32 and 10 eggs on dorsal, lateral and ventral surface of larva, respectively.

Sreekanth and Muralimohan [5] revealed that the oviposition rate of *G. nephantidis* was higher (89.15 ± 7.63) and the oviposition period was longer (29.55 ± 5.24) in larger female parasitoid than in smaller ones.

Parasitic behaviour and potential of Bethylids

Boongeua and Louis [6] showed that fifth instar of sapodilla fruit borer hosts yield more cocoon (11.4) and progeny (10.6) compared to either third or fourth instar hosts. Moreover, third instar were parasitized (2.0) while in case of the fifth instar larvae exhibited more number of larval parasitism (8.0).

Subaharan [7] indicated that 63 per cent of *G. nephantidis* oriented to the arm with *Opisina arenosella* Walker hemolymph followed by 35 per cent to *O. arenosella* frass. The starved parasitoids were more attracted towards food source honey (32%) than the larval products (26.0%).

Seasonal abundance of Bethylid parasitoids

Kapadia [8] revealed that the maximum parasitism by *Pristocera nephantidis* was 5.98 per cent in November followed by 5.75 and 4.48 per cent in February under filed condition.

Shivanand and Deshapande [9] reported that the activity period of larval parasitoid, *Goniozus* sp. was observed from second week of August to second week of November. The peak parasitization of sorghum ear head caterpillar, *Helicoverpa armigera* (Hubner) was observed (18.88%) during the first week of October.

Mass production of the factitious host

Mehendale [10] showed that the significantly heavier larvae of *C. cephalonica* were mass produced on composited diet i.e. Sorghum + Cowpea + Powdered yeast diet (54.50 mg) with no much detrimental impact on the life cycle.

Mass production of the Bethylids

Kapadia and Mittal [11] indicated that egg to larval period of *G. nephantidis* on *C. cephalonica* was less (4.00 days) in the months of June than higher in April (5.83 days). The ovipositional period prolonged in the month of April (12.0 days), followed by November (9.50 days) and shortened in January (2.70 days).

Gómez., *et al.* [12] studied the influence of age and diet on the survivorship of *C. stephanoderis* results noted that the survivorship ranged from 86.5 to cent per cent.

Impact of thermal regime

Sreekanth and Muralimohan [5] revealed that 25 to 30^{0}C temperature regimes found to be optimum for mass multiplication of the parasitoid, G. nephantidis under laboratory conditions.

Sreekanth and Muralimohan [5] revealed that at 30^{0}C hatching percentage was 92.15 and 25^{0}C pupation was more 94.55% and 30^{0}C the adult emergence was 98.05%.

Field release technique

According to Lyla., *et al.* [13], the trunk method of release of *G. nephantidis* suppressed the pest population up to sixth releases of the parasitoid. The trunk method of release was low cost and easy to operate under the field condition.

Abbas., *et al.* [14] reported that the ratio of *B. amydraula: Goniozus sp.* (B: G) ranged from 1:1.1 to 1:1.5 in date palm treated orchards as compared to the untreated orchard.

Compatibility with other management strategies

According to Rajamanickam., *et al.* [15], the root feeding of coconut palm with Azadirachtin F5% @ 10 ml + 10 ml water followed by the release of promising larval parasitoids among the treatment *B. brevicornis* (29.40% parasitism) and *G. nephantidis* (16.96% parasitism) and pupal parasitoid, *Trichospilus pupivora* Ferr (6.25% parasitism) at 21 days after treatment was found effective against coconut black headed caterpillar.

Venkatesan., *et al*. [16] showed that the mean percent of adult production was significantly higher (91.3%) for *G. nephantidis* than *B. brevicornis* (81.8%).

Role in pest management

Kapadia and Mittal [9] revealed that the per cent parasitism by *G. nephantidis* was higher and varied from 18.52 to 88.50 per cent with maximum recovery (52.20%).

The treatment with larval parasitoid *G. nephantidis* and predator *C. exiguous* among these reduction in black headed caterpillar population 1.86 larva/ten leaflet in larval parasitoid *G. nephantidis* and predator *C. exiguus* 4.53 larva/ten leaflet after three month of release the adult [17].

