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Survey on major insect pests of groundnut in Southern Telangana zone

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Abstract

Survey on major insect pests of groundnut was carried out in Southern Telangana Zone comprising of the three districts viz., Mahabubnagar, Nagarkurnool and Wanaparthy at three stages of crop growth period viz., vegetative, pod formation and maturity stages for identification of pest scenario. In all the three districts the mean percent damage per plant (14.50-18.85%) and mean no. of larva per plant (0.90-1.05) of tobacco caterpillar were comparatively higher at pod formation stage while percent infested plants were more during maturity stage (38.60-40.30%). With respect to gram caterpillar, the mean percent damage per plant (2.90-3.60%) and mean percent infested plants (12.80-18.50%) was higher at maturity stage while in case of the leaf miner mean percent mining per plant (1.75-3.10%) was more at vegetative stage while mean percent infested plants (7.80-9.50%) was greater at pod formation stage. The mean no. of sucking pests viz., leafhoppers and thrips were recorded to be higher during pod formation stage (2.37-2.47 and 3.92-4.02, respectively).

Keywords: survey, insect pests, groundnut, Telangana, Mahabubnagar, Nagarkurnool, Wanaparthy

Introduction

The groundnut (*Arachis hypogaeae* L.) is an important leguminous food crop in India and is known as peanut, earthnut, monkey nut, and goobers^[1]. It has originated in South America, where the genus *Arachis* is widely distributed. It is cultivated mostly in the semi-arid tropical and sub-tropical regions^[2]. Known as poor man's almond, groundnut is a crop of global economic significance due to its use as a source of diverse food products. It contains about 35-54 percent oil, 6-24 percent carbohydrates and 21-36 percent proteins and forms a high-energy source^[3]. The area, production and productivity of groundnut in Telangana in 2019-20 was about 1.11 lakh ha, 2.65 lakh tonnes and 2391 kg/ha, respectively^[4] making it one of the major crops of the state. It is widely grown in Mahabubnagar, Warangal, Nalgonda and Karimnagar Districts^[5].

Low productivity in groundnut is attributed to several constraints. Over one hundred insect species have been reported on groundnut in India^[6]. Studies revealed that 15-20 percent of the total oilseed production is lost directly or indirectly by the attack of insect and mite pests every year^[7]. The relative economic importance of pests (insect pests, diseases, weeds, birds, nematodes and rodents etc.) varies from one region to other region depending upon the local cultivation practices, the environment and the cropping patterns. The pests which cause significant damage at one place are considered as minor pests in other places. Some pests are widely distributed and cause economic reduction while others are restricted in distribution and are confined to few areas. Moreover, the pest scenario of the crops is changing year after year and more and more new pests are being added to the existing list.

The area, production and productivity of groundnut in Mahabubnagar and Nagarkurnool districts of Telangana state is increasing every year accounting for 60% of groundnut production in Telangana. The soil and climatic conditions existing in these areas are mainly suited for cultivation of groundnut. Though the area and production of groundnut in these areas are increasing every year the prevalence of the insect pests in these districts is not documented properly. Hence, survey for the insect pests of the major groundnut growing districts of Telangana state would help in formulating the suitable management practices and timely management of the insect pests.

Material and Methods

The survey on insect pests of groundnut was carried out in major groundnut growing districts of Southern Telangana zone viz., Mahabubnagar, Nagarkurnool and Wanaparthy districts at three stages of crop growth period viz., vegetative, pod formation and maturity stages during *rabi*, 2019-20.

From each district two mandals were selected and from each mandal ten farmers' field were selected. The details of locations for field study are represented in Table 1. The farmers' fields were surveyed following roving survey method and pest status was evaluated by taking observations on ten plants from each field and expressed on per plant basis at vegetative, pod formation and maturity stages.

For recording observations, the methodology as given in NCIPM manual for groundnut surveillance [8] was followed. In case of sucking pests, population counts on leafhoppers was taken by counting the number of leafhoppers present on top three open leaves of ten plants and the mean number of leafhoppers per plant was worked out.

Population counts on thrips was carried out by counting the number of thrips present in top three open leaves on each of the ten randomly selected plants and mean number per plant was worked out.

