The Journal of Plant Protection Sciences, **4**(1) : 27-32, June, 2012

Branch gall of mango (*Oligotrophus mangiferae* Keiffer) – its bioecology and management

Goutam Samui and Shantanu Jha

Bidhan Chandra Krishi Viswavidyalaya, Department of Agricultural Entomology, Mohanpur, Nadia, West Bengal, India, E-mail: goutamsamui@gmail.com

A B S T R A C T

The branch gall, *Oligotrophus mangiferae* Keiffer has recently appeared in serious proportion in the major mango growing districts of West Bengal, India. The present study had been taken up regarding the biology, population dynamics and management of this pest. Branch gall is a univoltine species. Emergence of adults from gall could be found from 2nd week of February, which continued up to 2nd week of March. Incubation, larval and pupal period lasted for 3-5 days, 315 days and 30-45 days, respectively. Eggs were laid singly throughout the young vegetative shoots by puncturing the tissue. A full grown larva was yellow in colour with a clear dark brown constriction on head. Initially the pupa was creamy white in colour which gradually turned light yellow and finally blackish. Adults were grey in colour and 2-3mm in length. A single species of parasite (*Tetrastichus* spp.) was found to emerge from the gall. Pruning at 30 cm had been found to be most effective in managing the pest. Spraying of thiamethoxam @ 0.008%, imidacloprid @ 0.006% and monocrotophos @ 0.005% gave effective control of the pest.

Keywords: Branch gall, mango, bioecology, management

Introduction

Mango (*Mangifera indica* L.) the king of fruit crops, is attacked by more than 400 pests in the world, of these about 260 insect and mite pests have been reported from Indian subcontinent, of which nearly 30 pests are serious, capable of causing losses to crop growth and yield (Kapadia 2003). Among the different gall insects, branch gall caused by *Oligotrophus mangiferae* Keiffer and psyllid galls or bud galls (*Apsylla cistellata* Bucton.) are the major maladies affecting mango cultivation in many countries. The injury caused by some gall midge species can cause loss up to 50% (Ananthakrishnan 1984). Bioecology of psyllid galls or bud galls induced by *Apsylla cistellata* was studied in an orchard at Murshidabad of West Bengal, India (Samui & Jha 2009). The feeding of branch gall maggot in the young shoots and development of gall tissues interfere with the physiology of the affected twigs resulting in failure of such twigs to put forth inflorescence properly. So a careful study of the pest was carried out to find out its seasonal incidence, biological activities, finding out tolerance varieties and development of control measures.

Materials and Methods

Seasonal incidence and field biology

Incidence pattern of the insect was taken up for study at Mondouri Research Farm of Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal. Two plants were selected at random for each cultivar and three shoots of each plant were marked. The infestation was re-

corded by observing the galls formed on branch. The biology of the pest was studied at the field level. The incubation, larval, pupal and adult period were recorded. Parasites emerging from the galls were also counted.

Varietal screening

Ten cultivars had been taken up for field screening against the infestation of the pest and to find out level of susceptibility.

Effects of pruning in management of the pest

The experiment was conducted in the month of May, 2005 and 2006 with three treatments including control. The treatments included pruning of shoots which emerged in just previous flush at 15cm, 30cm and without.

Effects of different insecticides in management of the pest

Effect of different insecticides was recorded with seven treatments including control. In the year 2007, first spray was done on 15th February and the second after 15 days on marked shoots. Prior to spray 15 randomly selected twigs were tagged per treatment. Observations were recorded on number of galls per shoot and number of shoot infested.

