Influence of Weather Parameters on the Infestation of Fall Armyworm *Spodoptera frugiperda*(J. E. Smith) in Perambalur Districtof Tamil Nadu, India

ABSTRACT

Maize, *Zea mays* L (Family:Poaceae), is a main cereal crop cultivated across diverse agro-climatic regions worldwide. The Fall Armyworm (FAW), *Spodoptera frugiperda* (J. E. Smith) (Lepidoptera: Noctuidae),migratory insect is notorious for its economic impact, inflicting severe damage on various crops including maize, rice, sorghum, millet, sugarcane, vegetables, and cotton, and has been documented to affect over 80 other plant species. A roving survey was carried out in four major maize growing blocks of Perambalur district *Viz.,*Perambalur, Veppanthattai, Alathur and Veppur during *Kharif* and *Rabi* season of 2023-2024. The experiment consisted of sixty standard weeks from 3rd July 2023 to 4th August 2024. The results indicated a positive correlation between the number of fall armyworm larvae/plant with Tmax, relative humidity (Evening), and the negative correlation was observed between the number of fall armyworm larvae/plant with Tmin, relative humidity (Morning), Sunshine and rainfall. The data concluded that the maximum temperature significantly influenced the emergence of the fall armyworm and its infestation on maize. The incidence of FAW started in 46th mean standard week MSW (13 larvae/plant) Alathur, (17.25 larvae/plant) Perambalur, (17.25 larvae/plant) Veppanthattai, (18 larvae/plant) Veppur and the population increased gradually and reached the peak in the 47th mean standard week MSW (26 larvae/plant) Alathur, (32.75 larvae/plant) Perambalur, (33 larvae/plant) Veppanthattai, (42 larvae/plant). Correlation analysis revealed that larval population showed a significant positive correlation with the maximum temperature and relative humidity. At the same time, minimum temperature, sunshine, and rainfall exhibited a negative association with larval incidence of *S. frugiperda.*

Keywords: Correlation, fall armyworm, maize, Perambalur, Weather parameters, Tamil Nadu

1. INTRODUCTION

Maize (*Zea mays* L.) Poaceae, is widely recognized as a vital cereal crop, valued for its significant role in human diets, with its stalks extensively utilized for feeding livestock, producing fuel, and even in construction applications [1]. The historical spread of maize production showcases its remarkable adaptability to diverse conditions [1]. It is grown from 58°N to 40°S, from below sea level to altitudes higher than 3000 m and in areas with 250 mm to more than 5000 mm of rainfall per year and with a growing cycle ranging from 3 to 13 month [2]. A total of 141 insect pests are responsible for causing damage from sowing to storage[3]. Among the various insect pests, *Spodoptera frugiperda* (J. E. Smith), Noctuidae, Lepidoptera, is of serious concern due to its rapid spread and polyphagous behaviour. The fall armyworm is an invasive pest native to the Americas, has become a global concern since its introduction into Africa in 2016 and subsequent invasion into Asia, including India[4-6]. This polyphagous insect pest primarily targets maize (*Zea mays*) but also feeds on a wide range of crops, causing substantial economic losses and threatening food security worldwide [7, 8]. In India, the impact of fall armyworm is particularly severe in regions like Perambalur district, Tamil Nadu, where maize cultivation forms a cornerstone of the agricultural economy[9]. The ability of fall armyworm to adapt rapidly to diverse environmental conditions and its high reproductive capacity underscore the urgency of understanding the factors influencing its population dynamics[2]. Among these factors, weather parameters such as temperature, humidity, precipitation, and wind speed play crucial roles in shaping the pest's behavior, lifecycle, and spatial distribution[10, 11]. These variables influence various aspects of fall armyworm ecology, from developmental rates and survival thresholds to migration patterns and seasonal outbreaks [12, 13]. Recent research has increasingly highlighted the significant impact of weather variability on fall armyworm populations. Temperature fluctuations, for instance, affect the developmental rates of fall armyworm larvae, with optimal temperatures accelerating growth and development [10]. Conversely, extreme temperatures can disrupt developmental processes and influence adult behavior and longevity [13]. Humidity levels also play a critical role, affecting oviposition behavior, larval survival rates, and the persistence of fall armyworm populations in agricultural landscapes [11]. Precipitation patterns contribute significantly to fall armyworm dynamics, influencing egg laying behaviors and larval migration[12]. Moisture availability affects egg viability and larval survival rates, impacting the timing and severity of pest outbreaks [12]. Furthermore, wind patterns facilitate the dispersal of fall armyworm populations over long distances, contributing to the rapid spread of infestations across agricultural regions [14]. The Perambalur district, situated in the maize belt of Tamil Nadu, confronts recurring challenges from fall armyworm infestations[9]. Farmers in this region face difficulties in managing the pest due to its rapid lifecycle and ability to develop resistance to conventional insecticides [4, 9]. Understanding how local weather conditions interact with fall armyworm biology is critical for developing integrated pest management (IPM) strategies that are effective, sustainable, and environmentally friendly. This study aims to investigate the influence of weather parameters on fall armyworm population dynamics in Perambalur district, Tamil Nadu. By integrating field observations with meteorological data analysis, quantify the relationships between temperature, humidity, precipitation, sunshine, rainfall, and fall armyworm abundance. The findings will contribute to enhancing the understanding of pest ecology in relation to climate variability and inform the development of targeted integrated pest management strategies tailored to local agroecological conditions.