In case of defoliators, observations on larval population and percent damaged leaves was recorded on ten randomly plants and the mean percent damage and mean number of larvae per plant, respectively was worked out.

Similarly, in case of leaf miner number the number of webs or mines per plant on ten randomly selected plants was recorded and the mean percent leaf damage was worked out.

To evaluate the percent infested plants with insect pests in each field, a spot was selected for computing the incidence of insect pests per field. Percent infestation was calculated by using the formula. Simple statistical tools like percentages and means were used to analyze the data.

$$\text{Percent infested plants} = \frac{\text{Number of plants infested in each spot}}{\text{Total number of plants in each spot}} \times 100$$

Table 1: Locations selected for survey of insect pests on groundnut at Mahabubnagar, Nagarkurnool and Wanaparthy districts.

S. No	District	Mandal	Village	No. of fields
1.	Mahabubnagar	Midjil	Wadiyal	5
			Munnanoor	5
		Bhoothpur	Tadparti	3
			Lambadkuntatandra	3
			Kothur	4
2.	Nagarkurnool	Nagarkurnool	Mantati	5
			Gaggalapally	5
		Bijinapally	Bijinapally	5
			Mahadevpet	5
			Mangampally	5
3.	Wanaparthy	Peddamandadi	Gatlakhanapoortandra	5
			Solipur	5
		Ghanpoor	Ghanpoor	5

Simple statistical tools like percentages and means were used to analyze the data

Results and Discussion

During the conduct of survey, a questionnaire on the variety being cultivated, its acreage, type of fertilizers and pesticides applied, intercropping if any, method of irrigation etc. was asked to the farmers (60 No's) in general. From the survey, it was found that the most common cultivar grown by farmers was K-6 (80%) followed by TAG-24 (20%). About 70 percent of the groundnut farmers had field area less than 5 acres. Nitrogen was mostly applied in the form DAP. In about 75 per cent fields, fungicides were applied during vegetative stage due to incidence of stem rot. In about 20 per cent fields cowpea was grown as intercrop with groundnut. The insecticide spraying was taken only once in about 65 per cent field and twice in 35 per cent fields. The main method of irrigation was sprinkler irrigation by about 80 per cent. Gypsum was applied in the fields in only 30 per cent of the fields surveyed.

Survey in Mahabubnagar district

In Mahabubnagar district, Midjil and Bhoothpur mandals were selected for survey under groundnut crop and the data is presented in table 2. The overall mean percent leaf damage, larva per plant and percent infestation of *S. litura* at vegetative, pod formation and maturity stages of the crop in the mandals surveyed was (7.50, 0.24 and 23.50 percent, respectively; 14.50, 0.90 and 37.60 percent, respectively; 13.85, 0.35 and 38.60 percent, respectively). With respect to

H. armigera, the overall mean per cent damage per plant and percent infestation in the mandals surveyed was (1.70 and 6.70 percent, respectively; 1.95 and 12.20 per cent, respectively; 2.90 and 12.80 percent, respectively).

The overall mean percent mining per plant and percent infestation due to miner in the mandals surveyed at vegetative and pod formation of the crop was (2.60 and 7.00 percent, respectively; 1.50 and 7.80 percent, respectively). During the maturity stages, there was no incidence of this pest.

In the mandals surveyed, the overall mean incidence of leafhoppers and thrips per top three open leaves per plant at vegetative, pod formation and maturity stages were (1.19, 2.37 and 0.87, respectively; 1.28, 3.92 and 1.00, respectively)

Survey in Nagarkurnool district

In Nagarkurnool district, Bijinapally and Nagarkurnool mandals were selected for survey under groundnut crop and the data is presented in table 3. The overall mean percent leaf damage, larva per plant and percent infestation of *S. litura* at vegetative, pod formation and maturity stages of the crop in the mandals surveyed was (9.80, 0.34, 25.10, respectively; 18.85, 1.03 and 38.50, respectively and 16.90, 0.38 and 40.30, respectively). With respect to *H. armigera*, the overall mean per cent leaf damage per plant and percent infestation in the mandals surveyed was (3.40 and 12.90 percent, respectively; 2.85 and 17.80 percent, respectively; 3.05 and 18.50 percent, respectively).

