International Journal of Bio-resource and Stress Management https://ojs.pphouse.org/index.php/IJBSM

Crossref

IJBSM May 2026, 17(5): 01-08 Article AR6985

Research Article Stress Management

DOI: HTTPS://DOI.ORG/10.23910/1.2026.6985

Population Dynamics of Sorghum Foliage-feeding Insects and their Natural Enemies in Relation to Abiotic Factors

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ABSTRACT

A field investigation was carried out during the summer (March–June), *kharif* (July–September) and *rabi* (November–February) seasons of 2024–25 at the Agronomy Instructional Farm, Sardarkrushinagar, to study the population dynamics of foliage-feeding insect pests and their natural enemies in relation to abiotic factors. The study revealed distinct seasonal variations in pest and natural enemy activity. During the summer season, ash weevil and leaf hopper populations reached their peak during the 18th and 21st Standard Meteorological Week (SMW), respectively, while spider activity was highest during the 19th SMW. In the *kharif* season, major pests such as ash weevil, leaf folder and aphid, along with the natural enemy coccinellids, recorded peak incidence between the 33rd and 35th SMW. During the *rabi* season, aphid population attained its maximum between the 48th SMW and 1st SMW, indicating its dominance during cooler months. Correlation analysis showed that abiotic factors such as bright sunshine hours, temperature and relative humidity significantly influenced the population build-up of insect pests and their natural enemies, although the degree and direction of influence varied across seasons. Regression analysis further indicated that abiotic factors had a strong influence on pest incidence during the *kharif* season (R^2=0.75–0.94), a moderate influence during *rabi* (R^2=0.64–0.79), and a comparatively lower influence during summer (R^2=0.28–0.67). Overall, the findings emphasized the crucial role of weather parameters in regulating seasonal pest occurrence and natural enemy activity, which could support the development of timely, season-specific and location-based pest management strategies.

KEYWORDS: Abiotic, correlation, foliage feeders, SMW, and sorghum

***Citation* (VANCOUVER):** Thilak et al., Population Dynamics of Sorghum Foliage-feeding Insects and their Natural Enemies in Relation to Abiotic Factors. *International Journal of Bio-resource and Stress Management,* 2026; 17(5), 01-08. HTTPS://DOI.ORG/10.23910/1.2026.6985.

Data Availability Statement: Legal restrictions are imposed on the public sharing of raw data. However, author have full right to transfer or share the data in raw form upon request subject to either meeting the conditions of the original consents and the original research study. Further, access of data needs to meet whether the user complies with the ethical and legal obligations as data controllers to allow for secondary use of the data outside of the original study.

Conflict of interests: The author has declared that no conflict of interest exists.

RECEIVED on 15th February 2026 RECEIVED in revised form on 16th April 2026 ACCEPTED in final form on 01st May 2026 PUBLISHED on 05th May 2026