2. MATERIAL AND METHODS

Perambalur district, the dry tract of Tamil Nadu with black cotton soil has cotton and maize as its major crop. This district is having a maximum area of maize production (Kharif 55,692 ha and Rabi 5,950 ha) in the State[9]. A roving survey was carried out in four maize growing blocks of Perambalur district *Viz.,*Perambalur, Veppanthattai, Alathur and Veppur during *Kharif* and *Rabi* season of 2023-2024 (Fig. 1). The crops was grown from 58°N to 40°S, from below sea level to altitudes higher than 3000 m and in areas with 250 mm to more than 5000 mm of rainfall per year and with a growing cycle ranging from 3 to 13 month [2].The study monitored the presence of *S. frugiperda* larvae weekly from July 2023 to August 2024. The survey followed a semi-systematic approach, with samples collected in a zigzag pattern resembling a "W" across the field [15]. Correlation analyses were conducted to examine the association between pest incidence and weather variables including maximum temperature, minimum temperature, relative humidity, and rainfall. Their population was expressed per plant from the mean of three replications and each replication data is a mean of data obtained from 10 plants. The data on abiotic factors such as maximum temperature, minimum temperature, relative humidity and rainfall were collected using“visual crossing” website for thedifferent blocks of Perambalur district. Correlation with weather parameters such as maximum temperature, minimum temperature, relative humidity, sunshine and rainfall were worked to find the relationship of pest with these weather parameters[15]. Correlation analysis was worked out using the software OPSTAT (beta version) [15]. The formula for calculating the per cent incidence is given below, [15]

$$\textbf{FAW incidence (\%)} = \frac{\textbf{Total number of damaged plants}}{\textbf{Total of number of plants observed}} \times 100$$

