



Research Note

Survey on parasitoids of shoot, panicle and capsule borer, *Conogethes* sp., (Lepidoptera: Crambidae) in small cardamom of cardamom hill reserve, Kerala

P. THIYAGARAJAN*, A. S. PRASEEDA, M. A. ANSAR ALI and A. B. REMA SHREE

Division of Entomology, Indian Cardamom Research Institute, Spices Board India, Myladumpara - 685553, Idukki District, Kerala, India

*Corresponding author E-mail: thiyainsect@gmail.com

ABSTRACT: Survey was conducted in the three different cardamom zones, viz., Vandanmedu (Zone A), Myladumpara (Zone B), and Santhanpara (Zone C) to study the incidence of natural parasitoids of *Conogethes* sp., on cardamom plant parts viz., shoot, panicle and capsule in Cardamom Hill Reserve (CHR), Idukki district, Kerala. under Pesticide Applied Cardamom Field (PACF) and Pesticide Non Applied Cardamom Field (PNACF) and compared. Two natural parasitoids viz., larval parasitoid, *Apanteles taragamae* Vierick (Hymenoptera: Braconidae) and larval-pupal parasitoid, *Agrypon* sp. (Hymenoptera: Ichneumonidae) only were recorded. *Apanteles taragamae* parasitism was high on the *Conogethes* population found on capsules (1.01 to 16.79%) than shoots (0.13 to 0.54%) and panicles (0.03%) and also noticed first time in shoots and panicles. *Agrypon* sp. was high on the *Conogethes* population found on shoots only (5.46 to 9.63%) and this species not parasitized on *Conogethes* in panicles and capsules. It is suggested that this well known species of local strain be further evaluated for potential use in mass rearing and augmentative release of this parasitoid for managing *Conogethes* in cardamom ecosystem.

KEY WORDS: *Conogethes* sp., *Elettaria cardamomum*, parasitoids, small cardamom

(Article chronicle: Received: 07-12-2018; Revised: 10-08-2019; Accepted: 15-09-2019)

Small cardamom (*Elettaria cardamomum* L. Maton); (Family: Zingiberaceae) is an economically important spice crop known as “Queen of Spices”. India is a major exporter of cardamom and mainly cultivated in Kerala (60%), Karnataka (30%) and Tamil Nadu (10%) only. Nearly 60 species of insect pests infest cardamom at different stages of its growth; shoot, panicle and capsule borer, *Conogethes* sp., (Lepidoptera: Crambidae) is one among them (Gopakumar and Chandrasekar, 2002). *Conogethes* causes indirectly heavy yield loss and also adversely affects the livelihood of the farmers and the national economy in general. Cardamom Hill Reserve (CHR) is a major source of this spice, which is an export oriented crop and always facing the problem of pesticide residues. To overcome the residue problem and indiscriminate usage of harmful pesticides in cardamom ecosystem, the effective conservation and augmentation of potential parasitoids will be the future sustainable bio-control strategy to manage *Conogethes* sp., in cardamom eco-system. So, survey was conducted to study the incidence of natural parasitoids of *Conogethes* in CHR, Kerala.

Survey's was conducted in the farmer's fixed plot in the three different zones viz., Vandanmedu (Zone A), Myladumpara (Zone B), and Santhanpara (Zone C) to study natural parasitization on *Conogethes* in Cardamom Hill Reserve (CHR), Idukki Dt., Kerala from January 2018 to June 2018 under Pesticide Applied Cardamom Field (PACF) and Pesticide Non Applied (Free) Cardamom Field (PNACF) and compared.

Natural parasitism of *Conogethes* sp.

Shoot

Twenty five cardamom plants were selected randomly in the pesticide applied and non applied (free) fields in all three zones and in each cardamom clump, damaged shoots were counted to calculate the percent damage by *Conogethes*. All damaged shoots in a clump were collected and brought to the laboratory, kept separately and observed for adult parasitoid emergence and per cent natural parasitism was worked out. The adult's parasitoids were collected and preserved in 70% alcohol and sent to ICAR - National Bureau of Agriculturally Important Insects, Bengaluru, Karnataka, for identification.

