Content list available at http://epubs.icar.org.in, www.kiran.nic.in; ISSN: 0970-6429

Indian Journal of Hill Farming

December 2021, Volume 34, Issue 2, Page 138-143

Insect pest complex of Pumpkin (*Cucurbita moschata* Duch. ex Poir.) and their incidence on different three sowing dates under foot hill conditions of Nagaland.

Siraj Miah • Hijam Shila Devi[1*] • Waluniba[1]

[1]School of Agricultural Sciences and Rural Development, Nagaland University, Medziphama Campus-797106

ARTICLE INFO

Article history:
Received: 07 November, 2021
Revision: 22 November, 2021
Accepted: 28 November, 2021

Key words: Insect pest, pumpkin, dates of sowing, red pumpkin beetle, fruit fly, incidence.

ABSTRACT

A field experiment conducted in the Experimental Farm, Department of Entomology, SASRD, Medziphema Campus, Nagaland University from March to June 2019, on pumpkin revealed that nine (9) insect pests under four orders and eight families were found infesting pumpkin. Among them, the incidence of red pumpkin beetle (RPB), fruit flies, leaf hopper and gundhi bug were observed to be the important insect pests while others were negligible. The highest population of RPB was recorded on 23rd (6th June) and 24th SMW (13th June) with 4.00 beetles/ plant on both D_1 (14th March) and D_2 (21st March) sowing dates respectively. The lowest population was observed at 16th SMW (18th April) with 0.33 beetle/ plants on D_2 (21st March) sowing date. The highest leaf hopper population was recorded at 22nd SMW (30th May) with 4.67 hoppers/ plant on D_3 sowing date while the lowest was observed at 19th SMW (9th May) with 1.67 hoppers/ plant on D_1 sowing date. The highest population of gundhi bug was recorded at 22nd SMW (30th May) with 5.33 bugs/ plant on D_3 sowing date while the lowest was observed at 19th SMW (9th May) with 2.00 bugs/ plant on D_2 sowing date. Minimum temperature and minimum relative humidity had a mostly positive and significant correlation with the incidence of RPB, fruit fly and gundhi bug but showed non-significant with the population of leaf hoppers

1. Introduction

Pumpkin (*Cucurbita moschata* Duch. ex Poir.) is an annual summer vegetable, grown extensively all over India on a commercial scale because of its high productivity, long storability, and better transportability. According to the recent database of NHB, India is producing 1,714,000 MT of pumpkin from an area of 78,000 ha (Anonymous, 2018). Cucurbit crops are attacked by different pests and diseases right from the nursery up to the maturity stage, which causes severe damage to the crops. Some of the important pests of cucurbits are *Aulacophora foveicollis* Lucas (red pumpkin beetle), *Bactrocera cucurbitae* Coq. (fruit fly), *Henosepilachna vigintioctopunctata* Fabricius (epilachna beetle), *Aulacophora atripennis* Fabricius (black pumpkin beetle), *Diaphania indica* Saunders (pumpkin caterpillar), *Liriomyza trifolii* Burgess (American serpentine leaf miner), *Aphis* spp. (aphids), *Zonabris postulate* Tk. and *Mylabris phalerata* Pall. (Banded blister beetle), etc. Among them the serious insects are fruit fly, red pumpkin beetle and epilachna beetle which cause a severe reduction in the yield (Gupta, 2004). According to Ram *et. al.* (2009), red pumpkin beetle, leaf miner and flea beetles cause serious damage to the crop at the seedling stage while fruit flies are serious at the fruiting stage. However, little work has been done in the agro-climatic conditions of the North-eastern region. Thus, no enough information is available on the on the insect pest complex of pumpkin (*Cucurbita moschata* Duch. ex Poir.) and their incidence. To fulfill these lacunae, the present investigation entitled "Study on the insect pest complex of pumpkin (*Cucurbita moschata* Duch. Ex Poir.) and their incidence under foot hill conditions of Nagaland." was conducted. Furthermore, it is very much essential to have relevant information on the insect pest complex of this crop and their incidence at different growing stages from sowing to harvest. This will help the farmers and researchers in the frame out of a suitable method of control and appropriate time of action.