1. INTRODUCTION

Sorghum (*Sorghum bicolor* (L.) Moench) is one of the most important food and fodder crops in India with a productivity of 1162 kg ha^{-1} during 2024 and in Gujarat, the productivity recorded as 1550 kg ha^{-1} (Anonymous, 2025). Sorghum can produce yields in different climatic conditions which makes it valuable cereal crop. Most of the varieties of sorghum crop are generally heat and drought tolerant, making them suitable for cultivation in arid region and could be grown even under the water scarcity conditions. It is fifth important cereal in the world after wheat, maize, rice and barley (Ahmed et al., 2016). It was grown in more than 90 countries in Africa, Asia, Oceania and the Americas. It is the dietary staple of more than 500 million people in over 30 countries primarily in the developing world (Kumar et al., 2011). The top ten sorghum producers globally are the United States, India, Mexico, Nigeria, Sudan, Ethiopia, Australia, Brazil, China and Burkina Faso (Rakshit et al., 2014). The advantage of this cereal crop is that it can be cultivated in both *kharif* and *rabi* seasons. It is nutritionally superior to other cereals such as rice and wheat with high fiber content, minerals and slow digestibility (Gonzalez-Montilla et al., 2012, Tasie and Gebreyes, 2020). The activity of the pests varies from season to season and region to region with the difference in their weather factor (Priyanka et al., 2018). The major being sorghum shoot fly, *Atherigona soccata* Rondani, stem borer, *Chilo partellus* Swinhoe, sorghum shoot bug, ear-head bug, army worm, sorghum aphid, Gram caterpillar (Patil and Varma, 2023). Despite of its wide use as food, feed and fodder its cultivation is reducing in past few years in the country because of its low productivity. Sorghum's low production is attributable to a variety of abiotic (rainfall, humidity, temperature) and biotic factors. In terms of biotic factors, the losses caused by insect pests are enormous. Nearly 32% of the actual production of sorghum is lost because of insect pests in India (Okosun et al., 2021). Major insect pests affecting productivity includes shoot fly, grasshopper, grey weevil, stem borer, aphid and termite. Due to variation in the agroclimatic conditions, insects show varying trends in their incidence pattern and extent of damage. The weather factors play a key role in determining the incidence and dominance of a pest or pest complex (Meena et al., 2013). The damage due to insect pest complex depends upon their population trends in the field which, in turn, rely upon them dynamically of the physical factors of their immediate environment (Isard, 2004). Invasive aphid, *Melanaphis sorghi* (Theobald) sorghum aphid previously published as sugarcane aphid, *Melanaphis sacchari* (Zehntner) (Hemiptera: Aphididae) was recognized as a major pest of sorghum (Brewer et al., 2022). The aphid may cause substantial economic loss through negative impact on sorghum plants and through negative impact on harvesting efficiency due to sticky honeydew excretion buildup on leaves (Bowling et al., 2016; Zapata et al., 2018) but the impact can vary regionally with climate and types of sorghum grown (Brewer et al., 2019). Among the sucking pests, the aphid *Melanaphis sacchari* (Zehntner) (commonly known as sugarcane aphid) is becoming a constraint in *rabi* sorghum growing areas. The earlier authors also found that biotic and abiotic factor plays crucial role in the population build-up of insect pests and predators. Thus, study was done to study the population dynamics of foliage-feeding insect pests and their natural enemies with abiotic factors.

2. MATERIALS AND METHODS

Studies were undertaken to assess the dynamics of foliage feeders infesting sorghum during summer (march to June), *kharif* (July to September) and *rabi* (November to February) seasons of 2024–2025 at Agronomy Instructional Farm, Sardarkrushinagar, from March 2024 to February 2025. Sorghum variety GJ-43 was selected for the study. Observations were recorded at weekly intervals, commencing from 12th to 24th Standard Meteorological Week (SMW) during summer, 27th to 39th SMW during *kharif* and 46th SMW to 6th SMW during *rabi*. The crop was sown in a plot measuring 9×7.5 m^2 with a spacing of 45×15 cm^2 and crop was raised as per all agronomic standards.

2.1. Observations

The pest population of ash weevil, aphids and leaf hoppers were recorded as number $plant^{-1}$. Whereas, leaf folder population recorded as larvae $plant^{-1}$ and natural enemies population (spider) recorded as number $plant^{-1}$ and coccinellids beetles as beetles $plant^{-1}$ all these pests and their natural enemies were recorded directly from five randomly selected plants from each quadrate starting from the vegetative stage to reproductive stage. Weather parameters that prevailed during SMW of all the seasons were correlated with biological observations (pest number $plant^{-1}$). The statistical analysis was used to correlate the pest population data of different insects and abiotic parameters (Pearson, 1895). The statistical software GRAPES was used for regression analysis (Gopinath et al., 2021).

3. RESULTS AND DISCUSSION

3.1. Summer, 2024

3.1.1. Ash weevil

The population was commenced from 3rd WAS i.e., 14th SMW (0.13 weevils $plant^{-1}$) which attained its higher peak (0.83 weevils $plant^{-1}$) during 8th WAS i.e., 18th SMW (Table 1). Then after, it declined during 23rd SMW (0.06 weevils $plant^{-1}$). The population of ash weevil was fluctuated between 0.06 and 0.83 weevils $plant^{-1}$ with an average of 0.32 weevils $plant^{-1}$ during the crop season.

