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<https://doi.org/10.29321/MAJ.10.A02423>

*Madras Agric. J.* 72 (12) : 695—700. December, 1985

EFFECT OF INTERCROPPING, SPACING AND MULCHING IN THE CONTROL OF GROUNDNUT LEAF MINER, *Apioaerema modicella* DEVENTER (GELECHIIDAE : LEPIDOPTERA)

G. LOGISWARAN<sup>1</sup> and M. MOHANASUNDARAM<sup>2</sup>

A field experiment was conducted at Oilseeds Experiment Station, Indivanam during *kharif* 1983 to study the effect of intercropping, spacing and straw mulching in the control of ground leaf miner. The results indicated that intercropping groundnut with cowpea or blackgram at 3:1 ratio was beneficial in reducing the leaf miner incidence as well as in increasing the income. The paddy straw mulching and adopting closer spacings though reduced the incidence did not fetch increased income.

Part of M. Sc. (Ag.) thesis submitted by the first author to the Tamil Nadu Agricultural University, Coimbatore - 3.

1. Associate Professor of Agrl. Entomology, Agricultural College and Research Institute, Madurai 625 104.
2. Professor of Agrl. Entomology, Agricultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore 641 003.

Groundnut crop is attacked by many insect pests among which the leaf miner,  *Aproaerema modicella* Deventer popularly called as 'surul-poochi' has assumed economically damaging proportions in the recent years. This pest, hitherto considered as minor one is now posing a major threat in almost all the groundnut growing areas of the State. Pod yield losses to an extent of 49 to 56 per cent are attributed to the attack by this pest is of immense importance to realise the potential yield of groundnut. Chemical control measures are being recommended with success but the high cost is the limiting factors. Since eighty per cent of the area is grown under rainfed conditions, farmers are reluctant to invest money on chemical control measures. Hence investigations were carried out to find out the effect of cultural practices like intercropping, spacing and mulching in the control of this pest, the results of which were presented in this article.

## MATERIALS AND METHODS

A field experiment was conducted during 1983 rainfed season in a randomised block design with a plot size of 16.2 m<sup>2</sup>. Eight treatments (Table 1) consisting of pure crop, straw mulch, two spacings and four intercrops replicated thrice were tried. TMV 7 groundnut, KM 1 cowpea, KM 2 cumbu, CO 19 cholam and TMV 1 blackgram were used. In the intercropped plots there were four rows

of intercrop and eleven rows of groundnut crop. The spacing between plants within rows was 10 cm. for all crops except cowpea which was sown at a spacing of 15 cm. Straw mulching was done on tenth day of sowing using 4320 kg paddy straw/ha. The plants received only fungicidal sprayings for protection against diseases.

The observations on pest incidence (larval counts and symptom basis) and parasitism were made on 20th, 50th and 80th day of sowing by selecting twenty five plants at random from each plot. The number of live larvae and the parasitised larvae were counted and the mean number of live larvae per plant and percentage parasitism were worked out. For assessing the incidence on symptom basis, the top twenty opened leaflets from the central axis were examined, affected leaflets counted and percentage calculated. Data on soil moisture (%) and soil temperature (°C) at 15 cm depth, number and fresh weight of weeds per m<sup>2</sup> were recorded on the date of sowing, 20, 35, 50 and 65 days of sowing. After harvest the dry pod yield, weight of ill filled pods, 100 pod weight, 100 kernel weight and shelling percentage were recorded for groundnut crop. In the case of cumbu and cholam, grain and straw yields were recorded. In the case of blackgram and cowpea grain yield was recorded.

