Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

J E Z S Journal of Entomology and Zoology Studies

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2018; 6(2): 2192-2196

Received: 06-01-2018
Accepted: 09-02-2018

SS Karabhantanal
Scientist (Entomology),
Regional Agricultural Research Station, Vijayapur, Karnataka, India

SS Udikeri
Professors, College of Agriculture, Vijayapur, Karnataka, India

SB Jagginavar
Professors, College of Agriculture, Vijayapur, Karnataka, India

Jolli RB
Professors, College of Agriculture, Vijayapur, Karnataka, India

Correspondence
SS Karabhantanal
Scientist (Entomology),
Regional Agricultural Research Station, Vijayapur, Karnataka, India

Population buildup of leaf and flower web forming insect, *Maruca vitrata* (Geyer) and their management in redgram ecosystem

SS Karabhantanal, SS Udikeri, SB Jagginavar and Jolli RB

Abstract
Study was conducted for nine years from 2006-07 to 2014-15 during *kharif –rabi* season to know the behavioral of web forming insect on red gram. Results revealed that incidence was ranged from 8.58 to 26.25 percent in the district with a highest incidence of 22.40 percent during 2010-11. Among the several insecticides tested, combination of profenophos 50%EC @ 2.00 ml/l + DDVP 76EC @0.50 ml/l was found to be the best treatment and recorded the minimum number of larvae (0.20/pl), pod damage (4.90%) as compared to the other insecticide treatments and untreated control (6.60 larvae/ plant & 38.10% of pod damage). The highest yield (11.14q/ha) and net profit (Rs.30382/ha) was also realized in Profenophos + DDVP treatment.

Keywords: Redgram, *Maruca vitrata*, management, incidence

1. Introduction
The pulses being rich source of proteins with high nutritional value occupy a special role in diet of human beings Pigeonpea cultivars were observed with good quality resistant starch [1], protein rich in sulfur containing amino acids [2-3], cajanol [4], several minerals and with quality forage [5] with medicinal [6] and antimicrobial properties for healthy ruminant nutrition [7] globally. Pigeon pea seed has 36.5% protein [3] with excellent water retention (250.3 ml/100g), fat absorption (130 ml/100g), emulsification (120%) and foaming (130%) capacities [8].
The pigeonpea production in recent years is not able to meet the requirements of growing population necessitating the losses and constraints to be curbed. The pod borers have been identified as the major constraints in increasing the productivity of pigeonpea [9]. Among the constituents of the pod borer community infesting pigeon pea, the legume pod borer, *Maruca vitrata* (Geyer) (Lepidoptera: Crambidae) is one of the most serious pests occurring during flowering and pod formation stage causing huge losses [10]. In India, Maruca damage has been found to range from 9 to 51% in pigeon pea [11]. Effective management strategies have to be developed to reduce the losses caused by the pest. Understanding the population dynamics in the crop will yield valuable information for strategizing the management options of that particular pest. Hence, the present investigation has been carried to know population dynamics of legume pod borer and evaluated different insecticides against web forming insect, *M.vitrata* under field condition.

2. Materials and Methods
2.1 Roving survey:
Roving survey was conducted during peak pest incidence (bud initiation) on the redgram crop in all five talukas (Vijayapur, Basavan Bagewadi, Sindagi, Muddebihal and Indi) of Vijayapur district for nine years from 2006-07 to 2014-15. In all the years, three red gram and villages were selected. In each village, three plots were selected and in each plot 15 plants were selected randomly for the observations.
Observations on number of webbed branches due to *M. vitrata* and un webbed branches in each plant were counted to work out the percent webbing.

2.2 Evaluation of chemical and insecticides and bio pesticides
To know the efficacy on different insecticides and bio pesticides against the web forming insect, *M. vitrata*, a field experiment was conducted during kharif seasons 2010-11 and

2011-12 in the Agricultural research Station, Vijayapur, Karnataka. The randomized block design was used with following eleven treatments and three replications on cultivar TS 3R.