Table 1: Occurrence of various foliage feeders in sorghum during summer, *kharif* and *rabi* sorghum

Summer, 2024						*Kharif*, 2024							
Month	WAS	SMW	Ash weevil	Leaf hopper	Spiders	Month	WAS	SMW	Ash weevil	Leaf folder	Leaf hopper	Aphid	Cocci-nellids
			No. plant^{-1}						No. plant^{-1}	Larvae plant^{-1}	No. plant^{-1}		Beetle plant^{-1}
March	1	12	0.00	0.00	0.00	July	1	27	0.00	0.00	0.00	0.00	0.00
	2	13	0.00	0.00	0.00		2	28	0.16	0.00	0.00	0.00	0.00
April	3	14	0.13	0.00	0.03		3	29	0.26	0.13	0.00	19.00	0.03
	4	15	0.26	0.00	0.06		4	30	0.30	0.23	0.10	21.00	0.06
	5	16	0.57	0.06	0.10	August	5	31	0.53	0.26	0.16	63.00	0.26
	6	17	0.63	0.26	0.06		6	32	0.67	0.63	0.23	92.00	0.40
May	7	18	0.83	0.30	0.16		7	33	0.86	0.76	0.36	118.00	0.63
	8	19	0.77	0.33	0.27		8	34	0.83	0.60	0.53	123.00	0.36
	9	20	0.47	0.43	0.23	Sep-tember	9	35	0.56	0.26	0.60	88.00	0.30
	10	21	0.30	0.53	0.10		10	36	0.36	0.10	0.43	52.00	0.13
	11	22	0.13	0.23	0.06		11	37	0.10	0.06	0.10	21.00	0.06
June	12	23	0.06	0.16	0.00		12	38	0.00	0.00	0.00	0.00	0.00
	13	24	0.00	0.00	0.00		13	39	0.00	0.00	0.00	0.00	0.00
	Mean		0.32	0.18	0.08		Mean		0.36	0.23	0.19	45.92	0.17

Table 1: Continue...

Rabi, 2024–25					
Month	WAS	SMW	Aphid	Leaf hopper	Coccinellids
			Number plant^{-1}		Beetle plant^{-1}
November	1	46	0.00	0.00	0.00
	2	47	0.00	0.00	0.00
	3	48	23.00	0.00	0.06
December	4	49	54.00	0.13	0.26
	5	50	67.00	0.16	0.33
	6	51	72.00	0.20	0.43
	7	52	121.00	0.26	0.50
January	8	1	129.00	0.36	0.40
	9	2	86.00	0.40	0.30
	10	3	33.00	0.20	0.16
	11	4	18.00	0.03	0.10
February	12	5	0.00	0.00	0.00
	13	6	0.00	0.00	0.00
	Mean		46.38	0.13	0.20

WAS: Weeks after sowing, SMW: Standard meteorological weeks

3.1.2. Leaf hopper

The population observed from 5th WAS i.e., 16th SMW (0.06 hoppers plant^{-1}) with higher (0.53 hoppers plant^{-1}) activity during 10th WAS i.e., 21st SMW (Table 1). Then after, it declined slowly during 12 WAS i.e., 23rd SMW 0.16 hoppers plant^{-1}. The population of leaf hoppers ranged between 0.06 and 0.53 hoppers plant^{-1} with an average of 0.18 hoppers plant^{-1}.

3.1.3. Spider

The activity of spider was observed from 3rd WAS i.e., 14th SMW (0.03 spiders plant^{-1}) and increased gradually and found peak (0.27 spiders plant^{-1}) during 8th WAS i.e., 19th SMW (Table 1). Further it was declined gradually and remained active till 11th WAS i.e., 22nd (0.06 spiders plant^{-1}). The spider population varied from 0.03 to 0.27 spiders plant^{-1} with an average of 0.08 spiders plant^{-1}.

