

BIOLOGY OF GALL FLY, *Procontarina matteiana* (Kieffer & Cecconi) ON MANGO

*JADHAV, K. M., PATEL, R. K. AND PATEL S. A.

DEPARTMENT OF ENTOMOLOGY
CHIMANBHAI PATEL COLLEGE OF AGRICULTURE
SARDARKRUSHINAGAR DANTIWADA AGRICULTURAL UNIVERSITY
SARDARKRUSHINAGAR –385506, BANASKANTHA (GUJARAT), INDIA

*Email: jadhav.kiran03@gmail.com

ABSTRACT

The mango gall fly lays minute, transparent, elongated eggs on upper side of the leaves. The early instar maggot burrows the leaf tissue and forms reddish spot on the leaf tissue. The average length and breadth of egg was 0.18 to 0.32 mm and 0.12 to 0.21 mm, respectively. The newly hatched first and second instar maggots were flat in shape and pale yellowish in colour, while the third instar maggot was sub-cylindrical in shape and whitish in colour. The first, second and third instar maggots measured an average of 0.38 ± 0.03 , 0.73 ± 0.04 and 1.16 ± 0.07 mm in length and 0.15 ± 0.01 , 0.52 ± 0.01 , 0.76 ± 0.01 mm in breadth, respectively. The total development period of maggots was 7.1 ± 0.76 days. The freshly formed pupa was cylindrical in shape and yellowish brown in colour. The average length and breadth of pupa was 1.28 ± 0.02 mm and 0.93 ± 0.09 mm, respectively, while average pupal period was 6.90 ± 0.87 days. The male and female can be distinguished by presence of numerous hairs at the tip of male abdomen and presence of ovipositor at the tip of female abdomen. The male adult measured on an average 1.35 ± 0.03 mm in length and 2.96 ± 0.12 mm in breadth with wing expansion, whereas adult female was 1.53 ± 0.04 mm in length and 3.25 ± 0.15 mm in breadth. The sex ratio of male : female was 1:0.74 in laboratory condition. The total life period of male and female was 16.50 ± 0.50 and 19.90 ± 0.69 days, respectively.

KEY WORDS: Biology, gall fly, *Procontarina matteiana*, mango

INTRODUCTION

In India, 22,96,000 hectares of area is under mango cultivation with production of 15.18 million tonnes. In Gujarat, the total area under mango cultivation is about 3,49,900 hectares contributing 7.2 million tonnes production during the year 2010-11 (Anonymous, 2011). Now a days, the demand of mango fruits have been increased in many developed and developing countries in the form of canned or fresh fruits. This has created the demand for increasing the yield as well as quality of the mango fruits.

Mango (*Mangifera indica* L.) is infested with 250 species of plant-feeding arthropods throughout the world. About 26 of these produce galls on various organs of mango tree (Pena and Mohyuddin, 1997; Gagne and Medina, 2004; and Raman *et al.*, 2009). Most of the mango gall inducing species belong to genus *Procontarina* (Cecidomyiidae: Diptera) (Boucek, 1986). *Procontarina matteiana* Kieffer & Cecconi is a common gall midge on mango in India, Guadeloupe, Brazil, and West Indies, Kenya, South Africa, Java, Indonesia and Iran (De

Villiers, 1998, Askari & Radjabi, 2003). In India, it attacks mango throughout the year prominently during vegetative and fruit maturity period (September and April) of the crop (Kaushik *et al.*, 2012). *P. matteiana* was reported an economic pest during 1980s in Indian Gujarat, as it damaged 25.80 to 47.70% leaves of 3 varieties (Alphonso, Kesar and Rajapuri) of mango in 17 places (Jhala *et al.*, 1987). Severe infestation of this insect was found on the leaves and ultimately reduces the crop yield. Looking to the importance of this insect the present investigations on biology of gall fly *Procontarinia matteiana* (Kieffer & Cecconi) on mango was carried out in the laboratory of Department of Agricultural Entomology, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar.