Panicle

Twenty five cardamom plants were selected randomly in the pesticide applied and non applied (free) fields in all three zones and in each cardamom clump, damaged panicles were counted to calculate the percent damage by *Conogethes*. The damaged panicles, which are having larvae of *Conogethes* were collected and brought to the laboratory, kept separately and observed for adult parasitoid emergence and per cent natural parasitism was worked out. The adult's parasitoids were collected and preserved in 70% alcohol and sends to ICAR- National Bureau of Agriculturally Important Insects, Bengaluru, Karnataka for identification.

Capsule

Twenty five cardamom plants were selected randomly in the pesticide applied and non applied (free) fields in all three zones and in each cardamom clump, five panicles and its damaged capsules were counted to calculate the percent damage by *Conogethes*. All damaged capsules were collected and brought to the laboratory, kept separately and observed for adult parasitoid emergence and per cent natural parasitization was worked out. The adult's parasitoids were collected and preserved in 70% alcohol and sends to ICAR-National Bureau of Agriculturally Important Insects, Bengaluru, Karnataka, for identification.

Diversity of parasitoids

Two natural parasitoids viz., larval parasitoid, *Apanteles taragamae* Vierick (Hymenoptera: Braconidae) and larval-pupal parasitoid, *Agrypon* sp. (Hymenoptera: Ichneumonidae) were recorded in all three different zones in pesticide non applied cardamom fields in CHR, Kerala. *A. taragamae* was noticed on *Conogethes* in capsules and recorded for the first time in shoots and panicles and *Agrypon* sp. was noticed on *Conogethes* in shoots only.

Natural parasitism of *Apanteles taragamae* on *Conogethes* sp. shoots

Apanteles taragamae recorded only in PNACF during May and June in Zone B and April to June in Zone C and natural parasitism ranged from 0.27 to 0.54 % (Zone B) and 0.13 to 0.24 % (Zone C) (Fig. 1).

Panicles

Apanteles taragamae was recorded only Zone C in PNACF during May and natural parasitism was very low (0.03%).

Capsules

Apanteles taragamae was recorded in Zone A, B and C in PNACF during April to June in Zone B (1.01 to 10.25%) and C (2.17 to 16.79 %) and May and June in Zone A with low parasitism (0.05 to 0.65%). Due to increased natural parasitism, the capsule borer damage was decreased during June in both Zone B and C in PNACF. In PACF, natural parasitism ranged from 0.33 to 0.38% (Zone B) and 0.24 to 0.45% (Zone C) (Fig. 1).

Natural parasitism of *Agrypon* sp. on *Conogethes* sp.

Shoots

Agrypon sp. was recorded only in Zone B (during May and June) and C (from April to June) in PNACF and PACF (during May and June) and natural parasitism ranged from 5.46 to 7.25 % (Zone B) and 7.24 to 9.63 % (Zone C) in PNACF and 0.05 to 14% in Zone B and 0.12 to 0.16% in Zone C in PACF (Fig. 2). Due to increased natural parasitism, the shoot borer damage was decreased during June in both Zone B and C from 19.46 to 10.14% in Zone B and 22.63 to 14.04% in Zone C in PNACF.

Panicles and capsules

Agrypon sp. was not observed on *Conogethes* in panicles and capsules in all three zones in PACF and PNACF. Two natural parasitoids, viz., larval parasitoid, *A. taragamae* and larval-pupal parasitoid, *Agrypon* sp. only were recorded in higher level in all three different zones in pesticide non-applied cardamom fields in CHR, Kerala which was already reported in 1990's (Devasahayam, 1996). *Apanteles taragamae* noticed on *Conogethes* which is damaging capsules showed high level parasitization (1.01 to 16.79%) followed by shoots (0.13 to 0.54%) and panicles (0.03%) and also noticed for first time in panicle and shoots. *Agrypon* sp. was noticed on *Conogethes* in shoots only with 5.46 to 9.63% natural parasitism and this species not parasitized on *Conogethes* in panicles and capsules.

Apanteles taragamae were noticed on *Conogethes* in capsules as high per cent natural parasitism followed by shoots and panicles. Ansar Ali *et al.* (2014) identified *A. taragamae* and *Glyptapanteles* sp. in cardamom CHR. *Agrypon* sp. recorded on *Conogethes* in shoots only and this species not parasitoid on *Conogethes* in panicles and capsules.