3.2. Kharif, 2024

3.2.1. Ash weevil

The presence of ash weevil was spotted from 2nd to 11th WAS. The population started to found from 2nd WAS i.e., 28th SMW with lower activity (0.16 weevil plant^{-1}) (Table 1). Highest population (0.86 weevil plant^{-1}) was observed during 7th WAS i.e., 33rd SMW. Then after, it declined slowly till 11th WAS i.e., 37th SMW (0.10 weevil plant^{-1}). The population of ash weevil was fluctuated between 0.10 and 0.86 with an average of 0.36 weevil plant^{-1} during the cropping season.

3.2.2. Leaf folder

First infestation started after 3rd WAS i.e., 29th SMW (0.13 larva plant^{-1}) which gradually increased and attained the peak (0.76 larva plant^{-1}) status during 7th WAS i.e., 33rd SMW (Table 1). Then after, its activity declined and stood as 0.06 larva plant^{-1} during 37th SMW.

3.2.3. Leaf hopper

Activity of leaf hopper was spotted from 4th to 11th WAS. The population was observed from 4th WAS i.e., 30th SMW (0.10 hoppers plant^{-1}). The higher (0.60 hoppers plant^{-1}) activity was seen during 9th WAS i.e., 35th SMW. Then after, it declined slowly till 37th SMW (0.10 hoppers plant^{-1}) and then disappeared. The population of leaf hopper was fluctuated between 0.10 and 0.60 hoppers plant^{-1} with an average of 0.19 hoppers plant^{-1} (Table 1).

3.2.4. Aphid (Melanaphis sacchari)

The population was observed from 4th WAS i.e., 30th SMW (0.10 hoppers plant^{-1}). The higher (0.60 hoppers plant^{-1}) aphid incidence was seen during 9th WAS i.e., 35th SMW (Table 1). Then after, it declined slowly till 37th SMW (0.10 hoppers plant^{-1}). The population of leaf hopper was fluctuated between 0.10 and 0.60 hoppers plant^{-1} with an average of 0.19 hoppers plant^{-1} during the cropping season.

3.2.5. Coccinellids

The infestation started from 3rd WAS i.e., 29th SMW (0.03 adult plant^{-1}) which slightly increased and attained its peak (0.63 adult plant^{-1}) during 7th WAS i.e., 33rd SMW. Further its activity declined gradually and remained active till 11th WAS i.e., 37th SMW (0.06 adult plant^{-1}). The population of coccinellids during the study period with as 0.17 beetle plant^{-1} (Table 1).

3.3. Rabi, 2024–25

3.3.1. Aphid (*Raphalosiphum maidis*)

The activity of aphid was noticed from 3rd to 11th WAS. The population started appearing from 8th WAS i.e., 48th SMW (23.00 aphids plant^{-1}). Higher activity (129.00 aphids/plant) was observed during 8th WAS i.e., 1st SMW. Then after, it declined slowly till 11th WAS i.e., 4th SMW (18.00 aphids plant^{-1}). The population of aphids was fluctuated between 18.00 and 129.00 aphids plant^{-1} with an average of 46.38 aphids plant^{-1} (Table 1).

3.3.2. Leaf hopper

The activity of leaf hopper was spotted from 4th to 11th WAS. The population was started from 4th WAS i.e., 49th SMW (0.13 hoppers plant^{-1}). Peak leaf hopper (0.40 hoppers plant^{-1}) activity noticed during 9th WAS i.e., 2nd SMW. Then after, it declined slowly till 11th WAS i.e., 4th SMW (0.03 hoppers plant^{-1}) (Table 1). The population of leaf hopper was fluctuated between 0.03 and 0.40 hoppers plant^{-1} with an average of 0.13 hoppers plant^{-1} during the cropping season.