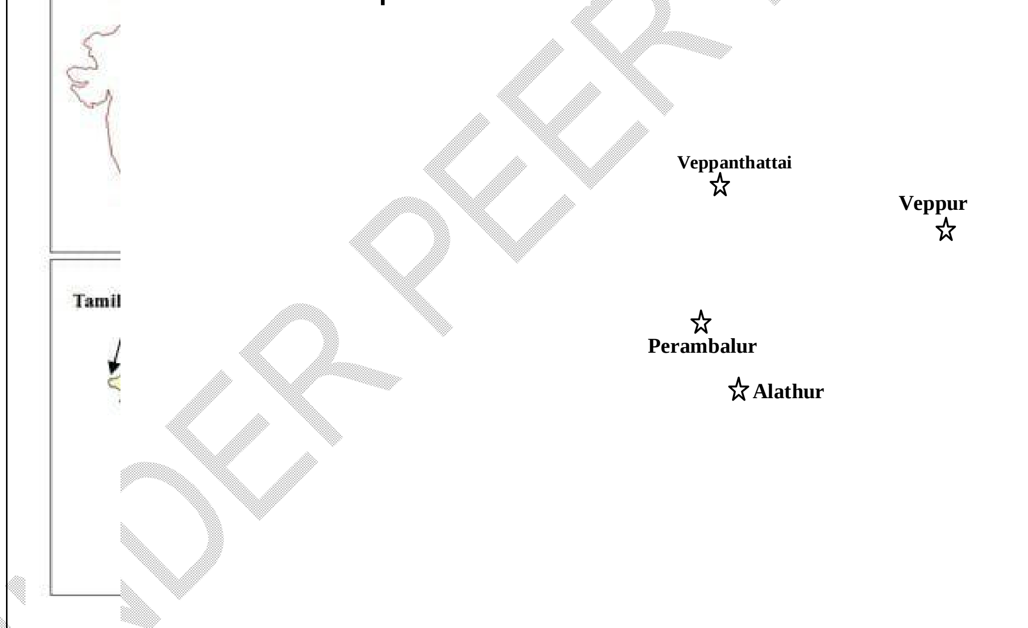

Fig 1. Survey location of fall armyworm in Tamil Nadu during *Kharif* and *Rabi* season 2023-2024

☆ - **Survey area**

3. RESULTS AND DISCUSSION

3.1. Seasonal incidence of fall armyworm on maize

The population of fall armyworm recorded as larvae /10 plants. The population of fall armyworm appeared in 35^{th} standard week of August (0.25%). The highest fall armyworm population was recorded in 47^{th} standard mean week as 26% in Alathur, 32.75% in Perambalur, 33% in Veppanthattai, and 42% in Veppur was noticed during last week of November with the prevalence of maximum (39.5 °C) and minimum (18.86 °C) temperature, morning (74.43%) and evening (50.86%) relative humidity, sunshine 5.97 hours per day respectively. The larval population was noticed in entire crop growth period it was ranging between 18 - 40 larvae/10 plants during 46 -49th MW.

In table 2, In the Veppanthattai block, damage varies notably between villages. Annamangalam reports a larval count of 6.5 per plant, with damage percentages of 48.33% to both Leaf and Whorl, 7.0% to Tassel, and 4.16% to Cob. Valikandapuram, with 7.0 larvae per plant, shows slightly higher damage with 50.00% to Leaf and Whorl, 7.33% to Tassel, and 3.0% to Cob. Periyavadakkari, having 5.75 larvae per plant, experiences slightly lower damage overall, with 45.00% to Leaf and Whorl, 7.83% to Tassel, and 2.66% to Cob. Venbavur, with the lowest larval count at 5.25 per plant, still reports significant damage, particularly to the Leaf and Whorl (35.66% each), while Tassel and Cob damage are at 4.0% and 5.6%, respectively.

In Perambalur, Kavulpalayam, with 2.75 larvae per plant, exhibits moderate damage, with 42.00% to both Leaf and Whorl, 4.83% to Tassel, and 7.0% to Cob. Thoramangalam has 3.0 larvae per plant, showing a slight increase in damage percentages compared to Kavulpalayam, with 38.66% to Leaf and Whorl, 9.0% to Tassel, and 8.16% to Cob. Sengunam, with 3.25 larvae per plant, shows even higher damage, particularly in Tassel (10.33%) while Leaf and Whorl damage are at 46.33%. Nochiam stands out with 2.50 larvae per plant but extremely high Tassel damage at 83.3%, alongside 46.66% damage to Leaf and Whorl and 8.0% to Cob.

In Alathur block, Naramangalam shows 3.25 larvae per plant, with significant damage to Leaf and Whorl (60.66% each), 5.33% to Tassel, and 9.5% to Cob. Nochikulam, also with 3.25 larvae per plant, has slightly lower Leaf and Whorl damage at 55.00%, but higher damage to Tassel and Cob at 4.83% and 11.0%, respectively. Padalur reports 4.25 larvae per plant, with notable damage of 63.66% to both Leaf and Whorl, 3.0% to Tassel, and 9.16% to Cob. Chettikulam, with the same larval count, has the highest Leaf and Whorl damage at 77.00%, and 7.33% damage to Cob, showing a high level of infestation impact.

