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EFFICACY OF PETROLEUM ETHER EXTRACT OF PLANT PARTS ON THE BIOLOGY OF *Sitotroga cerealella*

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ABSTRACT

The petroleum ether extract of botanicals viz., leaves of *Eucalyptus teriticornis*, *Bassia latifolia*, *Ocimum basilicum*, *Pongamia glabra*, *Tribulus terrestris* and *Tridax procumbens* and rhizomes of *Acorus calamus* was prepared at four concentrations viz., 0.05, 0.1, 0.15 and 0.2 per cent by dissolving them in acetone. They were used to evaluate their efficacy on the biology of *Sitotroga cerealella* (Oliv.) The observations taken on fecundity, hatching, developmental period and adult emergence indicated that the fecundity and percentage of egg hatching was significantly lowest in grains treated with petroleum ether extract of *E.teriticornis* 0.2% followed by *T.terrestris* 0.2%. The developmental period was prolonged in grains treated with *T.terrestris* 0.2% and the per cent adult emergence was lowest in *A.calamus* 0.2 and 0.15 per cent.

KEY WORDS : Botanicals, *S.cerealella*, Petroleum Ether Extract, Paddy

Rice Angoumois grain moth, *Sitotroga cerealella* (Oliv.) is a primary pest of whole cereal grains, including paddy. They are often infested in the field before harvest as well as during storage. The effectiveness of plant materials in the management of this pest was reported by many authors. In the present study, the efficacy of certain botanicals, viz., leaves of *Eucalyptus teriticornis* Smith., *Bassia latifolia* Roxb., *Ocimum basilicum* L., *Pongamia glabra* Vent. *Tribulus terrestris* L. on the biology of this pest was evaluated.

MATERIALS AND METHODS

The plant parts were shade dried, powdered and passed through 60 mesh sieve. Twenty g of powdered material was extracted serially in soxhlet apparatus with 200ml petroleum ether (6.p, 40-60°C). The extract was made free of solvent on water bath. The extraction was continuously done for 30h. The total residue from 20g sample was weighted and redissolved in acetone to obtain required concentrations viz., 0.05, 0.1, 0.15 and 0.2 per cent (Prabhu *et al.*, 1973; Shanthi, 1989). One ml of the extract was mixed thoroughly with 10g of

paddy grains and allowed to equilibrate for atleast 24 ha before testing. Controls with and without acetone were maintained for comparison. The treated grains were kept in polythene bags with numerous pinholes. One pair of newly emerged adults was introduced into each bag.

Total number of eggs laid and hatched were counted 10 days after introduction by carefully examining the grains and the percentage of hatching was calculated. The hatched eggs were white with broken chorion (Ragumoorthy, 1987) while the unhatched eggs remained light orange in colour.

After 25 days of introduction of insects, the number of adults emerged was counted daily and removed. This observation was continued up to 40 days. The mean development period was calculated from the day of introduction of insects to 50 per cent adult emergence (Howe, 1971).

The number of adults emerged out of the total number of eggs hatched expressed as adult emergence percentage

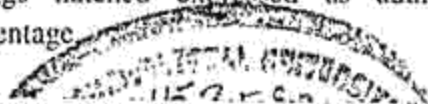


Table 1. Effect of petroleum ether extract on number of eggs laid* : *S.cerealella*

Treatments	Concentration (%)				Mean
	0.05	0.1	0.15	0.2	
<i>E.terticornis</i>	24.92 (1.39) ^a C	25.11 (1.40) ^{ab} C	21.87 (1.34) ^{ab} B	18.62 (1.28) ^a A	22.38 (1.35) ^a
<i>B. latifolia</i>	36.30 (1.56) ^c D	28.18 (1.45) ^{bc} C	26.30 (1.42) ^{dc} B	19.49 (1.29) ^a A	26.91 (1.43) ^c
<i>O. basilicum</i>	32.35 (1.51) ^d C	26.91 (1.43) ^{abc} B	28.84 (1.46) ^c B	23.44 (1.37) ^{bc} A	27.54 (1.44) ^c
<i>P. glabra</i>	28.84 (1.46) ^{cd} C	26.30 (1.42) ^{abc} C	23.44 (1.37) ^{bc} B	19.95 (1.31) ^a A	24.54 (1.39) ^b
<i>T. terrestris</i>	25.11 (1.40) ^b B	23.98 (1.38) ^d B	20.41 (1.31) ^a A	20.89 (1.33) ^{ab} A	22.38 (1.35) ^a
<i>T. procumbens</i>	38.01 (1.58) ^e C	33.11 (1.52) ^c B	25.11 (1.40) ^{cd} A	24.54 (1.40) ^c A	29.51 (1.47) ^d
<i>A. calamus</i>	26.30 (1.42) ^{bc} B	25.70 (1.41) ^{abc} B	22.38 (1.35) ^{bc} A	20.89 (1.32) ^{ab} A	23.44 (1.37) ^{ab}
Control (Acetone)					41.68 (1.62) ^e
Control					43.65 (1.64) ^e
Mean	29.51 (1.47) ^D	26.91 (1.43) ^C	23.98 (1.38) ^B	20.89 (1.32) ^A	

