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Survey on incidence and insecticide usage for management of *Maruca vitrata* (Geyer) in major blackgram (*Vigna mungo* (L) Hepper) growing areas of Andhra Pradesh

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Abstract

Blackgram (*Vigna mungo* (L) Hepper) important pulse crop grown in Andhra Pradesh during *rabi* season. During the crop growth period various insect pests were observed among these insectpests *Maruca vitrata* caused more damage to the crop. This pest occurred on blackgram flowering stage to pod maturing stage during these crop *M. vitrata* causes more vulnerable damage to the crop. To know the intensity of incidence of *M. vitrata* survey was conducted during 15-10-2019 to 16-11-2019 in major blackgram growing areas of Andhra Pradesh. Incidence of *M. vitrata* varied from 29.09 to 71.52 per cent during *rabi* 2019-20. Majority of the farmers preferred PU-31, TBG-104, LBG-752 and TAU-1 varieties of blackgram for cultivation. Major blackgram growing areas of Andhra Pradesh farmers used chlorpyrifos, dichlorvos, thiodicarb, spinosad and chlorantraniliprole insecticides were used to managing the *M. vitrata*. *Therophilus marucae* larval parasitoid and *Phanerotoma philippinensis* egg-larval parasitoid of *M. vitrata* also observed during survey.

Keywords: Spotted pod borer (*Maruca vitrata*), blackgram (*Vigna mungo*), *Therophilus javanus*, *Phanerotoma hendecasisella*, *Bassus relativus*

Introduction

Blackgram (*Vigna mungo* L. Hepper) is also known as urdbean, mash, black maple. India is the world's largest producer of blackgram contributing 28 per cent to the global pulse basket from an area of about 37 per cent as well as consumer of blackgram, producing 1.959 million tonnes from an area of 3.246 million hectares with an average productivity of 604 Kg ha⁻¹ (Indiastat.com, 2019)^[6]. The important blackgram growing states in India are Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Maharashtra, Karnataka, Kerala, Tamil Nadu, Madhya Pradesh, Rajasthan, Uttar Pradesh, West Bengal and Tripura. In Andhra Pradesh, the crop is grown in an area 3.15 lakh ha with a total production of 2.98 lakh tonnes and productivity of 946 Kg ha⁻¹ (Indiastat.com, 2019)^[6]. The yield losses on urdbean due to insect pests *M. vitrata*, *Spodoptera litura* (Fabricius), thrips and pod bugs *etc.*, at various stages of the crop growth accounts 30 to 54.3 per cent in India (Dhuri and Singh, 1983)^[2]. The larvae of *M. vitrata* larvae feeds on flowers, buds, and pods by webbing with leaves and causing serious damage (Mandal *et al.*, 2013)^[3]

Material and Methods

A roving survey was conducted during *rabi* 2019-20 in five major blackgram growing districts of Andhra Pradesh *viz.*, Prakasam, Nellore, Chittoor, Guntur and Kurnool.

Selection of villages

Based on data obtaining from Department of Agriculture (A.P) five major blackgram growing districts were selected. In each district two mandals were selected and from each mandal two villages were selected.

Collection of data

From each village, five farmers were selected from each farmer's field five one metre square areas were selected and used for recording observations. Along with incidence of *M. vitrata* information regarding the names of the varieties of the blackgram grown by farmers and insect pests observed during different growth stages of the crop and insecticides used for the managing various insect pests were also collected. The per cent infestation of *M. vitrata*, was calculated by formula.

$$\text{Per cent infested plants} = \frac{\text{Number of plants infested per metre square}}{\text{Total number of plants per metre square}} \times 100$$

Data was also recorded on natural enemies viz., parasitoids, predators from the surveyed plots. Frequency of natural enemies' incidence calculated by using below formula = Total number of farmers' fields observed - number of fields without incidence of natural enemies

