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RELATIVE SUSCEPTIBILITY OF EXISTING GROUNDNUT VARIETIES AGAINST SUCKING INSECT PESTS, HAIRY CATERPILLAR AND LEAF ROLLER

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ABSTRACT

Islam MA, Akter S, Roy P, Islam R (2024) Relative susceptibility of existing groundnut varieties against sucking insect pests, hairy caterpillar and leaf roller. *Int. J. Sustain. Crop Prod.* 19(1), 01-05.

The experiment was conducted during the Rabi 2022 and 2023 seasons at the research field of Oilseed Research Centre (ORC), Bangladesh Agricultural Research Institute (BARI), Gazipur, Bangladesh, to determine the relative susceptibility of BARI-released groundnut varieties to insect pests, leaf rollers and hairy caterpillars. The population of whiteflies was more abundant during the early growth stage, while jassids and thrips were more abundant during the advanced growth stage of crops in both years. Over two years, the lowest amount of whitefly was obtained with Basonti Badam, BARI Chinabadam-6, BARI Chinabadam-7 and BARI Chinabadam-10. The greatest amount of jassid was found in the Dhaka-1, Tridana Badam and BARI Chinabadam-11 varieties, which included Jhinga Badam. The Thrips population was greater for all varieties in both years. The greatest percentages of plant infestation by leaf rollers were observed for Dhaka-1, Jhinga Badam and BARI Chinabadam-11, but not for Tridana Badam. Hairy caterpillars were most abundant in Dhaka-1, Tridana Badam, and Jhinga Badam. As far as the cultivars are known, Dhaka-1, Tridana Badam and BARI Chinabadam-11 were found to be relatively susceptible, while Basonti Badam, BARI Chinabadam-6 and BARI Chinabadam-7 were relatively resistant in both years. The findings of this study will be helpful for ensuring the sustainability of groundnut production under a changing climate.

Key words: *groundnut, susceptibility, hairy caterpillar, leaf roller*

INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is an important oilseed and supplementary food crop worldwide. It is also known as peanut or monkey nut and is a legume crop grown mainly for its edible seeds. It is widely grown in the tropics and subtropics. It is one of the world's principal oil seeds. It provides food, animal feed and cash and improves soil fertility (Freeman *et al.* 1999).

In Bangladesh, the cultivation area of groundnuts is approximately 87131 acres, and groundnut production was approximately 62832 metric tons during the 2018-2019 cropping season; during 2019-2020, groundnut cultivation covered 80828 acres, with 60914 metric tons (BBS 2020). Among the oilseed crops, groundnut occupies the third largest area of production, and this crop was grown in 47 districts of Bangladesh in 2015 (BBS 2016).

The yield of groundnut in Bangladesh is very low and fluctuates every year compared to the yield in other countries. During its cultivation, several factors are responsible for the low productivity of groundnut. This lower yield is mostly attributed to both biotic stresses and abiotic stresses, the unavailability of high-yielding cultivars and a lack of proper management practices. Among the numerous biotic stress-causing agents, the incidence of insect pests is more crucial. The greatest threat to groundnut cultivation is vulnerability to and widespread attack by insect pests. More than 100 insect pests are attacked from planting to storage (Nandagopal 1992). Studies show that 15-20% of the overall production of oilseeds is lost directly or indirectly by insect and mite attacks every year (Biswas and Das, 2011). Among the recorded pest species, the hairy caterpillar (*Spilarctia obliqua* (Walker), common cutworm (*Spodoptera litura* F.), jassid (*Empoasca terminalis* Distant), leaf miner (*Stomopteryx nerteria* M.) and leaf roller (*Anersia ephippias* Meyr.) were considered the major pests, while the remaining pests were of minor importance on the basis of their population densities/plant, nature and extent of damage and yield reductions. Most of the major and minor pests infest during the vegetative to prematurity stages (45-95 DAS), and the maximum infestation occurred during the pod formation and pod filling stages (50-80 DAS) of the crop in both years (Biswas 2014).

