



## Survey for Incidence of *Maruca vitrata* (G.) (Pyralidae: Lepidoptera) and its Natural Enemies on Greengram and other Alternative Hosts in Main Pulse Growing Tracts of Khammam District, Andhra Pradesh

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### ABSTRACT

The survey conducted for two consecutive years (2009-10 and 2010-11) in the twenty major greengram growing mandals of Khammam district during *rabi*, at different growth stages of pulses from randomly selected five farmer's fields revealed that, apart from greengram *Maruca vitrata* infestation was noticed on two weed hosts, *Physalis minima* and *Abutilon sp* and cultivated hosts viz., Blackgram, Redgram, Cowpea and Groundnut. The larval incidence was ranged from 5 to 25 larvae per twenty five plants in different growth stages, i.e. bud initiation, flowering and podding stages. The year wise data on flower infestation was ranged from 10- 50% and 10- 45%, whereas pod damage was ranged from 20-38 and 19-32 per cent respectively. Among the surveyed mandals, Khammam Urban (33.25%), Penubally (33.0%), Gundala (32.75%), Kamepally (32.5%), Chintakani (32.0%) and Thirumalayapalem (32.0%) mandals recorded the highest pod damage, whereas the lowest pod damage was recorded in Kalluru (19.5%), Bonakal (22.75%), Singareni (23.75%), Bhadrachalam (24.25%) and Garla (25.0%) mandals. Among the natural enemies, only spiders and coccinellids were recorded. Larval and pupal parasitoids or entomopathogens were not recorded in the *Maruca* infested pulse crops. Among the coccinellids, *Chilomenus sexmaculata* species only observed in Pulses ecosystem. Among the spiders, *Oxyopes sp.*, *Oxyopes javanus*, *Tetragnatha javana*, *Thomisus sp.*, *Chrysilla sp.*, spiders were observed in Blackgram ecosystem. *Neoscona theisi*, *Telemonia dimidata* (male and female), *Curba sp.*, *Salticus sp.*, *Chrysilla sp.*, spiders were observed in pigeonpea (redgram) ecosystem. *Oxyopes sp.*, *Argiopos anasuja* (Thorell) and *Peucetia viridana* spiders were observed in greengram.

**Key words :** Alternative hosts, *Maruca vitrata*, *Rabi*, Natural enemies.

Pulses are wonderful gifts of nature. They are one of the important segments of Indian Agriculture and second most important group of crops after cereals. The global pulses production was 61.5 million tons from an area of 70.6 m.ha with an average yield of 871 kg/ha. India is the major country for the pulse production and consumption (17.5 m.t including 3.5 tons of imports) with a relative share of 25-28% of the total global production. India grows a variety of pulse crops under a wide range of agro-climatic conditions since time immemorial. The production of total pulses in India is about 15 m.t covering an area of 23.6 m.ha. Pulses are well known as cheap and excellent source of dietary proteins of Indian Sub-continent, feed and fodder for animals and also soil fertility restorers. They are grown in the semi arid regions of India since time immemorial both in

*kharif* and *rabi* seasons, with almost two third production from the *rabi*. Andhra Pradesh is the 4<sup>th</sup> major state of India contributing the 15.5% of the national production of greengram with average productivity of 351kg/ha. Khammam is the important pulse crop growing district occupied the 3<sup>rd</sup> place in productivity, but 5<sup>th</sup> place in area and production of greengram. Among the pod borers, legume pod borer, *Maruca vitrata* (G.) is the devastating pest of pulses. It is widely distributed in Asia, Africa, Australia and America. It feeds on plant species belonging to 20 genera and 6 families, the majority of which belonging to Papilionaceae and is a major pest of cowpea, pigeonpea, mungbean, snapbean, lima bean, faba bean, hyacinth bean and adzukibean. In Asia, it is an important pest of pigeonpea, common bean, soya bean and cowpea. It infests pigeonpea, cowpea,

mungbean, urd bean and field bean in southern zone of A.P (Sharma *et al.*, 2000). In recent decades, it infested groundnut also (Babu *et al.*, 2006). Because of its extensive host range and destructiveness, it became as a persistent endemic pest in pulses in A.P particularly on greengram, as it is cultivated throughout the year in different seasons / situations. Studies and surveys on the seasonal occurrence of pest, its natural enemy fauna and alternative hosts available in a particular area was the basic need for management of the pest, hence the survey conducted.