*Corresponding author: hsdevi@nagalanduniversity.ac.in

2. Materials and methods

The experimental site was located at Medziphema, Dimapur district of Nagaland with an elevation of 310 meters above the sea level (MSL), with the geographical location of 23°45'53" N latitude and 93°52'04" E longitude. Pumpkin variety Arjun (F_1 hybrid) was sown on 3 different dates *i.e.* 14th March (D_1), 21st March (D_2) and 28th March (D_3) respectively. Counting of the important insect pests was started at the initiation of pest infestation during the cropping period. Five plants were randomly selected per sub-plot and the pests were recorded at weekly intervals in early morning hours. The number of adults (such as red pumpkin beetle, epilachna beetle, black pumpkin beetle, banded blister beetle, etc.) per plant from five randomly selected plants in each sub-plot. Population of sap-sucking pests such as leaf hoppers, gundhi bug, etc were recorded from the three leaves, one leaf each from upper, middle and lower canopy per plant from five randomly selected plants in each sub-plot. Among the dipteran insects, melon fruit fly being the major pest of pumpkin, fruit fly bottle traps were set up in each sub-plot and populations were counted from each trap /sub-plot. For leaf miner, the number of infested or mined leaves was counted.

3. Results and Discussion

During the course of investigation, nine insect pests belonging to 4 orders and 8 families were recorded infesting pumpkin. Red pumpkin beetle, *Aulacophora foveicollis* Lucas (Coleoptera: Chrysomelidae) and short horned grasshopper, *Hieroglyphus banian* Fabricius (Orthoptera: Acrididae) appeared during the seedling stage of the crop and caused damage to the crop till harvest. While, leaf miner, *Liriomyz atrifolii Burgess* (Diptera: Agromyzidae) appeared during the early stage of crop causing damage to newly planted crops. Gundhi bug, *Leptocorisa acuta* Thunberg (Hemiptera: Coriedae) and leaf hopper, *Bothrogonia sclerotica* Young (Hemiptera: Cicadellidae) were observed to cause severe damage from early vegetative stage till harvesting of the crop. While, black pumpkin beetle, *Aulacophora atripennis* Fabricius (Coleoptera: Chrysomelidae) and epilachna beetle, *Henosepilachna vigintioctopunctata* Fab. (Coleoptera: Coccinellidae) occurred in the vegetative stage of the crop. While the incidence of blister beetle, *Mylabris phalerata* Pallas (Coleoptera: Meloidae) and fruit fly, *Bactrocera dorsalis* Hendel (Diptera: Tephritidae) were recorded during flowering and fruiting to harvesting stage, respectively. Among them, incidence of red pumpkin beetle, fruit flies, leaf hopper and gundhi bug were observed to be the important pests while others were negligible. The observation of nine pests during the period of investigation is in conformity with the findings of several researchers, for example, Afroz *et al.* (2019) reported pumpkin beetle, epilachna beetle and fruit fly infesting on *Cucurbita moschata*. Halder *et al.* (2017) also reported several pests like fruit fly (*Bactrocera cucurbitae* Coquillett), blister beetle (*Mylabris phalerata* Pallas, *M. pustulata*Thunberg), pumpkin beetle (*Aulacophora foveicollis* Lucas), Leaf miner (*Liriomyza trifolii* Burgress), Leaf hoppers and short-horned grasshopper etc. associated with the cucurbit crop sponge gourd. Serious among them are fruit fly, red pumpkin beetle and epilachna beetle which cause a severe reduction in the yield (Gupta, 2004). Sahu (1983) also observed pumpkin beetle, epilachna beetle, fruit fly, stink bug and several other pests causing damage to pumpkin (*Cucurbita moschata* Duchesne). Khan (2012) reported that pumpkin was the most preferred host to red pumpkin beetle and less preferred to the blue pumpkin beetle (*Aulacophora atripennis* Fabricius). According to Ram *et. al.* (2009) red pumpkin beetle, leaf miner and flea beetles cause serious damage to the crop at the seedling stage while fruit flies are serious at the fruiting stage.