Cultural practices such as fertilization, irrigation, and variety greatly influence the population dynamics of pests through some degree of resistance (Kogan 1982). It has been reported that sap-feeding insects have more intimate relationships with their host plants than many other pests and are affected by small changes in the nitrogenous status of the host (Wensler 1962). However, the important insect pests that cause damage to the crop are Tobacco caterpillar, thrips, jassids and white flies. Jassids cause a yield loss of approximately 584 kg/ha (Anon. 1988). The leafhopper and thrips populations reach their maximum during the 8th and 4th standard weeks, respectively, which coincides with summer-sown crops (Harish *et al.* 2013). The extent of losses incurred by various insect pests, *viz.*, leaf miners, tobacco leaves eaten by caterpillars, aphids, thrips and jassids, were 24 to 92, 13 to 71, 16 to 42, 17 to 40 and 9 to 22%, respectively, in groundnuts (Amin 1987).

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The avoidable yield loss due to major insect pests of groundnuts was 48.57% for pods and 42.11% for fodder (Dabhade *et al.* 2012). A considerable number of groundnut varieties with BARIs have been developed. Due to the attack of these insect pests, the varieties cannot produce desirable yields, and farmers are becoming less economically disadvantaged. Therefore, the present study was designed to determine the relative resistance of BARI-releasing groundnut varieties.

MATERIALS AND METHODS

The experiments were conducted during the *Rabi* seasons of 2022 and 2023 at the ORC Research Field of BARI, Gazipur, to determine the relative susceptibility of the BARI-releasing groundnut varieties.

In both years, eleven varieties of groundnuts were evaluated for their ability to prevent infestations by sucking pests, leaf rollers and hairy caterpillars. The varieties were as follows: V_1 = Dhaka-1, V_2 = Basonti Badam, V_3= Tridana Badam, V_4 = Jhinga Badam, V_5 = BARI Chinabadam-5, V_6 = BARI Chinabadam-6, V_7 = BARI Chinabadam-7, V_8 = BARI Chinabadam-8, V_9 = BARI Chinabadam-9, V_{10} = BARI Chinabadam-10, and V_{11} = BARI Chinabadam-11. Homogenous seeds of groundnut cultivars were sown in a well-prepared seed bed on 02 January 2022 and 01 January 2023. The experiment was performed in a randomized complete block design with three dispersed replications. The unit plot size was 4.0 m × 0.30 m with 30 cm row to row and 5 cm plant to plant distance in both years. Normal intercultural procedures were performed as necessary.

However, spraying of insecticides of any kind in and around the experimental area was avoided for proper exploitation of insect pests. To record the population buildup of sucking pests, whiteflies, jassids, and thrips, five plants were selected randomly from each plot of the respective variety and tagged. Three leaves from each selected plant were examined on a random basis, and the population of pests was recorded. The observations were recorded at weekly intervals from February 20 to April 25, 2022, and from February 20 to April 25, 2023. The data on the population of sucking insect pests recorded are presented as the mean, standard deviation and standard error. Further analysis of variance of the data was carried out, and the mean values of the pests were compared through least significant difference tests.

RESULTS AND DISCUSSION

Comparative evaluation of groundnut varieties against sucking pests

The overall averages of three sucking insect pests recorded on five groundnut varieties obtained in 2022 are presented in Table 1. The results indicated that all varieties evaluated were infested by the three sucking pests. Comparatively, the population of whiteflies was low on the Basonti Badam (1.36±0.075), BARI Chinabadam-5 (1.06±0.098), BARI Chinabadam-6 (0.89±0.077), BARI Chinabadam-7 (1.13±0.133) and BARI Chinabadam-10 (1.32±0.098) varieties. However, the populations of jassid were greater for the Dhaka-1 (4.15±0.450), Tridana Badam (5.19±0.519) and BARI Chinabadam-11 (3.95 ±0.121) varieties per leaf. However, a greater population of thrips was recorded for all varieties during the season. These differences between whiteflies and jassids may be attributed to changes in the morphological characteristics of the varieties. Sucking insect pests cause serious losses to groundnut crops; these pests not only damage the crop but also cause certain viral diseases. The results of the study suggested that all five varieties were infested by whiteflies, jassids and thrips. The population level varied between time intervals and within pest species. The results further demonstrated that whiteflies and jassids were more abundant on all varieties than were thrips. The insect pest populations on all varieties evaluated increased gradually and reached a maximum during the vegetative growth period. Jassids and thrips were found to be more active up to peg filling, while whiteflies were found to be active in the middle of the crop season and were less active during the entire growth period on all varieties. Among the eleven varieties Dhaka-1, Tridana Badam and BARI Chinabadam-11 were susceptible to insect pests, while Basonti Badam, BARI Chinabadam-6, BARI Chinabadam-7 and BARI Chinabadam-10 were resistant.

