Plant Archives Vol. 25, Special Issue (ICTPAIRS-JAU, Junagadh) Jan. 2025 pp. 583-586
e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2025.SP.ICTPAIRS-082

YIELD LOSS DUE TO THRIPS IN SUMMER GROUNDNUT IN SAURASHTRA

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ABSTRACT

The yield loss in summer groundnut due to thrips incidence was worked out by releasing 2, 4, 8, 12, 16 and 20 thrips per twig at the 4-leaf stage and covering the plants till harvest. It was found that there was haulm yield reduction to the tune of 1.92%, 2.77%, 6.14%, 7.28%, 8.80% and 10.78 % in respective treatments against the control where the plants were kept pest free and haulm yield was 26.13 grams per plant. A similar trend was observed in pod yield too having per cent reduction in treatments with 2, 4, 8, 12, 16 and 20 thrips per twig observed to be 2.49, 3.95, 7.31, 9.73, 15.59 and 17.26 respectively against control having yield of 19.85 gram/ plant. The ETL study found that the ETL for C. indicus in groundnut is 6 (six) thrips per plant.

Key words : Thrips, Groundnut, Saurashtra, Yield loss, EIL.

Introduction

Groundnut, India's major oil seed crop, plays a major role in bridging the country's vegetable oil deficit. Groundnuts in India are available throughout the year due to a two-crop cycle harvested in March and October. More than a hundred species of insects are known to attack the groundnut crop and around 12 species are of economic importance (Wighatman and Amin, 1988).

Several species of thrips are found in groundnut crop. Smith and Barfield (1982) reported 19 species of thrips that feed on groundnut crop in different countries. In India *Scirtothrips dorsalis* Hood, *Frankliniella schultzei* Trybom, *Thrips palmi* Karny, *Megalurothrips usitatus* Bagnall and *Caliothrips indicus* Bagnall are the important thrips species attacking groundnut crop, the former three species were dominant in southern parts of India, while the latter two predominantly occurring in western India (Nandagopal and Vasantha, 1991; Ranga Rao and Wightman, 1993).

All the species of thrips are polyphagous occurring in almost all the groundnut-growing countries in Asia and causing extensive damage to the crop. Although many earlier workers have worked out yield losses, summer groundnut have not been projecting any such studies to evaluate yield losses due to thrips in summer-grown groundnut. Besides causing direct damage to the crop, thrips are known to cause more indirect damage by acting as vectors of viral diseases *viz*., groundnut Bud Necrosis Virus, (Reddy and Wightman, 1988), Yellow Spot Virus and Stem Necrosis Virus (Prasad Rao *et al*, 2003). Hence it becomes inevitable to check the diversity of this pest group in major groundnut-growing areas of Saurashtra to assess the potential of virus outbreaks due to migration of varieties and planting materials in future.

Materials and Methods

The experiment was carried out during the summer of 2022 on groundnut variety GJG-31 at Entomological Farm, College of Agriculture, Junagadh Agricultural University, Junagadh to determine the yield loss due to *Caliothrips indicus* incidence at variable population and estimate EIL for its.

Estimation of yield loss was carried out in small plots with five plants per treatment replicated 4 times. The thrips collected from the infested field were reared and released artificially to the groundnut plants raised on small beds at different numbers *i.e.*, 2, 4, 8, 12, 16 and 20 thrips per twig. The release was made at four leaf stages of plants each replication post-release was enclosed with a muslin cloth bag to avoid the escape of thrips; an unreleased check was maintained to compare the yield.

The data thus obtained from each replication was averaged out to convert it into a per plant basis.

Observations on per cent leaf damage per plant, pod yield per plant and haulm yield per plant were recorded at harvest.

Estimation of economic injury level

Based on the level of infestation, yield per plant, cost of insecticide as standard recommendation, the average market price of groundnut pod per quintal, the economic injury level (EIL) was computed by utilizing the Procedure of Stone and Pedigo (1972) and modified by Ogunlana and Pedigo (1974). Economic injury level (EIL) was computed with the help of the following formula adopted by Stone and Pedigo (1972) for green clover worm.

$$\text{Economic Injury Level} = \frac{\text{Grain threshold}}{\text{Yield reduction/thrips}} \quad (1)$$

Where,

$$\text{Grain threshold} = \frac{\text{Cost of pest control}}{\text{Market price of groundnut pod } (\text{Rs/q})} \quad (2)$$

Yield reduction /thrips = regression co-efficient (b)

$$b = \frac{S\ XY - S\ X\ S\ Y/N}{S\ X2 - (SX)2/N} \quad (3)$$

Where,

N is the total number of observations

X is the total number of treatments

Y is the reduction in pod yield

Results and Discussion

Yield loss estimation

The highest haulm yield of 26.13 grams per plant was recorded in the control treatment (Table 1) (thrips were not released), significantly different from the yield obtained in the rest of the treatments. Plants receiving 2 thrips per twig had yield (25.64 g/plant). The rest of the treatments were significantly different from these treatments. Next superior yield was obtained in treatment with 4 thrips per twig (25.43 g/plant). Following it was the treatment with 8 thrips per twig (24.63 g/plant), which was at par with haulm yield recorded in plants receiving 12 thrips per twig (24.36 g/plant). Following it was the haulm yield in plants receiving 16 thrips per twig (24.03 g/plant), which was at par with the lowest haulm yield recorded in plants receiving 20 thrips per twig (23.60 g/ plant). The per cent reduction in treatments with 2, 4, 8, 12, 16 and 20 thrips per twig were observed to be 1.92%, 2.77%, 6.14%, 7.28%, 8.80% and 10.78%, respectively.