Two sprays were imposed on the crop one at bud initiation stage and second at 15 days after first spray. Evaluations were performed at one before and ten days after insecticides application (DAA). Observations were made five randomly selected plants. Number of webbed live larvae was counted before after each treatment.

2.3 Treatment details

T1: Monocrotophos 36SL(1.0ml/l)
T2: Methomyl 40SP (0.6g/l)
T3: Profenophos 50EC (2.0ml/l)
T4: Neem seed kernel extract (NSKE) - 5%
T5: DDVP 76EC (0.5ml/l)
T6: Mono+DDVP (1ml/l + 0.5 ml /l)
T7: Methomyl +DDVP (0.6g/l + 0.5 ml /l)
T8: Profenphos+DDVP (2ml/l + 0.5 ml /l)
T9: NSKE 5%+ DDVP (0.5 ml /l)
T10: IPM (std) (Methomyl- NSKE-HANPV- indoxacarb)
T11: UTC

At physiological maturity of the crop, total number of pod and damaged pod were counted from five randomly selected plants in each treatment to work out the percent pod damage. Finally yield per plot were recorded and convert to hectare basis to work out the cost economics and superiority of the treatment.

2.4 Statistical analysis

Number of webbed live larvae recorded per plant and pod damage was subjected to square root transformation and angular transformation, respectively before Randomized block design analysis. The data were subjected to ANOVA and the treatment means were compared by DMRT [12]

3. Results and Discussion

3.1 Populations build up of leaf and flower web former, *M. vitrata* in redgram

Roving survey conducted during peak incidence of the M. vitrata on redgram indicated that initially in the year of 2006-07, there was less than 10 percent except Indi taluk (10.82%). The pest incidence was shooting up to the tune of 22.40 percent during 2010-11 with highest incidence in Indi taluka (26.25%). In subsequent years, the incidence of the pest was above 10.0 percent in all the talukas of the district (Table 1). In all talukas, peak pest incidence was noticed between October and November months in all the years. Similar trend was noticed in Gulbarga wherein *M. vitrata* was bimodal where early infestation starts from September reaching its first peak during middle of October and second peak during December [13]. The period of maximum activity of *M. vitrata* was between second and last week of November and the mean population fluctuated around 12.67 to 15.17 larvae per plant at Dholi in Bihar. The damage to flowers was minimum (0.65%) in the second week of October and increased to maximum level (18.66%) in the last week of November. The mean level of pod damage gradually increased from 10.46 to 26.50 percent from third week of October to last week of December [14]. In the present investigation, appearance of *M. vitrata* as major pest in redgram ecosystem may be due to increased area under the redgram cultivation in the district, growing of different maturing verities (Gulyal, TS 3R, BSMR 736 & Private varities) and different date of sowing (June to August first week) in the district. All these factors provide food for the pest survival for long period. Similar opined was emerged at Gulbarga who noticed severity of *M. vitrata* in late sown conditions [13]. Rao *et al* [15] reported the short duration pigeonpea cultivars suffered with significantly higher infestation of *M. vitrata*.

3.2 Evaluation of insecticides against leaf and flower web former, *M. vitrata* in redgram

In both the years and in mean data, larval incidence was uniform among the treatments prior to treatments imposition as evidenced by non significant difference among the treatments indicating uniformity of pest incidence among treatments.

