Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2020; 9(1): 536-540
Received: 13-11-2019
Accepted: 15-12-2019

Y Peeru Saheb
Department of Entomology, S. V. Agricultural College, Tirupati, Andhra Pradesh, India

KV Hari Prasad
Department of Entomology, S. V. Agricultural College, Tirupati, Andhra Pradesh, India

K Swarajya Lakshmi
Department of Entomology, Agricultural College, Mahanandi, Acharya N.G. Ranga Agricultural University, Guntur, Andhra Pradesh, India

J Sailaja Rani
Department of Plant Pathology, Agricultural College, Mahanandi, Acharya N.G. Ranga Agricultural University, Guntur, Andhra Pradesh, India

Corresponding Author:
Y Peeru Saheb
Department of Entomology, S.V. Agricultural College, Tirupati, Andhra Pradesh, India

Screening of groundnut genotypes against groundnut leaf miner, *Aproaerema modicella* (Deventer)

Y Peeru Saheb, KV Hari Prasad, K Swarajya Lakshmi and J Sailaja Rani

DOI: https://doi.org/10.22271/phyto.2020.v9.i1i.10485

Abstract
Groundnut leaf miner is an oligophagous pest that feeds on leguminous host plants and also on groundnut both in rainy and post rainy season in India and the yield losses can reach up to 76 per cent (Anonymous, 1986) [2]. An experiment was conducted to study the incidence of this pest by screening different groundnut genotypes. Based on the incidence of this pest genotypes TCGS-894 and TCGS-1097 were ranked as highly resistant, ASK-2013-1 was ranked as moderately resistant and Narayani, K-1563, K-4 and Dharani were ranked as susceptible towards their reaction to groundnut leaf miner.

Keywords: Genotypes, groundnut leaf miner, resistant and susceptible

Introduction
Among the major pests reported in groundnut, *Aproaerema modicella* Dev., *Helicoverpa armigera* Hubner and *Spodoptera litura* Fabricius are the major defoliators of groundnut. (Sahayaraj and Amalraj 2006) [9]. Development of resistant variety for insect pest is one of the basic input of IPM, which is cost effective and environmentally benign. Continuous efforts by the plant breeders for development of new germplasm with resistance to insect pest and disease is the need of the hour and the role of entomologist to screen these new germplasm line under natural and artificial infestation.

Material and methods
The present investigation on reaction of different genotypes of groundnut, (*Arachis hypogaea* L.) to gelechiidae insect pests were carried out in the field number 144 of S. V. Agricultural College, Farm, Tirupathi, Andhra Pradesh which is situated at an altitude of 182.90 m above mean sea level, 13◦N latitude and 79◦E longitude, during 2014 *kharif* season.

Forty one genotypes of groundnut procured from Agricultural Research Station, Kadiri and Regional Agricultural Research Station, Tirupathi were used in the present investigation.

Genotypes that were procured from Regional Agricultural Research Station, Tirupathi are TCGS-1073, TCGS-1157, TCGS-1156, TCGS-1157 (A), TCGS-1097, TCGS-1186, TCGS-1119, TCGS-894, TCGS-1146, TCGS-341, Tirupathi-4, Tirupathi-3, TCGS-1342, TCGS-1343, TCGS-1345, TCGS-1375, TCGS-1550, Dharani, Narayani, ASK-2013-1, ASK-2013-2, ASK-2013-5.

Genotypes that were procured from Agricultural Research Station, Kadiri are K-1563, K-1662, K-1452, K-1628, K-1660, K-5, K-1454, K-8, K-7 (Bold), K-4, K-1501, K-1609, K-1468, K-9, K-1620, K-1559, K-6, Anantha, Kadiri Harithandra.

The genotypes of groundnut were sown in 2 rows of 4 m length with a spacing of 45 cm between the rows and 15 cm within the row in two replications. A row of popular groundnut genotype, Narayani was planted around the experiment plot as an infester line 10 days before sowing of experimental material of each genotype to favour the buildup of insect pest population.

Ten plants from each row were randomly selected and tagged for observations on groundnut leaf miner. Observations were taken at weekly intervals from 30 DAS to 60 DAS.

From ten tagged plants number of mines (leaf miner) on each plant were counted and recorded. Total number of plants in each genotype and number of plants infested by leaf miner were counted, to calculate per cent infestation (number of larvae) of leaf miner as under.

$$\text{Per cent infestatio n} = \frac{\text{Total number of plants infested by leaf miner in 4 m length}}{\text{Total number of plants in each genotype in 4 m length}} \text{X } 100$$

The per cent values were converted with help of Arc sine values before subjecting them to statistical analysis and the data was analyzed using ANOVA technique and subjected to DMRT (Duncan's Multiple Range Test) with the help of SPSS software (SPSS, 2014)

Based on results from the field experiment, the genotypes were grouped into resistant, moderately resistant and susceptible for their reaction to leaf miner.

