Karnataka J. Agric. Sci., 22(3-Spl. Issue) : (557-558) 2009

Bio-efficacy of proton, a plant product against fruit borer, *Helicoverpa armigera* (Hubner) on chilli

VENKATESHALU, A. G. SRINIVAS, SUSHILA NADAGOUDA AND L. HANUMANTHARAYA

College of Agriculture, Bheemarayanagudi-585 287, Karnataka, India.
E-mail: venk_ento@yahoo.co.in

Abstract: An experiment was laid out during *kharif* 2006-07 and 2007-08 to test the bio-efficacy of a new herbal pesticide, proton obtained from Universal Crop Science Ltd, Mumbai. Proton @ 1.50 ml/l recorded significantly lower *Helicoverpa armigera* (Hubner) larval population during 2006 and 2007 (0.77 and 0.62 larva/plant, respectively) which was on par with proton @ 2.0 ml/l and standard check spinosad 45 SC @ 0.12 ml/l. Similarly, Proton @ 2.00 ml/l recorded significantly lowest fruit damage (6.80%) which was at par with Proton @ 1.50 ml/l (7.22%) during 2006. Proton @ 1.50 ml/l recorded higher green chilli yield (34.38 and 31.68 q/ha during 2006 and 2007, respectively) which was on par with Proton @ 2.00 ml/ and standard check spinosad 45 SC @ 0.12 ml/l (34.92 and 30.28 q/ha during 2006 and 2007, respectively). Proton @ 1.50 ml/l recorded higher net profit of Rs. 36,962/ha and B:C ratio of 3.32, which is next best to spinosad 45 SC @ 0.12 ml/l but superior to nimbecidine 1500 ppm @ 3 ml/l.

Key words: Proton, plant product, chilli fruit borer, *Helicoverpa armigera,* cost economics

Introduction

Chilli (*Capsicum annum* L.) is an important commercial crop. India is the largest producer of chillies in the world and earns valuable foreign exchange for the country. In Karnataka, it is grown on an area of 1.74 lakh hectares with an annual production of 1.44 lakh tones of dry chillies (Singhal, 2003). Insect pest problem is most important constraint for chilli production. A total of 57 species of insect and mite pests were recorded damaging chilli (Reddy and Puttaswamy, 1984). Pest complex of chilli includes sucking pests like thrips, Scirtothrips *dorsalis* (Hood), yellow mite, *Polyphagotarsonemus latus* (Banks) and lepidopteran pests like fruit borer, *Helicoverpa armigera* (Hubner) and defoliator, *Spodoptera litura* (Fabricius). The pest problem has increased many folds on chilli as the number of sprays increased 2-3 folds compared to normal 5-6 sprays. This has enormously increased the cost of cultivation of chilli, making it non-profitable. In addition, sole dependence on chemical insecticides resulted in collapse of natural enemy fauna and resulted in resurgence of pests. Pesticide residue on chillies is also of great concern from the point of human health and export. It is therefore, imperative to resort to non-chemical or botanical pesticides, which are eco-friendly, economical and leaves no residues on chillies. Hence, the present trial was initiated to test a botanical insecticide.

Material and methods

Field trials were carried out at the College of Agriculture, Bheemarayanagudi during kharif 2006-07 and 2007-08. The experiment was laid out in a randomized block design (with three replications on a plot size of 5 x 6 m. The new herbal pesticide, proton obtained from Universal Crop Science Ltd, Mumbai was tested at four different concentrations *viz.,* 0.50, 1.0, 1.50 and 2.0 ml/l. Proton constitutes a cocktail of botanicals *viz.,* Langdu root extract (*Stellera chamaejasme* L.)- 2.9 %, CGL extract- 1.50 %, *Brassica campestris* L.- 0.5 %, Eugenol- 9.0 %, Siberian cocklour fruit extract-10 %, Trace elements- 10 %. This was compared with the standard checks, spinosad 45 SC @ 0.12 ml/l, nimbecidine 1500 ppm @ 3.0 ml/l and untreated control against sucking pests. Treatments were imposed twice at an interval of 15 days when the fruit borer population reached just more than economic threshold level. Observations were recorded on number of *Helicoverpa* larvae per plant and fruiting bodies damage on randomly selected and tagged ten plants in each plot. The observations were taken one day prior to treatment imposition as well as on 3rd, 7th and 10th day after imposition of treatment. The data collected from two sprays were averaged and expressed on per plant basis. The data were subjected to statistical analysis by single factor ANOVA.