## RESULTS AND DISCUSSION

The mean pest incidence and

Table 1: Effect of straw mulch, spacing and intercropping in the control of *A. modicella*

Treat- ment number	Treatment	% leaf lets affected 50, 80 DAS pooled	No. of larvae per plant 50, 80 DAS pooled	% parasitism 80 DAS
1.	Groundnut pure crop 30 x 10 cm	13.27 (21.12)	1.90	21.80 (27.83)
2.	Groundnut pure crop 30 x 10 cm + Paddy straw mulching	7.97 (15.85)	1.33	32.97 (35.04)
3.	Groundnut pure crop 20 x 10 cm	7.80 (16.00)	1.43	31.47 (34.15)
4.	Groundnut pure crop 15 x 10 cm	7.20 (15.47)	1.22	33.02 (35.07)
5.	Groundnut + cowpea	11.57 (19.68)	1.33	28.47 (32.23)
6.	Groundnut + Cumbu	10.27 (18.52)	1.51	26.23 (27.47)
7.	Groundnut + cholam	10.45 (18.47)	1.63	25.12 (30.09)
8.	Groundnut + blackgram	10.57 (18.79)	1.45	25.83 (30.54)
	C. D. (P=0.05)	1.28	0.18	4.13

DAS=Days after sowing

Figures in parentheses are transformed values (Arc sin transformation)

percentage parasitism in different treatments were furnished in Table 1: The mean data on soil moisture, temperature, weed number and fresh weed weight were furnished in Table 2. The mean yield data and the results of the quality studies were furnished in Table 3 along with the cost-benefit ratio.

#### Effect of straw mulch

Compared to unmulched crop (T 1), the paddy straw mulched crop (T 2) had significantly lesser

leaf miner incidence and higher percentage of parasitism (Table 1). Besides, the paddy straw mulched plots resulted in significant increase of soil moisture and reduction of soil temperature, weed number and fresh weed weight (Table 2). The yield of groundnut was also significantly more in straw mulched plots. The differences among the two treatments with regard to 100 pod weight, 100 kernel weight and shelling out turn were not significant. However, the paddy straw mulched plots had lower

Table 2. Mean data on soil moisture, temperature, weed number and fresh weed weight.

Treatment number	Soil moisture		Soil Temp. (°C)	Weed number	Fresh weed wt. (g)
	%	T. V.			
1.	6.33	14.34	31.14	92.4	09.8
2.	8.60	16.63	28.24	52.5	86.5
3.	7.78	15.84	29.51	67.9	73.2
4.	8.55	16.55	29.22	70.2	85.9
5.	6.38	14.28	31.76	102.2	05.2
6.	6.47	14.35	31.42	94.8	99.7
7.	6.75	14.72	30.91	96.2	90.5
8.	6.44	14.41	31.89	95.3	98.0
CD (P=0.05)	—	0.40	0.56	16.8	17.7

Mean of the observations made on 15, 35, 50 and 65 DAS

T. V. = Transformed values (Arc sin transformation)

percentage of ill filled pod (pops) when compared with unmulched plots, but the differences were on par with each other (Table 3). Although the yield was more in the case of paddy straw mulch treatment, the cost-benefit ratio was less (1:1.2) when compared with unmulched crop (1:1.4), because of the high cost of straw. Further, difficulty was also experienced in the application of gypsum at the 45th day of sowing as the operation involves removal of straw and remulching. Hence, based on these results, further attempts could be made to assess the locally available straw or other cheap materials as mulch so that adoption of this cultural practice would be cheaper to the farmers.

#### *Effect of intercropping*

Compared to pure groundnut crop (T 1), the intercropped plots (T 5, 6, 7, 8) had significantly lesser leaf miner incidence. The percentage of parasitism was significantly more in the plots intercropped with cowpea (T 5) compared to pure groundnut crop (Table 1). With regard to soil moisture, soil temperature, weed number and fresh weed weight the differences between groundnut pure crop and intercropped plots were on par (Table 2). The mean groundnut yield after taking into consideration the calculated groundnut yield for the intercropped space revealed significant increase both in the case of groundnut + cowpea (T 5) and groundnut + blackgram (T 8) when compared with the pure groundnut