Efficacy of treatments against the *M. vitrata* were similar in both the years of experiment (2009-10 and 2010-11), hence the mean data is used for interpretation. Ten days after insecticide sprays, treatment comprising of tank mix of profenophos 50EC @ 2.00 ml + DDVP 76EC @ 0.50 ml per liter was significantly superior in reducing web forming insect, *M. vitrata* (0.20 larvae/pl). Further, same treatment was also recorded significantly lowest pod damage (4.90%) and highest yield (11.14 q/ha). The efficacy of combined treatment against hiding larvae of *M. vitrata* in redgram is due to DDVP is a broad spectrum OP insecticide having contact, stomach poison and fumigant action and insecticide, profenophos 50EC proved very effective ovicidial and larvicidal against pod borer in redgram [16]. When both the insecticides (profenophos + DDVP) were tank mixed or combined, effectively reduced the web forming larval population. These results are in agreement with Sandhya Rani and Eswari [17] reported that lambda cyhalothrin in combination with dichlorvos was found highly effective with lowest pod damage (4.97%) in greengram at Andhra Pradesh. Chandrayudu *et al.* [18] also reported that pod damage by spotted pod borer in cowpea was significantly less in chlorpyriphos + DDVP treatment @ 2.5 + 1 ml/l.

Neem seed kernel extract (5%) when it was combined with DDVP 76EC @ 0.50 ml/l (0.89,13.84 & 8.80l) was found as effective as that of monocrotophos 36SL@ 1ml/l + DDVP 76EC @ 0.50 ml/l (0.69,9.07 & 9.30), methomyl 40SP @ 0.60 g/l + DDVP 76EC @ 0.50 ml/l (0.59, 7.99 &9.82) and found superior to sole insecticide treatments in reducing the larvae per plant, percent pod damage and yield (q/ha). Present results are in line with Gupta and Pathak [19]. who reported that neem oil 1% and Neem oil (in cow urine) 3% + dimethoate 0.03% were found better when compared to individual insecticides in reducing the pod borer damage in blackgram at Madhya Pradesh. Bhat *et al*. [20] also reported that neem seed extract was the next best treatment to monocrotophos against the pod borers on cowpea.

IPM module developed for pod borer, *Helicoverpa armigera* (Hub) could failed to reduce the web forming insect as it recorded 3.63 larvae per plant and inferior to rest of the DDVP combination treatments. Untreated control treatments recorded significantly highest number of larval population (6.66/ pl). pod damage (38.10%) and lowest yield (4.71 q/ha), It is due to in IPM module of red gram pod borer, *H. armigera*, there was no inclusion of DDVP or any chemical insecticides which is having fumigant mode of action hence the incidence of webber could not bring down considerably.

Cost economics of different insecticides used against *M. vitrata* in redgram indicated highest gross (profit Rs.46788/ha), net profit (Rs. 30408/ha) and BC ratio (2.86: 1.00) was recorded in treatment with profenophos 50EC @

2.00 ml + DDVP 76EC @ 0.50 ml per liter.

Table 1: Poulation buildup of *M. vitrata* over the years in Vijayapur district of Northern Karnataka

Year	Talukas of Vijayapura District	Percent incidence noticed	Average incidence of the district
2006-07	Vijayapur	9.45	9.50
	Indi	10.82	
	Sindagi	9.63	
	Muddebihal	9.02	
	B. Bagewadi	8.58	
2007-08	Vijayapur	11.95	12.10
	Indi	15.82	
	Sindagi	12.63	
	Muddebihal	10.43	
	B. Bagewadi	9.67	
2008-09	Vijayapur	14.21	14.30
	Indi	17.38	
	Sindagi	15.85	
	Muddebihal	12.56	
	B. Bagewadi	11.5	
2009-10	Vijayapur	20.56	20.40
	Indi	24.18	
	Sindagi	22.35	
	Muddebihal	18.45	
	B. Bagewadi	16.46	
2010-11	Vijayapur	22.31	22.40
	Indi	26.25	
	Sindagi	23.87	
	Muddebihal	20.36	
	B. Bagewadi	19.21	
2011-12	Vijayapur	17.35	18.50
	Indi	21.25	
	Sindagi	19.22	
	Muddebihal	17.62	
	B. Bagewadi	17.06	
2012-13	Vijayapur	13.02	14.30
	Indi	16.03	
	Sindagi	15.02	
	Muddebihal	14.32	
	B. Bagewadi	13.11	
2013-14	Vijayapur	15.92	16.40
	Indi	17.85	
	Sindagi	16.35	
	Muddebihal	16.05	
	B. Bagewadi	15.83	
2014-15	Vijayapur	10.03	10.10
	Indi	11.03	
	Sindagi	9.75	
	Muddebihal	10.01	
	B. Bagewadi	9.68	