Results and discussion

Results of screening various groundnut genotypes for their reaction to leaf miner (first planting)

Per cent infestation of leaf miner (no. of leaf mines) on different genotypes of groundnut (on tagged plants)

Data on per cent leaf miner infestation per plant was taken on different genotypes of groundnut at weekly intervals from 39, 46, 53 and 60 DAS (Days after Sowing) and are presented in Table 1.

At 39 DAS, lowest per cent leaf miner infestation per plant were found in TCGS-894 (3.85 ± 1.02) followed by TCGS-1097 (4.44 ± 1.88), TCGS-1157 (4.50 ± 2.20), KH (5.11 ± 2.80) and TCGS-1186 (5.28 ± 2.21) (on par with each other). Highest per cent leaf miner infestation per plant were found in K-4 (14.61 ± 6.48), followed by K-1563 (14.15 ± 8.92), Narayani (13.99 ± 5.34), TCGS-1343 (13.12 ± 9.69) and K-1628 (12.76 ± 7.41) (on par with each other). The genotypes K-1609 (6.35 ± 3.13), TCGS-1146 (6.42 ± 3.05), K-1468 (6.45 ± 3.36), K-1501 (6.66 ± 2.54) and ASK-2013-2 (6.71 ± 3.55) had per cent leaf miner infestation which were in between lowest and highest per cent leaf miner infestation.

At 46 DAS, lowest per cent leaf miner infestation per plant were found in TCGS-1345 (1.53 ± 0.75), followed by ASK-2013-2 (1.57 ± 1.90), K-1662 (1.71 ± 1.60), TCGS-1375 (1.87 ± 1.07) and K-7 (1.92 ± 0.75) (on par with each other). Highest per cent leaf miner infestation per plant were found in TCGS-1073 (5.46 ± 9.54), followed by TCGS-341 (4.84 ± 10.77), K-1468 (4.77 ± 13.31), TCGS-1119 (4.45 ± 2.80) and K-8 (4.36 ± 5.00) (on par with each other). The genotypes ASK-2013-1 (2.26 ± 1.13), ASK-2013-5 (2.29 ± 0.97), TCGS-1157 (2.37 ± 1.51), K-1559 (2.42 ± 2.14) and K-1609 (2.50 ± 2.06) had per cent leaf miner infestation which were in between lowest and highest per cent incidence of leaf mines.

At 53 DAS, lowest per cent leaf miner infestation per plant were found in K-1454 (0.84 ± 0.46), followed by TCGS-894 (0.89 ± 0.97), K-1452 (0.93 ± 0.60), K-8 (1.01 ± 0.98) and K-5 (1.06 ± 0.73) (on par with each other). Highest per cent leaf miner infestation per plant were found in TCGS-1146 (2.26 ± 1.40), followed by Dharani (TCGS-1043) (2.16 ± 1.58), K-7 (2.01 ± 1.53), K-1559 (1.98 ± 1.36) and TCGS-1375 (1.93 ± 0.97) (on par with each other). The genotypes TCGS-1156 (1.12 ± 1.25), TCGS-1343 (1.13 ± 0.81), ASK-2013-5 (1.14 ± 0.85), K-4 (1.17 ± 0.87) and ASK-2013-1 (1.20 ± 1.09) had per cent leaf miner infestation which were in between lowest and highest per cent leaf miner infestation.

At 60 DAS, lowest per cent leaf miner infestation per plant were found in K-8 (0.70 ± 0.51), followed by ASK-2013-1 (0.76 ± 0.53), TCGS-1345 (0.88 ± 0.93), TCGS-1375 (0.92 ± 0.76) and K-1454 (0.94 ± 0.61) (on par with each other). Highest per cent leaf miner infestation per plant were found in TCGS-341 (3.74 ± 2.02), followed by Dharani (TCGS-1043) (3.10 ± 1.39), K-5 (2.43 ± 1.53) (on par with each other), K-6 (2.29 ± 2.06) and K-9 (2.26 ± 2.54) (significantly different among themselves). The genotypes TCGS-1157(A) (1.11 ± 0.68), K-1452 (1.18 ± 0.76), K-1660 (1.18 ± 0.80), K-1501 (1.19 ± 0.81) and TPT-3 (1.20 ± 0.86) had per cent leaf miner infestation which were in between lowest and highest per cent leaf miner infestation.

At 67 DAS, lowest per cent leaf miner infestation per plant were found in TCGS-1186 (0.64 ± 0.64), followed by TCGS-1343 (0.66 ± 0.50), ASK-2013-2 (0.66 ± 0.49), K-8 (0.66 ± 0.56), and ASK-2013-5 (0.68 ± 0.58) (on par with each other). Highest per cent leaf miner infestation per plant were found in TCGS-341 (2.79 ± 1.77), followed by K-6 (2.56 ± 1.43), Dharani (TCGS-1043) (2.46 ± 1.00), Narayani (1.98 ± 1.36) and K-5 (1.91 ± 1.00) (on par with each other). The genotypes ASK-2013-1 (0.73 ± 0.48) followed by K-1452 (0.76 ± 0.45), K-1501 (0.77 ± 0.49), K-4 (0.77 ± 1.28), and K-1559 (0.86 ± 0.48) had per cent leaf miner infestation which were in between lowest and highest per cent leaf miner infestation.