Results and discussion

Proton @ 2.0 ml/l recorded significantly lowest *Helicoverpa* larval population @ during 2006 and 2007 (0.64 and 0.60 larvae/plant, respectively) which was on par with proton @ 1.50 ml/l and standard check spinosad 45 SC @ 0.12 ml/l (0.77 and 0.64 larvae/plant during 2006 and 0.62 and 0.56 larvae/plant during 2007, respectively). Proton @ 1.50 ml/l was significantly superior compared to its lower dosage (Proton @ 1.0 ml/l) and also nimbecidine 1500 ppm @ 3 ml/l during 2006 and 2007 (0.89 and 1.09 larvae/plant and 0.92 and 1.04 larvae/plant, respectively) (Table 1). The pooled data also indicated similar trend.

The fruit damage by *Helicoverpa* ranged from 6.80 to 11.73 per cent during 2006 and 6.73 to 11.35 per cent during 2007. Among the different treatments, Proton @ 2.00 ml/l recorded significantly lowest fruit damage (6.80%) which was on par with Proton @ 1.50 ml/l and standard check, spinosad 45 SC @ 0.12 ml/l during 2006 and 2007 (7.22 and 7.94% and 7.04 and 7.06 %, respectively). Proton @ 1.00 ml/lit was the next best treatment and was on par with nimbicidine 1500 ppm @ 3 ml/l during both the years. But the proton @ 1.50 ml/l was significantly superior to proton @ 1.00 ml/l and recorded significantly lower fruit damage. Gundannavar *et al.* (2007) reported that a schedule of sprays consisting of nimbecidine, garlic chilli kerosene extract followed by insecticide was found effective against chilli fruit borer, *H. armigera* in recording least larval infestation and fruit damage.

Table 1. Effect of proton on chilli fruit borer, *Helicoverpa armigera* and green chilli yield

Treatments	Dosage	No. of *Helicoverpa* larva/ plant			Fruit damage (%)			Green chilli yield (q/ha)		
	(ml/lit)	2006	2007	Pooled	2006	2007	Pooled	2006	2007	Pooled
Proton	0.50	1.07	1.05	1.06	10.98	10.45	10.72	24.04	22.29	23.17
Proton	1.00	0.89	0.92	0.91	9.47	9.23	9.44	28.40	27.02	27.71
Proton	1.50	0.77	0.62	0.69	7.22	7.04	7.13	34.38	31.68	33.03
Proton	2.00	0.64	0.60	0.62	6.80	6.73	6.77	35.52	32.02	33.77
Spinosad 45 SC	0.12	0.67	0.56	0.61	7.94	7.06	7.50	34.92	30.28	32.60
Nimbecidine 1500 ppm	3.00	1.09	1.04	1.06	10.30	9.68	9.98	20.75	23.92	22.34
Untreated check	-	1.27	1.12	1.19	11.73	11.35	11.54	16.05	14.44	15.25
S.Em.±		0.06	0.05	0.04	0.39	0.38	0.35	0.57	0.65	0.61
C.D. at 5 %		0.18	0.16	0.13	1.22	1.19	1.08	1.75	2.01	1.88

Table 2. Cost economics of proton sprays in chilli fruit borer management

Treatments	Dosage	Yield	Gross Returns	Total	Cost of	Net Returns	B:C
	(ml/lit)	(q/ha)	(Rs/ha)	cost (Rs/ha)	Plant Protection	(Rs/ha)	Ratio
Proton	0.50	23.17	37,072	12,862	1612	24,210	2.88
Proton	1.00	27.71	44,336	14,374	3124	29,962	3.08
Proton	1.50	33.03	52,848	15,886	4636	36,962	3.32
Proton	2.00	33.77	54,032	17,400	6150	36,632	3.10
Spinosad 45 SC	0.12	32.60	52,160	13,297	2047	38,863	3.92
Nimbecidine 1500ppm	3.00	22.34	35,744	12466	1216	23,278	2.86
Untreated check	-	15.25	24,400	11,250	-	13,150	2.16
S.Em.±	-	0.61	-	-	-	-	-
C.D. at 5 %	-	1.88	-	-	-	-	-