Figures in parentheses are log values.

In a column/row means followed by same small/capital letter(s) respectively are not significantly different by CD (P=0.05)

* by one adult.

RESULTS AND DISCUSSION

Fecundity and hatching

With regard to fecundity, all the treatments are significantly different from untreated and acetone treated control (Table 1). Among them, the number of eggs laid was lowest in *E.terticornis* (18.62) and *T.terrestris* (20.89) at 0.2 per cent concentration. Considering the concentrations of all the treatments, the number of eggs laid decreased with concentration. The highest concentration of 0.2 per cent registered 20.89 eggs which was significantly

different from other concentrations. Usha *et al.* (1990) also reported the effectiveness of mixing *E.citriodora* leaf powder with cowpea at 1,2 and 4 per cent by weight basis against the bruchid in reducing fecundity. The reasons for reduction in fecundity may be mortality and ovipositional deterrence.

With regard to percentage of egg hatching also, all the treatments were significantly different from untreated and acetone treated control (Table 2). Irrespective of concentrations, *E.terticornis* gave lowest percentage of egg hatching (56.80)

Table 2. Effect of petroleum ether extract of plant parts on percentage of egg hatching : *S.cerealella*

Treatments	Concentration (%)				Mean
	0.05	0.1	0.15	0.2	
<i>E. terticornis</i>	60.00 ^d B	56.69 ^a A	56.01 ^a A	54.61 ^a A	56.80 ^a
<i>B. latifolia</i>	63.08 ^{bc} B	63.52 ^{cd} B	61.70 ^b B	55.90 ^a A	61.05 ^d
<i>O. basilicum</i>	65.98 ^{cd} C	63.54 ^{cd} BC	63.25 ^h B	59.14 ^b A	62.98 ^c
<i>P. glabra</i>	64.38 ^{cd} B	62.55 ^{bc} B	57.71 ^h A	55.63 ^a A	60.09 ^{cd}
<i>T. terrestris</i>	60.43 ^{ab} B	60.24 ^b B	56.42 ^a A	54.63 ^a A	57.95 ^{ab}
<i>T. procumbens</i>	66.85 ^d B	65.74 ^c B	61.82 ^h A	62.68 ^c A	64.27 ^c
<i>A. calamus</i>	61.20 ^{ab} B	60.28 ^b B	57.33 ^a A	57.07 ^{ab} A	58.97 ^{bc}
Control (Acetone)					68.48 ^f
Control					68.18 ^f
Mean	63.14 ^D	61.78 ^C	59.18 ^B	57.10 ^A	

Table 3. Effect of petroleum ether extract on mean developmental period (days) : *S.cerealella*

Treatments	Concentration (%)				Mean
	0.05	0.1	0.15	0.2	
<i>E. tetricornis</i>	30.66	31.66	31.66	32.00	31.50 ^{ab}
<i>B. latifolia</i>	30.33	30.66	31.66	31.33	31.00 ^{bc}
<i>O. basilicum</i>	30.66	31.33	31.66	32.33	31.50 ^{ab}
<i>P. glabra</i>	31.00	30.66	31.66	32.00	31.33 ^{ab}
<i>T. terrestris</i>	31.00	31.66	31.66	32.33	31.67 ^a
<i>T. procumbens</i>	31.33	31.00	32.00	31.66	31.50 ^{ab}
<i>A. calamus</i>	30.66	31.33	32.00	32.33	31.58 ^{ab}
Control (Acetone)					30.67 ^c
Control					31.00 ^{bc}
Mean	30.80 _B	31.19 _B	31.76 _A	32.00 _A	

In a column/row means followed by same small/capital letter(s) respectively are not significantly different by CD (P=0.05). Interactions between treatments and concentrations are not significant.

followed by *T. terrestris* (57.95). Among the concentrations of all the treatments, 0.2 per cent recorded the lowest egg hatching (57.10%) which was significantly different from other concentrations. Reddy and Devaraj (1989) also found that 0.5 per cent plant extracts of *T. terrestris* was effective in reducing egg hatchability of *Phthorimaea operculella* Z. Anand Prakesh *et al.*, (1990) reported that the extract of *V. negundo* caused a marked reduction in the egg hatching of *S. cerealella*. This reveals that plant extracts are having ovicidal activity. The actual component in *E. tetricornis* responsible for ovicidal activity has to be found out.