From the mean data lowest per cent leaf miner infestation per plant was in TCGS-1097 (2.15 ± 0.58), followed by TCGS-894 (2.22 ± 0.68), K-1620 (2.26 ± 0.85), ASK-2013-2 (2.28 ± 0.88) and ASK-2013-5 (2.33 ± 0.52) (on par with each other). Highest per cent leaf miner infestation per plant were found in Narayani (4.83 ± 1.38), followed by TCGS-341, (4.64 ± 2.64), K-4 (4.31 ± 1.50), K-1563(3.90 ± 1.88) and TCGS-1156 (3.79 ± 1.21) (on par with each other). The genotypes K-1662 (2.54 ± 0.89), K-7(BOLD) (2.56 ± 0.64), K-1609 (2.57 ± 0.63), ASK-2013-1 (2.59 ± 1.02) and KH (2.68 ± 0.88) had per cent leaf miner infestation which were in between lowest and highest per cent leaf miner infestation.

Table 1: Per cent incidence of leaf mines on different genotypes of groundnut (on tagged plants)

Genotype	39 DAS	46 DAS	53 DAS	60 DAS	67 DAS	Per cent leaf miner damage mean Observation
ASK-2013-1	$8.01^{defghijk}$ ± 4.65 (16.02)	2.26^{abcde} ± 1.13 (8.28)	1.20^{abc} ± 1.09 (5.26)	0.76^{ab} ± 0.53 (4.46)	0.73^{abcd} ± 0.48 (4.66)	2.59^{abcde} ± 1.02 (9.15)
ASK-2013-2	$6.71^{abcdefgh}$ ± 3.55 (14.45)	1.57^{a} ± 1.90 (5.66)	$1.40^{abcdefg}$ ± 1.22 (5.79)	1.06^{abcde} ± 0.71 (5.60)	0.66^{abc} ± 0.49 (4.223)	2.28^{ab} ± 0.88 (8.52)
ASK-2013-5	6.15^{abcdef} ± 2.15 (14.16)	2.29^{abcdef} ± 0.97 (8.52)	1.14^{abcdef} ± 0.85 (5.43)	1.38^{abcde} ± 1.06 (6.04)	0.68^{abc} ± 0.58 (4.25)	2.33^{abc} ± 0.52 (8.73)
K-4	14.61^{n}± 6.48 (21.94)	3.72^{def} ± 2.35 (10.70)	1.17^{abcdef} ± 0.87 (5.58)	1.26^{abcde} ± 1.18 (5.73)	0.77^{a} ± 1.28 (3.95)	4.31^{klm} ± 1.50 (11.81)
K-5	9.89^{ijkl} ± 4.92 (17.85)	3.01^{bcdef} ± 2.12 (9.52)	1.06^{abcd} ± 0.73 (5.31)	2.43^{gh} ± 1.53 (8.51)	1.91^{fg} ± 1.00 (7.68)	3.66^{jkl} ± 0.78 (10.97)
K-7	6.22^{abcdef} ± 2.98 (14.05)	1.92^{abcd} ± 0.75 (7.81)	2.01^{defg} ± 1.53 (7.7)	1.45^{abcdef} ± 0.91 (6.45)	1.22^{abcdef} ± 0.84 (5.95)	2.56^{abcde} ± 0.64 (9.15)
K-8	$7.22^{bcdefghi}$ ± 4.80 (14.86)	4.36^{def} ± 5.00 (10.22)	1.01^{ab} ± 0.98 (4.72)	0.70^{a} ± 0.51 (4.18)	0.66^{abc} ± 0.56 (4.18)	$2.79^{abcdefg}$ ± 1.23 (9.38)
K-9	10.42^{jklm} ± 3.75	2.87^{bcdef} ± 1.11	$1.50^{abcdefg}$ ± 1.20	2.26^{cdef} ± 2.54	1.69^{def} ± 1.78	3.75^{jkl} ± 1.36