Green chilli yield obtained from different treatments varied from 14.44 to 32.02 q/ha. Significantly higher green chilli yield of 35.52 q/ha was obtained during 2006 and 32.02 q/ha during 2007 with Proton @ 2.0 ml/l. However, Proton @ 1.50 ml/l (34.38 q/ha and 31.68 q/ha during 2006 and 2007, respectively) was on par with Proton @ 2.00 ml/l and standard check, spinosad 45 SC @ 0.12 ml/l (34.92 and 30.28 q/ha during 2006 and 2007, respectively). The test chemical, Proton @ 1.50 ml/lit was significantly superior to its lower dosage and nimbecidine. The pooled data also indicated similar trend with respect to green chilli yield. Langdu (*S. chamaejasme*) root extract, a Chinese weed which is a constituent in Proton has showed insecticidal value as repellent, antifeedent (Zhang *et al.,* 2000) and oviposition deterrent and ovicidal activity against several insect pests (Zhang *et al.,* 2002 and Wang *et al.,* 2002).

The cost economics indicated that the treatment Proton sprayed twice @ 1.50 ml/l recorded net returns of Rs. 36,962 as compared to the existing standard check, spinosad 45 SC @ 0.12 ml/l which recorded Rs. 38,863 (Table 2). Highest B:C ratio of 3.92 was recorded in spinosad 45 SC @ 0.12 ml/l and the next best was Proton @ 1.50 ml/l (3.32). Thus, Proton @ 1.50 ml/l was next best to spinosad but superior than Proton @ 2.00 ml/l and nimbecidine 1500 ppm @ 3 ml/l with respect to net returns. Cocktail of garlic chilli kerosene extract + cow urine and neem neem seed kernel extract + cow urine recorded lower damage by insect pests and resulted in higher IBC ratio in chilli (Mallapur, 2002 and Ravikumar, 2004). Test chemical, Proton @ 1.50 ml/l was found to be effective dosage to manage the fruit borer, *H. armigera* on chilli and recorded higher green chilli yield which also resulted in higher net profits and B:C ratio. Cocktail of botanical extracts have a great potential in insect pest control with multiple modes of action.

References

Gundannavar, K.P., Giraddi R.S., Kulkarni K.A. and Awaknavar, J.S., 2007, Development of Integrated Pest Management modules for chilli pests, Karnataka J. Agric. Sci., 20: 757-760.

Mallapur, C.P., 2004, Management of chilli pests with indigenous materials. In: *Green Pesticides for Insect Pest Management*. Eds. S. Ignacimuthu and S. Jayaraj p. 250-253.

Ravikumar, 2004, Evaluation of organics and indigenous products for the management of *Helicoverpa armigera* (Hubner) in chilli. *M Sc (Agri.) Thesis,* Univ. Agric. Sci., Dharwad (India).

Reddy, D.N.R and Puttaswamy, 1984, Pest infesting chilli (*Capsicum annum* L.) in transplanted crop. Mysore J. Agric. Sci., 19: 236-237.

Singhal, V., 2003, Chillies, In: *Indian Agriculture*, Indian Economic Data Research Centre, Mayapuri, New Delhi, pp. 565-570.

Wang, Y. W., Zhang, G. Z., Xu, H.H. and Chiu, S.F., 2002, Biological activity of extract of *Stellera chamaejasme* against five pest insects. Entomol. Sinica, 9: 17-22.

Zhang, G. Z., Wang, Y. W and Xu, H.H., 2002, Studies on insecticidal activity of extract of Stellera chamaejasme. J. Changed Teachers Univ., 14: 60-63.

Zhang, G. Z., Wang, Y. W. and Xu, H.H., 2000, Oviposition deterrent activity and ovicidal activity of the extract of *Stellera chamaejasme* with ethanol against imported cabbage worm, J. Anhui Agric. Sci., 28: 623-628.