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Seasonal Incidence and Management of Leaf Miner, *Aproaerema modicella* (Dev.) on Post-rainy Groundnut

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ABSTRACT

Incidence of *Aproaerema modicella* (Deventer) in terms of larval population was recorded during the first week of February 2006, which showed non-significant relationship with maximum temperature, relative humidity, wind speed, spiders and coccinellid predatory beetles, but significant relationship with minimum temperature. The results of chemical control trial indicated that emamectin benzoate 0.0025% was the most effective treatment followed by indoxacarb 0.0145% and indoxacarb 0.00725% + novaluron 0.005% in reducing the larval population of *A. modicella*.

Key words : *Aproaerema modicella*, Groundnut, Leafminer, Management,Seasonal Incidence

Groundnut (*Arachis hypogaea* L.) is one of the major oilseed crops grown in India. In Andhra Pradesh, the groundnut crop is grown in an area of 1.47 m.ha, with 0.99 m.t. of production with a productivity of 660 kg ha^{-1} (CMIE reports, 2005). Insect pests are causing severe losses and are recognized as one of the major constraints to groundnut crop in India. There are about 100 pests, including insects, mites and nematodes accounting for 30 per cent yield losses (Amin, 1988). Groundnut leafminer, *Aproaerema modicella* (Deventer) is the most important pest and cause severe damage in irrigated as well as rainfed groundnut. As the chemical pesticides are causing several adverse effects in the agro-ecosystem it has become necessary to use bio-rational insecticides which are likely to provide effective control of *A. modicella* but also knowledge on its population dynamics as influenced by the biotic and abiotic factors.

MATERIAL AND METHODS

The study was conducted at Agricultural College Farm, Bapatla during rabi 2005-06. The popular groundnut variety TMV-2 seed was sown in bulk plot of 200 m^2 by adopting inter- and intra-row spacing of 30 x 10 cm. The larval counts of *A. modicella* were recorded at weekly intervals from 50 randomly selected plants. The incidence of this pest was recorded by counting the total number of larval population on the whole plant and correlated with meteorological data for establishing the effect of weather parameter on the activity of the test insect. The influence of biotic and abiotic parameters on the pest incidence was established through simple correlation and multiple linear regression studies. For management of this pest on groundnut, the experiment was designed in randomised blaock design with 13 treatments including untreated control and replicated thrice. Plots of size 4 x 3 m were prepared and enclosed by bunds all round and with irrigation channels in between the replications. Details of the treatments are given in Table 3. The larval population was recorded one day before spraying as pre-treatment count and 1,5,10 and 15 days after spraying as post-treatment counts. The observations were made from 10 randomly selected plants tagged in each plot, leaving the border rows. Per cent pest population reduction over untreated control in different treatments was calculated using modified Abbot's formula and these values were further transformed to the corresponding angular values and the data were subjected to statistical analysis.

RESULTS AND DISCUSSION

The data recorded on the occurrence of groundnut leafminer revealed that the initial occurrence of *A. modicella* was during the second week of December *i.e.*, at 18 days after sowing (18 DAS) and the pest population increased gradually and reached the peak during the first week of February *i.e.*, at 74 days after sowing with 2.26 larvae per plant and there after declined gradually with rise in temperature. The results are in close agreement with the observations of Senguttuvan (1999) who reported the positive correlation between the larval population and the maximum temperature.

The correlation studies indicated positive but non-significant relation between the larval population and the maximum temperature, morning relative

Table 1. Simple correlation between larval population of *A. modicella* and abiotic and biotic factors on groundnut during *rabi*, 2005 – 06

Abiotic and biotic Factors (Weather parameters and natural enemies)	Correlation coefficient (r)
X_1 – Maximum temperature (°C)	0.0251 NS
X_2 – Minimum temperature (°C)	-0.6727 *
X_3 – Morning relative humidity (%)	0.4347 NS
X_4 – Evening relative humidity (%)	-0.3436 NS
X_5 – Wind speed (Km h^{-1})	-0.2956 NS
X_6 – Spiders	0.5281 NS
X_7 – Coccinellids	0.1382 NS

NS = Non-significant * = significant at 5% level

Table 2. Multiple linear regression between larval population of *A. modicella* and biotic and abiotic factors on groundnut during *rabi*, 2005 - 06

Variable	Partial regression coefficient	Standard error	t- value
X_1 – Maximum temperature (°C)	0.219	0.209	1.047 NS
X_2 – Minimum temperature (°C)	-0.225	0.143	1.569 NS
X_3 – Morning relative humidity (%)	0.039	0.035	1.137 NS
X_4 – Evening relative humidity (%)	0.032	0.035	0.928 NS
X_5 – Wind speed (Km h^{-1})	0.067	0.195	0.348 NS
X_6 – Spiders	2.145	1.334	1.607 NS
X_7 – Coccinellids	-1.967	1.234	1.593 NS

Intercept = -7.882 R^2 value = 0.4836 NS = Non-significant

humidity and the population of the spiders and coccinellids while, the relation between the larval population and the minimum temperature was negative and significant. The relationship between the larval population and the evening relative humidity, wind speed was negative and significant. Multiple linear regression analysis also showed that weather parameters did not show significant effect on larval population (Table 1). It was observed that the coefficient of determination (R^2) of all the biotic and abiotic factors was 0.4836, which showed that biotic and abiotic factors together influenced variation in the larval incidence of *A. modicella* to the extent of 48.36 (Table 2).

