Original Research Article

IMPACT OF KEY INSECT PESTS ON COWPEA AND THEIR RELATIONSHIP WITH WEATHER PARAMETERS

ABSTRACT

Cowpea (*Vigna unguiculata* L.) is a vital pulse crop with substantial nutritional value in India that faces production challenges due to various biotic and abiotic factors. Among the biotic factors that affects cowpea, pests such as *Maruca vitrata* and *Riptortus pedestris* significantly impact cowpea yields. This study aimed to evaluate the seasonal incidence of these pests and analyze their correlations with weather parameters in Thiruvananthapuram, Kerala.

Methodology: Field observations were conducted over the cropping season to record pest populations across Standard Meteorological Weeks (SMWs). The population of the pod bugs and pod borers were taken from five plants. Statistical analyses were performed to identify correlations between pest incidence and key weather factors.

Key Findings: The incidence of *R. pedestris* peaked in the 16th SMW, reaching 7.54 bugs per five plants. This pest displayed a significant positive correlation with maximum temperature (r = 0.637) and minimum temperature (r = 0.559) and a negative correlation with evening relative humidity (r = -0.480). Similarly, *M. vitrata* larval populations peaked during the same period at 2.65 larvae per five plants, showing a similar temperature-dependent correlation.

Implications: The temperature-sensitive incidence patterns observed underscore the need for integrated pest management (IPM) strategies that address climatic factors to enhance cowpea sustainability. This data provides valuable insights for future pest forecasting and management efforts.

Keywords: pest incidence, seasonal correlation, cowpea pest, pod bug

INTRODUCTION

Major pulse crops grown in India include pigeonpea, mungbean, urdbean, chickpea, horse gram and cowpea. Among these, cowpea (*Vigna unguiculata* L.) from the Fabaceae family is one of the oldest known food sources. It provides essential daily nutrition to a large portion of the population. India is considered to be the largest producer and consumer of pulses, accounting for nearly 25% of global production and 27% of global consumption [1]. As reported by Sekhar and Bhatt, 2012 [2] pulse production remained nearly stagnant for around 40 years. The total production of food grains in India has declined from 16% in 1950 to 8% in 2022-23 [3]. The biotic and abiotic factors such as the presence of pests, diseases and parasitic weeds are the causes of this reduction. Drought and poor soil fertility is another reason for declining harvests [4].

A total of 21 insect pest species have been recorded damaging the cowpea crop from germination to maturity with most pests emerging during the pod-bearing stage of cowpea. *Maruca vitrata* is regarded as the most dangerous and significant pod borer that causes considerable damage during the flowering period [5]. Its destructive impact during critical stages of crop growth, especially flowering and pod development as well as its focus on economically important parts like flower buds, flowers, and pods makes it a major constraint to achieve potential productivity. Losses of 42% to 80% due to pod damage alone have been reported [6].

Pod bugs are another serious pest that attacks cowpea, particularly during the post-flowering phase. These bugs feed by extracting sap from the developing pods that affects both the quantity and quality of the harvest [7]. Both nymphs and adults pierce the pod walls and extract nutrients from the developing grains which leads to premature pod shedding, deformation and grain shrivelling that reduces grain yield [8].

The present study was to know the seasonal incidence of pod bug, pod borer and aphids that infest cowpea with weather parameters during the year 2024.

MATERIALS AND METHODS

A field study was conducted at the College of Agriculture, Vellayani in 2024 to monitor the seasonal incidence of pod bugs, pod borers and aphids in cowpea. The variety used in the study was Githika, released by Kerala Agricultural University.

1. Seasonal Incidence of Pod Bug, *Riptortus pedestris* in Cowpea

Data on the incidence of pod bugs were collected using a fixed plot sampling technique. From each plot, five plants were randomly selected and tagged to count the number of nymphs on each of the tagged plants. The sampling was done through direct counting at biweekly intervals during different phases of crop. Observations were taken in the morning hours to count the number of nymphs of pod bugs in the experimental plots. The average number of pod bug nymphs that attack cowpea was counted at each stage of crop. Then the values were correlated with weather parameters recorded during the crop period to assess the impact of temperature, relative humidity, rainfall, and wind speed on the population dynamics of the pests.

2. Seasonal Incidence of Pod borer, *Maruca vitrata* in Cowpea

The seasonal incidence of *M. vitrata* was observed by taking five plants randomly and the total number of larvae was recorded. Observations were made biweekly from the flowering period until the maturity stage. Finally, the larval population of *M. vitrata* was correlated with various weather parameters to assess their correlation effects. For this purpose, weekly data on different weather parameters were collected from the meteorological observatory of CoA, Vellayani.

3. RESULTS AND DISCUSSION

3.1. Seasonal Incidence of Pod Bug, *Riptortus pedestris* in Cowpea

In cowpea, the incidence of *R. pedestris* was observed on 9th Standard Meteorological Week (SMW) (0.60 bugs/five plants) which gradually increased and reached peak level during 16th MSW (7.54 bugs/five plants). Thereafter, the population gradually decreased to 0.6 bugs per five plants at 31st SMW (Fig. 1). These results were in compliance with the study conducted by Rahman *et al*., 2022 [11], where a similar temperature pattern was observed for pod bug in mungbean and peak population densities of nymphs (4-6 bugs/10 plants) was recorded in their study during mid-April which was followed by a gradual decrease. A comparable pattern was observed in the current study, where *R. pedestris* populations in cowpea surged during the 16th SMW (7.54 bugs/5 plants) and then gradually declined (Table 1).