Present study indicated that, the per cent natural parasitism on *Conogethes* in cardamom by larval and larval-pupal parasitoids were maximum up to 17% and due to increased natural parasitism, the shoot borer damage was decreased during June in both Zone B and C from 19.46 to 10.14% in Zone B and 22.63 to 14.04% in Zone C in PNACF. Ansar Ali *et al.* (2014) reported that the per cent natural

parasitism on *Conogethes* in cardamom by larval parasitoids ranged from 3.36 to 43.31% and pupal parasitoids ranged from 0.23 to 1.23 %. The per cent damage on shoots by cardamom shoot borer was reduced from 23.21 to 10.23% by the natural occurrence of larval parasitoids.

Both parasitoids were not recorded in higher level in the Pesticide Applied Cardamom Field (PACF), this could be due to presence of toxin/residue in few insecticides which is harmful to development of parasitoids which is already proved in different crops by Blibech *et al.* (2015), Gonzalez-Zamora, (2013) and Bueno *et al.* (2008). These reports establish that there is frequent and indiscriminate use of pesticides on cardamom plantations. Based on the present study and report

on natural occurrence of two parasitoids namely *Apanteles taragamae* and *Agrypon* sp. in Cardamom Hill Reserve (CHR), Kerala, it is suggested that these well known biological control agents be further evaluated for potential use in mass rearing and further release as augmentative bio-control agents in cardamom ecosystem to manage shoot, panicle and capsule borer, *Conogethes* under Kerala conditions. Conservation of these natural enemies would play a great role in reducing the level of pest population in the cardamom field.

ACKNOWLEDGEMENT

Authors are grateful to ICAR- National Bureau of Agricultural Insect Resources for identification of *Conogethes* parasitoids and valuable suggestions.

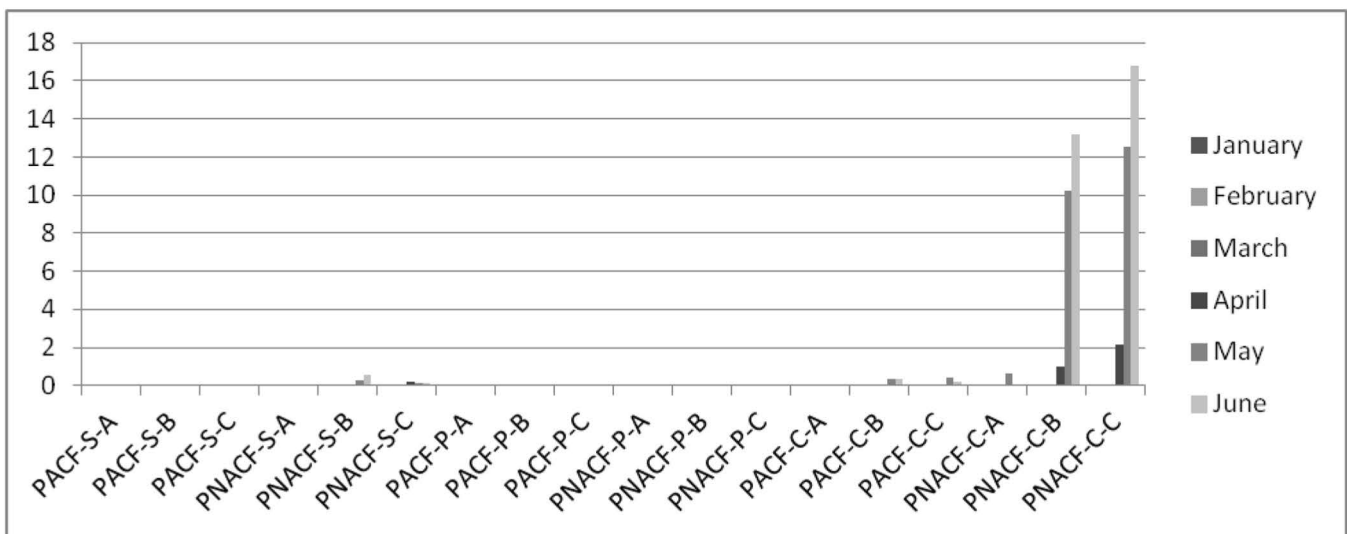


Fig. 1. Natural parasitism of *Apanteles taragamae* on *Conogethes* on shoot, panicle and capsules in PACF and PNCAF in CHR.