The incidence of red pumpkin beetle, *Aulacophora foveicollis* was observed initially in the field at 17th standard week (25th April) on D_1 (14th March) sowing date (Table 1), while the first occurrence at D_2 (21st March) and D_3(28th March) sowing dates were recorded on 16th standard week (18th April, Table 2) and 17th standard week (25th April, Table 3) respectively. The highest population of RPB was recorded at 23rd (6th June) and 24th SMW (13th June) with 4.00 beetles/ plant on both D_1 (Table 1) and D_2 (Table 2) respectively. The lowest population was observed at 16th SMW (18th April) with 0.33 beetle/ plants on D_2 (Table 2) sowing date. The finding also revealed that the RPB population persisted in the field till the time of harvesting. In support of the present finding, Borah (1999) from Assam also reported that the highest number of RPB infesting on cucumber in the month of June with 3.6-4.2 beetles plant^{-1}. Johri and Johri (2003) also observed beetle incidence was more during the period from March to September. Ghule *et. al.* (2015) also found that red pumpkin beetle was active mostly from the March, April and May. Similarly, Saljoqi and Khan (2007) reported that the infestation of red pumpkin beetle was high from May 7 to June 18, 1998, while from June 25 to August 13, 1998, the population gradually declined.

The incidence of fruit fly (*Bactrocera dorsalis* Hendel), gundhi bug (*Leptocorisa acuta*) and leaf hopper (*Bothrogonia sclerotica*) was observed initially in the field at 19th standard week (9th May) on all the sowing dates *i.e.* D_1 (Table 1), D_2 (Table 2) and D_3 (Table 3).The highest fruit fly population was recorded at 24th SMW (13th June) with 10.67 flies/ plant on both D_2 (Table 2) and D_3 (Table 3). The lowest population was observed at 19th SMW (9th May) with 3.33 flies/ plant on D_2 (Table 2) sowing date. The finding also revealed that the fruit fly population persisted in the field till the time of harvesting. In support of the present finding,

Meena *et. al.* (2019) found the infestation of fruit fly on bottle gourd from the third week of May and the peak infestation was recorded in the first week of June. Similarly, Laskar and Chatterjee (2010) also reported that the incidence of fruit flies was more during warm and rainy months (June, July and August at 25-37 °C).

The highest population of gundhi bug was recorded at 22nd SMW (30th May) with 5.33 bugs/ plant on D_3 (Table 3) sowing date while the lowest was observed at 19th SMW (9th May) with 2.00 bugs/ plant on D_2 (Table 2) sowing date. The highest leaf hopper population was recorded at 22nd SMW (30th May) with 4.67 hoppers/ plant on D_3 (Table 3) sowing date while the lowest was observed at 19th SMW (9th May) with 1.67 hoppers/ plant on D_1 (Table 1) sowing date.

