

Short Communications

Studies on Association between Natural Enemies and Insect Pests of Tamarind (*Tamarindus indica*) in Bastar District, India

Akhilesh Kumar* and Saurabh Padamshali

Department of Entomology, Indira Gandhi Krishi Vishwavidyalaya,
Raipur (Chhattisgarh), India 492012

*Corresponding author

ABSTRACT

Tamarind (*Tamarindus indica*), an important tree of semi-arid tropical conditions belongs to dicotyledonous family: leguminaceae, sub-family: caesalpiniaceae and has multipurpose use. In India, the tree is found abundantly in Chhattisgarh, Madhya Pradesh, Telangana, parts of Maharashtra, Tamil Nadu, Odisha, Bihar and West Bengal. The annual production of tamarind in India is ranging from 2.5-3 lakh tonnes. Annual returns from tamarind seed powder are estimated about 17 lakhs. A mature tree may annually produce 330 to 500 lbs (150.225 kg) of fruit, pulp may constitute 11 to 30 per cent shells and fibres and 33 to 40 per cent seed. Among various factors responsible for low yield of tamarind, losses due to insect-pests attack are of prime importance.

Keywords

Tamarind
(*Tamarindus indica*), Natural
Enemies and
Insect Pests

Introduction

Tamarind tree is attacked by more than 40 species of insect pests, although only few of them are of economic importance (Joseph and Oommen, 1960). Fruit borer, *Aphomia gularis* Zeller among the insect pests is most devastating pest causing yield loss to the extent of 27 to 30 per cent followed by aphids (*Toxoptera aurantii*), jassids (*Amrascabiggutula abiggutula*), thrips (*Scirtothrips dorsalis*), mealy bugs (*Nipaecoccus viridis*), scale insects (*Aonidiella orientalis*), cow bug and butterfly (*Charax fablus*) (Patil, 2005). In the pest succession studies, six species of different insect pest i.e. fruit borer, mealy bug, tree hopper, scale insect, hairy caterpillar and bag

worm were observed in tamarind crop. Among these, fruit borer, *A. gularis* was categorized as major pest causing 27.95 per cent fruit borer infestation/tree (Patel, 2015). In Chhattisgarh, the farmers of Bastar Plateau Zone are not so aware for new plant protection techniques, so they adopt their own system based on indigenous knowledge.. Therefore, to produce higher yield, it is necessary to evaluate low cost management technique.

In order to study the different insect pests associated with tamarind, two blocks of Bastar district namely Jagdalpur and Tokapal were selected. In each blocks, five villages were selected where, eight trees per village were tagged randomly. For the present

investigation, area of 1 square meter and 1 square feet (30 cm²) was marked in all four directions (N, S, E and W) in each selected tree. Fortnightly observation on insect pests population with their predators and parasites were observed on randomly selected trees during the cropping season *i.e.* July to March. The population of insect pests and their natural enemies was counted from one square feet (30 cm²) area in all directions of eight randomly selected trees. Insect pests and natural enemy population was subjected to simple correlation (r) where insect population was as dependent factor and weather parameters, such as temperature, humidity and rainfall as independent factors.

The incidence of various insect pests and associated natural enemies was observed on tamarind during *kharif-rabi*, 2015-16. Fortnightly observation on insect pests populations with their natural enemies were

recorded on marked area of trees randomly per village, given in Table 1 and depicted in Fig.1.

The occurrence of insect pest complex on tamarind commenced from second week of July. During the course of study, six insect pest species were noticed causing damage at various growth stages of tamarind, namely fruit borer, mealy bug, plant hopper and scale insect were first to infest the crop followed by hairy caterpillar and tree hopper which infested tamarind crop from flowering stage to fruit maturity stage. Besides these, their natural enemies *i.e.* dragon fly, damsel fly, red ant, black ant, spiders, Ichneumonid wasp, orange wasp, preying mantid, lace wing were observed during the course of work. Findings on the incidence of insect pests and natural enemies are as mentioned below in table 2:

Table.1 Fortnightly population of insect pests on tamarind crop during *kharif – rabi*, 2015 – 16

SMW	Date of Observation	Fruit borer (per100cm ²)	Mealy bug (per 30cm ²)	Scale insect (per 30cm ²)	Plant hopper (per 30cm ²)	Tree hopper (per 30cm ²)	Hairy caterpillar (per 30cm ²)
28	09/07/2015	1.97	0.55	0.25	0.12	0.00	0.0
30	23/07/2015	3.25	1.09	0.59	0.15	0.10	0.0
32	09/08/2015	4.14	1.53	0.67	0.23	0.00	0.09
34	23/08/2015	9.61	1.83	1.56	0.42	0.46	0.06
36	09/09/2015	13.92	17.64	16.03	10.99	4.02	0.27
38	23/09/2015	18.08	26.53	28.83	18.68	5.28	0.14
40	09/10/2015	19.91	29.58	25.83	20.76	5.73	0.00
42	23/10/2015	17.23	25.75	26.08	19.29	5.46	0.00
44	09/11/2015	18.12	22.73	29.95	17.93	5.35	0.00
46	23/11/2015	15.62	19.95	21.69	16.98	5.14	0.00
48	09/12/2015	13.23	18.57	20.97	16.25	5.08	0.00
50	23/12/2015	9.89	17.68	19.36	15.55	5.08	0.00
2	09/01/2016	6.76	8.12	8.31	1.25	0.39	0.00
4	23/01/2016	5.23	5.42	6.74	0.59	0.71	0.00
6	09/02/2016	3.39	4.00	5.58	0.00	0.00	0.00
8	23/02/2016	2.72	2.75	2.17	0.00	0.00	0.00
10	09/03/2016	1.88	2.01	0.00	0.00	0.00	0.00
	Seasonal mean	9.70	12.10	12.62	8.19	2.52	0.03

Fig.1 Fortnightly population of major insect pests on tamarind crop during *kharif – rabi*, 2015-16

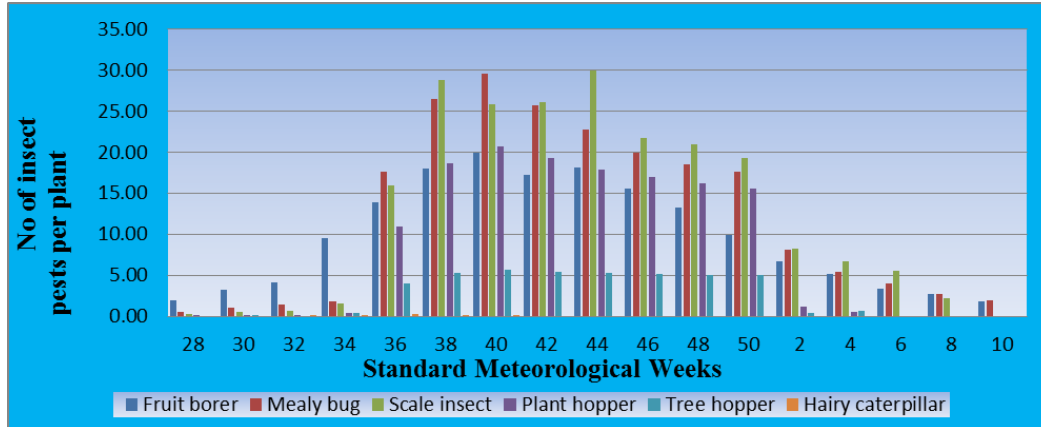


Table.2 List of natural enemy of tamarind insect pests during, *kharif-rabi*, 2015 – 16