3.3.3. Coccinellids

The activity of coccinellids was seen from 3rd WAS i.e., 48th SMW (0.06 adult plant^{-1}) which slightly increased and attained higher (0.50 adult plant^{-1}) level during 7th WAS i.e., 52nd SMW along with the pest incidence. Further activity declined gradually and remained active till 11th WAS i.e., 4th SMW with (0.10 adult plant^{-1}) with Average of 0.20 beetles plant^{-1} (Table 1).

3.4. Correlation of foliage pest and natural enemies with abiotic factors during all seasons

3.4.1. Ash weevil

During summer relationship between ash weevil incidence with different weather parameters revealed that no weather parameters played significant role with ash weevil activity during cropping period (Table 2). In *kharif*, correlation revealed that bright sun shine hours ($r=-0.693^{**}$) had established highly significant negative relationship and maximum temperature ($r=-0.600^{*}$) established significant negative relationship.

3.4.2. Leaf hopper

The correlation study between leaf hopper and weather parameters revealed that bright sun shine hours ($r=0.697^{**}$) and maximum temperature ($r=0.554^{*}$) established highly significant and positive relation with leaf hoppers in sorghum during summer. In *kharif*, it revealed that bright sun shine hours ($r=-0.693^{**}$) had established highly

Table 2: Correlation of weather parameters with foliage feeders infesting summer, *kharif* and *rabi* sorghum

Summer, 2024							
Pest and natural enemies		Abiotic factors					
		Bright sunshine hours	Wind speed (km h^{-1})	Temperature °C		Relative humidity (%)	
				Max	Min	Max	Min
Number plant^{-1}	Ash weevil	0.285^{NS}	-0.312^{NS}	-0.111^{NS}	-0.118^{NS}	0.168^{NS}	-0.293^{NS}
Number plant^{-1}	Leaf hoppers	0.697**	0.199^{NS}	0.554*	0.482^{NS}	-0.002^{NS}	-0.289^{NS}
Number plant^{-1}	Spider	0.404^{NS}	-0.049^{NS}	0.279^{NS}	0.081^{NS}	-0.109^{NS}	-0.416^{NS}

Kharif, 2024								
Pest and natural enemies		Bright sunshine hours	Rainfall	Wind speed (km h^{-1})	Temperature °C		Relative humidity (%)	
					Max	Min	Max	Min
Number plant^{-1}	Ash weevil	-0.667*	0.152^{NS}	0.218^{NS}	-0.594*	-0.081^{NS}	0.506^{NS}	0.372^{NS}
Number plant^{-1}	Leaf folder	-0.611*	-0.066^{NS}	0.210^{NS}	-0.441^{NS}	0.001^{NS}	0.392^{NS}	0.293^{NS}
Number plant^{-1}	Leaf hopper	-0.248^{NS}	0.357^{NS}	0.148^{NS}	-0.665*	-0.444^{NS}	0.674*	0.501^{NS}
Number plant^{-1}	Aphid	-0.459^{NS}	0.137^{NS}	0.179^{NS}	-0.626*	-0.262^{NS}	0.659*	0.502^{NS}
Beetle plant^{-1}	Coccinellids	-0.529^{NS}	0.018^{NS}	0.269^{NS}	-0.587*	-0.182^{NS}	0.555*	0.433^{NS}

Rabi, 2024–25							
Pest and natural enemies		Bright sunshine hours	Wind speed (km h^{-1})	Temperature °C		Relative humidity (%)	
				Max	Min	Max	Min
Number plant^{-1}	Aphid	-0.275^{NS}	0.179^{NS}	-0.561*	-0.553^{NS}	0.381^{NS}	0.143^{NS}
Number plant^{-1}	Leaf hopper	-0.223^{NS}	0.377^{NS}	-0.675*	-0.668*	0.377^{NS}	0.084^{NS}
Beetle plant^{-1}	Coccinellids	-0.332^{NS}	0.197^{NS}	-0.577*	-0.591*	0.334^{NS}	0.123^{NS}

significant negative relationship and maximum temperature (r=-0.600*) established significant negative relationship (Table 2). In *rabi*, maximum temperature (r=-0.675*) and minimum temperature (r=-0.668*) have established significant negative relationship with hopper incidence.