Veppur demonstrates the highest levels of damage among all blocks. Varagur, with 7.50 larvae per plant, shows the highest damage to Leaf and Whorl at 83.00% each, 10.16% to Tassel, and 11.5% to Cob. Keelapuliyur, with 7.0 larvae per plant, reports 68.00% damage to Leaf and Whorl, with 12.83% to Tassel and 10% to Cob. Sirumathur, having 7.75 larvae per plant, has substantial damage across all categories, especially to Leaf and Whorl at 78.00%, 11.50% to Tassel, and 11.83% to Cob. Othiyam, with the highest larval count of 8.0 per plant, exhibits the ultimate damage levels, particularly severe on Cob at 14%, with significant damage of 74.00% to Leaf and 15.33% to Tassel.

3.2. Correlation between weather parameters and fall armyworm of maize

In *rabi* season, the occurrence of *S. frugiperda* was positively correlated with maximum temperature (ranging from 0.386 to 0.418). This indicates that higher maximum temperatures are associated with an increase in pest populations. Therefore, the larval population of fall armyworm showed significant positive correlation with maximum temperature r = 0.412** in Alathur, r = 0.418** in Perambalur, r = 0.386** in Veppanthattai, r = 0.393** in Veppur (Table 2).Minimum temperature has a negativeand statistically significant correlation with insect pest populations in all locations (ranging from -0.640 to -0.739). This suggests that lower minimum temperatures are associated with higher insect pest population. Relative humidity in morning has no significant correlation (NS) with insect pest populations in all locations, indicating that morning humidity may not be a key determinant for pest abundance. The occurrence of *S. frugiperda* was positively correlated with evening relative humidity (ranging from 0.473 to 0.499). This indicates that increase in relative humidity (evening) are associated with an increase in pest population.Therefore,the larval population with evening relative humidity also showed significant positive correlation r = 0.480**in Alathur, r = 0.482**in Perambalur, r = 0.499** in Veppanthattai, r= 0.473** in Veppur (Table No. 2). For Sunshine correlation with sunshine are generally negative and statistically significant across the locations (ranging from -0.245 to -0.309), indicating that more hours of sunshine are associated with lower insect pest populations. Correlation with the number of rainy days is mostly negative and significant in three out of the four locations (ranging from -0.271 to -0.303), suggesting that more rainy days are associated with fewer insect pests.

Fig. 2. Damage of fall armyworm on leaves

Fig 3. Defoliation of young maize crop

Fig. 4. Borehole damage caused by fall armyworm

Fig. 5. Damage of fall armyworm on maize cob

Fig. 6. Healthy and FAW infested maize cob

4. DISCUSSION

Fall armyworm (FAW), scientifically known as *Spodoptera frugiperda*, has emerged as a pest of significant global economic concern. Originally confined to the Americas, this pest has recently been detected in multiple countries across Africa, presenting a severe threat to agricultural sustainability. Since its initial invasion of Africa in 2016, FAW has rapidly spread across the continent FAW has swiftly spread across Africa and has extended its presence into Asia and Australia [16]. Kumar et al.[9] noted a significant positive correlation between the occurrence of *S. frugiperda*, specifically in terms of larval population, and maximum temperatures (r=0.7205). They also observed significant negative correlations with relative humidity (r= -0.6739) and rainfall (r= -0.8293) in Perambalur district. Paul and Deole[17] found a notable positive correlation (r=0.586) between *S. frugiperda* and maximum temperature. Silva et al.[18]indicated that the development rate of fall armyworm is heavily influenced by temperature, with faster rates observed at higher temperatures.

Caniçoet al.[19]documented that in Mozambique, the population density of FAW is higher during the dry season compared to the rainy season. Temperature plays a crucial role in influencing insect pest dynamics. Warmer temperatures have a substantial influence on insect pest dynamics, hastening their development rates and reproductive cycles, which lead to higher pest populations [20]. Sunshine duration affects insect pests indirectly by modifying environmental temperature and moisture levels. Prolonged periods of sunshine can raise surface temperatures and decrease humidity, potentially limiting the activity of some insect pests [21]. The positive correlation coefficients in table connecting Sunshine (hours/day) with insect pests indicate that increased sunshine often corresponds to increased occurrences of insect pests.