Minimum temperature and minimum relative humidity had a mostly positive and highly significant correlation on the incidence of red pumpkin beetle and fruit fly on all the sowing dates (Table 4). However, all other parameters showed mostly a non-significant effect (Table 4).Similarly, Dubale *et. al.* (2018) also reported that minimum temperature has a positive significant effect; relative humidity has a negative correlation and rainfall showed a non-significant correlation with red pumpkin beetle incidence. On the other hand, Yadav *et. al.* (2017) found that the population of red pumpkin beetle exhibited a significant positive correlation with mean temperature. However, Saha *et. al.* (2018) revealed that red pumpkin beetle showed a significant positive correlation with the maximum and minimum temperature whereas; negative and non-significant correlation with relative humidity and rainfall.Present findings are also very close to that reported by Ghule *et al.* (2013) who found the fruit fly population has a non-significant negative correlation with maximum relative humidity and non-significant positive correlation with total rainfall. However, the maximum and minimum temperature revealed a significant positive correlation whereas; minimum RH showed a negatively significant correlation with the fruit fly population. Wazir *et. al.* (2019) also reported that the fruit fly population has a highly significant and positive correlation with mean relative humidity but highly negatively correlated with maximum temperature. Similarly, Laskar and Chatterjee (2010) recorded a negative correlation of fruit fly incidence with maximum humidity and positive with the minimum whereas significant positive correlation of fly incidence was noted with minimum and maximum temperature.

Minimum temperature and minimum relative humidity had a positive and significant effect with the incidence of *Leptocorisa acuta* on all the sowing dates (Table 4). However, all the weather parameters exhibited mostly a positive non-significant correlation with the incidence of *Bothrogonia sclerotica* (Table 4).

4. Conclusion

The present study can be concluded that pumpkin crops are attacked by different pests right from the nursery up to the harvesting stage that leads to severe damage to the crops. Therefore, it draws a serious attention of the researchers in the related field as no detail study has been done on the pests of pumpkin. Among all the pests red pumpkin beetle, fruit fly, leaf hopper and gundhi bugs were found to be the major pests. Minimum temperature and minimum relative humidity had a positive and highly significant correlation with the incidence of red pumpkin beetle, fruit fly and gundhi bug on all the sowing dates.All the weather parameters exhibited mostly positive and non-significant correlation with the incidence of *Bothrogonia sclerotica*. The finding of the present investigation provides important information about the pest complex of pumpkin, their incidence and the right time of sowing. This information will be useful in conducting future research on this particular crop as well as in the management of the pests.

Table 1. Incidence of pest complex in pumpkin during first date of sowing (D_1)

Standard Mean week	Date of observation	Mean number per leaf or plant			
		Date of sowing (14th March 2019): D_1			
		Aulacophora foveicollis	*Bothrogonia sclerotica*	*Leptocorisa acuta*	*Bactrocera dorsalis*
16	18th April	0.00	0.00	0.00	0.00
17	25th April	1.33	0.00	0.00	0.00
18	2nd May	1.67	0.00	0.00	0.00
19	9th May	2.00	1.67	2.33	3.67
20	16th May	2.67	2.33	3.00	5.67
21	23rd May	3.33	2.67	3.67	7.00

22	30th May	3.67	4.00	5.00	7.67
23	6th June	4.00	3.33	4.33	8.33
24	13th June	3.67	2.33	4.00	10.33
25	20th June	3.33	1.00	3.67	8.67
26	27th June	2.00	0.67	3.00	8.33
Mean		2.51	1.63	2.63	5.42

Note: Mean value of five plants

Table 2. Incidence of pest complex in pumpkin during second date of sowing (D_2)

Standard Mean week	Date of observation	Mean number per leaf or plant			
		Date of sowing (21st March 2019): D_2			
		Aulacophora foveicollis	*Bothrogonia sclerotica*	*Leptocorisa acuta*	*Bactrocera dorsalis*
16	18th April	0.33	0.00	0.00	0.00
17	25th April	1.33	0.00	0.00	0.00
18	2nd May	1.67	0.00	0.00	0.00
19	9th May	2.00	2.00	2.00	3.33
20	16th May	3.00	3.00	2.33	5.33
21	23rd May	3.33	3.00	4.33	6.67
22	30th May	3.33	4.33	4.67	7.33
23	6th June	3.67	3.67	4.33	8.00
24	13th June	4.00	2.67	4.00	10.67
25	20th June	3.67	1.33	3.33	8.67
26	27th June	2.67	1.00	3.33	8.33
Mean		2.63	1.90	2.57	5.30

