Pest Management in Horticultural Ecosystems
Vol. 24, No.2 pp 181-184 (2018)

RESEARCH NOTE

A new report on parasitisation of coconut spike moth, *Tirathaba rufivena* Walker by *Goniozus nephantidis* Muesebeck

N. B.V. CHALAPATHI RAO[1], G. KRISHNA RAO[1] and G. RAMANANDAM[2]

[1] Department of Entomology, [2] Department of Horticulture HRS, Ambajipeta, DR YSRHU, East Godavari 533 214 Andhra Pradesh , India

E-mail: chalapathirao73@gmail.com

ABSTRACT: The coconut spike moth / bunch moth of oil palm, *Tirathaba rufivena* (Pyralidae, Lepidoptera) is reported as a pest causing varying losses in coconut and oil palm. In recent years regular and increasing incidence of this lepidopteron pest is being recorded in young and dwarf coconut palms in East Godavari District, Andhra Pradesh. A high per cent infestation was recorded in the dwarf cultivar , Ganga Bondam (12.5 %) and in various cross combinations the infestation of coconut spike moth ranged from 3.5 per cent to 9.4 per cent The laboratory observations on identification of promising parasitoid for this pest revealed that gregarious ectoparasitoid *i.e., Goniozus nephantidis* is an effective parasitoid on *T. rufivena* As *G. nephantidis* can be successfully multiplied on large scale in laboratory therefore, the field efficacy of *G. nephantidis* can be explored against *T. rufivena* in coconut and oil palm plantations.

Keywords: Coconut spike moth , *Goniozus nephantidis, Tirathaba rufivena*

Among the lepidopteran insect pests of coconut, black headed caterpillar, *Opisina arenosella* and slug caterpillar, *Macroplectra nararia* are the important pests and off late the Greater coconut spike moth *Tirathaba rufivena* (Lepidoptera, Pyralidae) incidence is also being observed to be increasing especially in young and dwarf coconut palms in East Godavari district of Andhra Pradesh . The coconut spike moth is often referred to as bunch moth in oil palm and is reported as a major insect pest of palmaceae such as *Areca catechu* L. (areca), *Cocos nucifera* L. (coconut), and *Elaeis guineensis* Jacq. (African oil palm) and well distributed in China, Malaysia, Indaonesia, Philippines, and Sri Lanka. (Baozhu Zhong *et al*., 2017). In India it was reported to cause nearly 6-9 per cent nut loss to the coconut palms in Bastar tribal belt of Chhattisgarh state (Rajesh Kumar Patel , 2018).

In coconut, the caterpillar bores at perianth portion in small size to large size buttons and causes nut drop (Nair and Visalakshi, 1999). The affected nuts can be recognized by the presence of excreta and oozing gummy substances. Generally a single larva is found in an infested nut but in case of severe infestation more than one larva can be seen. Male flowers are especially attacked by the larvae which are very active and move quickly when disturbed. Infestation causes abortion of young, underdeveloped nuts. It was reported that the compact leaves of the crown in young (3 to 5-year-old) hybrid palms of the variety MAWA (Malayan Dwarf x West African Tall) in Philippines cause the flowers to be constricted and 100% damage of the female flowers by coconut spike moth was reported in this hybrid (Cock, *et al* ., 1987)

In oil palm on developing bunches, the larvae feed and scrape on the fruitlets, later boring holes into the mesocarp up to the kernel. High infestation can greatly reduce the quality and weight of the fruit bunch and may cause malformed and premature bunch abortion (Alouw *et al*., 2005). It was also reported that the oil palm plantations which experienced heavy infestation have recorded lower number of bunches per palm and high number of rotten bunches (Idrus *et al*., 2016). In oil palm, infestation is characterised by the presence of long tube of silk and frass in the bunch, which are reddish when fresh and brownish-black when old (Lim, 2012). The oil palm plantations in Malaysia mainly rely on insecticides, particularly cypermethrin, to control the bunch moth (Lim, 2012) which is adversely affecting the population of oil palm pollinating weevil, *Elaeidobius kamerunicus* and its rate of degradation is also slow when applied on peat (Ismail *et al*., 2012). Efforts to manage this pest using biological agents such as the parasitoid, *Argyrophylax basifulva* and nematode, *Steinernema feltiae* have been unsuccessful (Godfray, 1985; Zelazny, 1985). Hence, the present studies on successful identification of a lab amenable parasitoid which can be mass multiplied bears importance .