According to Suparthaet al.[22], this increase in insect population density can be attributed to the availability of overlapping maize crops throughout the growing season. They emphasized that environmental factors such as maize growth conditions, maize genotype, agricultural practices, plant phenology, and maturity are crucial determinants affecting the dynamics of FAW in specific locations [7, 23&24]. Temperature is a critical factor influencing the survival and development of fall armyworm[25, 26]. Research on the seasonal patterns of fall armyworm and other noctuid species has shown that higher temperatures contribute to the proliferation of their populations[27, 28&29].The differences in correlation coefficients observed among various locations (Alathur, Perambalur, Veppanthattai, and Veppur) underscore the likelihood of distinct local influences on insect pest dynamics[27]. Local factors such as soil type, types of crops cultivated, and specific pest management strategies can further shape these relationships [30].

5. Future research directions

Conducting long-term studies to assess how climate change impacts insect pest populations over extended periods and also developing spatially explicit models to predict pest outbreaks based on local environmental data and agricultural practices.

6. Conclusion

The analysis of the influence of microclimate variability on *Spodoptera frugiperda* infestation across different regions in Perambalur district reveals several significant correlations between weather parameters and pest infestation levels.The comprehensive analysis of the correlation table examining the relationships between environmental factors and insect pest occurrences across Alathur, Perambalur, Veppanthattai, and Veppur blocks in Perambalur district provides valuable insights into the complex dynamics influencing agricultural ecosystems. Across all locations, high temperatures exhibit a significant positive correlation with increased insect pest occurrences. This relationship underscores the critical role of temperature in accelerating insect development and reproduction. Farmers and agricultural practitioners should anticipate heightened pest pressures during periods of elevated temperatures and consider implementing temperature-based pest management strategies. The correlation coefficients for relative humidity show mixed results, with some locations displaying statistically insignificant relationships. While humidity influences insect behaviors such as activity and survival, its impact varies depending on local environmental conditions and pest species adaptations. Future research could delve deeper into the mechanisms through which humidity affects specific pest populations, informing more targeted pest management approaches. Extended sunshine duration correlates positively with increased insect pest occurrences across all studied locations.Understanding how temperature, humidity, sunshine, and rainfall interact to influence *Spodoptera frugiperda* populations allows for more precise and effective pest control measures. For instance, monitoring temperature trends can help predict periods of high pest activity, while managing relative humidity and adjusting irrigation practices could mitigate pest infestation. Furthermore, incorporating weather forecasts into pest management planning can enhance the timing and effectiveness of interventions.The findings underscore the complexity of microclimate influences on *Spodoptera frugiperda* and highlight the need for localized pest management strategies that account for specific weather conditions in each region.