Table 2: Influence of different chemicals on the larval incidence of *Maruca (testulalis) vitrata* in pigeonpea

	Treatment	Dosage/ lit Water	Number of larvae / plant					
			2008-09		2009-10		Mean	
			1 DBA	10 DAA	1 DBA	10 DAA	1 DBA	10DAA
T1	Monocrotophos 36SL	1.0 ml	3.98[a]	1.52[c]	5.57[a]	2.80[e]	4.78[a]	2.15[d]
T2	Methomyl 40SP	0.6 g	2.86[a]	0.95[b]	4.46[a]	2.05[d]	3.66[a]	1.50[c]
T3	Profenphos 50EC	2.0 ml	2.72[a]	0.96[b]	4.30[a]	2.08[d]	3.51[a]	1.51[c]
T4	NSKE 5%	50 g	2.88[a]	1.61[c]	5.06[a]	2.65[e]	3.97[a]	2.13[d]
T5	DDVP 76EC	0.5 ml	2.65[a]	1.02[b]	4.54[a]	2.04[d]	3.60[a]	1.53[c]
T6	Mono+DDVP	1.0+0.5	2.76[a]	0.78[b]	5.24[a]	0.60[bc]	4.00[a]	0.69[b]
T7	Methomyl +DDVP	0.6+0.5	3.77[a]	0.64[b]	6.06[a]	0.53[ab]	4.92[a]	0.59[b]
T8	Profenophos+DDVP	2.0+0.5	3.46[a]	0.14[a]	5.22[a]	0.27[a]	4.34[a]	0.20[a]
T9	NSKE 5%+ DDVP	50 + 0.5	3.48[a]	0.93[b]	5.42[a]	0.84[c]	4.45[a]	0.89[b]
T10	IPM (std)	--	3.65[a]	2.26[d]	5.64[a]	5.00[f]	4.65[a]	3.63[e]
T11	UTC	--	3.73[a]	5.02[e]	5.97[a]	8.30[g]	4.85[a]	6.66[f]
	CD at 5%		NS	0.42	NS	0.26	NS	0.32
	SEm ±		0.44	0.14	0.58	0.09	0.70	0.12

DBA: Day before treatment, DAA: Days after treatment

Table 3: Influence of different chemicals on the *Maruca (testulalis) vitrata* and their impact on pod damage and yield in pigeonpea

	Treatment	Dosage/ lit Water	Yield parameters					
			Pod Damage (%)			Yield (q/ha)		
			2008	2009	Mean	2008	2009	Mean
T1	Monocrotophos 36SL	1.0 ml	21.10 (27.35)[de]	16.09 (23.66)[de]	18.59 (25.53)[de]	7.53[cd]	8.60[cd]	8.06[cd]
T2	Methomyl 40SP	0.60 g	15.35 (23.08)[c]	14.41 (22.30)[d]	14.87 (22.70)[cd]	8.97[b]	9.53[bc]	9.24[bc]
T3	Profenphos 50EC	2.0 ml	15.02 (22.80)[c]	14.70 (22.55)[de]	14.86 (22.68)[cd]	8.85[b]	9.15[bcd]	9.01[bc]
T4	NSKE 5%	50 g	25.40 (30.26)[e]	19.41 (26.14)[e]	22.41 (28.26)[e]	7.05[d]	7.64[d]	7.34[d]
T5	DDVP 76EC	0.50 ml	16.06 (23.62)[c]	13.78 (21.80)[d]	14.91 (22.72)[cd]	8.40[c]	9.13[bc]	8.77[bc]
T6	Mono+DDVP	1.0+0.5	8.80 (17.26)[b]	9.33 (17.79)[bc]	9.07 (17.53)[b]	9.10[b]	9.54[bc]	9.30[b]
T7	Methomyl +DDVP	0.6+0.5	7.53 (15.91)[ab]	8.44 (16.89)[b]	7.99 (16.43)[b]	9.72[ab]	9.95[b]	9.82[b]
T8	Profenphos+DDVP	2.0+0.5	5.12 (13.08)[a]	4.71 (12.53)[a]	4.90 (12.79)[a]	10.90[a]	11.40[a]	11.14[a]
T9	NSKE 5%+ DDVP	50 + 0.50	14.38 (22.28)[c]	13.30 (21.47)[cd]	13.84 (21.84)[c]	8.90[b]	9.28[bc]	9.09[bc]
T10	IPM (std)	--	17.12 (24.44)[cd]	16.58 (24.02)[de]	16.85 (24.24)[cd]	8.70[c]	8.90[c]	8.80[bc]
T11	UTC	--	39.20 (38.76)[f]	37.01 (37.48)[f]	38.10 (38.12)[f]	4.55[e]	4.87[e]	4.71[e]
	CD at 5%		2.90	3.62	3.50	1.22	0.95	1.16
	SEm ±		0.97	1.21	1.17	0.41	0.32	0.39