MATERIALS AND METHODS

Large numbers of gall fly infested mango leaves were collected from the Horticultural Instructional Farm of Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar. The galls present on the leaves were observed critically under the microscope by inserting pointer inside the gall. Numbers of maggots were observed carefully inside the galls and galls were round marked with the marker pen. Such galls with the maggots were cut in square and kept in the petri dish on wet cotton wool to kept leaf fresh and turgid for a longer period. The gall was observed daily till the formation of pupa. The pupae so collected were kept in petri dish containing moist cotton wool for the adult emergence. The newly emerged adult flies were sorted into male and female based on their external morphological character. The uninfected branches of mango were collected from the field and brought to laboratory to prepare the oviposition cage. The portion of fresh branches so collected were wrapped with cotton wool and were inserted in conical flask containing water to keep branch fresh and

turgid for longer period. Eggs laid by female on the leaves of mango were marked and taken on the slide with the help of camel hair brush to study the biology.

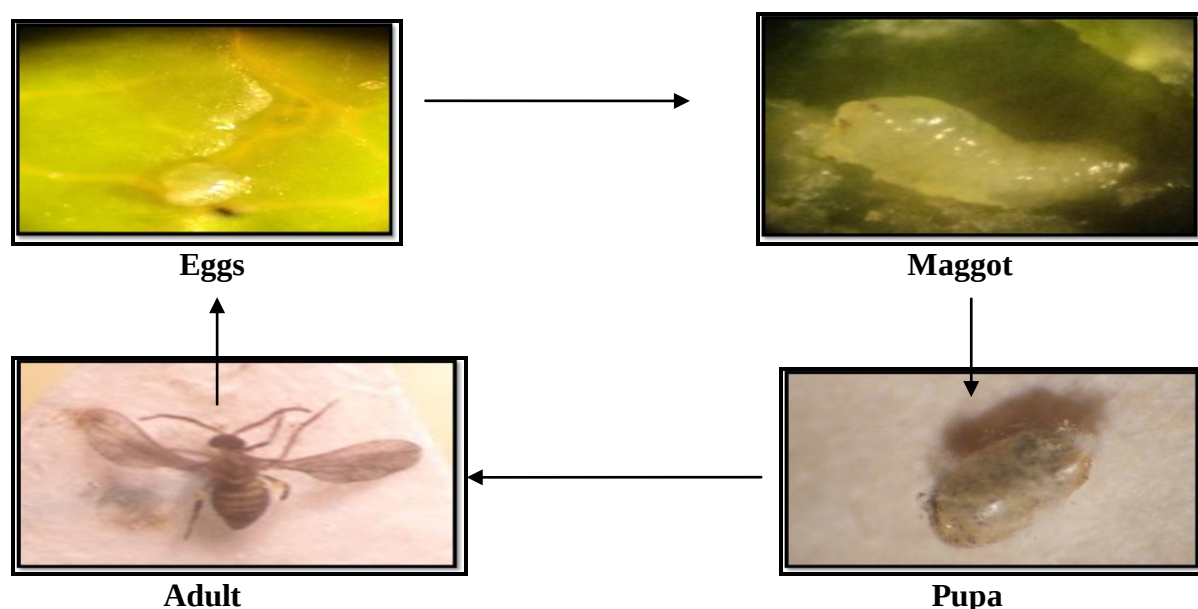
RESULTS AND DISCUSSION

The study revealed that the eggs were minute, transparent and cylindrical in shape. Nakhara (1981) reported that eggs of mango blossom midge *D. mangiferae*, was tiny, translucent, elongated and cylindrical in shape. The results of biological study of gall fly, *Procontarinia matteiana* are presented in Table 1 and 2. It can be seen that the average length and breadth of egg was 0.18 to 0.32 mm and 0.12 to 0.21 mm, respectively. The average incubation period was 2.6 ± 0.69 days with a hatching percentage of 54.30 ± 5.0 per cent. The newly hatched first and second instar maggots were flat in shape and pale yellowish in colour, while the third instar maggot was sub-cylindrical in shape and whitish in colour. The first, second and third instar maggots measured an average of 0.38 ± 0.03 , 0.73 ± 0.04 and 1.16 ± 0.07 mm in length and 0.15 ± 0.01 , 0.52 ± 0.01 , 0.76 ± 0.01 mm in breadth, respectively. Strydom (2011) and Plazanin *et al.