The overall mean percent mining per plant and percent infestation due to miner in the mandals surveyed at vegetative and pod formation of the crop was (1.77 and 7.00 percent, respectively; 0.55 and 9.10 percent, respectively). During the maturity stages, there was no incidence of this pest.

In the mandals surveyed, the overall mean incidence of leafhoppers and thrips per top three open leaves per plant at vegetative, pod formation and maturity stages were (1.77, 2.46 and 0.94, respectively; 1.99, 4.02 and 1.08, respectively).

Survey in Wanaparthy district

In Wanaparthy district, Peddamandadi and Ghanpoor mandals were selected for survey under groundnut crop and the data is presented in table 3. The overall mean percent leaf damage, larva per plant and percent infestation of *S. litura* at vegetative, pod formation and maturity stages of the crop in the mandals surveyed was (7.00, 0.27 and 23.30 percent, respectively; 18.75, 1.05 and 38.30 percent, respectively; 17.75, 0.41 and 39.50 per cent, respectively). With respect to *H. armigera*, the overall mean percent leaf damage per plant and percent infestation in the mandals surveyed was (1.30 and 6.30 percent, respectively; 3.25 and 13.20 percent, respectively; 3.60 and 15.50 percent, respectively).

The overall mean percent mining per plant and percent infestation due to miner in the mandals surveyed at vegetative and pod formation of the crop was (3.10 and 8.80 percent, respectively; 2.95 and 9.50 percent, respectively). During the maturity stages, there was no incidence of this pest.

In the mandals surveyed, the overall mean incidence of leafhoppers and thrips per top three open leaves per plant at vegetative, pod formation and maturity stages were (1.35, 2.47 and 0.67, respectively; 1.89, 3.95 and 0.88, respectively). The results of the survey indicate that the most common insects noticed in groundnut in all the three districts were tobacco caterpillar (Plate 1), gram caterpillar (Plate 2), leaf miner (Plate 3), leaf hoppers and thrips (Plate 4). Similar to our results Keerati-Kasikorn *et al.* [9] reported that the most common insects observed during survey for insect pests in groundnut were thrips (*S. dorsalis*), leaf hoppers (*Empoasca* sp.), cutworms (*S. litura*) and leaf miners. Biswas [10] reported that most of the major and minor pests had infested during the vegetative to pre-maturity stages (45-95 DAS) and the maximum infestation occurred during pod formation and pod filling stages (50-80 DAS) of the groundnut crop.

Apart from these insect pests that were commonly observed in all the three districts, a very low incidence of fall armyworm (FAW), *Spodoptera frugiperda* (J.E. Smith) was observed in Wadiyal village of Midjil mandal and Bijinapally village of Bijinapally mandal during vegetative stage of the crop. The reason for the incidence of FAW was due to migration from surrounding maize fields. Likewise, low incidence of semiloopers and hairy caterpillars at vegetative and pod formation stages of all the three districts (Plate 5).

Also, it is clearly evident that in all the three districts the mean percent damage per plant (14.50-18.85%) and mean no. of larva per plant (0.90-1.05) of tobacco caterpillar were

comparatively higher at pod formation stage while per cent infested plants were more during maturity stage (38.60-40.30%) (Table 5). Similar to our results, 21 percent damage due to *Spodoptera* was recorded during pod formation stage at Jagtial during the year 2004 [11] while in 2005 [12] it ranged from 10 to 45 percent. At Dharwad 20 to 30 percent damage was observed [13] while at Vriddhachalam the percent defoliation by larvae of *Spodoptera* percent at Vriddhachalam while it was 45 to 51 percent at Jagtial during vegetative stage [14]. Survey at Dharwad indicated that *Spodoptera* was noticed with minimum of 3.20 percent leaf damage and reached peak of 25.50 percent leaf damage [15].