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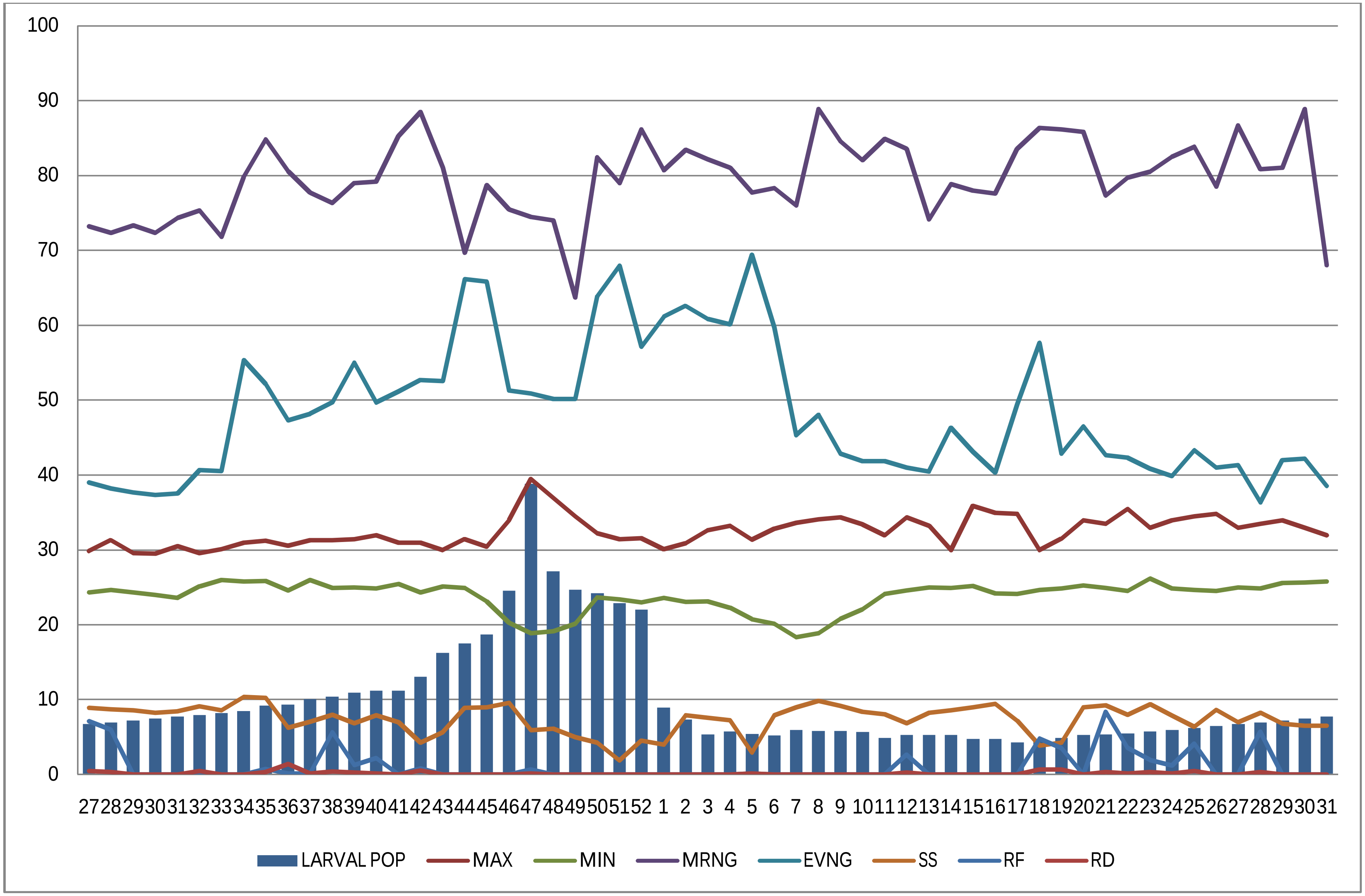

Fig. 7. Graphical representation of larval population and date of observation (Mean Standard week), weather parameters at Perambalur district during *Kharif* and *Rabi* season, 2023 - 2024

Table. 1. Incidence of *Spodoptera frugiperda* in maize during *Kharif* and *Rabi*, 2023-2024