Results and Discussion

Biology

Branch gall caused by *Oligotrophus mangiferae* Keiffer is a univoltine species. Emergence of adult from galls could be found from second week of February, which continued up to second week of March. The pre-oviposition period was very short, ranging from one to two days. Adults were very short lived and died soon after oviposition. Eggs were laid singly on the young vegetative shoots whose diameter ranged from 2.5 to 3.0mm. The eggs were inserted throughout the young shoot. Eggs hatched within 3-5 days and newly hatched maggot started to feed inside the shoot. One maggot was found to remain in a single chamber. Due to the feeding of maggot, pear shaped swelling could be found on shoots. Larval period lasted for approximately 315 days. A full grown larva was yellow in colour with a clear dark brown constriction on head. In severe infestation the shoot became swelled up and translocation of food material was arrested. Pupation inside the gall started from end of December to first week of January. Pupal period lasted for 30-45 days. Initially the pupa was creamish white in colour which gradually turned light yellow and finally blackish. All the appendages could be found from outside. Adults came out from pupa making an exit hole at the top of the gall. Presence of the remains of white puparia on the galls indicated the emergence of adults. Due to its severe attack no inflorescence could come out and the shoots gradually dried up. West (1990) also reported that apical meristem never developed in such gall infested buds and these never flushed.

Seasonal incidence

From the graphical representation (Fig. 1), in the year 2005-2006, it had been found that emergence of the adults took place during the middle of February to end of March when the temperature, relative humidity and rainfall

varied from 19.7- 33.2ºC, 33- 71% and 0.87 mm, respectively. The insects laid eggs immediately after emergence and gall formation started in April. Maximum number of gall was recorded in the month of January, 2006 (2.33 galls/shoot) when temperature, relative humidity and rainfall varied from 11.2-24.9ºC, 38-88% and 0.0 mm, respectively. The insects passed their larval and pupal stages within the galls.

From the investigation undertaken it could be concluded that adult emergence occurred during the month of February- March and gall formation reached its maximum during the month of April-May. The level of population was higher in the year 2007 (10.67 galls/shoot) than 2006 (2.33 galls/shoot). No report till date, other than the present one could be found on the incidence pattern of the pest.

Varietal screening

In the year 2005-2006 (Fig. 2a) the cultivar Alphanso (2.96 galls/shoot) was highly infested by the gall where as Neelam (1.69 galls/shoot) and Himsagar were moderately infested and other cultivars remained free from it. While, in the year 2006-2007 (Fig. 2b) the cultivar Mallika (13.11galls/shoot) and Neelam (9.66 galls/shoot) were found to be highly infested. The cultivars Krishanbhog, Ranipasand, Langra Bombay Yellow, Amrapali and Himsagar were free from its attack.

Parasite of branch gall *Tetrastichus* spp.

The only hymenopteran parasite that could be found to emerge from the galls was *Tetrastichus* spp (Family- Eulophidae). The emergence of the parasite synchronised with the emergence of the pest.

The study on the insect pest and natural enemies ratio (Table-1) showed that in 2005, the parasite population (*Tetrastichus* spp.) was more (1:2) at 2nd wk of February. The ratio was more or less equivalent (1:1.18) at the 3rd week. The parasite population further declined to become nonexistent in the following

