IMPACT OF MONOCROTOPHOS AND NEEM OIL MIXTURE ON DEFOLIATOR MANGMENT IN GROUNDNUT

K. SAHAYARAJ[1], A. AMALRAJ[2]

[1]Crop Protection Research Centre, Department of Zoology, St. Xavier's college, Palayamkottai 627 002, Tamil Nadu, India, Ph. No. 0461 2361957, e-mail ttn_ksraj@sancharnet.in

[2]Plant protection Research Unit, Department of Botany, St. Joseph's College, Trichy- 620002, Tamil Nadu 620 002, India.

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ABSTRACT

The integrated effect of intercropping, a synthetic pesticide (monocrotopas) (M) and neem based biopesticide (neem oil - 2%) (NO) on three-groundnut defoliators damage and also the groundnut production was studied. The monocrotopas and neem oil combination was found to be very effective in reducing the defoliator infestation. Defoliator's incidence was significantly higher in untreated plots, resulting in significantly lower yield (1539.03 Kg h^{-1}). The groundnut yield was increased (2011.18 Kg h^{-1}) when monocrotophos and neem oil mixture was applied than monocrotophos (1877.77 Kg h^{-1}) and control categories. The estimated avoidable groundnut and black gram yield loss were lower in monocrotopas.

KEY WORDS: monocrotophos, neem oil, intercropping, groundnut production

INTRODUCTION

Groundnut (Arachis hypogaea Linn.) is the premier oilseed crop of India. It holds a 35 per cent share of the total oilseed area (24 million ha) and contributes nearly 40 per cent of the total oil seeds production (20 million tones). The low level of productivity in India is largely because of the crop is rainfed, exposed to various abiotic and biotic stresses. An estimated annual loss of Rs. 150 crores in groundnut due to pests has been reported [1,2]. Among the major pests reported in groundnut, Aproaerma modicella Dev., Helicoverpa armigera Hubner and Spodoptera litura Fabricius are the major defoliators of groundnut [3 – 7]. Unrestrained application of chemical pesticides for pest control has created pesticide resistance on both H. armigera [8] and S.litura [7, 9]. This grown consciousness toward the environment has made to imperative to the crop production specialists to search for viable and economical alternatives to the chemicals. Therefore, the strategy should aim at economically sound Integrated Pest Management (IPM) where plant product and intercrops place an important role. Growing mixed crops or intercropping is an important feature of Indian agriculture [7, 10]. Moreover, intercropping affects the microclimate in the agroecosystem and is highly relevant in the pest management strategy and also plays a very important role in population dynamics of insect pests. Further more, it was reported that integration of groundnut with grams increased the yield and gross economic return [11]. However, information on the incidence of defoliator in relation to monocrotophos and neem oil mixture application is lacking. The present study was conducted during in the farmers filed to evaluate the impact of monocrotophos and neem oil mixture on the groundnut defoliators infestation, groundnut and black gram yield, avoidable loss, cost of cultivation and net income.

MATERIAL AND METHODS

Groundnut (PLO - Red) and Blackgram (T-9) in 6:1 ratio were raised under controlled irrigation conditions at Regunathapuram, Pudukottai district, Tamil Nadu, India. The experiments were laid in randomized block design in a plot size of 20 x 24 m^2 for each treatment. Three replications were maintained for each treatment. Three applications with monocrotophos alone (M) (2%) and monocrotophos with neem oil (M + NO) (2%) were made at 33, 48 and 63 days after seeding sowing (ASS). Observations on the defoliator infestation level were recorded after 4 days of spray from thirty randomly selected plants from each replication. Infestations were recorded in morning hours from top, middle and bottom leaflets in each selected plant. The mean values were taken into account. Symptoms define by Wightman and Amin [3] has been followed to identity the infestation of each defoliator. The percentage of defoliation was calculated by using Kapadia et. al. [12] procedure. At harvest, the yield of main crop and intercrop in different treatments were recorded. The data were analysed statistically and expressed as Kg h^{-1}. Percentage of available loss was also calculated with standard procedure [13]. The data on pest infestation level, mean yield, available loss, cost of cultivation and net income separately was pooled and subjected to statistically analysed with ANOVA and DMRT by using system statistics version 6.

RESULT AND DISCUSSION

Defoliators infestation level

The results revealed that all the three-defoliator population was effectively controlled by the monocrtophos and neem oil mixture followed by monocrotophos alone. Among the three defoliators studied, the intensity of H. armigera was highest in all the categories followed by S. litura and A. modicella (Table 1). Previously it has been reported that among the defoliating insects of groundnut, leaf miner has been causing serious damage to the foliage, resulting in 23 to 89 per cent loss in pod yield at national level [14]. Nandagopal et. al [15] reported that monocrotophos was effective against leaf miners and also too to other pests [16]. Neem leaf extract has more effect on A. modicella than other two plants extract test (Pongamia glabra and Calotropis giganta) under laboratory condition [17]. The percent defoliation of S. litura was higher in control (1.23 ±0.16, 5.90±0.36 and 7.43 ± 0.42 for 37, 52 and 67 DASS, respectively) and it was reduced to 0.3,1.9 and 3.5 times in monocrotophos spray. Further reduction (0.35, 2.14 and 4 times, for 37, 52 and 67 DASS, respectively) was observed in the monocrotophos and neem oil mixture. This might be due to the action of neem oil. The neem based insecticide suppressed the S. litura damage as there was least foliage damage in groundnut and also gave higher pod yield says Anon [2]. Recently it was reported that the intercrop groundnut and black gram showed higher incidence and percent leaf damage by S.litura [7]. In monocrotophos alone-sprayed field, H. armigera infestation level was gradually decreased from 37 days after sowing (6.13±0.29 %) to 52 (7.06±0.27 %) and 67 (7.80±0.21 %) DASS. This clearly shows the pesticide resistant capacity of H. armigera. The resistant level was probably driven by high selection pressure created by increased usage of insecticide [18]. The total reduction of leaf infestation due to monocrotophos spray was significantly lower ($p<0.05$) (10.63±0.36 %) when compared to control (29.13±0.83 %) at 67 DASS