* (2012) reported that the length of adult gall fly was ranged from 2 to 3 mm. The average duration of first, second and third instar maggots was 1.20 ± 0.22 , 2.30 ± 0.48 and 3.60 ± 0.72 days, respectively. The total development period of maggots was 7.1 ± 0.76 days. The freshly formed pupa was cylindrical in shape and yellowish brown in colour. The average length and breadth of pupa was 1.28 ± 0.02 mm and 0.93 ± 0.09 mm, respectively, while average pupal period was 6.90 ± 0.87 days. Mardi (2010) reported that the pupal period of *P. matteiana*, was of 5 to 7 days. The adult of *P. matteiana* was tiny and pale yellowish in colour. The head was conspicuous with prominent dark brown compound eyes and possessed a pair of antennae. They possess three pair of thoracic legs. The prothoracic and mesothoracic legs were more or less similar in the length, while

metathorasic legs were much longer than mesothorasic and prothorasic legs. Adult having a fore wing and second pair of wing is modified into halters. The male and female can be distinguished by presence of numerous hairs at the tip of male abdomen and presence of ovipositor at the tip of female abdomen. Female was comparatively larger than the male. The male adult measured on an average 1.35 ± 0.03 mm in length and 2.96 ± 0.12 mm in breadth with wing expansion, whereas adult female was 1.53 ± 0.04 mm in length and 3.25

± 0.15 mm in breadth with wing expansion. The average pre-oviposition, oviposition and post-oviposition periods were 1.20 ± 0.25 , 1.45 ± 0.43 and 1.24 ± 0.20 days, respectively. The average fecundity of female moth was 8.8 ± 1.03 eggs. The longevity of male and female was 2.70 ± 0.42 and 4.30 ± 0.39 days, respectively. The sex ratio of male : female was 1:0.74 in laboratory condition. The total life period of male and female was 16.50 ± 0.50 and 19.90 ± 0.69 days, respectively.

LIFE CYCLE OF MANGO GALL FLY



CONCLUSION

The early instar maggot burrows the leaf tissue and forms reddish spot on the leaf tissue and it becomes swollen and soft. The maggot remains inside the leaf tissue and fully developed maggot produce a gall with the help of cephalopharangeal apparatus by feeding continuously on the leaf tissue. The total life period of male and female was 16.50 ± 0.50 and 19.90 ± 0.69 days, respectively. The average sex ratio (Male : Female) of *P. matteiana* was found 1 : 0.74.

REFERENCES

- Anonymous (2011). Area and Production of Fruit Crops. National Horticultural Board. Ministry of Agriculture, Government of India, at a glance. pp. 17-23. (www.nhb.gov.in).
- Askari, M. and Radjabi, G. (2003). Study on the biology and population fluctuations of mango midge gall *Procontarinia mattiana* (Diptera: Cecidomyiidae) in Hormozgan province. *Appl. Ent. Phytopath.*, **70** : 121-35.