Table 4: Cost economics of different Treatments

Treatment		Dosage/lit of water	Yield (q/ha)	Cost of Insecticide (Rs)	Other Cost (Rs)	Total Cost (Rs)	Gross Return (Rs.)	Net Return (Rs.)	B:C
T1	Monocrotophos 36SL	1.0 ml	8.06	310	15300	15610	26598	10988	1.70
T2	Methomyl 40SP	0.6 g	9.24	620	15300	15920	30492	14572	1.91
T3	Profenphos 50EC	2.0 ml	9.01	790	15300	16090	29733	13643	1.85
T4	NSKE 5%	50 g	7.34	400	15300	15700	24222	08522	1.85
T5	DDVP 76EC	0.5 ml	8.77	350	15300	15650	28941	13291	1.85
T6	Monocrotophos + DDVP	1.0 +0.5	9.30	630	15300	15930	30690	14760	1.92
T7	Methomyl + DDVP	0.6+ 0.5	9.82	1050	15300	16350	32406	16056	1.98
T8	Profenphos +DDVP	2.0 +0.5	11.14	1080	15300	16380	36762	20382	2.24
T9	NSKE 5% + DDVP	50 + 0.5	9.09	680	15300	15980	29997	14017	1.87
T10	IPM (std)	--	8.80	0	15300	15300	29040	13740	1.89
T11	UTC	--	4.71	0	15300	13100	15543	02443	1.18

4. Conclusion

Over all research indicated that among the constituents of the pod borer community infesting pigeonpea, *M. vitrata* could damage upto 8.58 to 26.25 percent pod damage in redgram. To minimize their incidence and to get higher net profit, two spraying of profenophos 50EC @ 2.00 ml + DDVP 76EC @ 0.50 ml per liter (one at bud imitation stage and second at 15 days after first spray) treatment was found to be superior.

5. References

1. Narina SS, Xu Y, Hamama AA, Phatak SC, Bhardwaj H L. Effect of cultivar and planting time on resistant starch accumulation in pigeonpea grown in Virginia. ISRN Agronomy, 2012. http://dx.doi.org/10.5402/2012/576471
2. Singh, Eggum. Factors effecting the protein quality of pigeonpea (*Cajanus cajan* L). Plant Foods for Human Nutrition, 1984; 34(4),273-283. http://dx.doi.org/10.1007/ BF01126556
3. Pathak SC, Nadimpalli, RG, Tiwari, SC, Bhardwaj HL. Pigeonpeas: Potential new crop for the southeastern United States. In J. Janick & J. E. Simon (Eds.), New crops Wiley, New York. 1993, 597-599.
4. Luo M, Liu X, Zu Y, Fu Y, Zhang S, Yao L *et al*. Cajanol, anovelanticancerous agent from pigeonpea roots, induces apoptosis in human breast cancer cells through a ROS-mediated mitochondrial pathway. Chem Biol Interact. 2010; 188(1):151-60. http://dx.doi.org/10.1016/j.cbi.2010.07.009
5. Cantrell SH, Philips WA, Rao SC, Mayeux JR, Gossen HSR. Nutritional value of pigeonpea (*Cajanus cajan*) for young ruminants. Oklahoma Academy of Science Proceedings, 2001, 81.
6. Pal DK, Mishra P, Ghosh A. Biological activities and