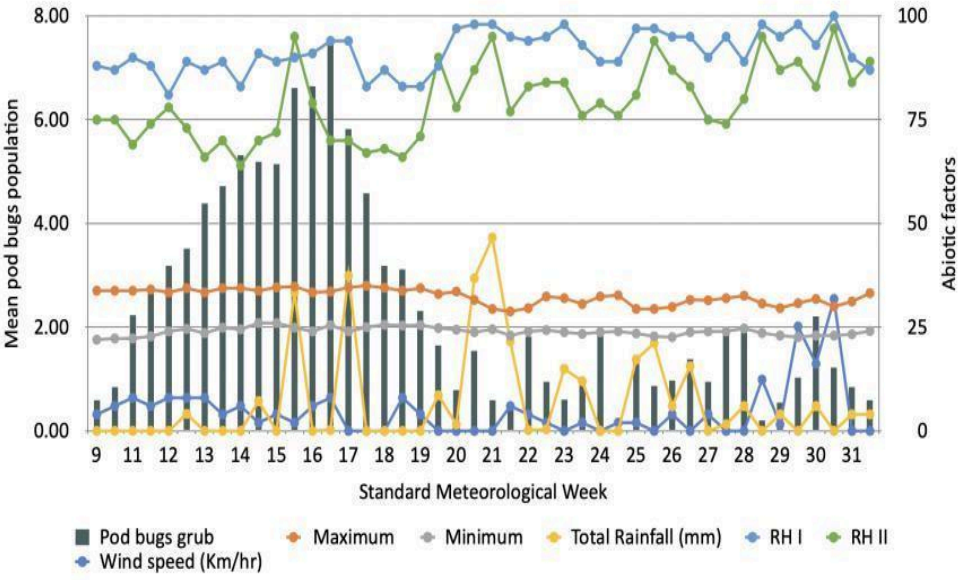


Fig. 1. Seasonal incidence of pod bugs in relation to weather parameter

Correlation studies with weather parameters revealed that incidence of *R. pedestris* exhibited a significant positive correlation with atmospheric maximum temperature (r = 0.637) and atmospheric minimum temperature (r = 0.559). A significantly negative correlation was observed with evening relative humidity (r = -0.480) and did not show any significant correlation with other abiotic factors (Fig. 2).

The current correlation study is in line with the temperature-dependent trends observed by Mahipal *et al*., 2017 [12] . A significantly negative correlation with evening relative humidity (r = -0.480) supports the theory that drier conditions favour the pest activity. These findings of the current study also align with similar trends observed in the study conducted by Soratur *et al*., 2017 [13].

The study on pod bugs reported a high significant negative correlation with morning relative humidity (r = -0.643) and a positive correlation with maximum temperature (r = 0.466). This implies that a higher temperature promotes the growth of the pod bug population. Whereas, the increased humidity during morning or evening hours tends to limit the activity of pod sucking bugs.

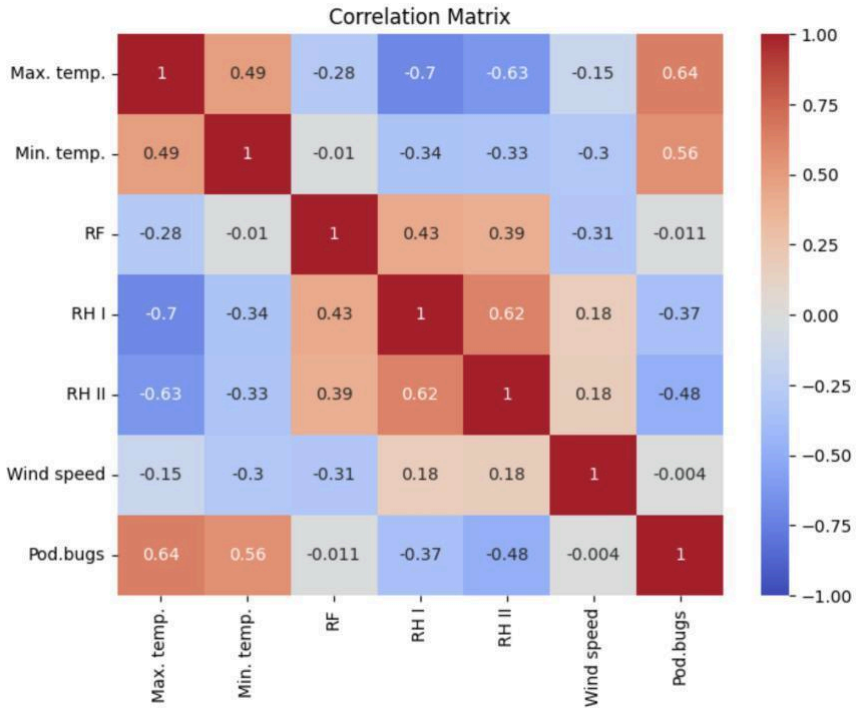


Fig. 2. Seasonal incidence of pod bugs in relation to weather parameters

3.2. Seasonal Incidence of Pod borer, *Maruca vitrata* in Cowpea

Pooled data on incidence of Maruca vitrata indicated that the number of pod borers per five plants was highest during the 16th SMW with 2.65. The pod borer population was noticed in the crop from 12th SMW and continued up to 31st SMW with a reduced incidence of 0.88 larvae per five plants (Fig. 3). The incidence of pod borer was more from 13th SMW to 19th SMW (Table 1).