crop (T 1). The differences with regard to quality characters were not significant. The groundnut and cowpea and groundnut and blackgram plots had lower percentage of ill filled pod (pops) when compared with pure groundnut crop, but the differences were on par. The groundnut + cumbu and groundnut + cholam plots had higher percentage of ill filled pods when compared with pure groundnut crop, but the differences were on par (Table 3). The cost benefit ratio was highest in groundnut + blackgram (1 : 1.78) followed by groundnut + cowpea (1 : 1.7) and groundnut + cholam (1 : 1.49) compared to pure groundnut crop (1 : 1.4). These results showed that intercropping groundnut with cowpea or blackgram at 3 : 1 ratio was beneficial in reducing the leaf miner incidence as well as in increasing the income. In addition to leaf miner, Sivasubramanian and Palanisamy (1984) reported that groundnut + cowpea cropping system was beneficial in minimising the incidence of jassids and thrips at Aliyarnagar. But they have reported higher incidence of leaf miner in groundnut + blackgram cropping system. It was observed by Fletcher (1914) that a mixed crop of groundnut and cumbu showed much lesser attack of leaf miner as compared with that suffered by an unmixed crop of groundnut. At ICRI SAT (Anon. 1983) it has been reported that thrips, jassids and leaf miner infestation was lowest in groundnut intercropped with cumbu. Highest leaf miner infestation was in ground-

nut as sole crop followed by groundnut + redgram intercrop.

#### *Effect of spacing*

Compared to groundnut crop at the normal spacing of 30 x 10 cm (T 1), the treatment with the spacing of 20 x 10 cm (T 3) and 15 x 10 cm (T 4) recorded significantly lesser leaf miner incidence and higher percentage of parasitism (Table 1). Besides, both the closer spacings resulted in significant increase of soil moisture and reduction of soil temperature, weed number and fresh weed weight (Table 2). Though the two closer spacings recorded higher yield the differences in the yield between the two closer spacings and normal spacing were on par. The differences with regard to quality characters were also not significant. The crop with the spacing of 15 x 10 cm had significantly higher percentage of ill filled pods when compared with the normal spacing. The crop with the spacing of 20 x 10 cm had higher percentage of ill filled pods than the normal spacing, but the differences were on par (Table 3). The cost-benefit ratio for both the closer spacings was less compared with the normal spacing. This showed that though the closer spaced crop had lesser leaf miner incidence and increased yield the additional expenditure by way of seed cost was not compensated by the extra income obtained. However, these results suggested the importance of maintaining proper plant population in reducing the incidence.

Table 3. Mean yield data and cost-benefit ratio

Treatment number	Mean yield (kg/ha)	100 pod weight (g)	100 kernel weight (g)	Shelling outturn	% of rejected pods to total dry weight	Cost-benefit ratio
1.	949	85.50	33.33	73.67 (59.13)	15.06 (22.77)	1 : 1.40
2.	1048	87.00	33.50	73.00 (58.70)	11.79 (20.04)	1 : 1.20
3.	995	85.67	32.83	73.50 (59.03)	18.09 (25.15)	1 : 1.31
4.	968	85.67	32.33	75.83 (60.56)	22.67 (28.43)	1 : 1.13
5.	1219*	84.33	30.33	72.50 (58.38)	12.82 (20.99)	1 : 1.70
6.	960*	86.17	33.00	73.50 (59.02)	17.07 (24.41)	1 : 1.29
7.	812*	84.50	32.50	74.67 (59.79)	17.44 (24.64)	1 : 1.49
8.	1205*	83.83	31.83	75.00 (60.01)	12.99 (21.11)	1 : 1.78
CD (P=0.05)	82	NS	NS	NS	2.94	

\* The figures include the calculated groundnut yield for the four intercropped rows/plot. Figures in parentheses are transformed values (Arc sin transformation)

At ICRISAT (Anon., 1983) it has been reported that the thrips, jassids and leaf miner on individual plants was lower in dense crop (30 x 10 cm) than sparse crop.

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