For the pod yield for the treatment with no thrips release the highest pod yield was observed to be 19.85 gram/ plant which was at par with the yield obtained in treatment plants receiving 2 thrips per twig (19.11 g/plant) this in turn was at par with the yield was obtained in treatment with 4 thrips per twig (18.85 g/plant). Following it was the treatment with 8 per twig (18.25 g/plant), which was at par with haulm yield recorded in plants receiving 12 thrips per twig (17.85 g/plant) which in turn was at par with pod yield in plants receiving 16 thrips per twig (17.09 g/plant). The lowest haulm yield was recorded in plants receiving 20 thrips per twig (16.71 g/plant) which was found at par with an earlier yield of 16 thrips per twig. The per cent reduction in treatments with 2, 4, 8, 12, 16 and 20 thrips per twig were observed to be 2.49, 3.95, 7.31, 9.73, 15.59 and 17.26 respectively.

Highest haulm yield reduction was recorded in treatment plants with 20 thrips per twig (2.54 g/plant), which was statistically at par with treatment having plants with 16 thrips per twig (2.10 g/plant). It was at par with the treatment having plants with 12 (1.77 g/plant) and 8 (1.51 g/plant) thrips per twig were at par with each other and together differed significantly from the rest of the treatments. Following it was the treatment with plants having 4 thrips per twig (0.70 g/plant). The lowest haulm yield reduction was observed in the treatment plants with 2 thrips per twig (0.49 g per plant).

A more or less similar trend was observed in pod reduction lowest reduction was recorded in treatment with 2 thrips per twig (0.47g/ plant) and was at par with 4 (0.74 g/plant) thrips per twig which in turn was at par with 8 (1.33 g/plant) thrips per twig and together differed significantly with all the other treatments. While, treatment with 12 &16 thrips per twig recorded 1.73 and 2.49g/ plant pod reduction over control and were on par with each other. The highest percentage of pod yield loss was observed in treatment plants released with 20 thrips per twig (2.88g/ plant), which was at par with a reduction of 16 thrips per twig which recorded 2.49g/ plant pod reduction (Table 1).

Foliar damage was significantly higher with an increase in the number of thrips per twig and was following the trend of 20 thrips (18.62%) > 16 thrips (17.57%) >12 thrips (14.63%) > 8 thrips (12.41%) > 4 thrips (9.68%) > 2 thrips (7.72%). All the treatments were significantly different from each other.

Ghewande (1987) documented a yield reduction ranging from 17 to 40 per cent in groundnut due to thrips in *kharif* groundnut in Uttar Pradesh. While Singh and Sachan (1992) reported yield loss due to sucking pest at

Table 1 : Yield loss due to thrips in summer groundnut.

No.	Thrips per twig	Haulm yield (g/plant)	Reduction in haulm yield (g/plant)	Per cent reduction (%)	Pod yield (g/ plant)	Reduction in pod yield (g/plant)	Per cent reduction (%)	Foliage damage (%)
1	**20**	23.60[d]	2.54[c]	10.78[d]	16.71[g]	2.88[f]	17.26[f]	18.62[f]
2	**16**	24.03[cd]	2.10[c]	8.80[c]	17.09[f]	2.49[e]	14.59[d]	17.57[e]
3	**12**	24.36[c]	1.77[b]	7.28[bc]	17.85[e]	1.73[d]	9.73[c]	14.63[d]
4	**8**	24.63[c]	1.51[b]	6.14[b]	18.25[d]	1.33[c]	7.31[b]	12.41[c]
5	**4**	25.43[b]	0.70[a]	2.77[a]	18.85[c]	0.74[b]	3.95[a]	09.68[b]
6	**2**	25.64[ab]	0.49[a]	1.92[a]	19.11[b]	0.47[a]	2.49[a]	07.72[a]
7	**0**	26.13[a]	-	-	19.58[a]	-	-	00.00
S.Em. ±		0.17	0.19	0.18	0.79	0.19	0.21	1.22
CD at 5 %		0.50	0.56	0.53	2.39	0.58	0.62	3.68
CV %		1.34	1.53	23.36	25.25	2.13	25.54	26.52

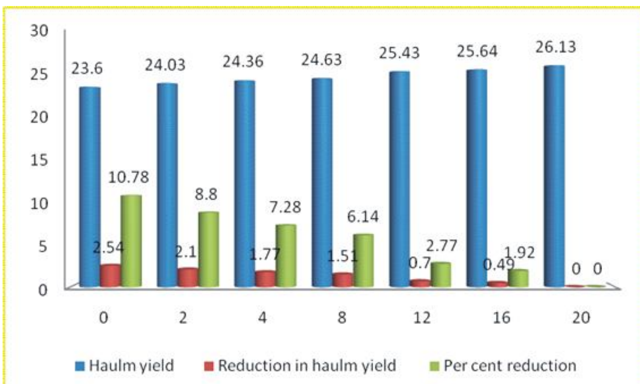

Fig. 1 : Haulm yield loss due to thrips in summer groundnut.

