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Evaluation and Demonstration of Pigeonpea IPM Module for Pod Borer Management

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Pigeonpea (*Cajanus cajan* L. (Millsp.)), a protein rich pulse is grown in the semi-arid regions of India. An IPM module consisting of different techniques developed by TNAU was evaluated in the pigeon pea farmer's holdings of Tamil Nadu during Kharif seasons of 2003, 2004 and 2005. The results indicated minimum damage of pod borers in IPM field and higher levels in the farmers' practice. Higher grain yield and C/B ratio were also realized in the IPM demonstrated fields compared to farmers' practice.

Key Words: Pigeonpea, IPM module, Pod borers Management

Pigeonpea, *Cajanus cajan* (L.(Millsp.)), is the most versatile food legume with diversified uses as food, feed, fodder and fuel. It has been recognized as a valuable source of protein particularly in the developing countries where majority of the population depends on the low-priced vegetarian foods for meeting dietary requirements. Pigeonpea is the fourth most important pulse crop in the world with almost all production confining to developing countries. Globally it is grown on about 4.16 million hectares producing 2.85 million tonnes of grains with an average yield of 686 kg ha^{-1} (Anonymous, 2003). India accounts for 78 per cent of the global output with a current production of 2.21 million tonnes from 3.38 million ha, recording an average yield of 653 kg ha^{-1}. Pigeonpea production had gone up in this country from 1.98 million tonnes during the triennium of 1980-82 to 2.40 million tonnes in 2000-02 because of area expansion from 2.86 to 3.46 million ha during the period (Ali and Kumar, 2004). As far as productivity is concerned, pigeonpea has attained almost stagnation not only at national level but also in different states except in Andhra Pradesh, Bihar, Gujarat, Rajasthan, Orissa and Maharashtra. In Tamil Nadu the area under pigeonpea is around 0.86 lakh ha with a production of 0.752 lakh tonnes. The average productivity of pigeonpea in the state (875 kg ha^{-1}) is lower than Uttar Pradesh (1134 kg ha^{-1}), Haryana (1145 kg ha^{-1}), Bihar (999 kg ha^{-1}), Gujarat (952 kg ha^{-1}) and Punjab (880 kg ha^{-1}).

One of the constraints is the damage by insect pests particularly the pod borer complex. Gram pod borer (*Helicoverpa armigera* Hb.) (Puri and Hem Saxena, 2003) spotted pod borer (*Maruca vitrata* Fab.) and pod fly (*Melanagromyza obtusa* Malloch.), blue butterflies, *Lampides boeticus* and *Catechrysops cnejus*,pod bugs, *Clavigrella* spp., blister beetle, *Mylabris pustulata* Thun., pod wasp, *Tanaostigmodes cajaninae* La Salle are the key pests of pigeonpea causing heavy losses. The possible way to reduce the yield losses due to these pests particularly pod borers is to adopt the integrated pest management practices which also eliminate other ill-effects of pesticides. Pigeonpea IPM modules for management of these dreaded pests have been developed and field-tested in our country (Yadav and Ahmad, 2003). An IPM module consisting of techniques promoted by Tamil Nadu Agricultural University was evaluated in the pigeonpea farmers' holdings of Tamil Nadu and the results are furnished hereunder.

Materials and Methods

Pigeonpea IPM components were demonstrated and evaluated in farmers' holdings in larger areas during *Kharif* seasons of 2003, 2004 and 2005 through National Pulses Research Centre, Vamban, Pudukkottai, Tamil Nadu in Pudukkottai district. The following were the two treatments. Treatment I: (IPM package) This IPM package consisted of

- Use of high yielding varieties like VBN 2/APK 1/ CORG 7
- Use of pheromone traps for *H. armigera* @ 12 no ha^{-1}
- Installing bird perches @ 50 no ha^{-1}
- Hand collection of pod borer larvae / beetles, wherever possible
- Spraying of HaNPV @ 1.5 x 10^{12} POB ha^{-1} when *Helicoverpa* alone was predominant

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- Spraying of indoxacarb 14.5 SC @ 0.75 ml l^{-1} at 50 per cent flowering or endosulfan 35 EC @ 2 ml l^{-1} or monocrotophos 36 WSC 2 ml l^{-1} at the time of flowering / early pod formation stage.

Treatment II (Farmers' Practice):

It mainly consisted of dusting lindane 1.3% D during flowering and podding @ 25 kg ha^{-1}.

These two treatments were imposed in larger areas of farmers' holding in an exploded design. Observations on the incidence of pests were made by following standard procedures. At the time of harvest yield was recorded both in the IPM and farmer's practice fields and the Cost: Benefit ratios were worked out.