The pooled data of 2 sprays indicated that cumulative efficacy recorded at 1,5,10 and 15 days of emamectin benzoate (0.0025%) resulted in the highest larval population reduction (65.03%) of *A. modicella* (Table 3). This was probably due to stomach and contact action and persistence of toxicity upto ten days (Jansson *et al.,* 1996). These results are in close conformity with Kumar and Devappa (2006). The second best treatments were indoxacarb (0.0145%) and indoxacarb (0.00725%) + novaluron (0.005%) being on par with each other and recorded 58.04% and 55.56% mean reduction in the larval population over control.

The treatment that closely followed was indoxacarb 0.00725% + *B.t.k.*0.1% which recorded 54.01% reduction of larval population over control. The next treatment that closely followed was indoxacarb 0.00725% + azadirachtin 0.15% which

Table 3. Mean efficacy of the treatments (two sprays) against *A. modicella* on groundnut during *rabi,* 2005-06

Treatments		Mean population per 10 plants before treatment	Mean per cent reduction of larvae over control				Overall mean efficacy
			1 DAT	5 DAT	10 DAT	15 DAT	
1.	Azadirachtin 0.3%	11.66	28.25 (32.10)^{e}	40.49 (39.51)^{f}	30.10 (33.26)^{f}	20.72 (27.05)^{d}	29.89 (33.13)^{g}
2.	*B.t.k.* 0.2%	11.67	24.16 (29.43)^{f}	44.46 (41.81)^{e}	8.47 (44.00)^{d}	23.02 (28.66)^{cd}	35.03 (36.28)^{f}
3.	SlNPV 250 LE ha^{-1}	13.50	3.67 (11.00)^{i}	2.27 (8.63)^{i}	2.13 (8.33)^{g}	1.24 (5.89)^{f}	2.33 (8.74)^{i}
4.	*N.rileyi* 1.2×10^{8} spores ml^{-1}	13.83	20.25 (26.73)^{g}	35.42 (36.52)^{g}	38.67 (38.45)^{e}	18.37 (25.35)^{de}	28.18 (32.05)^{g}
5.	Indoxacarb 0.0145%	15.33	61.44 (51.61)^{b}	72.17 (58.17)^{b}	58.28 (49.77)^{b}	40.28 (38.39)^{b}	58.04 (49.63)^{b}
6.	Novaluron 0.01%	11.83	27.37 (31.53)^{ef}	48.55 (44.17)^{d}	52.08 (46.19)^{c}	24.01 (29.33)^{c}	38.00 (38.05)^{f}
7.	Emamectin benzoate 0.0025%	14.00	67.23 (55.08)^{a}	85.16 (67.37)^{a}	65.20 (53.85)^{a}	42.51 (40.69)^{a}	65.03 (53.75)^{a}
8.	Indoxacarb 0.00725% + Novaluron 0.005%	12.67	48.31 (44.03)^{c}	66.18 (54.44)^{c}	63.55 (51.65)^{b}	44.23 (41.68)^{a}	55.56 (48.19)^{bc}
9.	Indoxacarb 0.00725% + Azadirachtin 0.15%	12.67	44.45 (41.81)^{d}	63.54 (52.86)^{c}	56.00 (47.58)^{c}	40.13 (38.30)^{b}	51.16 (45.91)^{d}
10.	Indoxacarb 0.00725% + *B.t.k.* 0.1%	12.17	46.91 (43.22)^{cd}	65.28 (53.90)^{c}	60.33 (50.96)^{b}	43.52 (41.27)^{a}	54.01 (47.30)^{c}
11.	SlNPV 125 LE ha^{-1} + *B.t.k.* 0.1%	14.00	15.39 (23.07)^{h}	30.10 (33.26)^{h}	32.64 (34.83)^{f}	15.73 (23.34)^{e}	23.47 (28.96)^{h}
12.	Endosulfan 0.07%	11.67	60.22 (50.90)^{b}	51.36 (45.78)^{d}	39.38 (38.86)^{e}	25.19 (30.11)^{c}	44.04 (41.57)^{e}
13.	Control	15.83	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
	F- test	NS	Sig.	Sig.	Sig.	Sig.	Sig.
	SEm±		0.74	0.74	0.75	0.89	0.71
	CD (0.05)		2.15	2.16	2.17	2.28	2.09

Figures in parentheses are angular transformed values.
Values with same superscript are statistically non - significant by DMRT.

Sig. = Significant
NS = Non-significant
DAT = Days after treatment

recorded 51.16% reduction of larval population over control and was significantly superior to the rest of the treatments. The treatments that followed in the descending order of efficacy by recording more than 23% mean reduction of larval population over control were endosulfan 0.07% (44.04%), novaluron 0.01% (38.00%), *B.t.k.* 0.2% (35.03%), azadirachtin 0.3% (29.89%), *N.rileyi* 1.2 x 10^8 spores ml^{-1} (28.18%) and Sl NPV 125 LE ha^{-1} + *B.t.k*. 0.1% (23.47%). Among all the treatments, Sl NPV 250 LE ha^{-1} was significantly least effective with only 2.33% reduction in the larval population over control. However, all the treatments were significantly superior over the control in bringing down the larval population.

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