### MATERIAL AND METHODS

The survey was conducted, to record the natural enemies viz., number of coccinellids, spiders, preying mantids on twenty five randomly selected *Maruca* infested plants at weekly interval in five randomly selected farmer's fields of Khammam district and also to record alternative hosts for *Maruca* at A.R.S. Farm and farmers' fields. Observations on larval incidence, flower infestation and pod damage were recorded from the pulse crops grown in surroundings and weed plants available nearby/within the greengram fields in the A.R.S., Farm and farmers' fields also at flowering stage. The mandal and village wise greengram area particulars are presented in the table 1.

### RESULTS AND DISCUSSION

Survey was conducted during two consecutive *rabi* seasons (2009-10 and 2010-11) and the data on incidence of the *M. vitrata* at different growth stages of greengram and other alternative hosts, plant parts of alternative hosts attacked and its natural enemies was presented and discussed here under.

#### Survey for Incidence of *M. vitrata*

During *rabi*, the survey was made in five randomly selected farmers' fields at different growth stages in twenty major greengram growing mandals during 2009-10 and 2010-11 and reports revealed that the *M. vitrata* larval incidence was ranged from 5 to 25 larvae per twenty five plants in different growth stages, i.e. bud initiation, flowering and podding stages. The flower infestation was ranged from 10- 50% and 10- 45%, whereas pod damage was ranged from 20-38 and 19-32 per cent.

*Maruca vitrata* infestation was noticed in all surveyed mandals.

#### Survey for Natural Enemies

Among the natural enemies, only spiders and coccinellids were recorded. Larval / pupal parasitoids or entomopathogens were not recorded from the *Maruca* infested plants during the survey made at Khammam district at different growth stages of pulses ecosystem. Krishna (2004) reported that the late larval instars of *M. vitrata* were naturally parasitized by a Braconid parasitoid, *Apanteles taragamae* and infected by fungal pathogen, *Nomuraea rileyi* (Farlow) Samson, but the extent of parasitisation and infection was very low or negligible in *rabi*.

The *rabi* data on number of coccinellids and spiders per twenty five *Maruca* infested plants recorded on randomly selected *Maruca* infested plants from the farmer's fields was ranged from 10 - 17.5 and 1.0 - 4.0 in 2009-10, while 6.0 - 14.0 and 2.0 - 3.5 in 2010-11 respectively. Present findings of domination of spiders and coccinellids, among predators is in accordance with Bhattacharya *et al.* (2006), who reported 26 species of predators of which spiders and coccinellids were abundant.

#### Survey for Alternative Hosts of *M. vitrata*

Survey on *M. vitrata* incidence in different cultivated pulse crops in the greengram growing mandals and weed plants grown nearby or within the greengram fields of the A.R.S., Farm and farmers' fields was conducted and reported that Blackgram, Redgram, Cowpea and Groundnut were the cultivated hosts. These reports are in accordance with the findings of Bindu and Jhala (2007), who concluded that cowpea, greengram, blackgram, redgram and indian bean were preferred hosts. Among the various weeds of pulses ecosystem, *Physalis minima* (Solanaceae) and *Abutilon* sp., (Malvaceae) were found as alternative weed hosts (Table 2), as they are hosting early instar larvae at flowering stage. Arodokoun *et al.* (2003) reported that *Lonchocarpus* and *Tephrosia* are preferred alternative host plants of *Maruca* and the time of infestation was at flowering stage.

Table 1. Mandal wise greengram area particulars in the Khammam District.