S.N.	Common name	Systemic position	Period of activity	Stage of host insect	population range/ unit area	Status of peak activity
1.	Spider	<i>Oxypessp, Plexippussp & Nephilasp,</i> Class: Arachnida	Throughout year	Nymph and adult of tree hopper and scale insect	0.25-2.01	Fourth week of September
2.	Preying mantid	<i>Mantis religiosa</i> Mantidae: Dictyoptera	Aug - Jan	Caterpillar, nymph and adult of scale insect, hopper & tree hopper	0.13 – 1.50	Second week of November
3.	Ichneumonid wasp	<i>Charopssp</i> Ichneomonidae: Hymenoptera	Aug – Dec	Late larval stage of fruit borer	0.15 – 0.46	Fourth week of August
4.	Black ant	<i>Camponotuscompressus</i> Formicidae: Hymenoptera	Throughout year	Nymph and adult of mealy bug	0.55 – 2.65	Second week of September
5.	Red ant	<i>Oecophyllasmaragdina</i> Formicidae: Hymenoptera	Throughout year	Nymph and adult of mealy bug	0.30 – 2.02	Second week of September
6.	Dragon fly	<i>Ortheriumsabina</i> Aeshnidae: Odonata	Sep - Dec	Nymph and adult of mealy bug	Traces	-
7.	Damsel fly	<i>Pseudagrion Microcephalum</i> Rambur Coenagrionidae: Odonata	Aug – Oct	Nymph and adult of mealy bug	Traces	-

Table.3 Fortnightly population of insect pests with associated natural enemies on tamarind during *kharif-rabi*, 2015 – 16

SMW	Date of Observation	Fruit borer (per 100cm ²)	Mealy bug (per 30cm ²)	Scale insect (per 30cm ²)	Plant hopper (per 30cm ²)	Mean population per plant			Preying mantid (per 30cm ²)	Ichneumonid wasp (per 30cm ²)
						Tree hopper (per 30cm ²)	Spider (per 30cm ²)	Black ant (per 30cm ²)		
28	09/07/2015	1.97	0.55	0.25	0.12	0.00	0.25	0.55	0.00	0.00
30	23/07/2015	3.25	1.09	0.59	0.15	0.10	0.51	1.05	0.00	0.00
32	09/08/2015	4.14	1.53	0.67	0.23	0.00	1.01	1.20	0.45	0.38
34	23/08/2015	9.61	1.83	1.56	0.42	0.46	1.24	1.72	0.49	0.46
36	09/09/2015	13.92	17.64	16.03	10.99	4.02	1.93	2.65	0.65	0.25
38	23/09/2015	18.08	26.53	28.83	18.68	5.28	2.01	2.63	0.55	0.30
40	09/10/2015	19.91	29.58	25.83	20.76	5.73	1.78	2.32	0.37	0.35
42	23/10/2015	17.23	25.75	26.08	19.29	5.46	1.60	2.15	0.40	0.25
44	09/11/2015	18.12	22.73	29.95	17.93	5.35	1.39	1.87	1.50	0.20
46	23/11/2015	15.62	19.95	21.69	16.98	5.14	1.35	1.72	0.25	0.29
48	09/12/2015	13.23	18.57	20.97	16.25	5.08	1.34	1.71	0.39	0.19
50	23/12/2015	9.89	17.68	19.36	15.55	5.08	1.30	1.73	0.25	0.15
2	09/01/2016	6.76	8.12	8.31	1.25	0.39	1.33	1.77	0.25	0.00
4	23/01/2016	5.23	5.42	6.74	0.59	0.71	1.33	1.80	0.13	0.00
6	09/02/2016	3.39	4.00	5.58	0.00	0.00	1.34	1.73	0.00	0.00
8	23/02/2016	2.72	2.75	2.17	0.00	0.00	1.33	1.73	0.00	0.00
10	09/03/2016	1.88	2.01	0.00	0.00	0.00	1.28	1.60	0.00	0.00
	Seasonal mean	9.70	12.10	12.62	8.19	2.52	1.31	1.76	0.33	0.17
						Fruit Borer	-	-	-	0.658**
						Mealy bug	0.702**	0.717**	0.543*	
						Scale insect	0.659**	0.671**	0.627**	
						Plant Hopper	0.597*	0.606*	0.544*	
						Tree hopper	0.608**	0.622**	0.559*	