With respect to gram caterpillar, the mean percent damage per plant (2.90-3.60%) and mean percent infested plants (12.80-18.50%) was higher at maturity stage while in case of the leaf miner mean percent mining per plant (1.75-3.10%) was more at vegetative stage while mean percent infested plants (7.80-9.50%) was greater at pod formation stage (Table 5). Similarly, in the coastal region of Karnataka 10 percent damage by leaf miner was noticed during pod formation stage [16]. On the contrary, Muthiah and Kareem [17] found that the occurrence of the pest was maximum in Dharmapuri district with mean percent leaflet damage of 90.10 ± 5.00 . The mean larvae per plant was 11.30 ± 2.70 . Maximum of 100 percent leaflet damage and 17.00 larvae per plant was observed in Athanoor village of Indoor block in Dharmapuri district. This was followed by Thiruvannamalai district which recorded a mean leaflet damage of 64.50 ± 8.00 and mean larvae per plant of 3.80 ± 1.50 . Our results are also on contrary to leaf miner incidence at Vriddachalam where percent leaflet damage ranged from 7 to 49 [18].

The mean no. of sucking pests viz., leafhoppers and thrips were recorded to be higher during pod formation stage (2.37-2.47 and 3.92-4.02, respectively) (Table 5). The results are in lieu with findings of Nigude *et al.* [19] who reported that the population of jassids and thrips reached peak *i.e.* 3.06 jassids per three leaves and 4.20 thrips per three leaves respectively, at Kolhapur. Similar results were obtained by Jayanthi *et al.* [20] wherein maximum incidence of groundnut thrips occurred from vegetative stage to flowering stage of the crop. Survey conducted at Raichur indicated maximum of 2.4 thrips per terminal bud during vegetative stage of the groundnut crop in *rabi* season [21]. Also, Veershetty [22] revealed that the activity of thrips was higher during initial stage of the groundnut crop growth and recorded population of 3.00 and 2.30 thrips per terminal leaf bud during second and first fortnight of December, respectively.

Conclusion

The present information on the status and diversity of the insect pests of groundnut crop ecosystems in Southern Telangana zone will help formulate the priority research strategies by researchers. The knowledge on insect pests scenario in groundnut crops ecosystems will also help the extension workers and farmers in deciding the judicious use of insecticides.

Table 2: Roving survey for insect pests of groundnut at Mahabubnagar district during *rabi*, 2019-20

S. No	Stage of the crop	Mandal	Tobacco caterpillar			Gram caterpillar		Leaf miner		Leaf hopper	Thrips
			Damage/ plant (%)	Larva/ plant	Infested plants (%)	Damage/ plant (%)	Infested plants (%)	Mining/ plant (%)	Infested plants (%)	Hopper/3 open leaves	Thrips/ top 3 open leaves
1	Vegetative stage	Midjil	7.20	0.23	23.80	1.90	5.60	2.50	7.20	1.22	1.21
		Boothpur	7.80	0.25	23.20	1.50	7.80	2.70	6.80	1.16	1.34
		Mean	7.50	0.24	23.50	1.70	6.70	2.60	7.00	1.19	1.28
2	Pod formation stage	Midjil	16.50	0.98	38.80	2.10	12.80	1.40	7.40	2.45	3.88
		Boothpur	12.50	0.81	36.40	1.80	11.60	1.60	8.20	2.29	3.96
		Mean	14.50	0.90	37.60	1.95	12.20	1.50	7.80	2.37	3.92
3	Maturity stage	Midjil	13.70	0.33	39.80	2.60	13.20	-	-	0.91	1.15
		Boothpur	14.00	0.36	37.40	3.20	12.40	-	-	0.82	0.85
		Mean	13.85	0.35	38.60	2.90	12.80	-	-	0.87	1.00

Table 3: Roving survey for insect pests of groundnut at Nagarkurnool district during *rabi*, 2019-20

S. No	Stage of the crop	Mandal	Tobacco caterpillar			Gram caterpillar		Leaf miner		Leaf hopper	Thrips
			Damage/ plant (%)	Larva/ plant	Infested plants (%)	Damage/ plant (%)	Infested plants (%)	Mining/ plant (%)	Infested plants (%)	Hopper/3 open leaves	Thrips/ top 3 open leaves
1	Vegetative stage	Bijinapalle	10.40	0.32	24.80	3.31	12.60	1.60	7.20	1.97	1.85
		Nagarkurnool	9.20	0.35	25.40	3.50	13.20	1.90	6.80	1.56	2.12
		Mean	9.80	0.34	25.10	3.40	12.90	1.75	7.00	1.77	1.99
2	Pod formation stage	Bijinapalle	18.00	1.08	37.40	2.60	17.20	0.80	9.40	2.49	4.12
		Nagarkurnool	19.70	0.98	39.60	3.10	18.40	0.30	8.80	2.42	3.91
		Mean	18.85	1.03	38.50	2.85	17.80	0.55	9.10	2.46	4.02
3	Maturity stage	Bijinapalle	16.20	0.37	39.20	2.20	17.80	-	-	0.86	1.01
		Nagarkurnool	17.60	0.39	41.40	3.90	19.20	-	-	1.01	1.14
		Mean	16.90	0.38	40.30	3.05	18.50	-	-	0.94	1.08