	(18.57)	(9.59)	(6.06)	(6.99)	(6.60)	(11.00)
K-1452	9.41^{ghijkl} ± 3.96 (17.55)	2.61^{bcdef} ± 0.96 (9.15)	0.93^{ab} ± 0.60 (4.89)	1.18^{abcde} ± 0.76 (5.82)	0.76^{abcd} ± 0.45 (4.80)	2.98^{bcdefghij} ± 0.83 (9.86)
K-1454	9.13^{fghijkl} ± 4.58 (17.05)	2.97^{bcde} ± 1.57 (9.67)	0.84^{ab} ± 0.46 (4.90)	0.94^{abc} ± 0.61 (4.92)	0.72^{abcd} ± 0.37 (4.64)	2.92^{abcdefghij} ± 0.94 (9.72)
K-1468	6.45^{abcdefg} ± 3.36 (14.31)	4.77^{bcdef} ± 13.31 (9.35)	1.53^{bcdefg} ± 0.89 (6.68)	1.60^{abcdef} ± 1.31 (6.33)	1.29^{abcdef} ± 1.31 (5.80)	3.13^{abcdefghij} ± 2.54 (9.74)
K-1501	6.66^{bcdefghi} ± 2.54 (14.70)	3.51^{bcdef} ± 3.42 (9.28)	1.60^{bcdefg} ± 1.03 (6.78)	1.19^{abcde} ± 0.81 (5.72)	0.77^{abcd} ± 0.49 (4.75)	2.75^{abcdefgh} ± 0.76 (9.45)
K-1559	7.35^{cdefghij} ± 2.42 (15.50)	2.42^{abcd} ± 2.14 (8.09)	1.98^{cdefg} ± 1.36 (7.44)	1.21^{abcde} ± 0.72 (5.93)	0.86^{abcd} ± 0.48 (5.04)	2.77^{abcdefghi} ± 0.68 (9.50)
K-1563 (VG)	14.15^{mn} ± 8.92 (21.18)	2.17^{abcd} ± 1.04 (8.09)	1.21^{abcdefg} ± 0.67 (5.98)	1.00^{abc} ± 0.94 (4.82)	0.96^{abcd} ± 1.06 (4.96)	3.90^{jkl} ± 1.88 (11.09)
K-1609	6.35^{abcdefg} ± 3.13 (14.25)	2.50^{abcd} ± 2.06 (8.20)	1.33^{abcdefg} ± 0.92 (5.89)	1.38^{abcdef} ± 0.83 (6.32)	1.30^{cdef} ± 0.79 (6.27)	2.57^{abcde} ± 0.63 (9.17)
K-1620	5.40^{abcd} ± 2.77 (13.02)	2.02^{abcd} ± 1.28 (7.74)	1.24^{abcdefg} ± 0.93 (5.76)	1.58^{abcdef} ± 1.44 (6.39)	1.04^{abcd} ± 1.02 (4.96)	2.26^{ab} ± 0.85 (8.51)
K-1628	12.76^{lmn} ± 7.41 (20.27)	2.71^{bcdef} ± 1.09 (9.12)	1.09^{abc} ± 0.89 (5.16)	1.29^{abcdef} ± 0.68 (6.27)	1.00^{abcd} ± 0.62 (5.40)	3.77^{jkl} ± 1.47 (11.01)
K-1660	10.95^{klmn} ± 4.92 (18.90)	2.12^{abcd} ± 0.90 (8.06)	1.52^{abcdefg} ± 1.34 (6.16)	1.18^{abcde} ± 0.80 (5.71)	0.90^{abcd} ± 0.65 (5.04)	3.33^{efghijk} ± 1.04 (10.40)
K-1662	7.46^{cdefghij} ± 3.14 (15.54)	1.71^{ab} ± 1.60 (6.54)	1.29^{abcdefg} ± 0.96 (5.90)	1.35^{abcde} ± 0.92 (6.01)	0.91^{abcd} ± 0.64 (4.94)	2.54^{abcde} ± 0.89 (9.04)
TCGS-341	10.41 ^{jklm} ± 3.93 (18.52)	4.84^{cdef} ± 10.77 (10.17)	1.43^{abcdefg} ± 1.16 (5.79)	3.74^{h} ± 2.02 (10.84)	2.79^{g} ± 1.77 (9.24)	4.64^{lm} ± 2.64 (12.12)
TCGS-894	3.85^{a} ± 1.02 (11.22)	3.50^{def} ± 1.62 (10.51)	0.89 ± 0.97 (4.13)	1.60^{bcdef} ± 1.34 (6.60)	1.29^{abcd} ± 1.89 (5.46)	2.22^{ab} ± 0.68 (8.499)
TCGS-1073	8.20^{efghijk} ± 2.87 (16.48)	5.46^{ef} ± 9.54 (11.52)	1.09^{ab} ± 1.11 (4.97)	1.48^{abcdef} ± 1.01 (6.38)	1.44^{def} ± 0.88 (6.58)	3.54^{fghijk} ± 2.00 (10.59)
TCGS-1097	4.44^{ab} ± 1.88 (11.91)	2.92^{bcdef} ± 2.11 (9.15)	1.08^{abcde} ± 0.68 (5.36)	1.22^{abcde} ± 0.80 (5.84)	1.09^{abcdef} ± 0.62 (5.74)	2.15^{a} ± 0.58 (8.36)
TCGS-1119	7.32^{bcdefghi} ± 4.63 (14.97)	4.45 f ± 2.80 (11.73)	1.67^{bcdef} ± 1.21 (6.75)	1.04^{abcd} ± 0.72 (5.23)	1.35^{abcdef} ± 1.63 (5.96)	3.17^{cdefghij} ± 0.97 (10.14)
TCGS-1146	6.42^{abcdefg} ± 3.05 (14.33)	2.56^{abcdef} ± 2.14 (8.53)	2.26^{g} ± 1.40 (8.11)	1.28^{abcde} ± 0.92 (5.86)	0.86^{abcd} ± 0.61 (4.91)	2.68^{abcdef} ± 0.88 (9.31)