In Horticultural Research Station, Ambajipeta, East Godavari district , Andhra Pradesh incidence of *T. rufivena* ranging from 3.5 to 12.5 per cent on various coconut cultivars and cross combinations in the age group of 5- 8 years old palms was observed from December 2016 and continued up to April 2017 . Nut damage was noticed in the dwarf cultivar , Tall × Dwarf and Dwarf ×Dwarf cross combinations but no incidence was observed in tall cultivars and as well as in Tall × Tall cross combinations (Table 1) . Highest incidence was recorded in the dwarf cultivar Ganga Bondam (12.5 %) and the cross Ganga Bondam × Ganga Bondam (12.0 %) and in other crosses also varied incidence was recorded . However, where ever the nut damage was recorded it was mostly confined up to five months old buttons . Under severe infestation of buttons, around 5 to 10 larvae were observed in the each button. However , no infestation was recorded in the cultivar East Coast Tall and Tall × Tall crosses *i.e.,* East Coast Tall × Philippines Ordinary cross and East Coast Tall × Kalpa Pratibha cross . The dwarf coconut varieties and crosses probably produces more leaves (fronds) and bunches in rapid succession probably this favors *T. rufivena* incidence as compared to talls , Further the crown shape and its compactness also might have a role on population build up of *T.rufivena*

Table 1. Greater coconut spike moth *T. rufivena* infestation in various coconut cultivars and different crosses

Cultivars / Crosses	Infestation (%)
Cultivars	
Ganga Bondam	12.5
East Coast Tall	0.0
Crosses	
Tall × Tall	
East Coast Tall × Philippines Ordinary	0.0
East Coast Tall × Kalpa Pratibha	0.0
Tall × Dwarf	
Philippines Ordinary × Ganga Bondam	4.5
East Coast Tall ×Ganga Bondam	3.5
Kalpa Pratibha × Ganga Bondam	5.0
Dwarf ×Dwarf	
Ganga Bondam × Malayan Green Dwarf	9.4
Ganga Bondam × Ganga Bondam	12.0
Ganga Bondam ×Malayan Orange Dwarf	7.5
Malayan Yellow Dwarf × Chowghat Green Dwarf	6.0
Chowghat Orange Dwarf × Malayan Green Dwarf	4.5
Chowghat Orange Dwarf × Malayan Yellow Dwarf	5.2

Laboratory and field studies conducted in the Philippines to assess the effectiveness of different parasites and pathogens against *T. rufivena* revealed that larvae of >15 mm were highly susceptible to the entomoparasitic nematode, *Steinernema feltiae*, in the laboratory (Zelazny, 1985) however, the pest was not significantly reduced in field trials. The studies on the ichneumonid *Venturia palmaris* against *T. rufivena* in Malaysia revealed that the parasite was present throughout the year but no parasitism was observed in November or December months . The degree of parasitism ranged from 2% in August to 31.9% in February. The parasite preferred to oviposit in late-instar larvae rather than in young larvae or pupae. Laboratory studies on life cycle and oviposition behaviour indicated that the sex ratio was probably the limiting factor in mass rearing *V. palmaris* in the laboratory for use in biological control (https://www.plantwise.org/KnowledgeBank/Datasheet.aspx).

The *G. nephantidis* (Hymenoptera: Bethylidae) is a gregarious larval ecto parasitoid and responsible for decline the pest population of *O. arenosella* under field conditions (Cock and Perera, 1987, Venkatesan *et al*., 2008 and Chalapathi Rao *et al.,* 2013). *G. nephantidis* is the dominant parasitoid in the coconut ecosystem due to its parental care or host guarding (Venkatesan *et al.,* 2009). Remadevi *et al*. (1996) reported *Anigraea albomaculata* as an alternate host for *G. nephantidis* and it can be reared in the laboratory on *C. cephalonica* and *Galleria mellonella* (Linnaeus) (Venkatesan *et al.* 2004). The laboratory observations on parasitisation efficiency of *G. nephantidis* on *T.rufivena* was conducted from November, 2017 to June, 2018 The parasitoid *G. nephantidis* was reared on the alternate host, *C. cephalonica* and were released in to the test tubes (6"×1") containing *T. rufivena* larva of varying sizes . The results revealed that spike moth larvae (10 to 15 mm size) were effectively paralyzed within in 48 to 72 hours and around 10 to 15 eggs in each paralyzed larvae were recorded . The life cycle of the parasitoid was completed in 10-15 days (incubation period 24 hrs, larval feeding 48-72 hrs, prepupal stage 48 - 60 hrs and cocoon period 48 to 56 hrs + resting adult inside the cocoon 120 hrs) and the progeny obtained were in 1: 3 male female ratio and laboratory longevity of *G. nephantidis* emerging from this pest ranged from 60 to 65 days.

The parasitoid *G. nephantidis* is apparently reported to be host-specific, but may have a broader host range in coconut ecosystem and present study confirms *T.rufivena* as one more alternate host . As this parasitoid is amenable for mass production therefore field evaluation of *G. nephantidis* for management of *T.rufivena* in coconut and oil palm can be contemplated in near future or successful management of this pest .