Conclusion

Bethylid wasps are living weapons to endopterygotan pests due to its wider parasitic potential. Easy to mass produce due to some good attributes viz., short life cycle, high fecundity, perfect site of oviposition and maximum progeny production. Temperature ranging from 25^{0}C to 30^{0}C found to be an optimum regime for mass production of Bethylid parasitoids. In field condition, host guarding or parental care of the Bethylids are able to competitive to other natural enemies and thus prevent/minimize the hyper parasitism. Frequent release of the parasitoid at certain intervals will helps to reduce the pest population. Release of the parasitoid in last week of February to found to be highly effective for management of endopterygotan pests.

Bibliography

1. Azevedo CO. “Notes on geographic distribution, Insecta, Hymenoptera, Bethylidae: range extension and filling gaps in Australia”. *Check List* 2.1 (2006): 42-44.

2. Jongok L and Seunghwan L. “Taxonomy of the family Bethylidae (Hymenoptera: Chrysidoidea) from Cambodia and adjacent countries. I. Genus Odontepyris Kieffer (Bethylidae: Bethylinae) with four new species and two new records”. *Journal of Natural History* 47.31-32 (2013): 2017-2038.

3. Seetharama HR., *et al*. *Journal of Coffee Research* 35.1-2 (2007): 10-24.

4. Elahe S., *et al*. “Oviposition Behaviour of Goniozus swirskiana (Hymenoptera: Bethylidae: Bethylinae) A Parasitoid of Batrachedra amydraula Meyrick From The Warmest Desert of Iran”. *World Applied Sciences Journal* 20.11 (2012): 1493-1498.

5. Sreekanth PL and Muralimohan K. "Influence of body size of female parasitoid, Goniozus nephantidis Muesebeck (Hymenoptera: Bethylidae) on its fecundity and longevity". *Journal of Insect Science* 26.2 (2013): 238-240.

6. Boongeua WV and Louis PL. *Journal of Scientific Society* Thailand 23 (1997): 13-22.

7. Subaharan K. Project report under ICAR- AP Cess Fund Scheme 9-25 (2008).

8. Kapadia MN. "Occurrence and distribution of different parasites of Opisina arenosella Walker under Mahuva conditions of Gujarat". *Gujarat Agricultural University Research Journal* 12.2 (1987): 16-21.

9. Shivanand TW and Deshapande VP. "Natural enemies of sorghum earhead caterpillar, Heliothis armigera". *International Journal of Plant Protection* 4.1 (2011): 207-211.

10. Mehendale SK., *et al*. *The Bioscan* 9.1 (2014): 259-264.

11. Kapadia MN and Mittal VP. "Seasonal development of Goniozus nephantidis Muesobeek and its effectiveness against Opisina Wensalla Walker". *Gujarat Agricultural University Research Journal* 19.1 (1993): 47-51.

12. Gómez J., *et al*. "Influence of age and diet on the performance of Cephalonomia stephanoderis (Hymenoptera, Bethylidae) a parasitoid of the coffee berry borer, Hypothenemus hampei (Coleoptera, Curculionidae)". *Revista Brasileira de Entomologia* 56.1 (2012): 95-100.

13. Lyla KR., *et al*. *Journal of Biological Control* 20.1 (2006): 33-36.

14. Abbas MST., *et al*. "Utilization of goniozus sp. (Hym.: Bethylidae) as a bio-control agent against the lesser date moth, Batrachedra amydaraula (Meyrick) (Lep.: Batrachedridae) in date palm orchards in Sultanate of Oman". *Egyptian Journal of Biological Pest Control* 18.1 (2008): 47-50.

15. Rajamanickam K., *et al*. Proceedings of the 15th Plantation Crops Symposium Placrosym XV (2002): 627-629.

16. Venkatesan T., *et al*. "Competitive interactions between Goniozus nephantidis and Bracon brevicornis, parasitoids of the coconut pest Opisina arenosella". *International Journal of Pest Management* 55.3 (2009): 257-263.

17. Anonymous. "Annual Report (2014-15). ICAR- All India Co-ordinated Research Project on Palms". ICAR- CPCRI, Kasaragod (2015): 26-27.

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