In the present investigation, three predators and one parasitoid were observed feeding upon different insect pests on tamarind. Spiders, *Oxypepp*, *Plexippussp*, and *Nephilasp* were observed as a major bio agent against scale insects and tree hoppers, whereas black ant and preying mantid were the next major predators preying upon mealy bug and scale insects, respectively. They were active during the month of September and November, respectively. Besides the predators, late larval parasitoid, *Charopssp* was parasitizing upon tamarind fruit borer and active during the month of August. Similar studies were undertaken by Patil (2005) and Patel (2015) at Jagdalpur, who reported that spider preying mantid and parasitic wasp were preying upon scale insects hopper and fruit borer larvae respectively. These findings are in agreement with present one. Dhanapati and Varatharajan (2013) also reported the Ichneumonid parasitoids parasitizing the several lepidopteron larvae. Flanders (1951) were noticed ant as a facultative heliotism, play an important role in the biological control of certain agricultural pests.

To observe the effect of bio agents on the activity of the insect pests, the population of fruit borer, mealy bug, scale insect and tree hopper was correlated with spider, black ant, red ant, preying mantid and Ichneumonid wasp (Table 3) which revealed a highly significant positive relationship between fruit borer and Ichneumonid wasp with the correlation coefficient value (r) of 0.658. Mealy bug, Scale insect and tree hopper were highly significantly positive correlated with spider with the correlation coefficient value (r) of 0.702, 0.659 and 0.608. The population of black ant highly significantly positively influenced the population of mealy bug, scale insect and tree hopper with the coefficient values (r) 0.717, 0.671 and 0.622 respectively. Plant hoppers population

was significantly positively influenced with spider and black ant with coefficient value (r) of 0.597 and 0.606 respectively. Scale insect and preying mantid had a highly significantly positive relationship with the coefficient value(r) of 0.627. Whereas, Preying mantid significantly positively influenced the mealy bug, plant hopper and tree hopper population with the coefficient value (r) of 0.543, 0.544 and 0.559 respectively.

The incidence of various insect pests and associated natural enemies was observed on tamarind during kharif-rabi, 2015-16. Fortnightly observation on insect pests population with their natural enemies were recorded on marked area of trees randomly per village. The occurrence of insect pest complex on tamarind commenced from second week of July. During the course of study, six insect pest species were noticed causing damage at various growth stages of tamarind, namely fruit borer, mealy bug, plant hopper and scale insect were first to infest the crop followed by hairy caterpillar and tree hopper which infested tamarind crop from flowering stage to fruit maturity stage. Besides these, their natural enemies i.e. dragon fly, damsel fly, red ant, black ant, spiders, Ichneumonid wasp, orange wasp, preying mantid, lace wing were observed during the course of work.

Fruit borer, *C. ombrodelta* is one of the most prevalent insect pest of tamarind. Its first appearance on fruiting stage of the crop was observed in the second week of July with a mean population of 1.97 fruit borer infested fruits / unit area. Two peaks of fruit borer population of 19.91 and 18.12 population / unit area were recorded during second week of October and second week of November, respectively. After second peak, population of fruit borer gradually declined up to 1.88 fruit borer / unit area in second week of

March with seasonal mean of 9.70 fruit borer / unit area.

The incidence of mealy bug was first recorded on crop in second week of July with a mean population of 0.55 nymph and adult / unit area. It was active throughout the cropping period. Maximum population of 29.58 nymphs and adults / unit area was recorded during second week of October with the seasonal mean of 12.10 nymphs and adults / unit area. T

The initial infestation by scale insect was first recorded on tamarind during the second week of July with a mean population of 0.25 scale insects / unit area. Two peaks of scale insects were recorded during fourth week of September and second week of November with 28.83 and 29.95 scale insects / unit area, respectively with the seasonal mean of 12.62 scale insects / unit area.

First appearance of plant hopper was recorded with mean population of 0.12 nymph and adult / unit area during second week of July. Peak population of 20.76 nymphs and adults / unit area recorded during second week of October with the seasonal mean of 8.19 nymphs and adults / unit area.