TCGS-1156	12.08^{cdefghij} ±5.02 (19.87)	3.29^{def} ± 1.49 (10.22)	1.12^{ab} ± 1.25 (4.77)	1.57^{abcde} ± 1.34 (6.44)	0.89^{abcd} ± 1.21 (4.58)	3.79^{jkl} ± 1.21 (11.10)
TCGS-1157	4.50^{ab} ± 2.20 (11.93)	2.37^{abcdef} ± 1.51 (8.44)	1.46^{abcdefg} ± 0.99 (6.37)	1.96^{def} ± 1.45 (7.43)	1.62^{def} ± 1.41 (6.57)	2.38^{abcd} ± 0.65 (8.80)
TCGS-1157(A)	11.22^{klmn} ± 4.83 (19.19)	3.23^{bcdef} ± 1.80 (9.855)	1.57^{bcdefg} ± 1.02 (6.62)	1.11^{abcd} ± 0.68 (5.58)	0.87^{abcd} ± 1.09 (4.52)	3.60^{hijkl} ± 1.19 (10.81)
TCGS-1186	5.28^{abcd} ± 2.21 (13.02)	2.54^{abcde} ± 2.33 (8.25)	1.45^{bcdefg} ± 0.67 (6.73)	1.72^{abcde} ± 3.55 (6.1)	0.64^{a} ± 0.64 (4.02)	2.33^{ab} ± 0.94 (8.64)
TCGS-1342	7.45^{cdefghij} ±3.15 (15.59)	2.15^{abcd} ± 1.21 (8.17)	1.21^{abcdef} ± 0.94 (5.68)	1.30^{abcdef} ± 1.02 (6.18)	1.66^{bcdef} ± 2.17 (6.22)	2.75^{abcdefg} ± 1.10 (9.39)
TCGS-1343	13.12^{lmn} ± 9.69 (19.91)	2.55^{abcdef} ± 1.10 (8.83)	1.13^{abcdef} ± 0.81 (5.52)	1.10^{abcde} ± 0.62 (5.78)	0.66^{ab} ± 0.50 (4.13)	3.71^{ghijkl} ± 1.87 (10.79)
TCGS-1345	8.81^{efghijk} ± 5.03 (16.63)	1.53^{abc} ± 0.75 (6.8)	1.49^{abcdefg} ± 1.67 (6.01)	0.88^{abc} ± 0.93 (4.64)	0.73^{abc} ± 0.62 (4.30)	2.69^{abcdef} ± 1.10 (9.27)
TCGS-1375	5.95^{abcde} ± 3.25 (13.71)	1.87^{abcd} ± 1.07 (7.56)	1.93^{efg} ± 0.97 (7.76)	0.92^{abc} ± 0.76 (4.99)	1.18^{abcde} ± 1.15 (5.64)	2.37^{abc} ± 0.73 (8.76)
TCGS-1550	9.69^{ghijkl} ± 5.63 (17.54)	3.17^{bcdef} ± 3.39 (9.44)	1.10^{abcdef} ± 0.80 (5.53)	1.58^{bcdef} ± 0.98 (6.77)	0.71^{abc} ± 0.63 (4.28)	3.25^{defghi} ± 1.29 (10.21)
TPT-3	7.52^{cdefghij} ± 3.53 (15.52)	3.06^{bcdef} ± 1.52 (9.79)	1.42^{abcdefg} ± 0.89 (6.19)	1.20^{abcde} ± 0.86 (5.63)	1.14^{abcd} ± 1.20 (5.38)	2.87^{abcdefghij} ± 0.71 (9.69)
TPT-4	9.27^{fghijkl} ± 5.55 (17.06)	4.20^{f} ± 1.65 (11.64)	1.71^{bcdefg} ± 1.23 (6.69)	1.93^{cdef} ± 1.80 (6.94)	1.82^{def} ± 2.33 (6.59)	3.79^{jkl} ± 1.65 (11.00)
Anantha	9.72^{hijkl} ± 4.76 (17.73)	3.64^{def} ± 2.11 (10.65)	1.89^{defg} ± 0.89 (7.70)	1.68^{bcdef} ± 1.32 (6.65)	1.69^{def} ± 1.81 (6.47)	3.73^{jkl} ± 1.01 (11.04)
Dharani	7.27^{bcdefghi} ± 4.95 (15.05)	2.95^{bcdef} ± 1.95 (9.54)	2.16^{fg} ± 1.58 (7.80)	3.10^{gh} ± 1.39 (9.85)	2.46^{g} ± 1.00 (8.81)	3.59^{ghijkl} ± 1.63 (10.73)
KH	5.11^{abc} ± 2.80 (12.64)	3.75^{bcdef} ± 5.51 (9.60)	1.41^{abcdefg} ± 1.15 (5.99)	1.32^{abcde} ± 1.33 (5.67)	1.10^{abcde} ± 0.78 (5.64)	2.54^{abcd} ± 1.35 (8.93)
Narayani	13.99^{mn} ± 5.34 (21.61)	4.25^{def} ± 5.87 (10.41)	1.79^{bcdefg} ± 1.48 (7.12)	2.16^{efg} ± 1.20 (7.99)	1.98^{efg} ± 1.36 (7.58)	4.83 ^{m} ± 1.38 (12.58)
K-6	7.35^{cdefghij} ± 3.13 (15.42)	4.34^{ef} ± 2.28 (11.51)	1.62^{bcdefg} ± 0.99 (6.78)	2.29^{def} ± 2.06 (7.63)	2.56 ^{g} ± 1.43 (8.91)	3.63^{ijkl} ± 1.07 (10.88)
Grand Mean	8.40 ± 5.16	3.03 ± 3.82	1.41 ± 1.10	1.50 ± 1.39	1.20± 1.23	3.11 ± 1.40