3.4.3. Aphid

During summer, the correlation between aphid incidence and weather parameters revealed that weather parameters bright sun shine hours (r=-0.564*) had significant negative relationship, maximum temperature (r=-0.634*) had significant negative relationship and maximum relative humidity (r=0.596*) noted significant positive relationship with the aphid incidence. During the *kharif* season, correlation stated that the maximum temperature (r=-0.561*) recorded significant negative relationship and rest of the other parameters have no effect on aphid activity (Table 2).

3.4.4. Leaf folder

In *kharif*, correlation study between leaf folder larvae and abiotic factors revealed that bright sun shine hours had established significant negative relationship along with the larvae incidence (r=-0.611**) (Table 2).

3.4.5. Spider

The spider population was not significantly influenced by any weather parameters during the summer season (Table 2).

3.4.6. Coccinellids

The correlation study during *kharif* between coccinellids and abiotic factors revealed that maximum temperature (r=-0.587*) had established significant negative relationship and maximum relative humidity (r=0.555*) had established significant positive relation with coccinellids population occurrence. The correlation study during the *rabi* season stated that maximum temperature (r=-0.577*) and minimum temperature (r=-0.591*) have established significant negative relation with coccinellids population (Table 2).

3.5. Regression analysis of pest and natural enemies with abiotic factors

3.5.1. Summer 2024

During summer, the regression model explained 35% (R^2=0.35) of variation in ash weevil population, indicating moderate influence of weather factors. Positive coefficients for X_1, X_4 and X_5 suggest that these variables contributed positively to ash weevil incidence, while X_2, X_3 and X_5 showed negative effects. For leaf hopper, the model showed a relatively higher explanatory power (R^2=0.67), indicating that 67% of the population fluctuation was influenced by the abiotic variables. X_1 and X_4 had positive effects, suggesting their favourable role in leaf hopper build-up. The regression model for spiders explained 28% (R^2=0.28) of variation, indicating comparatively weaker weather influence. Some parameters (X_1, X_3, X_5) positively influenced spider population, while others had a suppressive effect. Overall, during summer, weather parameters had moderate impact on leaf hopper but comparatively less influence on spiders and ash weevil (Table 3).

3.5.2. Kharif, 2024

The ash weevil population exhibited a very high coefficient of determination (R^2=0.94), suggesting that 94% of the variation was explained by the included weather parameters. Similarly, aphid (R^2=0.89), coccinellids (R^2=0.84), leaf folder (R^2=0.80) and leaf hopper (R^2=0.75) populations were strongly influenced by climatic variables. Negative coefficients of X_1 in most equations suggest an inverse relationship with pest incidence, whereas positive coefficients of X_3 and X_4 in several models indicate favourable effects of these parameters on pest multiplication. Natural enemy (coccinellids) population also showed strong dependence on abiotic factors (R^2=0.84), suggesting that their activity closely followed seasonal weather variations. Thus, during *kharif*, abiotic factors played a dominant role in regulating both pests and natural enemies.

3.5.3. Rabi, 2024–25

In *rabi* season, moderate to high R^2 values were recorded. The aphid model explained 64% (R^2=0.64) of the variation, while leaf hopper (R^2=0.70) and coccinellids (R^2=0.79) showed relatively higher explanatory power. Regression coefficients of *rabi* season were negative, indicating that several abiotic parameters exerted suppressive effects on pest and predator populations. The comparatively higher R^2 for coccinellids suggested that their population was more strongly governed by weather factors than aphids.