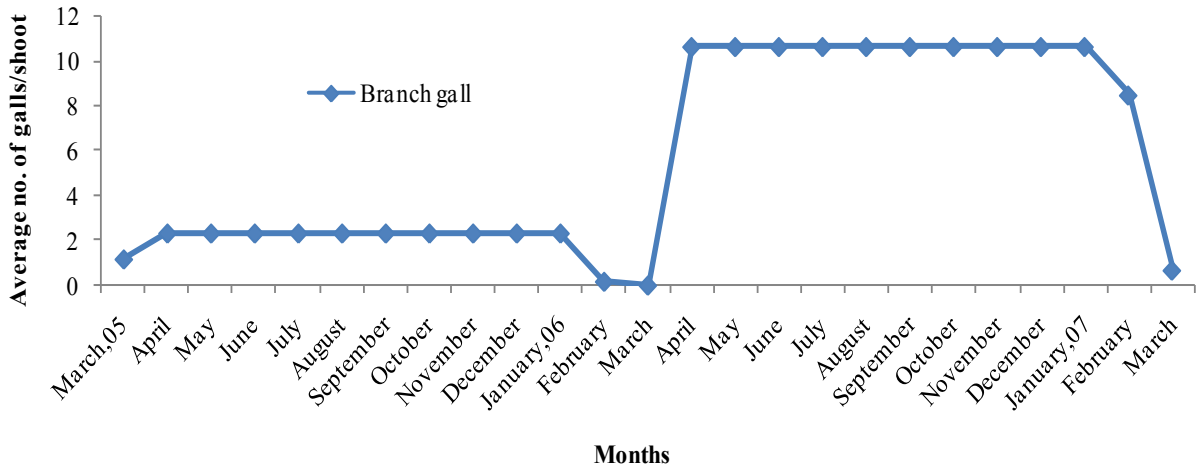

Fig 1. Seasonal incidence of branch gall during 2005-2007

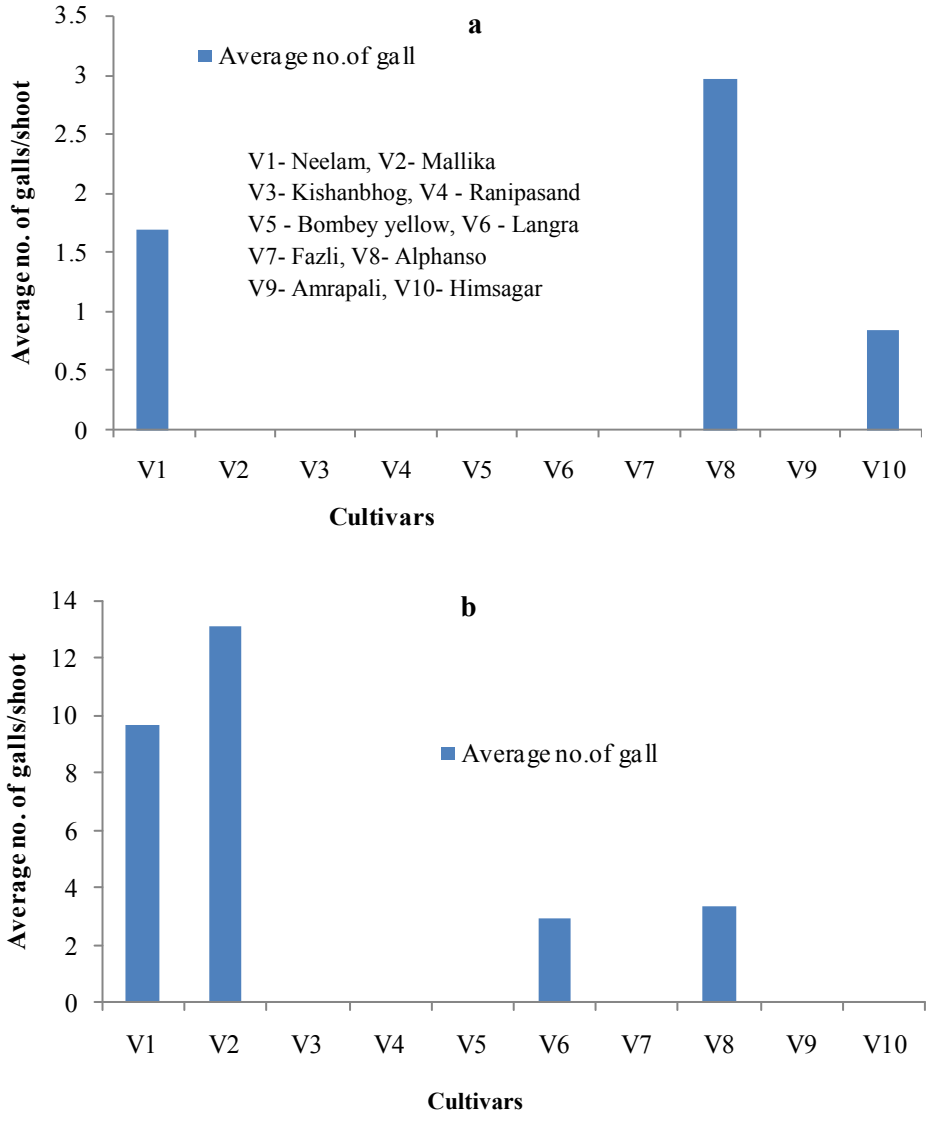

Fig 2. Incidence of branch gall on different varieties of mango during (a) 2005-06- and (b) 2006-07