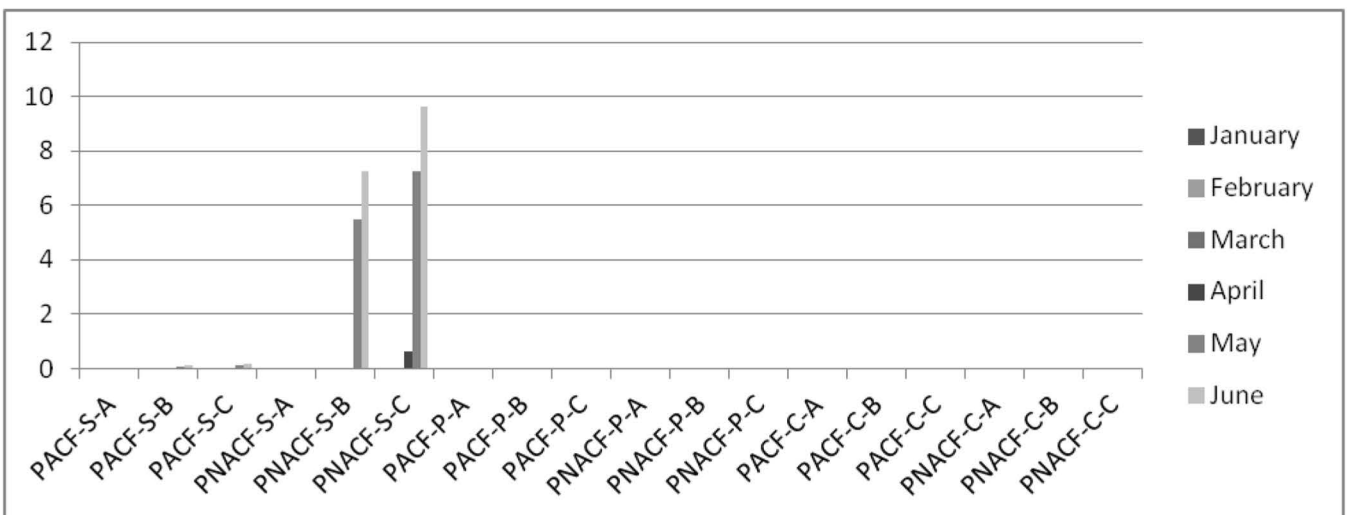


Fig. 2. Natural parasitism of *Agrypon* sp., on *Conogethes* on shoot, panicle and capsules in PACF and PNCAF in CHR.

REFERENCES

- Ansar Ali MA, Manoharan T, Kuttalam S. 2014. First report of larval parasitoids on small cardamom shoot, capsule, panicle borer, *Conogethes punctiferalis* Guenee (Lepidoptera; Crambidae) under lab and field Conditions. *Trends Biosci J*. **7**: 3771-3773.
- Blibech I, Ksantini M, Jardak T, Bouaziz M. 2015. Effect of insecticides on Trichogramma parasitoids used in biological control against Prays oleae insect pest. *Adv Chem Eng Sci*. **5**: 362-372 <https://doi.org/10.4236/aces.2015.53038>
- BuenoADF, BuenoRCODF, ParraJRP, VieiraSS. 2008. Effects of pesticides used in soybean crops to the egg parasitoid *Trichogramma pretiosum*. *Ciência Rural* **38**: 1495-1503. <https://doi.org/10.1590/S0103-84782008000600001>
- Devasahayam S. 1996. Biological control of insect pests of spices. In: pp 33-45. Anandaraj M, Peter KV (Eds.). *Biological control in spices*. Calicut, Indian Institute of Spices Research.
- Gonzalez-Zamora JE, Castillo ML, Avilla C. 2013. Side effects of different pesticides used in citrus on the adult stage of the parasitoid *Aphytis melinus* DeBach (Hymenoptera: Aphelinidae) and its progeny. *Spanish Agric Res*. **11**: 494-504. <https://doi.org/10.5424/sjar/20131112-3556>
- Gopakumar B, Chandrasekar SS. 2002. Insect pests of cardamom. In: pp. 190-20. Ravindran PN, Madhusoodanan KJ (Eds.). *Cardamom: The genus Elettaria*. Taylor and Francis, London and New York.
- Praseeda AS. 2018. Survey on incidence of shoot, panicle and capsule borer, *Conogethes punctiferalis* (Guenee), (Lepidoptera: Crambidae) parasitoids of small cardamom in Cardamom Hill Reserve (CHR), Dissertation submitted to Mahatma Gandhi University, Kottayam, Kerala. 46pp.