The above results were in line with Meena and Bhamare (2023) who reported that the first incidence of *Melanaphis sacchari* during 49th (SMW) (19 aphids plant^{-1}) with its peak (166.66 aphids plant^{-1}) in 4th SMW and the first incidence of *R. maidis* was observed on in 50th SMW (15 aphids plant^{-1}) with its peak (40 aphids plant^{-1}) in 5th SMW correlation studies stated that wind speed (r=-0.648*) showed negatively significant correlation (r=-0.422) with the aphid incidence in sorghum. Similarly, Rakesh et al. (2022) recorded *Amarasca biguttula biguttula* infesting sorghum during 30th SMW while its peak incidence was observed during 12th WAS i.e., 38th SMW with 41 Jassids (nymph or adult) plant^{-1} and also reported that *Raphalosiphum maidis* was first recorded during the 31st SMW and peak incidence during 37th SMW with 54 aphids leaf^{-1} in sorghum and correlation results revealed that relative humidity morning (r=0.642**), relative humidity afternoon (r=0.643**), found positive against leaf

Table 3: Multiple regression equation for foliage feeders with various abiotic factors infesting sorghum (Gopinath et al., 2021)

Season	Pest and natural enemies	Multiple regression equation	Coefficient of determination R^2
Summer 2024	Ash weevil	$Y=0.188+0.005X_1-0.132X_2-0.026X_3+0.048X_4+0.018X_5-0.022X_6$	0.35
	Leaf hopper	$Y=-1.118+0.081X_1-0.031X_2+0.005X_3+0.025X_4-0.002X_5-0.001X_6$	0.67
	Spiders	$Y=-0.645+0.013X_1-0.005X_2+0.017X_3-0.008X_4+0.003X_5-0.003X_6$	0.28
Kharif, 2024	Ash weevil	$Y=-5.77-0.172X_1+0.001X_2+0.081X_3+0.172X_4-0.154X_5+0.070X_6-0.021X_7$	0.94
	Leaf folder	$Y=-6.246-0.134X_1-0.001X_2+0.066X_3+0.142X_4-0.069X_5+0.055X_6-0.014X_7$	0.80
	Leaf hopper	$Y=-1.289-0.077X_1+0.002X_2+0.057X_3+0.096X_4-0.175X_5+0.045X_6-0.017X_7$	0.75
	Aphid	$Y=-981.27-22.346X_1+0.170X_2+13.89X_3+26.25X_4-21.49X_5+10.62X_6-2.85X_7$	0.89
	Coccinellids	$Y=-4.875-0.080X_1+0.000X_2+0.058X_3-0.0087X_4+0.031X_5-0.043X_6-0.011X_7$	0.84
Rabi, 2024–25	Aphid	$Y=153.47-7.62X_1-17.91X_2+2.14X_3-15.40X_4+1.28X_5-1.11X_6$	0.64
	Leaf hopper	$Y= 0.86-0.10X_1-0.03X_2-0.01X_3-0.02X_4+0.00X_5-0.06X_6$	0.70
	Coccinellids	$Y= 0.06-0.05X_1-0.05X_2+0.04X_3-0.09X_4+0.00X_5-0.00X_6$	0.79

hopper incidence in sorghum and morning relative humidity (r=0.630**), evening relative humidity (r=0.562*) and rainfall (r=0.601**) also found positive with aphid incidence. Further Poul et al. (2023) reported first appearance of aphid during 01–07 January i.e., 18.3 aphids (3 leaf)$^{-1}$ and reached at its peak between 15–21 January i.e., 48.9 aphids (3 leaf)$^{-1}$ in sorghum and correlation also revealed that that morning relative humidity (r=0.493**) and evening relative humidity (r=0.303**) showed significant positive correlation with sorghum aphid population.

4. CONCLUSION

The investigation revealed distinct seasonal patterns in pest incidence on sorghum. During summer, ash weevil and leaf hopper peaked in the 18th and 21st SMW, while spiders increased with pest build-up. In *kharif*, ash weevil, leaf folder, aphid (*Melanaphis sacchari*), and coccinellids showed maximum incidence during 33rd-35th SMW. In *rabi*, aphid (*Rhopalosiphum maidis*) peaked between 48th and 1st SMW. Weather factors significantly influenced pest and predator populations, with the strongest effect in *kharif* (R^2=0.75–0.94). These findings aid pest forecasting and IPM planning.

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