Developmental period and adult emergence

The data on the mean developmental period, are presented in Table 3. The petroleum ether extract of plant parts have slightly influenced the mean developmental period of *S. cerealella*. Irrespective of the concentrations, it was longest in

T. terrestris treated grains (31.67 days), while other botanicals were on par with untreated control. Jilani (1984) reported that wheat grains treated with *M. sylvestris* at 0.5 per cent delayed adult emergence upto 13 days. Gunasekaran and Chelliah (1985) also reported the juvenilising effect of *Tribulus terrestris*. Due to the JH effect the developmental period might be prolonged.

Adult emergence percentage on the basis of hatched eggs, irrespective of the concentrations, was lowest in *A. calamus* (38.05) which was on par with *E. tetricornis* (40.28) and *P. glabra* (40.42), all of which were significantly different from other treatments, while it was 56.71 and 55.18 per cent in untreated and acetone treated control respectively (Table 4). With regard to concentration of all the treatments, 0.2 and 0.15 per cent were on par with each other. Dakshinamurthy (1988) reported that *E. tetricornis* leaf powder mixed with paddy at the rate of 1 per cent by weight inhibited the development of this pest. The toxicity of *P. glabra*

Table 4. Effect of petroleum ether extract on adult emergence percentage : *S.cerealella*

Treatments	Concentration (%)				Mean
	0.05	0.1	0.15	0.2	
<i>E. tetricornis</i>	48.89 ^{ab} C	42.05 ^a B	34.73 ^a A	35.45 ^a A	40.28 ^a
<i>B. latifolia</i>	54.35 ^c A	51.85 ^{bc} A	54.23 ^b A	51.51 ^b A	52.99 ^{bc}
<i>O. basilicum</i>	54.77 ^c A	53.84 ^{bc} A	52.73 ^b A	52.55 ^b A	53.47 ^{bc}
<i>P. glabra</i>	48.24 ^{ab} C	43.99 ^a B	34.12 ^a A	35.35 ^a A	40.42 ^a
<i>T. terrestris</i>	50.00 ^{bc} A	50.00 ^b A	51.51 ^b AB	54.31 ^b B	51.45 ^b
<i>T. procumbens</i>	51.96 ^{bc} A	55.35 ^c A	55.16 ^b A	53.19 ^b A	53.91 ^c
<i>A. calamus</i>	44.95 ^a C	40.51 ^a B	33.27 ^a A	33.86 ^a A	38.05 ^a
Control (Acetone)					55.18 ^{cd}
Control					56.71 ^d
Mean	50.45 _C	48.23 _B	45.11 _A	45.12 _A	

Means followed by same small/capital letter(s) are not significantly different by CD (P=0.05).

was attributed mainly to Karanjin and furanoflavonoids present in the oil (Singh and Pradeep Kumar Kataria 1985).

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Research Notes

EFFECT OF INTERCROPPING AND TIME OF SOWING ON COTTON LEAFHOPPER AND BOLLWORM

Cotton is widely grown as a pure crop in southern districts Tamil Nadu under rainfed condition. Intercropping in cotton was recommended earlier to get some returns even if there was a failure of main crop. Earlier studies indicated that cotton and green gram sown in alternate rows and in paired rows with 2:1 ratio gave the highest net return (Devotta and Chowdappan (1975) while soybean or black gram as the best intercrop in cotton (Muthusankaranarayanan *et al.*, 1989). The present work was undertaken to study the effect of intercropping against cotton leafhopper *Amrasca*

A field trial was laid out at the Agricultural Research Station, Kovilpatti during 1991-92 to study the effect of intercropping against cotton leafhopper and bollworm incidence with clusterbeans, black gram, green gram, mustard in 2:1 ratio and compared with pure cotton (MCU 10) crop. Spacing adopted was 30 x 10 cm for inter crops and 45x 30 cm for the main crop. Observation were made on the leaf hopper population and bollworm incidence following routine methods. Yield of main crop influenced by time of sowing return and cost benefit ration were also worked out.