SYNERGISTIC SUPPRESSION OF FENVALERATE RESISTANCE IN *Helicoverpa armigera* (HUBNER) BY PUNGAM OIL AND PIPERONYL BUTOXIDE

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Objectives

To obtain the relationship between laboratory measured Fenvalerat resistance suppression by Piperonyl butoxide and Pongamia oil and the corresponding level of control achievable with these synergists in the field at realistic application rates.

Materials and Methods

Protocol – CFC NRI

200 eggs from F1 generation placed on 100 plants @ 2/plant

12 days after egg placement pre count & spraying was done

Post counts were taken 2 & 7 days after treatment

Two runs were made one in early boll formation stage & another 1 month later

Field Experiment

Field experiment,ARS,Bhavanisagar

Chemistry	**:Fenvalerate(20EC)**	**: 75g.a.i/ha**
Synergists	**: Pbo**	**: 250g.a.i/ha**
	PO	**: 1ml/l of spray fluid**
Design	**: RBD**	
Treatments	**: 7**	
Replication	**: 4**	

Treatment structure

Treatments	Doses	Fenvalerate g a.i./ha
T_1	1/10 of field dose	7.5
T_2	1/10 of field dose + synergist	7.5
T_3	1/3 of field dose	25.0
T_4	1/3 of field dose + synergist	25.0
T_5	Recommended field dose	75.0
T_6	Recommended field dose + synergist	75.0
T_7	Untreated check	-

Results and Discussion

Per cent survival of *H.armigera* at RD in the field – 87.0 %

Per cent survival of spray survived population at DD dose - 95.3 %

Percent survival of *H.armigera* at DD dose before spray - 91.8 %

Percent survival of *H.armigera* in fenvalerate + PO - 46.7%

Percent survival of *H.armigera* in fenvalerate +Pbo - 64.6 %

PO being oil act as physical toxicant & facilitate penetration of toxicant

Pbo has to be recommended to spray in the evening to maximize its impact & delay its breakdown by sunlight (Shaw, 1991).

Tabe 1 Synergistic action of Pongamia oil with fenvalerate on III instar larvae of *H. armigera* in cotton field

Dose (g a.i /ha).	Precount	7 DAT							
		Application I				Application II			
		Population *	Reduction (%)**	Field survival (%)	Lab survival (%)	Population *	Reduction (%)**	Field survival (%)	Lab survival (%)
7.5	86.25-92.0	83.75 (9.18)[d]	5.24 (13.22)[f]	97.10	89.00	89.75 (9.50)[f]	2.93 (9.66)[e]	97.59	90.60
7.5+PO	86.5-91.25	80.50 (9.00)[c]	9.18 (17.63)[d]	93.06	60.00	84.25 (9.21)[d]	8.85 (17.29)[d]	92.35	61.50
25.0	89.25-92.50	83.75 (9.18)[d]	8.42 (16.86)[e]	93.84	92.00	87 (9.35)[e]	7.15 (15.49)[d]	94.06	93.00
25.0+PO	87.25-93.75	67.75 (8.26)[b]	24.22 (29.48)[b]	77.66	64.00	71 (8.46)[b]	25.19 (30.10)[b]	75.79	66.00
75.0	90.25-91.75	79.5 (8.94)[c]	14.03 (21.99)[c]	88.09	94.50	79 (8.92)[c]	14.98 (22.75)[c]	86.14	96.00
75.0+PO	88.25-94.5	41.00 (6.44)[a].	54.66 (47.67)[a]	46.47	67.00	44.25 (6.69)[a]	53.73 (47.14)[a]	46.88	68.90
Check	91.25-96.25	93.50 (9.70)[e]				97.5 (9.90)[g]			

Table 2. Synergistic action of Pbo with fenvalerate on III instar larvae of *H. armigera* in cotton field

Dose (g a.i /ha).	Precount	7 DAT							
		Application I				Application II			
		Population *	Reduction (%)**	Field survival (%)	Lab survival (%)	Population *	Reduction (%)**	Field survival (%)	Lab survival (%)
94.00	94.0-97.50	91.25 (9.58)[f]	3.67 (11.03)[f]	97.08	88.00	94.25 (9.73)[e]	5.69 (13.80)[f]	96.66	89.50
93.00	93.0-96.50	89.25 (9.30)[e]	4.77 (12.60)[e]	95.97	47.00	92.00 (9.61)[d]	7.00 (15.34)[e]	95.33	49.20
94.00	94.0-97.50	85.00 (9.25)[d]	10.27 (18.68)[d]	90.42	90.20	90.50 (9.54)[d]	9.44 (17.88)[d]	92.82	93.00
93.00	93.0-98.50	77.50 (8.87)[b]	17.31 (24.58)[b]	83.34	50.60	83.00 (9.13)[b]	17.83 (24.95)[b]	84.24	54.00
96.00	96.0-98.50	82.25 (9.09)[c]	14.98 (22.77)[c]	85.68	93.70	85.75 (9.28)[c]	15.07 (22.84)[c]	87.05	95.80
92.00	92.0-97.50	60.00 (7.78)[a]	35.29 (36.44)[a]	65.22	53.40	62.5 (7.94)[a]	37.46 (37.74)[a]	64.10	58.00
96.00	96.0-99.50	96.50 (9.85)[g]				102.50 (10.15)[f]			