Results and Discussion

On farm evaluation and demonstrations of pigeonpea IPM module developed at Tamil Nadu Agricultural University were carried out in five villages during Kharif 2003 and the results are furnished in Table 1. Pigeonpea IPM demonstrations in five villages revealed lower cumulative pod borer incidence of 16.27% as against higher incidence of 30.56 per cent in the farmers' practice of protection. In the same way, lower incidence levels of pod wasp, pod fly and pod bug were recorded in the IPM demonstration fields. Higher mean yield of 1397 kg ha^{-1} was recorded in the IPM fields against 1141 kg in the farmers' practice resulting higher CB ratio of 1.75 for the IPM demonstrated fields and 1.62 for the farmers practice.

During *Kharif* 2004 in all the locations of IPM demonstrations, the cumulative pod borer damage on pods by lepidopteran borer pests *viz., Maruca vitrata*, blue butterflies and *Helicoverpa etc*., pod wasp and bugs were observed in lower percentage compared to higher in farmers' practice plots (Table 2). The mean cumulative pod borer damage in IPM demonstration plots was 31.51 per cent as against 47.50 per cent in farmers' practice which was significantly high and accounted 33.69 per cent mean reduction in pod borer damage as well as 28.0 per cent increase in yield over farmers' practice, respectively. Incidence of pod wasp (3.38%) and pod bug (5.97%) were also on lower level in IPM demonstrations compared to farmers' practice (5.72 and 5.83%). The Cost: Benefit ratio was also high in the IPM demonstrated fields (2.50) as against 2.13 in the farmers' practice.

Table 1. Evaluation and demonstration of IPM module in pigeonpea (cv. Vamban 2) during *Kharif* 2003

Parameter	Kuppankudi		Michaelpatti		Dhakshinapuram		Venkatakulam		Kadayakudi		Mean	
	IPM*	FP**	IPM*	FP**	IPM*	FP**	IPM*	FP**	IPM*	FP**	IPM*	FP**
Cumulative pod borer (%) damage	18.73	32.45	16.50	30.32	14.55	29.92	14.34	31.75	17.22	28.35	16.27	30.56
Podwasp (%) damage	2.16	6.72	6.25	7.82	2.98	4.22	5.66	7.83	2.13	3.82	3.84	6.08
Pod fly seed damage (%)	6.92	14.87	7.34	12.30	7.87	12.59	9.49	17.20	5.75	8.21	7.47	13.03
Pod bug damage (%)	3.15	9.87	5.47	8.92	4.22	9.97	4.19	6.17	3.85	7.86	4.18	8.56
Grain yield (kg/ha)	2166	1883	1535	1330	1238	926	1333	1063	713	505	1397	1141
Cost : Benefit	1:1:74	1:1.65	1:1.67	1:1.63	1:1.82	1:1.63	1:2.01	1:1.90	1:1.51	1:1.33	1:1.75	1:1.62
Area (ha)	3.00	1.00	4.00	1.00	2.50	1.00	5.00	2.00	3.00	1.00		

*IPM- Integrated Pest Management **FP- Farmers' Practice

Four numbers of red gram IPM on-farm demonstrations were conducted during *Kharif* 2005 in farmers' holdings with the set of IPM components tested in the previous years. Observations showed incidence of spotted pod borer, *H. armigera*, blue butterfly on low levels in IPM demonstrations. Final results indicated that wherever the IPM techniques were demonstrated, higher yields were realized compared to non-IPM fields. The results are furnished in Table 3.

Table 2. Evaluation and demonstration of IPM module in pigeon pea (cv. CORG7) during *Kharif* 2004

Parameter	Paachikottai		Pappanpatti		Venkatakulam		Dakshinapuram		Kallupallam		Mean	
	IPM*	FP**	IPM*	FP**	IPM*	FP**	IPM*	FP**	IPM*	FP**	IPM*	FP**
Cumulative pod borer (%) damage	31.50	52.66	28.32	47.54	28.56	50.36	33.78	49.54	25.39	37.53	31.51	47.50
Podwasp (%) damage	3.33	7.33	4.12	6.58	2.97	4.84	4.12	6.73	2.39	3.14	3.38	5.72
Pod bug damage (%)	6.33	5.66	5.46	6.78	6.39	6.32	4.73	5.32	6.97	5.11	5.97	5.83
Grain yield (kg/ha)	801	562	728	573	783	599	673	488	812	743	759	593
Cost : Benefit	1:2.79	1:2.35	1:2.43	1:1.99	1:2.52	1:2.18	1:2.13	1:1.75	1:2.64	1:2.41	1:2.50	1:2.13
Area (ha)	2.00	-	2.50	-	2.00	-	2.00	-	2.00	-	-	-

*IPM- Integrated Pest Management **FP- Farmers' Practice

Table 3. Evaluation and demonstration of IPM module in pigeonpea (cv. APK1) during *Kharif* 2005