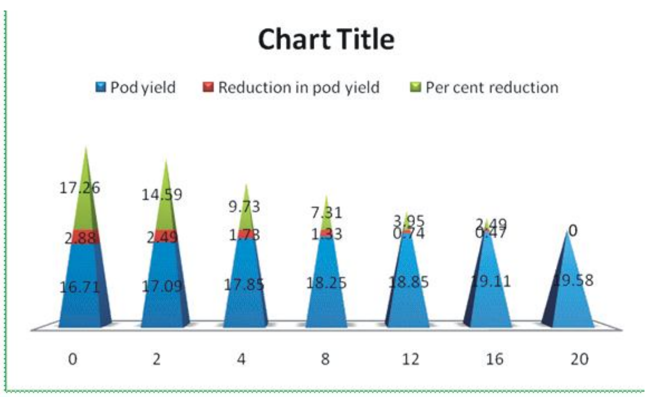

Fig. 2 : Pod yield loss due to thrips in summer groundnut.

31.4% in 1988 and 23% in 1989 and emphasized effective crop protection measures during vegetative stages and found it crucial in minimizing yield losses. Shetgar *et al*. (1994) reported losses in groundnut in Maharashtra due to thrips in *kahrif* season varying from 23.9% to 31.7%. Yield losses of up to 30% in peanuts due to thrips injury have been documented in Virginia (Herbert *et al*., 2007). Baskaran and Rajavel (2013) highlighted avoidable yield losses in groundnut due to sucking pests (15.7%) whereas,

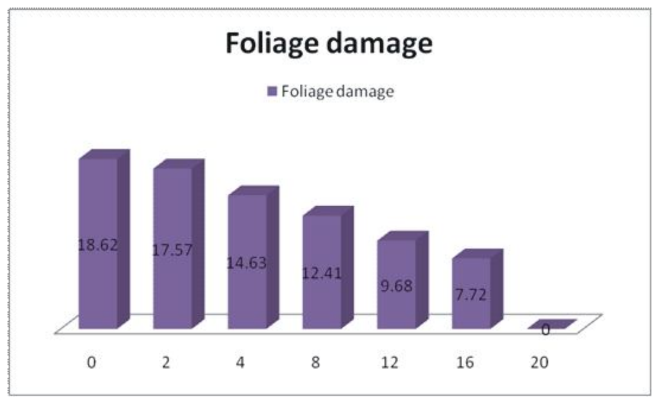

Fig. 3 : Foliage damage due to thrips in summer groundnut.

(Paul and Baba, 2017) reported a yield loss of 37% in groundnut due to foliar insects in Ghana. Gadad *et al*. (2014) found that the highest percentage of pod yield reduction occurred in plants treated with 20 thrips per terminal bud, resulting in a 7.33% loss. All these studies point towards the losses incurred by Groundnut due to thrips vary from season to season and region to region and are close to the present findings.

Economic injury level

Data obtained from the yield loss estimation experiment (Table 1) was used for the estimation of economic injury level. The calculated regression co-efficient was 0.08. Two sprays of thiamethoxam + lambda-cyhalothrin were required to keep the crop free from the pest and its application cost was worked out to be Rs 2998 / ha (cost of insecticide + labour charge). The cost of the insecticide was Rs.1998 for two sprays and the labour charge was Rs. 500 per head. The total labour to spray for 2 sprays is 1000. Considering the market price of the groundnut pod as Rs.6783 /q and the calculated gain threshold (GT) is 0.442. Therefore, as per the formula economic injury level for groundnut thrips was 5.5 (= 6 thrips / terminal bud). Nabirye *et al.* (2003) conducted studies in Eastern Uganda to evaluate the impact of legume flower thrips (*M. sjostedti*) injury on cowpea grain yields and to establish economic injury levels (EILs) for thrips on cowpea and found it to be 7 thrips per plant. While Gadad *et al*. (2014) reported the ETL of groundnut thrips to be 8 thrips/plant in Karnataka. These results are in close association with the present findings.

Conclusion

With the increase in the thrips population, there was a drastic reduction in the yield of groundnut. Thrips at an intensity of 20 thrips per plant could result in tremendous loss. The span varies up to 11 per cent loss in haulm yield and as good as 17 per cent loss in pod yield. For the Saurashtra region as this crop is of prime importance, the ETL determined for application of insecticides is also important. It was determined that chemical interventions should be given to the crop at 6 thrips per plant as beyond that the crop could suffer economic loss.

Acknowledgement

The authors acknowledge the help from the Department of Agronomy for providing facilities for experimenting.

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