Result and Discussion

In Prakasam district, roving survey was carried out in Katuri Vari Palem and Raju Palem villages of Podili mandal, Darsi and Rajam Palle villages of Darsi mandal on 15-11-2019 and 16-11-2019. The crop was at different growth stages, insect pests like *M. vitrata*, *Spodoptera litura* (Fabricius), *Thrips tabaci* Lindeman, *Bemisia tabaci* (Gennadius) and *Aphis craccivora* Koch prevailed during various growth stages of the crop (Table 1) and among all these, the incidence of *M. vitrata* was severe which was ranged from 29.09 to 38.79 per cent in Darsi and Rajam Palle villages of Darsi mandal respectively (Table 2). In Nellore district, roving survey was carried out in Podalakuru and B. Cherlopalli villages of Podalakuru mandal, Rapuru and Pangili villages of Rapuru mandal on 07-11-2019 and 08-11-2019. The crop was at different growth stages, insect pests like thrips, aphids, *S. litura* and *M. vitrata* prevailed during various growth stages of the crop (Table 1) and among all these, the incidence of *M. vitrata* was severe which was ranged from 37.58 to 44.85 per cent in Podalakuru and B. Cherlopalli villages of Podalakuru mandal respectively (Table 2). In Chittoor district, roving survey was carried out in C. Gollapalli and Pudipatla villages of Tirupati rural mandal, Chandragiri and Kottala villages of Chandragiri mandal on 15-10-2019 and 16-10-2019. The crop was at different growth stages, insect pests like thrips, aphids, *S. litura* and *M. vitrata* prevailed during various growth stages of the crop (Table 1) and among all these, the incidence of *M. vitrata* was severe which was ranged from 46.06 to 55.15 per cent in C. Gollapalli and Pudipatla villages of Tirupati rural mandal (Table 2). In Guntur district, roving survey was carried out in Gudipudi and Barthipudi villages of Bapatla mandal, Returu and Kommuru villages of Kakumanu mandal on 17-10-2019 and 18-10-2019. The crop was at different growth stages, insect pests like thrips, aphids, *S. litura* and *M. vitrata* prevailed during various growth stages of the crop (Table 1) and among all these, the incidence of *M. vitrata* was severe which was ranged from 59.39 to 71.52 per cent in Gudipudi and Barthipudi villages of Bapatla mandal (Table 2). In Kurnool district, roving survey was carried out in Kotakonda and Sri Rangapuram villages of Kurnool mandal, Kotha Kandukur and R Krishnapuram villages of Allagadda mandal on 09-11-2019 and 10-11-2019. The crop was at different growth stages, insect pests like thrips, aphids, *S. litura* and *M. vitrata* prevailed during various growth stages of the crop (Table 1) and among all these, the incidence of *M. vitrata* was severe which was ranged from 49.70 to 63.03 per

cent in Kotha Kandukur villages of Allagadda mandal and Sri Rangapuram village of Rudhravaram mandal respectively (Table 2). The per cent damage for plots in different villages was in the range of 29.09 to 71.52 per cent during *rabi* 2019-20. Per cent incidence of *M. vitrata* during survey was confirmed with results of Reddy *et al.*, 2018 who reported that per cent infestation of spotted pod borer was observed in Kadapa district 41.99 ± 6.84 per cent followed by Nellore 39.77 ± 5.97 per cent and Chittoor 38.50 ± 5.54 .

The present survey has revealed that, majority of the farmers in all five districts preferred chlorpyrifos (47%), dichlorvos (45%), thiodicarb (42%), Spinosad (38%) and chlorantraniliprole (37%) and other insecticides 18 per cent for management of *M. vitrata* (Table 3). Present survey results were supported by Reddy *et al.*, 2018 reported that majority of the farmers preferred chlorpyrifos (51.9%) insecticide followed by the DDVP (8.9%) and thiodicarb (4.4%) to control the spotted pod borer.