Note: Mean value of five plants

Table 3. Incidence of pest complex in pumpkin during third date of sowing (D_3)

Standard Mean week	Date of observation	Mean number per leaf or plant			
		Date of sowing (28th March 2019): D_3			
		Aulacophora foveicollis	*Bothrogonia sclerotica*	*Leptocorisa acuta*	*Bactrocera dorsalis*
16	18th April	0.00	0.00	0.00	0.00
17	25th April	1.00	0.00	0.00	0.00
18	2nd May	1.33	0.00	0.00	0.00
19	9th May	1.67	2.00	2.33	4.00
20	16th May	2.00	2.67	3.33	5.67
21	23rd May	2.67	3.33	4.00	7.33
22	30th May	3.33	4.67	5.33	8.00

23	6th June	3.67	4.00	4.67	9.00
24	13th June	3.67	2.67	4.33	10.67
25	20th June	3.00	1.33	4.00	9.33
26	27th June	2.00	1.00	3.00	9.00
Mean		2.21	1.97	2.81	5.72

Note: Mean value of five plants

Table 4. Correlation coefficient (r) of major insect pests with abiotic factors in Pumkin at different dates of sowing during April to June 2019

Date of sowing	Pests	Pearson's correlation coefficient				
		Temperature (ºC)		Relative humidity (%)		Rainfall (mm)
		Max.	Min.	Max.	Min.	
14th March 2019	*Aulacophora foveicollis*	0.292^{NS}	0.713*	-0.317^{NS}	0.758**	0.430^{NS}
	Bothrogonia sclerotica	0.027^{NS}	0.306^{NS}	-0.239^{NS}	0.426^{NS}	0.458^{NS}
	Leptocorisa acuta	0.380^{NS}	0.670*	-0.287^{NS}	0.722*	0.483^{NS}
	Bactrocera dorsalis	0.511^{NS}	0.842**	-0.258^{NS}	0.817**	0.355^{NS}
21stMarch 2019	*Aulacophora foveicollis*	0.408^{NS}	0.827**	-0.308^{NS}	0.841**	0.399^{NS}
	Bothrogonia sclerotica	0.067^{NS}	0.344^{NS}	-0.269^{NS}	0.466^{NS}	0.438^{NS}
	Leptocorisa acuta	0.324^{NS}	0.691*	-0.283^{NS}	0.734*	0.447^{NS}
	Bactrocera dorsalis	0.525^{NS}	0.853**	-0.239^{NS}	0.812**	0.349^{NS}
28th March 2019	*Aulacophora foveicollis*	0.356^{NS}	0.763**	-0.264^{NS}	0.759**	0.424^{NS}
	Bothrogonia sclerotica	0.039^{NS}	0.336^{NS}	-0.255^{NS}	0.459^{NS}	0.453^{NS}
	Leptocorisa acuta	0.366^{NS}	0.664*	-0.271^{NS}	0.724*	0.495^{NS}
	Bactrocera dorsalis	0.520^{NS}	0.852**	-0.264^{NS}	0.826**	0.342^{NS}

Note: df = (11-2) = 9 $r_{0.05} = 0.602$ $r_{0.01} = 0.735$

* = Significant at 5% level of significance

** = Significant at 1% level of significance

NS = Non-significant at 5% level of significance

5. References

Afroz, M., Amin, M.R., Miah, M.R.U. and Hossain, M.M. (2019) Effects of weather on the abundance and infestation of major insect pests of sweet gourd in Gazipur. Bangladesh Journal of Zoology.47(2): 285-291.

Anonymous (2018) Horticulture database. National Horticulture Board, Ministry of Agriculture and Farmers Welfare, Govt. of India.http://www.nhb.gov.in

Borah, R.K. (1999) Seasonality and varietal preference of red pumpkin beetle on cucumber (*Cucumis sativus*) in Assam. Indian Journal of Agricultural Sciences.69 (3): 180-181.