week (2:0). The new flush of parasite again emerged at 2nd week March (1:3). In 3rd week of March the pest parasite ratio was very wide (4.3:1). In 2006, the parasite population, however, had been found to be present in 3rd and 4th week of February only. The pest and natural enemy ratio was more or less at balance in 3rd week of February (1.6:1) while the ratio became wider (3:1) in 4th week of the month. The parasite became nonexistent in the following weeks. In 2007, the pest and natural enemy ratio was 1:2 in the 2nd week of February while in the 3rd week it became 1.2:1. In the 4th week also it was 1:1. It was significant to note that in 1st and 2nd week of March the pest population was absent but the natural en-

emy was in abundance. As an overall sum up we can conclude that the natural enemy population was quite high throughout the whole of its period of incidence in 2007 only. Report of West *et al.* (1989) also showed that *Platygaster rhabdophaga*, *Mesopolobus* spp, *Torymus* sp. and *Tetrastichus* sp were responsible for high parasitism of branch gall.

Management approaches

Effect of pruning

Significantly lower number of galls could be recorded on shoots pruned at 30 cm (1.13 / shoot) followed by those at 15cm (2.60 / shoot), while the gall population on unpruned shoots were 8.20 (Table 2). In the following year it was found that number of vegetative flushes and reproductive flushes at 15 cm pruning was 8 and 1 respectively where as at 30 cm pruning it was 10 and 3, respectively and no new flush emerged from the un pruned ones. Hence pruning at 30 cm had been found to be most effective in managing the branch galls.

Effect of different insecticides

As the adults of the insect had been found to emerge from second week of February to second week of March an experiment was conducted during February- March, 2007 to find out the efficacy of different treatments of insecticides.

Table 1.
Insect pest and natural enemy ratio

Date/Duration	Insect pest and Natural enemy ratio		
	Year of observation		
	2005	**2006**	**2007**
07th Feb to 13th Feb	1:2.0	--	1:2
14th Feb to 20th Feb	1:1.18	1.6:1	1.2:1
21st Feb to 27th Feb	2:0	3:1	1:1
28th Feb to 06th March	1:3	1:0	0:2
07th March to 13th March	--	--	0:1
14th March to 20th March	4.3:1	--	--
21st March to 27th March	--	--	--

Table 2.
Effect of pruning on branch gall

Treatment	Galls/shoot (Mean of 15 shoots)	Percentage of inflorescence emerged	Percentage of vegetative shoots emerged
15cm Pruning	2.60 b	6.67	53.33
30cm Pruning	1.13c	20.00	66.67
Control	8.20a	6.67	26.67

Means followed by same letter(s) in the same column do not differ significantly at 5% level by DMRT

Table 3.
Effect of different insecticides on branch galls

Treatments	Concentration %	Mean no. of gall per 15 shoots	Percent shoot infested
Imidacloprid 17.8% SL	0.006	1.67c	20.00
Chlorpyriphos 50% + cypermethrin 5%	0.060	5.27ab	40.00
Thiamethoxam 25% WG	0.008	1.13c	20.00
Monocrotophos 36% SL	0.050	2.13bc	26.67
Profenophos 50% EC	0.040	2.47abc	33.33
Quinalphos 25% EC	0.050	2.20bc	33.33
Control		5.53a	60.00

Means followed by same letter(s) in the same column do not differ significantly at 5% level by DMRT

From the result (Table 3) it could be found that significantly lowest number of galls (1.13/shoot) could be recorded in shoots treated with thiamethoxam 25% WG followed by imidacloprid 17.8% SL (1.67/shoot) while it was 5.53 on untreated shoots. The treatments monocrotophos 36% SL, quinalphos 25% EC, imidacloprid 17.8% SL, and thiamethoxam 25% WG were at par. The treatments monocrotophos 36% SL and quinalphos 25% EC, though at par in their performance showed somehow inferior result than thiamethoxam and imidacloprid.

Acknowledgement

The service of Insect Information Service, British Museum, U.K and Indian agricultural Research Institute, New Delhi for identification of the pest and natural enemy and financial support of Department of Food Processing Industries and Horticulture, Government of West Bengal, India for taking up the study are thankfully acknowledged.

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