Table 4: Roving survey for insect pests of groundnut at Wanaparthy district during *rabi*, 2019-20

S. No	Stage of the crop	Mandal	Tobacco caterpillar			Gram caterpillar		Leaf miner		Leaf hopper	Thrips
			Damage/ plant (%)	Larva/ plant	Infested plants (%)	Damage/ plant (%)	Infested plants (%)	Mining/ plant (%)	Infested plants (%)	Hopper/3 open leaves	Thrips/ top 3 open leaves
1	Vegetative stage	Ghanpoor	6.70	0.26	22.40	0.70	4.40	2.00	7.80	1.20	1.84
		Peddmandadi	7.30	0.28	24.20	1.90	8.20	4.20	9.80	1.50	1.94
		Mean	7.00	0.27	23.30	1.30	6.30	3.10	8.80	1.35	1.89
2	Pod formation stage	Ghanpoor	16.00	0.99	37.20	3.20	12.80	2.40	8.60	2.51	3.82
		Peddmandadi	21.50	1.10	39.40	3.30	13.60	3.50	10.40	2.43	4.08
		Mean	18.75	1.05	38.30	3.25	13.20	2.95	9.50	2.47	3.95
3	Maturity stage	Ghanpoor	16.50	0.37	38.80	3.10	15.20	-	-	0.63	0.83
		Peddmandadi	19.00	0.45	40.20	4.10	15.80	-	-	0.71	0.93
		Mean	17.75	0.41	39.50	3.60	15.50	-	-	0.67	0.88

Table 5: Incidence of insect pests at various crop growth stages in three districts

S. No	District	Stage	Tobacco caterpillar			Gram caterpillar		Leaf miner		Leaf hopper	Thrips
			Damage/ plant (%)	Larva/ plant	Infested plants (%)	Damage/ plant (%)	Infested plants (%)	Mining/ plant (%)	Infested plants (%)	Hopper/3 open leaves	Thrips/ top 3 open leaves
1	Vegetative stage	Mahabubnagar	7.50	0.24	23.50	1.70	6.70	2.60	7.00	1.19	1.28
		Nagarkurnool	9.80	0.34	25.10	3.40	12.90	1.75	7.00	1.77	1.99
		Wanaparthy	7.00	0.27	23.30	1.30	6.30	3.10	8.80	1.35	1.89
2	Pod formation stage	Mahabubnagar	14.50	0.90	37.60	1.95	12.20	1.50	7.80	2.37	3.92
		Nagarkurnool	18.85	1.03	38.50	2.85	17.80	0.55	9.10	2.46	4.02
		Wanaparthy	18.75	1.05	38.30	3.25	13.20	2.95	9.50	2.47	3.95
3	Maturity stage	Mahabubnagar	13.85	0.35	38.60	2.90	12.80	-	-	0.87	1.00
		Nagarkurnool	16.90	0.38	40.30	3.05	18.50	-	-	0.94	1.08
		Wanaparthy	17.75	0.41	39.50	3.60	15.50	-	-	0.67	0.88



Plate 1: Incidence and damage of *S. litura* observed during survey



Plate 3: Damage of *A. modicella* observed during survey



(a) Larva

(b) Damage to leaflets

Plate 2: Incidence and damage of *H. armigera* observed during survey



(a) Leaf hopper

(b) Thrips damage

Plate 4: Incidence of sucking pests observed during survey



(a) *S. frugiperda*

(b) Lymantriid caterpillar



(c) Mesta hairy caterpillar

(d) Semilooper

Plate 5: Incidence of minor pests observed during survey

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