Table 1. Populations of sucking pests/leaves recorded on different varieties of groundnuts during 2022

Varieties	Whitefly/leaf (no.)	Jassid/leaf (no.)	Thrips/leaf (no.)
V_1 = Dhaka-1	5.27±0.473a	4.15±0.450b	4.89±0.139a
V_2 = Basonti Badam	1.36±0.075d	1.48±0.237d	2.29±0.445d
V_3 = Tridana Badam	4.15±0.115b	5.19±0.519a	4.53±0.196b
V_4 = Jhinga Badam	2.39±0.155c	2.31±0.242c	2.87±0.214c
V_5 = BARI Chinabadam-5	1.06±0.098d	1.11±0.046d	3.89±0.589d
V_6 = BARI Chinabadam-6	0.89 ±0.077d	1.23±0.156d	2.06±0.173d
V_7 = BARI Chinabadam-7	1.13±0.133d	1.43±0.127d	2.21±0.242d
V_8 = BARI Chinabadam-8	4.13±0.572b	2.79±0.075c	2.93±0.133b
V_9 = BARI Chinabadam-9	3.87±0.364b	2.69±0.335c	2.65±0.248b
V_{10} = BARI Chinabadam-10	1.32±0.098d	1.29±0.115d	3.43±0.473d
V_{11} = BARI Chinabadam-11	5.81±0.185a	3.95±0.121b	5.09±0.589a
CV (%)	15.9	19.1	18.0

The means ± S.E.ss followed by the same latter in a column are not significantly **(**P<0.05) different from each other according to the LSD test.

Table 2 shows that the populations of whiteflies on the Basonti Badam (1.36±0.25), BARI Chinabadam-6 (0.92 ±0.17), BARI Chinabadam-7 (1.11±0.12) and BARI Chinabadam-10 (0.99±0.16) varieties were low. On the other hand, the populations of jassids were greater on the Dhaka-1 (4.06±0.31), Tridana Badam (4.06±0.48), Jhinga Badam (5.38±0.29) and BARI Chinabadam-11 (3.83 ±0.21) varieties per leaf during 2023. The lowest population of thrips was recorded for the Basonti Badam, BARI Chinabadam-6, BARI Chinabadam-7 and BARI Chinabadam-10 varieties during the season. Among the eleven varieties, Dhaka-1, Tridana Badam, Jhinga Badam and BARI Chinabadam-11 were susceptible to sucking insect pests, while Basonti Badam, BARI Chinabadam-6, BARI Chinabadam-7 and BARI Chinabadam-10 were resistant.

Table 2. Populations of sucking pests/leaves recorded on different varieties of groundnuts during 2023

Varieties	Whitefly/leaf (no.)	Jassid/leaf (no.)	Thrips/leaf (no.)
V_1 = Dhaka-1	2.35±0.27c	4.06±0.31b	3.91±0.48b
V_2 = Basonti Badam	1.36±0.25d	1.52±0.17c	2.16±0.25cd
V_3 = Tridana Badam	4.82±0.48ab	4.06±0.48b	5.72±0.21a
V_4 = Jhinga Badam	5.08±0.52a	5.38±0.29a	6.21±0.97a
V_5 = BARI Chinabadam-5	2.63±0.34c	3.60±0.47b	3.82±0.67bc
V_6 = BARI Chinabadam-6	0.92±0.17d	1.33±0.17c	1.80±0.24d
V_7 = BARI Chinabadam-7	1.11±0.12d	1.62±0.29c	2.10±0.27cd
V_8 = BARI Chinabadam-8	4.02±0.23b	3.69±0.19b	4.52±0.76d
V_9 = BARI Chinabadam-9	2.87±0.53c	3.95±0.42b	3.61±0.87bc
V_{10} = BARI Chinabadam-10	0.99±0.16d	1.21±0.19c	1.45±0.28d
V_{11} = BARI Chinabadam-11	4.92±0.55ab	3.83±0.21b	5.81±0.51a
CV (%)	19.56	15.25	27.34

The means ± S.E.ss followed by the same latter in a column are not significantly **(**P<0.05) different from each other according to the LSD test.