*Values in parenthesis are arc sine transformed values,

*Values followed by same letter are not significantly different as per DMRT

Results of screening various groundnut genotypes for their reaction to leaf miner (second planting)

Per cent infestation of leaf miner (no. of leaf mines) on different genotypes of groundnut (on tagged plants)

Data on per cent leaf miner infestation per plant was taken on different genotypes of groundnut at weekly intervals from 39, 46, 53 and 60 DAS (Days after Sowing) and are presented in Table 2

At 39, 46, and 60 DAS, no significant differences were observed among different genotypes of groundnut in terms of per cent leaf miner infestation per plant

At 53 DAS, lowest per cent leaf miner infestation per plant were found in K-1609 (1.56 ± 2.34) (significantly different from others) followed by ASK-2013-1 (1.75 ± 1.22), TCGS-1343 (1.89 ± 0.77), TCGS-1342 (1.92 ± 0.73) and TCGS-1345 (1.93 ± 0.95) (on par with each other). Highest per cent leaf miner infestation per plant were found in TPT-4 (4.77 ± 2.18), followed by TCGS-341 (5.15 ± 2.20), Narayani (5.84 ± 2.68) (on par with each other), Dharani (6.77 ± 2.37) and K-6 (6.90 ± 3.18) (on par with each other).

Table 2: Per cent incidence of leaf mines on different genotypes of groundnut (on tagged plants)