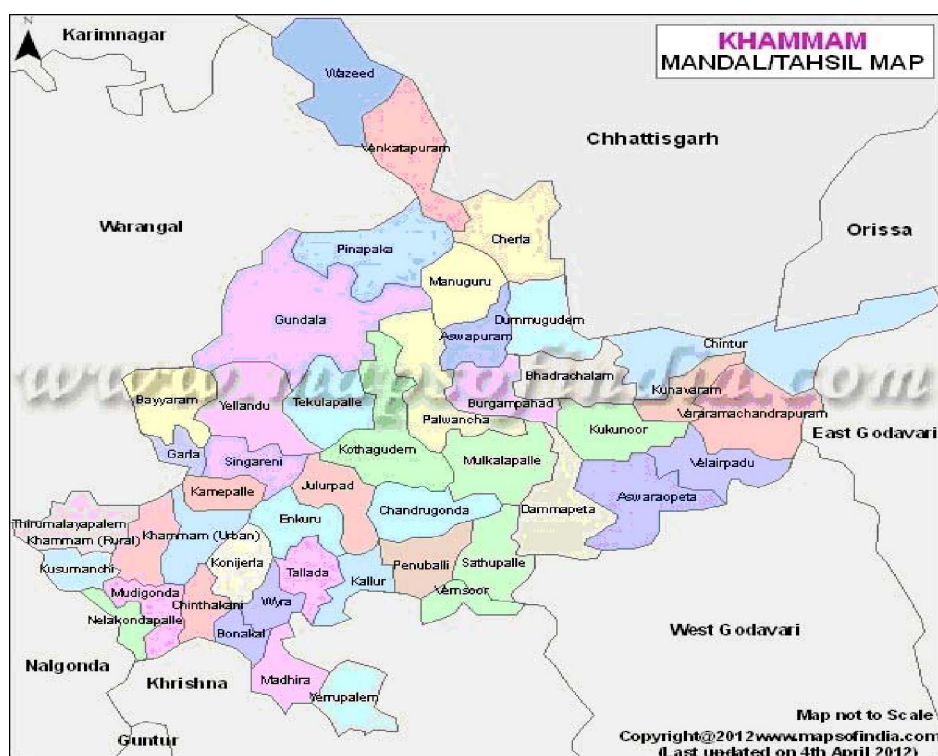
Sl. No	Name of the Mandal	Total No. of villages	No. of greengram cultivated villages			Greengram cropped Area (ha)		
			2009-10	2010-11	Mean	2009-10	2010-11	Mean
1.	Khammam Urban	17	4	12	8	6	35	20.5
2	Chintakani	16	12	9	10.5	98	36	67.0
3	Kusumanchi	18	5	3	4	44	12	28.0
4	Khammam Rural	23	4	2	3	19	3	11.0
5	Tirumalayapalem	25	15	14	14.5	34	55	44.5
6	Yerrupalem	24	2	2	2	2	3	2.5
7	Bonakal	25	3	17	10	7	52	29.5
8	Thallada	18	14	9	11.5	6	30	18.0
9	Kalluru	19	16	2	9	79	16	47.5
10	Penubally	23	2	6	4	21	16	18.5
11	Yellandu	21	7	7	7	26	303	164.5
12	Singareni	7	6	11	8.5	345	314	329.5
13	Kamepally	11	11	5	8	474	372	423.0
14	Garla	13	5	10	7.5	696	354	525.0
15	Bayyaram	11	10	17	13.5	607	410	508.5
16	Gundala	17	16	8	12	1374	94	734.0
17	Tekulapally	21	9	9	9	28	26	27.0
18	Kothagudem	6	6	6	6	141	200	170.5
19	Julurpadu	11	11	4	7.5	32	204	118.0
20	Chandrugonda	8	3	3	3	25	32	28.5
21	Enkoor	20	8	8	8	177	47	112.0
22	Aswaraopet	11	8	2	5	78	5	41.5
23	Mulkalapally	19	3	3	3	19	60	39.5
24	Palwancha	17	15	13	14	170	136	153.0
25	Burgampadu	17	10	16	13	110	269	189.5
26	Kukkunoor	18	10	18	14	81	244	162.5
27	Velairpad	21	20	18	19	485	415	450.0
28	Manuguru	8	8	8	8	250	416	333.0
29	Aswapuram	10	10	10	10	250	248	249.0
30	Pinapaka	25	16	20	18	191	372	281.5
31	Dummugudem	83	46	29	37.5	202	101	151.5
32	Bhadrachalam	71	25	55	40	238	289	263.5
33	Kunavaram	56	22	31	26.5	261	364	312.5
34	V.R.Puram	62	49	42	45.5	340	386	363.0
35	Chintoor	89	62	54	58	650	555	602.5
36	Wazeedu	61	40	32	36	183	183	183.0
37	Venkatapuram	25	6	16	11	147	177	162.0
38	Cherla	74	14	32	23	78	143	110.5
	Total area	1007	533	563	7974	6977	7475.5	

Table 2. Mandal wise greengram area survey on *M. vitrata* infestation and Natural enemies (Pooled data, 2009-10 and 2010-11) in Khammam dt.