Comparative evaluation of groundnut varieties on leaf rollers and hairy caterpillars

Table 3 shows that all varieties were infested by the leaf roller and hairy caterpillar during 2022. The leaf roller attacked the groundnut crop during the early vegetative stage and continued through the peg-forming stage of the crop. The infestation of hairy caterpillars started at the vegetative stage of the crop after leaf roller infestation. The insects were found to be most damaged at the vegetative, flowering and peg-forming stages. The lowest number of leaf rollers per ten plants was found for the Basonti Badam (1.13), BARI Chinabadam-5 (1.29), BARI Chinabadam-6 (1.16), BARI Chinabadam-7 (1.06) and BARI Chinabadam-10 (0.92) varieties. Additionally, the lowest percentages of plant infestations were detected for the Basonti Badam (22.6%), BARI Chinabadam-5 (25.8%), BARI Chinabadam-6 (23.2%), BARI Chinabadam-7 (21.2%) and BARI Chinabadam-10 (18.4%) varieties. In contrast, the greatest number of hairy caterpillars per ten plants was detected in Dhaka-1 (3.67), Tridana Badam (4.23), Jhinga Badam (3.39), BARI Chinabadam-8 (2.87), and BARI Chinabadam-11 (4.11). The greatest percentage of infestation by hairy caterpillars was also detected in the Dhaka-1 (73.40%), Tridana Badam (84.60%), Jhinga Badam (67.80%), BARI Chinabadam-8 (57.40%), and BARI Chinabadam-11 (82.20%) varieties.

Table 3. Effects of different varieties of groundnuts on controlling leaf rollers and hairy caterpillars during 2022

Varieties	Leaf roller/10 plant (no.)	Plant infestation (%)	Hairy caterpillar/10 plant (no.)	Plant infestation (%)
V_1 = Dhaka-1	3.06	61.20	3.67	73.40
V_2 = Basonti Badam	1.13	22.60	0.96	19.20
V_3 = Tridana Badam	3.92	78.40	4.23	84.60
V_4 = Jhinga Badam	1.89	37.80	3.39	67.80
V_5 = BARI Chinabadam-5	1.29	25.80	1.39	27.80
V_6 = BARI Chinabadam-6	1.16	23.20	1.26	25.20
V_7 = BARI Chinabadam-7	1.06	21.20	1.32	26.40
V_8 = BARI Chinabadam-8	2.11	42.20	2.87	57.40
V_9 = BARI Chinabadam-9	2.51	50.20	2.16	43.20
V_{10} = BARI Chinabadam-10	0.92	18.40	1.42	28.40
V_{11} = BARI Chinabadam-11	4.53	70.60	4.11	82.20
LSD(0.05)	0.63		0.91	
CV (%)	15.40		25.0	

Table 4. Effects of different groundnut treatments on controlling leaf rollers and hairy caterpillars in 2023

Varieties	No. of leaf roller/10 plant	% plant infestation	No. of hairy caterpillar/10 plant	% plant infestation
V_1 = Dhaka-1	5.06±0.19a	50.60	5.11±0.29a	51.11
V_2 = Basonti Badam	1.52±0.27d	15.21	1.42±0.13f	14.22
V_3 = Tridana Badam	3.37±0.15bc	33.26	4.42±0.43b	44.26
V_4 = Jhinga Badam	4.62±1.01ab	46.22	3.94±0.53c	39.41
V_5 = BARI Chinabadam-5	2.26±0.36cd	22.12	2.65±0.45e	26.50
V_6 = BARI Chinabadam-6	1.45±0.24d	14.21	1.38±0.18f	13.27
V_7 = BARI Chinabadam-7	1.39±0.25d	13.11	1.44±0.26f	14.36
V_8 = BARI Chinabadam-8	3.89±0.57ab	39.21	3.21±0.27d	32.21
V_9 = BARI Chinabadam-9	4.19±0.58ab	42.18	3.17±0.21d	31.47
V_{10} = BARI Chinabadam-10	2.21±0.36cd	22.12	2.51±0.36e	25.12
V_{11} = BARI Chinabadam-11	4.37±0.9ab	43.27	2.69±0.43e	27.20
CV (%)	25.67		7.54	