Genotype	39 DAS (Mean ± SD)	46 DAS (Mean ± SD)	53 DAS (Mean ± SD)	60 DAS (Mean ± SD)	Per cent incidence of GLM mean Observation (Mean ± SD)
ASK-2013-1	2.01 ± 1.01	1.83 ± 1.37	1.75^{b} ± 1.22 (7.02)	1.88 ± 1.33	1.85 ± 0.99
ASK-2013-2	1.97 ± 2.21	1.88 ± 1.62	$2.58^{bcdefgh}$ ± 1.63 (8.84)	1.48 ± 1.18	1.96 ± 1.14
ASK-2013-5	1.78 ± 1.56	2.41 ± 1.67	$3.00^{bcdefghi}$ ± 1.81 (9.32)	1.88 ± 1.41	2.28 ± 1.20
K-4	2.32 ± 1.99	2.96 ± 2.07	4.11^{ijklmn} ± 2.13 (11.30)	3.39 ± 1.78	3.23 ± 1.79
K-5	2.73 ± 3.06	3.65 ± 3.39	4.43^{jklmno} ± 2.43 (11.77)	3.81 ± 3.26	3.69 ± 2.82
K-7	1.71 ± 1.10	1.71 ± 1.02	2.31^{bcdef} ± 1.33 (8.42)	1.58 ± 0.90	1.82 ± 0.76
K-8	1.38 ± 1.00	2.46 ± 1.88	2.41^{bcdefg} ± 1.37 (8.58)	1.59 ± 0.76	1.97 ± 0.91
K-9	2.19 ± 2.18	2.01 ± 1.86	2.32^{bcdef} ± 1.39 (8.43)	1.73 ± 0.88	2.04 ± 1.29
K-1452	1.78 ± 1.06	1.96 ± 1.31	$2.90^{cdefghij}$ ± 1.33 (9.58)	2.64 ± 1.18	2.33 ± 1.04
K-1454	3.08 ± 2.18	3.54 ± 2.44	$3.76^{ghijklmn}$ ± 1.81 (10.87)	2.64 ± 1.90	3.25 ± 1.64
K-1468	2.06 ± 1.47	2.30 ± 1.30	4.48^{lmno} ± 1.65 (12.03)	3.08 ± 1.21	3.04 ± 0.94
K-1501	1.42 ± 0.82	1.88 ± 0.74	2.10^{bcde} ± 0.73 (8.20)	1.62 ± 0.67	1.76 ± 0.55
K-1559	1.01 ± 1.22	1.56 ± 1.13	1.94^{ab} ± 1.06 (7.60)	1.38 ± 0.81	1.49 ± 0.90
K-1563 (VG)	1.73 ± 1.81	2.07 ± 1.88	2.24^{bcd} ± 1.81 (7.98)	2.05 ± 1.84	2.03 ± 1.78
K-1609	1.67 ± 2.50	1.42 ± 2.02	1.56^{a} ± 2.34 (5.10)	1.38 ± 1.62	1.49 ± 1.94
K-1620	1.72 ± 1.36	2.82 ± 2.18	$2.68^{bcdefghi}$ ± 1.62 (9.03)	1.94 ± 1.28	2.31 ± 1.24
K-1628	1.57 ± 1.52	2.80 ± 1.82	2.50^{bcdefg} ± 1.43 (8.64)	1.84 ± 1.58	2.19 ± 1.38
K-1660	1.37 ± 1.37	2.45 ± 1.79	$2.56^{bcdefghi}$ ± 1.14 (9.01)	1.72 ± 0.96	2.04 ± 1.10
K-1662	2.04 ± 1.54	2.32 ± 2.01	2.40^{bcdef} ± 1.53 (8.47)	2.04 ± 1.11	2.20 ± 1.22
TCGS-341	2.30 ± 1.52	2.76 ± 2.11	5.15^{nop} ± 2.20 (12.87)	3.22 ± 1.81	3.41 ± 1.53
TCGS-894	2.29 ± 1.92	3.57 ± 3.97	$3.00^{bcdefghi}$ ± 2.28 (9.13)	2.94 ± 3.48	2.96 ± 2.44
TCGS-1073	4.10 ± 3.52	3.07 ± 1.94	4.42^{klmnop} ± 1.92 (11.85)	3.26 ± 1.53	3.67 ± 1.35
TCGS-1097	1.64 ± 1.47	3.07 ± 2.26	$3.57^{fghijklm}$ ± 1.72 (10.60)	1.81 ± 1.73	2.55 ± 1.45
TCGS-1119	1.63 ± 1.36	2.36 ± 2.95	2.26^{bcde} ± 1.87 (8.05)	1.85 ± 1.34	2.03 ± 1.67
TCGS-1146	2.12 ± 1.52	2.30 ± 1.80	2.24^{bcde} ± 1.36 (8.22)	1.90 ± 1.49	2.13 ± 1.19
TCGS-1156	2.46 ± 2.22	3.04 ± 3.00	$3.42^{cdefghijkl}$ ± 2.97 (9.79)	2.85 ± 3.10	2.93 ± 2.68
TCGS-1157	1.62 ± 1.26	2.36 ± 1.78	$3.33^{cdefghijk}$ ± 2.39 (9.72)	2.10 ± 1.55	2.38 ± 1.14
TCGS-1157(A)	1.82 ± 1.47	3.40 ± 1.83	$3.47^{efghijklm}$ ± 1.62 (10.40)	2.70 ± 1.29	2.84 ± 1.15
TCGS-1186	3.50 ± 3.93	2.02 ± 1.19	$3.89^{hijklmn}$ ± 1.83(11.08)	2.45 ± 0.91	2.90 ± 1.12
TCGS-1342	1.09 ± 0.77	2.47 ± 1.59	1.92^{bcd} ± 0.73 (7.79)	1.47 ± 0.62	1.75 ± 0.69
TCGS-1343	1.34 ± 0.76	1.59 ± 0.97	1.89^{bcd} ± 0.77 (7.72)	1.38 ± 0.68	1.55 ± 0.60
TCGS-1345	1.53 ± 1.32	2.02 ± 1.33	1.93^{bcd} ± 0.95 (7.73)	1.44 ± 0.89	1.73 ± 0.89
TCGS-1375	2.24 ± 3.05	2.53 ± 3.34	2.49^{bcdef} ± 2.40 (8.31)	2.05 ± 2.80	2.33 ± 2.26
TCGS-1550	2.13 ± 1.65	2.83 ± 1.77	$3.17^{defghijkl}$ ± 1.47 (10.01)	2.70 ± 1.90	2.73 ± 1.49
TPT-3	2.03 ± 1.41	1.99 ± 1.97	$2.83^{bcdefghi}$ ± 2.09 (9.10)	2.00 ± 1.65	2.22 ± 1.51
TPT-4	2.94 ± 2.76	4.43 ± 2.26	4.77^{mno} ± 2.18 (12.36)	4.17 ± 1.67	4.11 ± 1.89
ANANTHA	2.23 ± 1.77	2.25 ± 1.98	2.41^{bcdefg} ± 1.56 (8.59)	1.78 ± 1.34	2.15± 1.37
DHARANI	2.45 ± 1.70	3.71 ± 2.35	6.77^{p} ± 2.37 (14.90)	3.18 ± 1.59	4.11 ± 1.25
KH	2.58 ± 1.71	3.36 ± 2.81	$3.22^{cdefghij}$ ± 2.20 (9.57)	2.70 ± 2.34	2.97 ± 1.84
NARAYANI	3.48 ± 2.81	2.85 ± 1.56	5.84^{op} ± 2.68 (13.62)	3.20 ± 1.72	3.86 ± 1.53
K-6	4.43 ± 4.35	4.08± 2.48	6.90^{p} ± 3.18 (14.90)	5.32 ± 1.52	5.17 ± 1.87
Grand Mean	2.13 ± 2.09	2.59 ± 2.15	3.19 ± 2.22	2.34 ± 1.83	2.57 ± 1.67

*Values in parenthesis are arc sine transformed values

*Values followed by same letter are not significantly different as per DMRT

Per cent infestation of leaf miner per plant (first and second planting) (Table 1 and 2) was considered for ranking.