2023-2024	SMW	FAW				Temperature		Relative humidity		Sunshine	Rainfall	Rainy day
		Alathur	Perambalur	Veppanthattai	Veppur	Max	Min	Morning	Evening			
03-09 JULY	27	0	0	0	0	29.8	24.33	73.17	39.0	8.95	7.1	0.5
10-16 JULY	28	0	0	0	0	31.3	24.67	72.33	38.17	8.73	6.00	0.33
17-23 JULY	29	0	0	0	0	29.6	24.33	73.33	37.67	8.58	0	0
24-30 JULY	30	0	0	0	0	29.5	24.0	72.33	37.33	8.25	0	0
31-06 AUG	31	0	0	0	0	30.5	23.57	74.33	37.5	8.47	0	0
07 – 13 AUG	32	0	0	0	0	29.6	25.08	75.33	40.67	9.15	0	0.5
14-20 AUG	33	0	0	0	0	30.1	26.0	71.83	40.5	8.58	0	0
21-27 AUG	34	0	0	0	0	31.0	25.75	79.83	55.33	10.4	0	0
28-3 AUG	35	0.25	0.25	0.75	0.75	31.2	25.83	84.83	52.17	10.27	0.70	0.33
04-10 SEPT	36	0.25	0.50	0.50	0.50	30.6	24.57	80.57	47.29	6.31	0.14	1.43
11-17 SEPT	37	0.50	0.50	1.00	1.50	31.3	26.0	77.71	48.14	7.07	0.14	0.14
18-24 SEPT	38	0.50	1.00	1.25	1.50	31.3	24.93	76.29	49.71	8.04	5.69	0.43
25-01 SEPT	39	0.50	1.00	1.50	2.00	31.4	25.0	79.0	55.0	6.91	1.29	0.29
02-08 OCT	40	0.25	1.00	1.50	2.25	32.0	24.86	79.14	49.71	7.97	2.23	0.14
09-15 OCT	41	0.50	1.25	1.25	1.50	31.0	25.43	85.29	51.14	7.00	0	0
16-22 OCT	42	2.00	2.75	3.25	4.00	31.0	24.29	88.43	52.71	4.30	0.8	0.57
23-29 OCT	43	4.50	6.50	7.75	7.75	30.0	25.14	81.0	52.57	5.69	0	0
30-05 NOV	44	5.25	8.00	9.25	9.00	31.4	24.89	69.71	66.14	8.93	0	0
6-12 NOV	45	10.00	10.0	10.0	10.0	30.4	23.11	78.71	65.86	9.04	0	0
13-19 NOV	46	13.00	17.25	17.25	18.5	34.0	20.29	75.43	51.29	9.60	0	0
20-26 NOV	**47**	**26.00**	**32.75**	**33.0**	**42.00**	**39.5**	**18.86**	**74.43**	**50.86**	**5.97**	**0**	**0**
27-03 NOV	48	23.00	19.75	19.50	20.5	37.0	19.14	74.00	50.14	6.16	0	0
04-10 DEC	49	15.25	16.25	16.50	17.0	34.5	20.14	63.71	50.14	5.00	0	0
11-17 DEC	50	14.75	15.25	15.25	16.25	32.21	23.64	82.43	63.86	4.27	0	0
18-24 DEC	51	12.75	13.50	13.25	14.0	31.4	23.36	79.00	68.0	1.91	0	0
25-31 DEC	52	12.50	11.50	12.00	12.25	31.56	23.00	86.13	57.13	4.58	0	0
01-07 JAN	1	11.25	11.50	11.50	11.75	30.10	23.57	80.71	61.14	4.01	0	0

08-14 JAN	2	8.50	8.75	9.00	9.50	30.93	23.04	83.43	62.57	7.97	0	0
16-21 JAN	3	6.0	6.0	5.75	6.75	32.66	23.11	82.14	60.86	7.64	0	0
22-28 JAN	4	5.0	6.0	7.0	6.0	33.23	22.29	81.00	60.14	7.29	0	0
29 -04 FEB	5	7.0	5.0	6.0	5.0	31.36	20.71	77.71	69.43	2.97	0.14	0.14
05-11 FEB	6	8.0	9.0	3.0	5.5	32.86	20.14	78.29	59.71	7.94	0	0
12-18 FEB	7	7.0	8.0	6.0	4.5	33.64	18.36	76.00	45.29	9.03	0	0
19-25 FEB	8	6.5	7.0	5.5	4.0	34.07	18.86	88.86	48.00	9.86	0	0
26-03 FEB	9	6.0	6.0	5.0	4.0	34.36	20.79	84.57	42.86	9.19	0	0
04-10 MAR	10	6.0	5.0	4.0	4.0	33.43	22.07	82.00	41.86	8.44	0	0
11-17 MAR	11	6.0	4.0	3.0	2.0	32.00	24.14	84.86	41.86	8.11	0	0
18-24 MAR	12	5.0	4.0	3.5	2.0	34.36	24.57	83.57	41.00	6.89	2.66	0.29
25-31MAR	13	4.5	3.5	3.0	2.0	33.24	25.00	74.14	40.43	8.27	0	0
01-07 APR	14	4.0	3.0	3.0	1.5	30.0	24.93	78.86	46.29	8.64	0	0
08-14 APR	15	3.5	3.0	2.0	0	35.93	25.21	78.00	43.14	9.0	0	0
15-21 APR	16	3.0	2.0	1.5	0	35.00	24.21	77.57	40.29	9.46	0	0
22-28 APR	17	0.5	0.75	0	0	34.86	24.14	83.57	49.43	7.24	0	0
29-05MAY	18	0	0	0	0	30.00	24.67	86.33	57.67	3.93	4.77	0.67
06-12MAY	19	1.0	2.0	0	0	31.50	24.83	86.17	42.83	4.32	3.50	0.67
13-19 MAY	20	0	0	0	0	33.00	26.17	80.50	40.83	9.38	1.90	0.33
20-26 MAY	21	0	0	0	0	34.00	24.83	82.50	39.83	7.88	1.20	0.17
27-02 MAY	22	0	0	0	0	34.50	24.67	83.83	43.33	6.40	4.13	0.50
03-09 JUN	23	0	0	0	0	34.83	24.50	78.50	41.00	8.65	0	0
10-16 JUN	24	0	0	0	0	33.00	25.00	86.67	41.33	7.05	0	0
17-23JUN	25	0	0	0	0	33.50	24.83	80.83	36.33	8.30	5.70	0.33
24-30 JUN	26	0	0	0	0	34.00	25.58	81.00	42.00	6.85	0	0
01-07 JULY	27	0	0	0	0	33.00	25.67	88.83	42.17	6.58	0	0
08-14 JULY	28	0	0	0	0	32.00	25.75	68.00	38.50	6.57	0	0
15-21 JULY	29	0	0	0	0	29.80	24.33	73.17	39.00	8.95	7.10	0.50
22-28 JULY	30	0	0	0	0	31.30	24.67	72.33	38.17	8.73	6.00	0.33
29-04 AUG	31	0	0	0	0	29.60	24.33	73.33	37.67	8.58	0	0
Mean		**6.97**	**7.71**	**7.95**	**8.71**	**34.52**	**24.25**	**51.91**	**46.29**	**7.99**	**2.49**	**0.12**