medicinal properties of *Cajanus cajan* (L) Millsp. Journal of Advanced Pharmaceutical Technology and Research, 2011; 2(4):207-214. http://dx.doi.org/10.4103/2231-4040.90874
7. Mahala AG, Ahmed FA, Amasiab EO, AttaElnan BA, Elatti Kh AA. Effect of Dietary pigeonpea (*Cajanus canjan*) on growth and some blood parameters of desert goats. JNAS, 2012; 1(2):35-40.
8. Eltayeb ARSM, Ali AO, Haron R. The Chemical Composition of Pigeon Pea (*Cajanus cajan*) Seed and Functional Properties of Protein Isolate. Pakistan Journal of Nutrition. 2012; 9(11):1069-1073.
9. Sahoo BK, Senapati B. Effect of pod characters on the incidence of pod borers in pigeonpea. J Appl. Zool. Res. 2002; 13(1):10-13.
10. Pappu BK, Srivastava CP, Sharma RP. Bioefficacy of some newer insecticides against pest complex on short duration pigeonpea. Pestol. 2010; XXXIV(10):78-80.
11. Bhagwat VR, Shanower TG, Ghaffar MA. Ovipositional preference of *Maruca vitrata* (Geyer) (Lepidoptera: Pyralidae) in short- duration pigeonpea, ICPN 1998; 5:45-46.
12. Gomez KA, Gomez AA. Comparison between treatments means. In Gomez KA, Gomez AA. (eds.): In: Statistical Procedures for Agricultural Research, A Wiley Publication, New York, 1984, 207-215.
13. Gopali JB, Teggelli R, Mannur DM, Yelshetty S. Web-forming lepidopteran, *Maruca vitrata* (Geyer): an emerging and destructive pest in pigeonpea. Karnataka J. Agric. Sci. 2010; 23(1):35-38.
14. Akhauri RK, Yadav RP. Population dynamics, damage pattern and management of spotted pod borer (*Maruca testulalis* Geyer.) in early pigeonpea under North Bihar conditions. J. Ent. Res. 2002; 26(2):179-182.
15. Rao GVR, Kumari PRA, Rao VR, Reddy YVR. Evaluation of spinosad and indoxacarb for the management of legume pod borer, Maruca vitrata (Geyer) in pigeonpea. J Food Legumes, 2007; 20(1):126-127.
16. Malathi S. Evaluation of different spray schedules against *Maruca vitrata* in pigeonpea. J Food Legumes. 2007; 20:124-125.
17. Sandhya Rani C, Eswari KB. Evaluation of some newer insecticides against maruca on greegram. Asian J. Bio. Sci. 2008; 3:346-347.
18. Chandrayudu E, Srinivasan S, Rao VN. Comparative biology of spotted pod borer, *Maruca vitrata* (Geyer) in major grain legumes. J Appl. Zool. Res. 2006; 16:147-149.
19. Gupta MP, Pathak RK. Bioefficacy of neem products and insecticides against the incidence of whitefly, YMV and pod borers in blackgram. Nat. Prod.t Radiance, 2009; 8:133-136.
20. Bhat NS, Raju GT, Manjunatha M, Nagabhushana GG, Deshpande VP. Chemical control of cowpea pod borer. Indian J Pl. Prot., 1988; 16:197-200.