Dubale, M.M., Jalgaonkar, V.N., Golvankar, G.M., Naik, K.V. and Munj, A.Y. (2018) Seasonal activity of red pumpkin beetle on ridge gourd and weather relation. Journal of Entomology and Zoology Studies.6 (6): 332-335.

Ghule, T.M., Devi, L.L., Uikey, B.L. and Jha, S. (2015) Incidence studies on some important insect pests of ridge gourd (*Luffa acutangula*). Environment and Ecology. 33 (1A): 351-355.

Ghule, T.M., Uikey, B.L. and Jha, S. (2013) Influence of abiotic environmental factors on incidence of melon fruit fly (*Bactrocera cucurbitae* Coq.) on bittergourd. Journal of Plant Protection Sciences.5 (2): 42-44.

Gupta, D. (2004) Insect pests of cucurbit vegetables. In: Pest Management in Horticulture crops (eds. L. R. Verma, A. K. Verma and D. C. Gautam), Aristech Publishers Inc. pp 437.

Halder, J., Rai, A.B., Pandey, M.K., Chaubey, T., Dey, D. and Singh, B. (2017) Checklist of insect and acarine fauna associated with sponge gourd, *Luffa cylindrical* (L.) in the Indo-Gangetic plains of India. Vegetable Science.44 (2): 39-42.

Johri, R. and Johri, P.K. (2003) Seasonal biology, abundance and intensity of attack of red pumpkin beetle, *Aulacophorafoveicollis* Lucas on cucurbit crops at Kanpur in Uttar Pradesh. Journal of Applied Zoological Research.14 (2): 144-147.

Khan, M.M.H.(2012) Host preference of pumpkin beetle to cucurbits under field conditions. Journal of the Asiatic Society of Bangladesh.38 (1): 75-82.

Laskar, N and Chatterjee, H. (2010) The Effect of Meteorological Factors on the Population Dynamics of Melon fly, *Bactrocera cucurbitae* (Coq.) (Diptera: Tephritidae) in the foot hills of Himalaya.Journal of Applied Sciences and Environmental Management.14 (3): 53-58.

Meena, D.S., Acharya, V.S. and Kumar, D.(2019) Seasonal Incidence of Fruit Fly, *Bactrocera cucurbitae* on Bottle Gourd and their Correlation with Abiotic Factors. International Journal of Current Microbiology and Applied Sciences.8 (12): 381-388.

Ram, H.H., Prasad, L., Singh, O.K., Yadav, R.S. and Singh, B.(2009) Screening of cucurbit germplasm against insect-pests and diseases under natural conditions. Society for Recent Development in Agriculture.9 (2): 229-234.

Saha, T., Chandran, N., Kumar, S. and Kumari, K.(2018) Effect of weather parameters on incidence of insect pests of cucumber in eastern Bihar. Journal of Agrometeorology. 20(1): 57-61.

Sahu, B.P.(1982) Studies on the pests of pumpkin (*Cucurbitamoschtata* Duchesne). M.Sc. (Ag) Thesis, Orissa University of agriculture and technology, College of Agriculture, Bhubaneswar.

Saljoqi, A.U.R. and Khan, S.(2007) Relative abundance of the red pumpkin beetle, *Aulacophora foveicophora* lucas, on different cucurbitaceous vegetables. Sarhad Journal of Agriculture.23 (1): 109-114.

Wazir, Z.A., Singh, A.K. and Ramana, N.(2019) Seasonal incidence of fruit fly on Summer squash (*Cucurbita pepo* L.) and effect of weather parameters on population dynamics of fruit fly *Bactrocera cucurbitae* (Coquillett). Journal of Entomology and Zoology Studies.7 (5): 167-170.

Yadav, G., Mahla, M.K., Chhangani, G., Ahir, K.C. and Dangi, N.L. (2017) Seasonal incidence and ecofriendly management of red pumpkin beetle of bottle gourd. Indian Journal of Applied Entomology.31 (2): 98-103.