*Mean of three replications
SMW – Standard Meteorological Week

Table. 2. Damage of fall armyworm in Perambalur district of Tamil Nadu, during 2023-2024

Block	Village	Larva/plant* (Nos.)	Damage (%)			
			Leaf	Whorl	Tassel	Cob
Veppanthattai	Annamangalam	6.50	48.33	48.33	7.00	4.16
	Valikandapuram	7.00	50.00	50.00	7.33	3.00
	Periyavadakkari	5.75	45.00	45.00	7.83	2.66
	Venbavur	5.25	35.66	35.66	4.00	5.60
Perambalur	Kavulpalayam	2.75	42.00	42.00	4.83	7.00
	Thoramangalam	3.00	38.66	38.66	9.00	8.16
	Sengunam	3.25	46.33	46.33	7.00	10.33
	Nochiam	2.50	46.66	46.66	83.3	8.00
Alathur	Naramangalam	3.25	60.66	60.66	5.33	9.50
	Nochikulam	3.25	55.00	55.00	4.83	11.00
	Padalur	4.25	63.66	63.66	3.00	9.16
	Chettikulam	4.25	77.00	77.00	4.00	7.33
Veppur	Varagur	7.50	83.00	83.00	10.16	11.50
	Keelapuliyur	7.00	68.00	68.00	12.83	10.00
	Sirumathur	7.75	78.00	78.00	11.50	11.83
	Othiyam	8.00	74.00	74.00	15.33	14.00

*** Mean of three replications**

Table. 3. Relationship between *S. frugiperda* incidences with weather parameters during *Rabi&Kharif* season 2023-2024

Insect pest	Temperature		Relative humidity		Sunshine (hours/day)	Rainfall (mm)	Rainy day
	Max (°C)	Min (°C)	Morning (%)	Evening (%)			
Alathur	0.412**	-0.739**	-0.173NS	0.480**	-0.349**	-0.303*	-0.309*
Perambalur	0.418**	-0.729**	-0.192NS	0.482**	-0.324*	-0.282*	-0.279*
Veppanthattai	0.386**	-0.670**	-0.204NS	0.499**	-0.346**	-0.284*	-0.271*
Veppur	0.393**	-0.640**	-0.208NS	0.473**	-0.346**	-0.245NS	-0.228NS

***= significant at 5%, **= significant at 1%, NS= Non-siginificant or (*P*<0.05)**