Peak activity period of tree hopper was recorded during second week of October with 5.73 nymphs and adults / unit area with the seasonal mean of 2.52 nymphs and adults / unit area.

Mean population of hairy caterpillar was noticed less than one throughout the observation period and the pest population completely disappeared from second week of October with the seasonal mean population of 0.03 hairy caterpillar / unit area. Besides the above insect pests, semi looper, bag worm, *Eumetacrameri* Westwood and sweet potato bug,

Physomerus grossipes Fabricius were also observed feeding on tamarind. They were active during the months of July and September. However, their population was negligible.

In the present investigation, three predators and one parasitoid were observed feeding upon different insect pests on tamarind. Spiders, *Oxyptessp*, *Plexippussp*, and *Nephilasp* were observed as a major bio agent against scale insects and tree hoppers whereas, black ant and preying mantid were the next major predators preying upon mealy bug and scale insects, respectively. They were active during the month of September and November, respectively. Besides the predators, late larval parasitoid, *Charopssp* was parasitizing upon tamarind fruit borer and active during the month of August.

Correlation studies revealed a highly significantly positive relationship between fruit borer and Ichneumonid wasp with the correlation coefficient value (r) of 0.658. Mealy bug, Scale insect and tree hopper were highly significantly positive correlated with spider with the correlation coefficient value (r) of 0.702, 0.659 and 0.608. The population of black ant highly significantly positively influenced the population of mealy bug, scale insect and tree hopper with the coefficient values (r) 0.717, 0.671 and 0.622 respectively.

Plant hoppers population was significantly positively influenced with spider and black ant with coefficient value (r) of 0.597 and 0.606 respectively. Scale insect and preying mantid had a highly significant positive relationship with the coefficient value(r) of 0.627. Whereas, Preying mantid significant positively influenced the mealy bug, plant hopper and tree hopper with the coefficient value (r) of 0.543, 0.544 and 0.559 respectively.

References

- Butani, D.K. 1979. Insects of Fruits. Periodical Export Agency, Vivek Vihar, Delhi: 415.
- Coronel, R.E. 1991. *Tamarindus indica* L. In *Plant Resources of South East Asia*, Dhanapati, D.K. and Varatharajan, R. 2013. Parasitoids of the rice insect pests from Manipur Indian Journal of Entomology, 75(4): 269-273.
- Joseph, K.V. and Oommen. P.1960. Notes on some insect pests infesting dry tamarind fruits in Kerala State. Indian Journal of Entomology, 22(3): 172- 180.
- NAS, 1979. Tropical Legumes: Resources for the Future. Washington DC: 117-121.
- Patel, R. K. 2015. Studies on insect pest of tamarind, *Tamarindus indica* L. With special reference to fruit borer, *Aphomia gularis* Zeller in Bastar region of Chhattisgarh. M.Sc. Thesis, Indira Gandhi Krishi Vishwavidyala, Raipur. 16–18.
- Patil, N. K. 2005. Studies on losses of tamarind fruit and possibility of implementation of safe storage technique. M.Sc. Thesis, Indira Gandhi Krishi Vishwavidyala, Raipur. 23- 26.
- Singh, H.S. 2014. Record of *Cryptophlebiaom brodelta* (Lower) (Tortricidae: Lepitoptera) on Bael (*Aegle marmelos*) and tamarind (*Tamarindus indica*) in eastern India. Insect Environment, 20(1): 24-25.
- Timyan, J. 1996. BWA.Yo: Important Trees in Haiti. Southeast Consortium for International Development, 1634, 1 Street N.W. Suite 702, Washington D.C. 20006.
- Usman, S. and Puttarudriah. 1955. A list of the insects of Mysore including termites. Mysore Department of Agriculture Bulletin. Entomology Series No. 16: 194.
- Wageningen; Pudoc. No.2 Edible fruits and nuts. eds. E. W. M Verheij and R. E. Coronel, PROSEA Foundation, Bogor, Indonesia: 298-301.