Table 3 Synergistic action of Pongamia oil with fenvalerate on bollworm incidence - Winter 2001-2002

Dose (g a.i /ha)	Boll basis		Locule basis		Interlocule basis		Badkapas basis	
	Damage (%)	Reduction (%)	Damage (%)	Reduction (%)	Damage (%)	Reduction (%)	Damage (%)	Reduction (%)
7.5	17.12 (24.06)[e]	6.10	12.13 (20.36)[e]	4.94	6.08 (14.25)[f]	5.09	15.17 (22.91)[ef]	5.23
7.5+PO	14.15 (22.10)[d]	20.10	11.47 (19.77)[d]	10.14	5.62 (13.68)[e]	12.37	14.38 (22.77)[de]	10.13
25.0	14.52 (22.41)[d]	17.97	10.86 (19.22)[d]	14.85	5.38 (13.38)[d]	16.11	13.89 (21.87)[cd]	13.18
25.0+PO	11.00) (19.38)[b]	37.89	8.09 (16.52)[b]	36.56	4.41 (12.09)[b]	31.41	9.79 (18.23)[b]	38.64
75.0	13.40 (21.46)[c]	24.35	9.93 (18.35)[c]	22.19	4.68 (12.47)[c]	26.91	13.30 (21.38)[c]	16.87
75.0+PO	7.67 (16.07)[a]	56.69	5.46 (13.51)[a]	57.28	3.11 (10.13)[a]	51.85	7.83 (16.25)[a]	50.80
Check	17.87 (25.01)[f]		12.77 (20.91)[e]		6.40 (14.63)[g]		15.84 (23.44)[f]	

Table 4 Synergistic action of Pbo with fenvalerate on bollworm incidence - Winter 2001-2002

Dose (g a.i /ha)	Boll basis		Locule basis		Interlocule basis		Badkapas basis	
	Damage (%)	Reduction (%)	Damage (%)	Reduction (%)	Damage (%)	Reduction (%)	Damage (%)	Reduction (%)
7.5	18.17 (25.17)[f]	6.46	11.19 (15.53)[e]	3.89	6.11 (14.30)[f]	6.35	15.98 (23.57)[d]	4.57
7.5+Pbo	17.64 (24.77)[e]	9.25	11.05 (19.40)[e]	5.08	5.84 (13.97)[e]	10.4625	15.79 (23.41)[d]	5.74
25.0	15.64 (23.24)[d]	19.49	10.07 (18.49)[d]	13.45	5.46 (13.50)[d]	16.425	15.54 (23.21)[cd]	7.21
25.0+Pbo	14.64 (22.44)[c]	24.77	10.49 (17.93)[c]	18.45	5.06 (12.99)[c]	22.48	14.78 (22.61)[b]	11.71
75.0	14.09 (22.01)[b]	27.51	9.17 (17.62)[b]	21.26	4.59 (12.36)[b]	29.495	15.26 (23.00)[c]	8.84
75.0+Pbo	10.79 (19.13)[a]	44.57	7.46 (15.84)[a]	36.09	4.27 (11.91)[a]	34.67	12.95 (21.09)[a]	22.58
Check	19.42 (26.10)[g]		11.64 (19.94)[f]		6.53 (14.79)[g]		16.75 (24.16)[e]	

Table 5. Effect of fenvalerate with synergists on seed cotton yield on winter cotton 2001-2002

Treatments	Dose (g.a.i./ha)	Yield			
		Fenvalerate+PO		Fenvalerate +Pbo	
		Kg/plot(40m^2)	Kg/ha	Kg/plot(40m^2)	Kg/ha
T1	7.5	3.7^e	922.5	3.5^e	868.8
T2	7.5	3.9^d	968.5	3.5^e	874.3
T3	25.0	3.8^d	961.0	4.8^c	950.0
T4	25.0	4.5^b	1119.5	4.9^b	1222.5
T5	75.0	4.1^c	1036.5	4.2^d	1053.5
T6	75.0	5.8^a	1441.3	5.5^a	1369.8
T7	Check	3.9^f	895.0	3.4^f	849.3

Bollworms incidence and Seed cotton yield

Bollworms incidence & kapas yield	Per cent reduction		
	Fenvalerate	Fenvalerate + PO	Fenvalerate + Pbo
Larval incidence %	14.5	54.2	36.4
Boll damage %	24.4	56.7	44.6
Locule damage %	22.2	57.3	36.1
Interlocule damage%	26.9	51.9	34.7
Badkapas basis %	16.9	50.8	22.6
Yield kg /ha	1037	1441	1370

Conclusion

Co-application of PO and Pbo significantly reduced the bollworms incidence

The synergistic suppression by PO was better in field than Pbo

The synergistic suppression by Pbo was better in the laboratory than PO

THANK YOU