Among the survey conducted farmers in Prakasam district TBG-104, PU-31 and LBG -752 varieties cultivated by 45, 45 and 10 percent respectively. In Nellore district TBG-104, PU-31 and PBG- 1 varieties cultivated by 40, 35 and 25 per cent respectively. In Chittoor district TBG-104, PU-31 and LBG -752 varieties cultivated by 45, 40 and 15 per cent respectively. In Guntur district TBG-104, PU-31 and LBG -752 varieties cultivated by 50, 40 and 10 per cent respectively. In Kurnool district TBG-104, PU-31 and TAU -1 varieties cultivated by 45, 45 and 10 per cent respectively (Table 4). Most of the observed varieties which were supplied by the SAUs and Dept. of Agriculture, and some of the farmers retain some of the harvested produce for growing in next coming seasons. Present results are supported by Reddy *et al.* 2018 who reported that five genotypes of blackgram were majorly cultivated in the Southern zone of Andhra Pradesh viz., LBG-752, LBG-648, PU-31, LBG-123 and LBG-792. Out of these, LBG- 752 (62.2%) variety occupied the majority of the blackgram growing area followed by LBG- 123 (17.8%), LBG-792 (14.1%), PU-31 (4.4%) and LBG-648 (1.5%). Incidence of natural enemies in farmer fields during *rabi* 2019-20. The highest per cent incidence of natural enemies was observed in farmer's field braconids *Therophilus javanus* (60%), *Phanerotoma hendecasisella* (45%) and Ichneumon wasp *Bassus relativus* (43%) and Syrphids (27%) and coccinellids (34%) frequency incidence were observed (Table 5) present results were supported by Arodokoun *et al.* (2006) who reported that a braconid parasitoid, *Phanerotoma leucobasis*, could inflict about 30% parasitism of *M. vitrata* in Benin, West Africa and Srinivasan (2012) reported that *Therophilus marucae* (Braconidae: Hymenoptera) besides *T. javanus* emerged as a major parasitoid in a recent survey during May – June 2011 in Southern Taiwan. It is a larval parasitoid and the field parasitism rate was up to 38%.

Table 1: Insect pests observed at various growth stages of blackgram during *rabi* 2019-20

District	Mandal	Village	Date of survey	Stage of the crop	Pests observed					Surrounding crops
					aphids	thrips	white fly	<i>S. litura</i>	<i>M. vitrata</i>	
Chittoor	Tirupati Rural	C. Gollapalli	15-10-2019	Flowering	p	p	-	-	p	Jowar, Greengram
		Pudipatla	15-10-2019	Flowering and Pod formation	p	-	-	P	p	Groundnut, Maize, Greengram
	Chandragiri	Chandragiri	16-10-2019	Flowering	-	p	-	-	p	Maize, Jowar, tomato
		Kottala	16-10-2019	Vegetative	p	p	-	-	-	Chillies, Bajra
Nellore	Podalakuru	Podalakuru	07-11-2019	Flowering	p	-	-	P	p	Tomato
		B. Cherlopalli	07-11-2019	Flowering	-	p	-	-	p	Jowar
	Rapur	Rapur	08-11-2019	Flowering	p	p	-	P	p	Bajra, Groundnut
		Pangili	08-11-2019	Vegetative	-	p	-	-	-	Groundnut, Paddy
Kurnool	Rudhravaram	Kotakonda	09-11-2019	Flowering	p	p	-	P	p	Paddy, Greengram
		Sri Rangapuram	09-11-2019	Vegetative	-	-	-	-	-	Greengram, Paddy
	Allagadda	Kotha Kandukur	10-11-2019	Pod formation	-	p	-	-	p	Paddy, Jowar
		R. Krishnapuram	10-11-2019	Flowering	p	p	-	-	p	Jowar, Greengram
Prakasham	Darsi	Darsi	16-11-2019	Vegetative	-	-	-	P	-	Paddy, Banana
		Rajam Palle	16-11-2019	Pod formation	p	-	P	P	p	Greengram, Redgram
	Podili	Katuri Vari Palem	15-11-2019	Pod formation	-	p	-	-	p	Redgram, Jowar
		Raju Palem	15-11-2019	Flowering	-	p	-	P	p	Redgram, Groundnut
Guntur	Bapatla	Gudipudi	17-11-2019	Pod formation	p	-	-	-	p	Greengram, Redgram
		Barthipudi	17-11-2019	Vegetative	-	-	-	P	-	Marigold, Tomato
	Kakumanu	Returu	18-11-2019	Flowering	-	p	P	-	p	Greengram, Paddy
		Kommuru	18-11-2019	Pod formation	-	p	-	P	p	Groundnut, Chillies