Sl. No.	Name of the Mandal	Total No. of villages	No. of greengram cultivated villages	Green-gram cropped Area (ha)	<i>M. vitrata</i> infestation (Mean data of 5 villages)			Natural Enemies (Mean no./ 25 <i>M. vitrata</i> infested plants)		
					Larval incidence (No./ 25 PI)	Flower infestation (%)	% Pod damage	Coccinellids	Spiders	
1	Khammam (U)	17	12.0	66.5	9.5-24.0	29.25-44.0	33.25	11.5	2.25	
2	Penubally	21	6.5	21.0	7-24	15-40	33.00	9.0	2.50	
3	Gundala	21	8.0	56.5	6-25	16.5-35	32.75	14.5	2.50	
4	Kamepally	13	5.0	534.0	9-24	19.25-38.5	32.50	11.2	2.50	
5	Chintakani	16	7.0	40.0	10-25.0	20-40	32.00	13.5	3.25	
6	Tirumalayapalem	25	14.5	44.5	7-22.0	10-40	32.00	12.0	3.00	
7	Enkoor	11	8.0	62.5	7-22	15-45	31.50	14.5	3.00	
8	Palwancha	17	14.0	153.0	5-22	14.5-43	31.50	11.0	2.00	
9	Kothagudem	11	26.0	201.0	7-24	15.5-29	30.50	12.0	1.50	
10	Thallada	19	12.5	54.5	8-24	17-39.5	29.50	11.0	2.75	
11	Julurpadu	8	3.5	105.5	10-24.5	15.5-38	29.25	10.0	2.50	
12	Bayyaram	17	16.5	892.0	10-24	20-40	27.25	13.0	3.50	
13	Kusumanchi	18	3.5	15.5	10-24.0	21.5-42.5	25.75	13.2	3.50	
14	Yerrupalem	24	2.0	2.5	5-25.0	15.5-39	25.25	11.0	3.25	
15	Yellandu	7	6.5	324.0	10-22	15-44	25.25	10.0	3.00	
16	Garla	11	10.0	480.5	10-25	25-45	25.00	15.0	2.00	
17	Bhadrachalam	71	40.0	263.5	5-20	13-34.5	24.25	11.5	3.50	
18	Singareni	11	11.0	394.0	9-24	19.5-37	23.75	10.0	2.25	
19	Bonakal	18	15.5	29.0	5-21.5	10-39	22.75	11.0	3.00	
20	Kalluru	23	2.0	18.5	6-25	10-35	19.50	9.0	3.00	

Table 3. Mandal wise greengram area surveyed for alternative hosts of *M. vitrata* in Khammam District.

Name of the Mandals (20)	Alternative Host plants					
	Other crops			Weed plants		
	Crop Name	Plant Part attacked observed	Stage of the <i>M. vitrata</i>	Plant Name	Plant Part attacked	Stage of the <i>Maruca</i> observed
Khammam Urban, Chintakani Kusumanchi, Wyra, Tirumalayapalem, Kalluru, Penubally, Yellandu, Singareni, Kamepally, Garla, Bayyaram, Enkoor, Palwancha, Bhadrachalam, Gundala, Kothagudem, Julurpadu, Thallada	Blackgram Cowpea Redgram Groundnut	Buds, Flowers and Pod Buds, Flowers	Larva and Pupa 1 <sup>st</sup> and 2 <sup>nd</sup> instar	<i>Physalis minima</i> <i>Abutilan</i> <i>sp.</i>	Flowers	1 <sup>st</sup> and 2 <sup>nd</sup> instar larvae
A.R.S., Farm	Blackgram Redgram Cowpea	Buds, Flowers and Pod	Larva and Pupa	-do-	-do-	-do-