Based on per cent infestation of leaf miner per plant (39 DAS in 1st planting (highest per cent infestation of leaf miner per plant was observed on most susceptible popular genotypes Narayani, and Dharani (Table 1); 53 DAS in 2nd planting (highest per cent infestation of leaf miner per plant was observed on most susceptible popular genotypes Narayani, and Dharani (Table 2) different genotypes of groundnut were arranged into following plant resistance groups as highly resistant, moderately resistant and susceptible to their reacting to leaf miner.

Table 3: Cumulative data on infestation of groundnut leaf miner based on first and second planting

Character	Highly resistant	Moderately resistant	Highly susceptible
Per cent leaf miner infestation (no. of leaf mines) per plant (First and second planting)	ASK-2013-2, ASK-2013-5, TCGS-894, TCGS-1186 and TCGS-1097	K-1501, K-1559, ASK-2013-1, TCGS-1146 and TCGS-1342	Dharani, K-4, K-1563, Narayani and TCGS-341

Based on results of screening experiments, the genotypes TCGS-894 and TCGS-1097 were ranked as highly resistant; ASK-2013-1 as moderately resistant and Narayani, K-1563, K-4 and Dharani, were ranked as susceptible genotypes.

The per cent infestation of leaf miner (no. of leaf mines) in the present investigation varied from TCGS-894 (3.85 ± 1.02) to K-4 (14.61± 6.48) (first planting) and from K-1609 (1.56 ± 2.34) to TPT-4 (4.77 ± 2.18).

The results were supported by the findings of Rao and Sindagi (1974) [6] who recorded incidence of leaf miner was less than 20% in the varieties MS 11, GN 1024, NOS 271, 450, 362 and 191. Sathiamoorthy *et al*. (1978) [10], who reported that in the 220 groundnut lines, leaf miner incidence ranged from 3.8 per cent (USA-61) to 22.2 per cent (Ah 61). Kalaimani *et al*. (1989) [5], who reported 4.0% (CS 26) to 11.4% (VG-220) leaf miner damage in the entries VG 101, VG 78, 85, 91, 108, 113, 174, 183, 219, 220, CS 11 and 26. Jena *et al*. (1996) [4] reported that variety ICGS 65 showed the lowest leaf miner infestation (5.4%) while TAG-24 showed the highest infestation (30.2%). TMV-10, VG-77, ICGS-5 were also promising with moderate infestation of 8.10, 10.60 and 10.70 per cent respectively at 80 days after sowing.

Reddy (2001) [8] recorded K-135 genotype with significantly lower leaf miner infestation (50%) than K-139 and K-2 X TEG 7855 genotypes which recorded 70 per cent infestation. Maximum incidence was observed in K-3 X ICG-2716-1, (X-14-B-8-BXEC 21137-1) genotypes, JL-24 and Girnar (100%).

Shirale *et al*. (2010) [11] screened 38 soyabean cultivars to leaf miner (*A. modicella*) in India. The incidence of leaf miner varied from 0.25 to 2.15 larvae per plant, and leaflet damage ranged from 5.02 to 22.17%. MAUS 62-2 (5.2%), DS 97-12 (6.74%) and HIS 01(7.44%) registered lower percentages of leaflet damage compared to JS 71-05 (17.71%), Bragg (17.76%), JS 335 (16.40%) and JS 80-21 (11.70%).

Reddy (2000) [7] evaluated fifty five groundnut genotypes along with four controls against *A. modicella*. The lowest incidence was observed in genotypes having thick, dark green leaves i.e., ICGV-86031(20%), ICGV-87495(25%), ICGV-87237(30%), ICGV-86011(30%), ICGV-87206(30%) and ICGV-87165(30%). ICGV-87816 produced the highest yield (63.64 grams per 10 plants) while exhibiting 40% pest incidence.

Ghule *et al*. (1988) [3] reported that genotypes ICG 7758 and 8322 were the most promising with 20.53 and 21.35 percentage leaf miner infestation respectively.

Annual report (2014-2015) [1] conducted at agricultural research station Anantapuram reported that on screening different varieties of groundnut reaction to leaf miner the leaf damage recorded as on K-6 (28.1%), Dharani (25.3%), Narayani (28.7%). The plant damage was recorded as on K-6 (77%), Dharani (67.6%), Narayani (68.8%). Incidence of webs per plant GLM in the genotypes was as K-6 (3.7%), Dharani (3.9%), Narayani (3.8%).

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