Table 2: Incidence of *M. vitrata* during *rabi* 2019-2020

District	Mandal	Village	Date of survey	% incidence of <i>M. vitrata</i> (Mean \pm S.D)
Prakasam	Darsi	Darsi	16-11-2019	29.09 \pm 3.09
		Rajam Palle	16-11-2019	38.79 \pm 4.02
	Podili	Katuri Vari Palem	15-11-2019	32.12 \pm 3.09
		Raju Palem	15-11-2019	35.76 \pm 2.27
Nellore	Podalakuru	Podalakuru	07-11-2019	37.58 \pm 3.09
		B. Cherlopalli	07-11-2019	44.85 \pm 2.27
	Rapur	Rapur	08-11-2019	38.18 \pm 3.09
		Pangili	08-11-2019	40.61 \pm 3.09
Chittoor	Tirupati Rural	C. Gollapalli	15-10-2019	46.06 \pm 2.27
		Pudipatla	15-10-2019	55.15 \pm 2.27
	Chandragiri	Chandragiri	16-10-2019	46.67 \pm 3.09
		Kottala	16-10-2019	46.67 \pm 3.09
Guntur	Bapatla	Gudipudi	17-10-2019	59.39 \pm 3.09
		Barthipudi	17-10-2019	71.52 \pm 4.11
	Kakumanu	Returu	18-10-2019	63.64 \pm 2.71
		Kommuru	18-10-2019	61.21 \pm 3.53
Kurnool	Rudhravaram	Kotakonda	09-11-2019	56.97 \pm 3.53
		Sri Rangapuram	09-11-2019	63.03 \pm 2.27
	Allagadda	Kotha Kandukur	10-11-2019	49.70 \pm 2.42
		R. Krishnapuram	10-11-2019	55.76 \pm 3.09

Table 3: Insecticide usage for managing the *M. vitrata* during *rabi* 2019-2020

S. No.	Insecticide	Total no. of farmers sampled	Per cent Usage
1.	Chlorpyrifos 20% EC	100	47
2.	Dichlorvos 76% EC	100	45
3.	Thiodicarb 75% WP	100	42
4.	Spinosad 45% SC	100	38
5.	Chlorantraniliprole 18.5% SC	100	37
6.	Others	100	18

Table 4: Blackgram varieties grown by farmers during *rabi* 2019-20

S. No.	District	Variety	No. of farmers	<i>rabi</i> 2019-20	
				No. of farmers	% of variety grown
1.	Prakasam	TBG-104	20	9	45
		PU-31		9	45
		LBG-752		2	10
2.	Nellore	TBG-104	20	8	40
		PU-31		7	35
		PBG- 1		5	25
3.	Chittoor	TBG-104	20	9	45
		PU-31		8	40
		LBG-752		3	15
4.	Guntur	TBG-104	20	10	50
		PU-31		8	40
		LBG-752		2	10
5.	Kurnool	TBG-104	20	9	45
		PU-31		9	45
		TAU-1		2	10

Table 5: Incidence of natural enemies in farmers blackgram fields during *rabi* 2019-20

S. No.	Natural enemies	<i>rabi</i> 2019-20 (n=100)	
		Frequency	Percentage
1.	<i>Therophilus javaus</i> (Braconidae)	60	60
2.	<i>Phanerotoma hendecasisella</i> (Braconidae)	45	45
3.	<i>Bassus relativus</i> (Ichneumonidae)	43	43
4.	Syrphids	27	27
5.	Coccinellids	34	34

**Fig 1:** *Therophilus javanus* (Baeognatha javana) (Bhat and Gupta, 1977)**Fig 2:** *Phanerotoma hendecasisella* Cameron**Fig 3:** *Bassus relativus* (Bhat and Gupta)

Summary and Conclusions

The incidence of *M. vitrata* varied from 29.09 to 71.52 per cent during *rabi* 2019-20. Majority of the farmers preferred PU-31, TBG-104, LBG-752 and TAU-1 varieties of

blackgram for cultivation. Farmers preferred chlorpyrifos, dichlorvos, thiodicarb, spinosad and chlorantraniliprole insecticides for managing the *M. vitrata*. *Therophilus marucae* larval parasitoid and *Phanerotoma philippinensis*

egg-larval parasitoid of *M. vitrata* also observed during survey.

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