- Boucek, Z. (1986). Taxonomic study of Chalcidoid wasps (Hymenoptera) associated with midges (Diptera: Cecidomyiidae) on mango trees. *Bull. Entomol. Res.*, **76**: 393-407.
- Gange, R. J. and Medina, C. D. (2004). A new species of *Procontarinia* (Diptera: Cecidomyiidae), an important new pest of mango in the Philippines. *Proc. Entomol. Soc. Washington*, **106** : 19-25.
- Jhala, R. C., Patel, Z. P. and Shah, A. H. (1987). Studies on the relative occurrence of leaf-gall midge (*Procontarinia matteiana* Kieffer and Cecconi) on different varieties of mango in south Gujarat, India. *Trop. Pest Manage.*, **33**: 277-279.
- Kaushik, D. K, Baraiha, U., Thakur, B. S. and Parganiha, O. P. (2012). Pest complex and their succession on mango (*Mangifera indica*) in Chhattisgarh, India. *Plant Arch.*, **12**: 303-306.
- Mardi, H. G. (2010). A note on the mango gall midge (*Procontarina matteiana* Kieffer and Cecconi) (Diptera : Cecidomyiidae). A new threat to mango industry in south Kordofan State, Sudan. *University of Khartoum J. Agril. Sci.*, **18** (2): 263- 267.
- Nakahara, L. M. (1981). Survey of new mango blossom midge in Hawaii. Hawaii Department of Agriculture Memorandum. p. 4.
- Pena, J. E. and Mohyuddin, A. I. (1997). Insect Pests. In: The mango — Botany, Production and Uses (ed. R.E. Litz). CAB International, Oxfordshire, UK, pp. 327-362.
- Plazanin, Gotlin, T., Culjak and Ivan J. (2012). Blueberry gall midge, *Dasineura oxycoccana* Johnson, (Diptera : Cecidomyiidae), a new blueberry pest in Croatia *J. Food Agri. and Environ.*, **10** (2) : 521-526.
- Raman, A., Burckhardt, D. and Harris, K. M. (2009). Biology and adaptive radiation in the gall inducing Cecidomyiidae (Insecta: Diptera) and Calophyidae (Insecta: Hemiptera) on *Mangifera indica* (Anacardiaceae) in the Indian subcontinent. *Trop. Zool.*, **22**: 27-56.
- Strydom, C. (2011). Gall fly on mango. *South African Mango Growers Association Newsletter*. 57 pp. 1-3.

Table 1: Measurement of different stages of mango gall fly, *P. matteiana*

Stages		Length (mm)			Breadth (mm)		
		Min.	Max.	Av. $\pm$ S.D.	Min.	Max.	Av. $\pm$ S.D.
Egg		0.18	0.32	0.25 $\pm$ 0.04	0.12	0.21	0.16 $\pm$ 0.03
Maggot	I instar	0.32	0.45	0.38 $\pm$ 0.03	0.10	0.20	0.15 $\pm$ 0.03
	II instar	0.65	0.80	0.73 $\pm$ 0.04	0.46	0.62	0.52 $\pm$ 0.05
	III instar	1.00	1.25	1.16 $\pm$ 0.07	0.75	0.77	0.76 $\pm$ 0.01
Prepupa		1.20	1.30	1.25 $\pm$ 0.03	0.82	0.93	0.87 $\pm$ 0.04
Pupa		1.20	1.35	1.28 $\pm$ 0.02	0.80	1.06	0.93 $\pm$ 0.09
Adult	Male	1.30	1.40	1.35 $\pm$ 0.03	2.85	3.10	2.96 $\pm$ 0.12
	Female	1.46	1.59	1.53 $\pm$ 0.04	3.00	3.50	3.25 $\pm$ 0.15

Table 2: Period of different stages of mango gall fly *P. matteiana*

Sr. No.	Particulars		Period (Days)		
			Min.	Max.	Av. $\pm$ S.D.
1.	Egg period		2.0	3.0	2.60 $\pm$ 0.69
2.	Maggot period	I instar	1.0	1.5	1.20 $\pm$ 0.22
		II instar	2.0	3.0	2.30 $\pm$ 0.48
		III instar	3.0	5.0	3.60 $\pm$ 0.72
3.	Total Maggot period		6.0	8.0	7.10 $\pm$ 0.76
4.	Pupal period		6.0	8.0	6.90 $\pm$ 0.87
5.	Adult period	Male	2.0	3.0	2.70 $\pm$ 0.42
		Female	4.0	5.0	4.30 $\pm$ 0.39
6.	Pre-oviposition period		1.0	1.5	1.20 $\pm$ 0.25
7.	Oviposition period		1.0	2.0	1.45 $\pm$ 0.43
8.	Post-oviposition period		1.0	1.5	1.24 $\pm$ 0.20
9.	Total life period	Male	16.0	17.0	16.50 $\pm$ 0.50
		Female	19.0	21.0	19.90 $\pm$ 0.69
10.	Temperature ($^{\circ}$ C)		21.60	27.75	24.59 $\pm$ 1.47
11.	Relative humidity (%)		42.50	69.00	53.61 $\pm$ 6.34

[MS received: August 27, 2013]

[MS accepted: September 16, 2013]