Plate 1. Parasitised larvae

Plate 2. Feeding damage by *T. rufivena*

Plate 3. Cocoons formed in parasitized larva

Plate 4. Nuts damaged by *T. rufivena* on tree

REFERENCES

.

Alouw, J. C., Morallo Rejesus, B. and Ocampo, V. R. 2005. Biology of the coconut spike moth, *Tirathaba fructivora* (Meyr.) (Lepidoptera: Pyralidae). *Philippines Entomologist,* **19**(1): 84-93.

Baozhu Zhong , Chaojun, L. V. and Weiquan, Qin. 2017. Effect of temperature on the population Growth of *Tirathaba rufivena* (Lepidoptera: Pyralidae) on *Areca catechu* (Arecaceae). *Florida Entomologist*, **100**: 578-582

Chalapathi Rao, N. B. V., Emmanuel, N and Subaharan, K. 2013. Impact of olfactory conditioned parasitoid *Goniozus nephantidis* (Musebeck) in suppression of *Opisina arenosella* Walker under field conditions in east coast of Andhra Pradesh. *Journal of Plantation Crops.* **41**(3): 460-462.

Cock, M. J. W., Gallego, C.N. and Godfray, H.C.J. 1987. Biological control of *Tirathaba rufivena* in the Philippines. Paper prepared for the ACIAR workshop *on* Biological Control held in Tonga, 17-25 October 1985

Cock, M. J. W. and Perera, P. A. C. R. 1987. Biological control of *Opisina arenosella* Walker (Lepidoptera: Oecophoridae). Coconut Research Institute of Sri Lanka. *B.N.I.* 8: 283-309.

Godfray, H. C. J. 1985 . Mass rearing the Tachinid fly *Argyrophylax basifulva* a parasitoid of the greater coconut spike moth (*Tirathaba* spp.) (Lep: Pyralidae). *Entomophaga,* **30**(3): 211-215

https://www.plantwise.org/KnowledgeBank/Datasheet.aspx?dsid=55113

Idrus, M. S., Abu Hassan, A ., Abdul Hafiz, A. M. and Aiman, H. J. 2016. Fruit bunch moth *Tirathaba* sp. (Lepidoptera: Pyralidae) infestation in oil palm planted on peat soil: biology and ecology. In : Proceedings . of the Second Entomology Postgraduate Symposium (ENTOPOST 2016) . Bangi, Selangor, Malaysia, 29-30 March

Ismail, B. S., Maslinda, M. and Zuriati, Z. 2012. Effects of temperature, soil moisture content and soil type on the degradation of cypermethrin in two types of Malaysian agricultural soils. *World Applied Sciences Journal,* **17**(4): 428-432.

Lim, K. H. 2012. Integrated pest management of *Tirathaba* bunch moth on oil palm planted on peat. *The Planter,* **88**(1031): 97-104.

Nair, M. R. G. K and Visalakshi, K. 1999. A monograph on crop pests of Kerala and their control, Kerala Agricultural University, Vellanikkara

Rajesh Kumar Patel, Salam, P. K. and Beena Singh. 2018. . New record of coconut spike moth (*Tirathaba rufivena* Walker) from Bastar tribal belt of Chhattisgarh. *Journal of Entomology and Zoology Studies*, **6**(1): 1117-1118

Remadevi ,O. K., Abdurahiman, U. C. and Sasidharan, T. O. 1996 . Notes on the host range of *Goniozus nephantidis*(Hymenoptera: Bethylidae) with a new report on *Anigraea albomaculata* (Lepidoptera: Noctuidae) as an alternate host. *Entomon*, **21**:281–282.

Venkatesan, T., Jalali, S. K., Srinivasa Murthy, K., Rabindra, R. J and Rao, N. S. 2004. Comparative life table studies of *Goniozus nephantidis* (Muesebeck) (Hymenoptera: Bethylidae) on three lepidopteran insect pests. *Annals of Plant Protection Sciences,* **12**(1): 5–8.

Venkatesan, T., Ballal, C. R. and Rabindra, R. J. 2008. Biological control of coconut black headed caterpillar, *Opisina arenosella* using *Goniozus nephantidis* and *Cardiastethus exiguous,* Technical Bulletin No. 39. Project Directorate of Biological Control, Bangalore, pp: 1-14.

Zelazny, B .1985. Susceptibility of two coconut pests, *Oryctes rhinoceros* (Col.: Scarabaeidae) and *Tirathaba rufivena* (Lep.: *Pyralidae*) to the entomoparasitic nematode *Steinernema feltiae (=Neoaplleactana carpocapsae). Entomophaga,* **30**(2): 121-124.

MS Received 2 April 2018
MS Accepted 19 June 2018