Table 4 shows that in 2023, the leaf roller attacked the groundnut crop during the early vegetative stage, and this effect continued until the peg-forming stage of the crop, as in 2022. The infestation of hairy caterpillars started at the vegetative stage of the crop after leaf roller infestation. The lowest number of leaf rollers per ten plants on the variety was obtained for Basonti Badam (1.52±0.27), BARI Chinabadam-6 (1.45±0.2), and BARI Chinabadam-7 (1.39±0.25). The lowest percentages of plant infestations were detected for the Basonti Badam (15.21%), BARI Chinabadam-6 (14.21%), and BARI Chinabadam-7 (13.11%) varieties. On the other hand, the lowest number of hairy caterpillars per ten plants was recorded for the varieties Basonti Badam (1.42±0.13), BARI Chinabadam-6 (1.38±0.18), BARI Chinabadam-7 (1.44±0.26), and BARI Chinabadam-10 (2.21±0.36). The greatest percentage of infestation by leaf rollers was detected for the Dhaka-1 (60%), Jhinga Badam (46.22%) and BARI Chinabadam (43.27%) varieties. On the other hand, the greatest number of hairy caterpillars was detected in the Dhaka-1 (5.11±0.29), Tridana Badam (4.42±0.43), Jhinga Badam (3.94±0.53) and BARI Chinabadam-9 (3.21±0.27) varieties. The lowest percentages of infestation by hairy caterpillars were found for the varieties Basonti Badam (14.22%), BARI Chinabadam-6 (13.27%), BARI Chinabadam-7 (14.36%) and BARI Chinabadam-10 (25.12%).

CONCLUSION

According to the findings of the experiments, Basonti Badam, BARI Chinabadam-6, and BARI Chinabadam-7 were less infested by whiteflies, jassid thrips, leaf rollers and hairy caterpillars, and Dhaka-1, Tridana Badam, Jhinga Badam and BARI Chinabadam-11 were more prone to infest major pests. Thus, it is suggested that less infested varieties be cultivated in different regions of Bangladesh for better crop production.

REFERENCES

Amin PW (1987) Insect-pests of groundnut in India and their management. Lead papers of the national seminar on plant protection in field crops, 29-31 January 1986, CPPTI: 219-231.

Anonymous (1988) Annual Report, National Research Centre for Groundnut, Junagadh, Gujarat, 75 pp.

BBS (2016) Yearbook of Agricultural Statistics, 2015. 27th series. Statistics and Informatics Division (SID). Ministry of Planning, Government of the Peoples Republic of Bangladesh.

BBS (2020) Yearbook of Agricultural Statistics, 2019. 31st series. Statistics and informatics Division Ministry of Planning government of the Peoples Republic of Bangladesh.

Biswas GC (2014) Insect pests of groundnut *(Arachis hypogaea* L.), nature of damage and succession with the crop stages. *Bangladesh Journal of Agricultural Research*, 39(2), 273-82.

Biswas GC, Das GP (2011) Insect and mite pests diversity in the oilseed crops ecosystems in Bangladesh. *Bangladesh J. Zool*. 39(2), 232-235.

Dabhade PL, Bapodra JG, Jethava DM, Rathod RT, Dabhi MV (2012) Estimation of yield losses due to major insect-pests of groundnut in Gujarat. *Legume Res.-An International J*, 35(4), 354-356.

Freeman HA, Nigam SN, Kelley TG, Ntare BR, Subrahmanyam P, Boughton D (1999) The World Groundnut Economy, Facts Trends and Outlook. ICRISAT, 502, 324, Patancheru, India. 52 pp.

Harish G, Nataraja MV, Poonam J, Prasanna H, Savaliya SD, Meera G (2013) Influence of weather parameters on seasonal incidence of sucking pest of groundnut. In: International Conference on Insect Sciences. UAS, GKVK, Bengaluru. pp. 83.

Kogan M (1982) Plant resistance in pests management in: Ecological Theory and Integrated Pests Management. M. Kogan (Ed.) Jhon Wiley and Sons Inc., New York. pp. 93-134.

Nandagopal V (1992) Studies on integrated pest management in groundnut in Saurashtra. Ph.D. Thesis, Saurashtra University, Rajkot, pp. 246.

Wensler RJD (1962) Mode of host selection by an aphid. *Nature*, 195, 830- 831.