Fig. 1 Map showing the (1-20) surveyed Mandals of Khammam district for *M. vitrata* infestation and its natural enemies on greengram and other alternative hosts during *Rabi*

1, 8, 17, 11, 2, 4 numbered mandals recorded highest *Maruca* pod damage.  
7, 6, 10, 16, 12 numbered mandals recorded lowest *Maruca* pod damage

### **Pooled (*Rabi*) Survey Reports on *M. vitrata* Incidence and its Natural Enemies and Alternative Hosts**

During *rabi*, the pooled survey results from twenty mandals showed that, the pod damage due to *M. vitrata* was ranged from 19.5 – 33.25 per cent. It was found that, Pulse crops viz., greengram, blackgram, cowpea, pigeonpea (redgram) and oil seed crop, groundnut were the cultivated crops in the surveyed mandals. *Maruca vitrata* infestation was noticed in almost all pulse crops grown in the surveyed mandals of Khammam district (Table 3). Among the surveyed mandals, Khammam Urban (33.25%), Penubally (33.0%), Gundala (32.75%), Kamepally (32.5%), Chintakani (32.0%) and Thirumalayapalem (32.0%) mandals recorded the highest pod damage, whereas the lowest pod damage was recorded in Kalluru (19.5%), Bonakal (22.75%), Singareni (23.75%), Bhadrachalam (24.25%) and Garla (25.0%) mandals (Fig. 1).

Among the natural enemies, number of coccinellids and spiders from randomly selected *Maruca* infested pulse crops from the farmer's fields was ranged from 9.0 - 14.5 and 1.5 - 3.5 respectively. Among the coccinellids, *Chilomenus sexmaculata* species only observed in Pulses ecosystem. During *rabi* season, among the spiders, *Oxyopes* sp., *Oxyopes javanus*, *Tetragnatha javana*, *Thomisus* sp., *Chrysilla* sp., were observed in Blackgram ecosystem. *Neoscona theisi*, *Telemonia dimidata* (male and female), *Curba* sp., *Salticus* sp., *Chrysilla* sp., spiders were observed in pigeonpea (redgram) ecosystem. *Oxyopes* sp., *Argiope anasuja* (Thorell) and *Peucetia viridana* spiders were observed in greengram and also on weed hosts, namely *Abutilon* sp. and *Gynandroposis* sp. These observations are in conformity with the findings of Sudha (2008), who conducted survey and reported that, *Argiopes* sp, *Clubiona* sp., *Leucage* sp., *Neoscona* sp., *Oxyopes shwetha* are the predominant spider species found in the pulses ecosystem of Tamil Nadu.

### **LITERATURE CITED**

- Arodokoun DY, Tomo M, Cloutier C and Adeoti R 2003** Importance of alternative host plants for the annual cycle of the legume pod borer, *Maruca vitrata* Fabricious (Lepidoptera: Pyralidae) in southern and Central Benin. *Insect science and its application*. 23 (2): 103-113
- Babu B R, Rajsekhar P and Ramachandra rao G 2006** Ecology and management of *Maruca vitrata* (Geyer) on groundnut. *Journal of Economic Entomological Research*, 30 (4): 329-332.
- Bhattacharya B, Basti A and Saikia K 2006** Parasitoids and predators of rice insect pests of Jorhat district of Assam. *Journal of Biological Control*, 20 (1):37- 44.
- Bindu K Panickar and Jhala R C 2007** Impact of different host plants on growth and development of spotted pod borer, *Maruca vitrata* (Fab.) *Legume Research*, 30: 10-16.
- Krishna Y 2004** Germplasm screening and insecticidal management of *Maruca vitrata* (Geyer) in blackgram. M. Sc (Ag). Thesis submitted to Acharya N. G. Ranga Agricultural University, Rajendranagar, Hyderabad.
- Sharma KK, Yadav HS and Amarchandra 2000** A note on seasonal activity of pod borer complex on dolichos bean *J N K V V Research Journal*, 33(1/2) 74-77
- Sudha V 2008** Predatory Arthropod diversity in Pulses Ecosystem. *M. Sc (Ag). Thesis* submitted to Tamil Nadu Agricultural University, Coimbatore.