Parameter	Kalyanipuram		Kothakottai (1)		Kothakkottai (2)		Kothakkottai (3)		Mean	
	IPM*	FP**	IPM*	FP**	IPM*	FP**	IPM*	FP**	IPM*	FP**
Cumulative pod borer (%) damage	35.33	48.67	32.66	42.00	31.00	40.00	37.00	51.00	33.99	45.41
Podwasp (%) damage	6.74	10.00	6.67	8.33	8.00	13.00	8.00	15.00	7.35	11.58
Pod fly seed damage (%)	7.00	9.00	7.33	8.45	6.80	10.00	6.67	9.33	6.95	9.19
Pod bug damage (%)	8.66	11.00	7.00	9.66	6.85	8.33	7.66	10.33	7.54	9.83
Grain yield (kg/ha)	630	475	665	540	645	490	680	565	655	517.50
Cost : Benefit	1:2.58	1:1.90	1:1.84	1:1.75	1:1.90	1:1.85	1:2.32	1:1.88	1:2.18	1:1.85
Area (ha)	1.50	-	1.50	-	2.00	-	2.00	-	-	-

*IPM- Integrated Pest Management **FP- Farmers' Practice

In the management of pod borers of red gram, Hugar *et al.* (2003) reported that the IPM package consisting of summer ploughing, timely sowing of medium maturing varieties, seed treatment with *Trichoderma,* monitoring pod borer through pheromone traps, necessary use of ovicides, use of neem based and microbial tools and lastly the use of very effective chemical insecticides recorded more yield (725-1065 q/ha) compared to farmers' practice, mainly because of the interventions made at right time. Dodia *et al.* (2003) reported that in a pigeonpea IPM module the average damage due to *H. armigera* at harvest was found minimum (12.36%) with an ICBR of 1:9.81, which was closely followed by the farmers practice (14.08% damage and 1:6.54) ICBR at Sardar Krushinagar of Gujarat. Srivastava *et al.* (2005) had also suggested IPM practices for the management of *Heliothis armigera* in pigeonpea for different Indian zones from All India Co-ordinated Pulses Improvement Project. Ranga Rao *et al*., 2007, interpreted that the bio-intensive practices in Pigeonpea resulted in higher yielded 0.55 tonnes/ha (140% more) in Bio-intensive IPM plots compared to 0.23 tonnes/ha in non-IPM plots even though the overall yields were low. This is in consonance with the present study. The same trend was also observed in chickpea ecosystem (Visalakshmi *et al*., 2005) on the management of *Helicoverpa* through bio-intensive IPM. The present evaluation of redgram IPM confirms the benefits and this can be recommended as protection technology towards the management of pod borers of redgram in Tamil Nadu.

References

Ali, M. and Kumar, S. 2004. An overview of pigeonpea research in India. *Indian J. Pulses Res*., **17**: 111-120.

Anonymous. 2003. FAO Annual Report. p.230.

Dodia, D.A., Thakor, K.J., Ghetiya, L.V. and Tikka, S.B.S. 2003. Development of IPM module for pigeonpea borer. In *Proceedings of the National Symposium on Frontier Areas of Entomological Research*, 5-7th November, 2003, Division of Entomology, IARI, New Delhi. p. 253.

Hugar, P.S., Thulasiram, K. and Mudalagiriyappa, 2003. Demonstration of Ecofriendly strategies for pod borer management in pigeonpea. In *Proceedings of the National Symposium on Frontier Areas of Entomological Research*, 5-7th November, 2003, Division of Entomology, IARI, New Delhi. p. 252.

Puri, S.N. and Hem Saxena. 2003. Menace of *Helicoverpa* on pulse crops- a continuing challenge. In *National Symposium on Pulses for Crop Diversification and Natural Resource Management*, December, 20-22, 2003, IIPR, Kanpur. p.14-15.

Ranga Rao, G.V., Rupela, O.P., Wani, S.P., Rahman, S.J., Jyothsna, J.S., Rameshwar Rao, V. and Humayun, P. 2007. Bio-intensive pest management reduces pesticide use in India. *Pesticides News*, **76:** 16-17.

Srivastava, C.P., Ahmad, R., Ram Ujagir and Das, S.B. 2005. *Helicoverpa armigera* management in pulses-present scenario and future Strategies. In *Recent Advances in Helicoverpa Management.* Hem Saxena, Rai, A. B., Ahmad, R.and Sanjeev Gupta (Eds.) , Indian Society of Pulses Research and Development, IIPR, Kanpur, India, p. 265-286.

Visalakshmi, V., Ranga Rao, G.V. and Arjuna Rao, P. 2005. Integrated pest management strategy against *Helicoverpa armigera* Hubner in chickpea. *Indian J. of Plant Protect.*, **33**: 17-22.

Yadav, C.P. and Ahmad, R. 2003. Biorationals for management of borer complex of short duration pigeonpea. In *National Symposium on Pulses for Crop Diversification and Natural Resource Management*, December, 20- 22, 2003, IIPR, Kanpur. p.14-15.

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