Table 1. Percent of infestation caused by defoliator in untreated and two IBM components treated in groundnut field

Treatment	Pest Counting after sowing (days)	Percent of defoliation/Plant			Total defoliation (%)
		A.modicella	*H.armigera*	*S.litura*	
Control	37	0.50 ± 0.11^{aA}	6.70 ± 0.33^{aB}	1.23 ± 0.16^{aAC}	8.00 ± 0.53^{aD}
	52	3.03 ± 0.29^{bA}	12.50 ± 0.55^{bB}	5.90 ± 0.36^{bC}	21.60 ± 0.72^{bD}
	67	3.96 ± 0.33^{bcCA}	17.76 ± 0.63^{cB}	7.43 ± 0.42^{cC}	29.13 ± 0.83^{cD}
Monocrotophos 36EC	37	0.48 ± 0.12^{aA}	6.13 ± 0.29^{aB}	1.16 ± 0.14^{aC}	7.73 ± 0.39^{aBD}
	52	1.86 ± 0.22^{bA}	7.06 ± 0.27^{aB}	3.16 ± 0.29^{bC}	11.90 ± 0.43^{bD}
	67	1.10 ± 0.14^{cA}	7.80 ± 0.21^{aB}	2.70 ± 0.22^{cC}	10.63 ± 0.36^{bcBD}
Monocrotophos 36EC + Neem Oil	37	0.46 ± 0.13^{aA}	6.63 ± 0.37^{aB}	1.13 ± 0.14^{aC}	7.36 ± 0.48^{aD}
	52	1.13 ± 0.27^{bA}	6.63 ± 0.33^{aB}	2.80 ± 0.35^{aAC}	10.56 ± 0.44^{bBD}
	67	1.03 ± 0.15^{bcCA}	5.76 ± 0.25^{aB}	2.50 ± 0.31^{bcC}	9.38 ± 0.48^{bcD}

Values carrying same small alphabet in a column of each treatment separately and capital Alphabets in a row are not statistically significant at 5 % using DMRT.

Table 2. Yield, percent available loss Kg h^{-1}, Cost of cultivation and new income (Rs./ha) in different IPM components

Treatment	Mean Yield		% Available loss		Cost of cultivation	Net income
	G	BG	G	BG		
Monocrotophos (M)	1877.77^{a}	29.015^{a}	0.18^{a}	0.23^{a}	9955^{a}	3549^{a}
Monocrotophos + Neem oil (M + NO)	2011.18^{b}	33.55^{b}	0.23^{a}	0.33^{b}	10134^{b}	4361^{b}
Control	1506.03^{c}	22.30^{c}	-	-	9044^{c}	2006^{c}

G - groundnut; BG - Black gram, - indicates available loss was not observed.
Values in the column with letters in common are not significantly different at p = 0.05 using the DMRT

(Table 1). This results confirms the earlier findings of Das [19] and Nandagopal et. al. [15]. They reported that monocrotophos reduced the groundnut leaf miner damage. As observed in the A. modicella and H. armigera, the per cent infestation caused by S. litura was also gradually decreased from control to monocrotophos and to M+NO mixture. Efficacy of neem products in insect control was reviewed by many scientists [20 - 21]. According to them not much work has been done on the use of neem products in the control of groundnut insect pests. The role of neem products either alone or blend with a synthetic insecticide, on the biopesticidal and biological activities of leaf miner was studied [22]. The results indicated that crude neem oil suppressed oviposition, whereas larval and pupal mortality of leaf miner were not affected in desired extent. The effect of partially purified neem seed extract did not cause any juvenometric activity in the treated larvae [21].

Cost effectiveness of neem based IPM

Economic analysis of different treatments brought out the need for IPM and non-IPM methods in groundnut. The pod yield was significantly high (2011.18 Kg h^{-1}) in the M+NO plot followed with monocrotophos (1877.77 Kg h^{-1}) and theses two were superior to untreated control (1539.03 Kg h^{-1}) (Table 2). It is in confirmation with the observation of Nandagopal et. al. [15] and Reddy [23]. As observed in the groundnut, the blackgram production was also high in the M+NO treatment (33.55 Kg h^{-1}) followed by monocrotophos plot (29.19 Kg h^{-1}) and least in control field (22.30 Kg h^{-1}). Senthilvel [24] reported similar result in groundnut (TMV 12) and blackgram (TMV5) intercropping system. He pointed out that raising groundnut with a blackgram in 6:1 ratio was a more remunerative and economic system for intercropping system. The net return per ha. was highest in the M + NO mixture plots followed by monocrotophos (Table 2). This is in accordance with the suggestion of Mullen [25].

They reported that IPM components increased the annual production. Table 2 clearly indicates that the percent available loss was higher in blackgram of experimental plots. Thus, on the basis of this study it could be concluded that the effectiveness of M + NO mixture was found to be optimum in controlling groundnut defoliators when applied three times at 15 days interval starting from 37 days after seedling sowing.

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