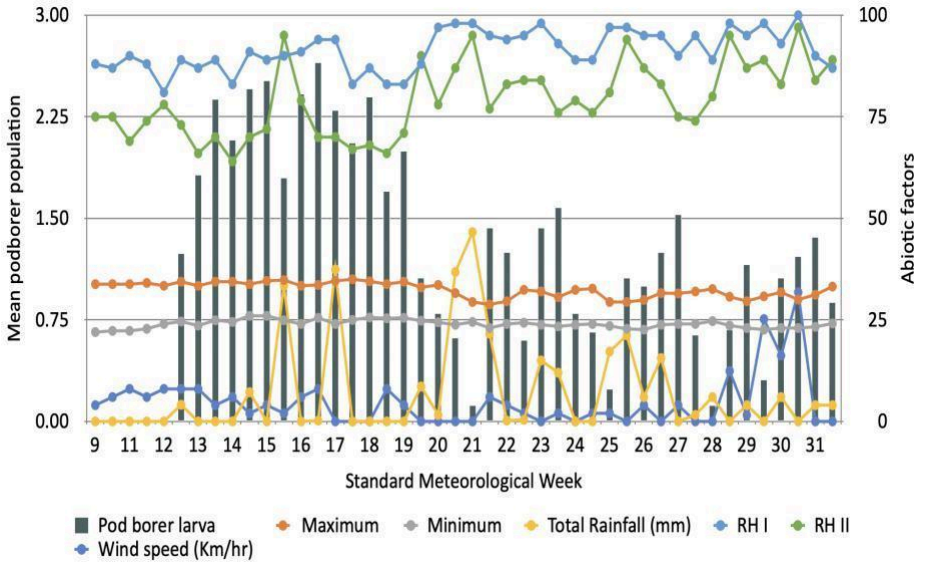


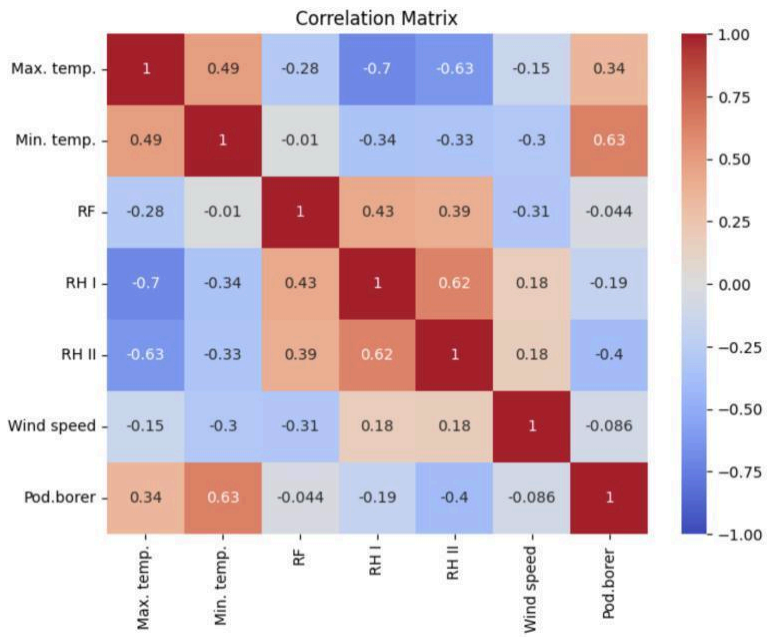
Fig. 3. Seasonal incidence of pod borers in relation to weather parameters

Correlations between pod borer population on cowpea and maximum temperature (r= 0.345), minimum temperature (r= 0.630) were found to have a positive correlation, whereas with evening relative humidity (r= -0.396) it was found to have a significant negative correlation (Fig. 4).

The results of this study align closely with findings by Patel *et al*. (2022) [14] on the incidence of *M. vitrata* in cowpea, particularly in observing peak pest activity during the reproductive stages of the plant, influenced positively by maximum temperature. Patel *et al*. reported a peak incidence of *M. vitrata* during the 41st SMW, with 6.97 larvae per plant, correlating with maximum temperature (r = 0.625) and bright sunshine hours (r = 0.586). This temperature-dependent pattern suggests that higher temperatures favor the population growth of *M. vitrata*.

Further analysis in this study reveals additional insights into the relationship between pod damage and weather parameters as reported by Shravani *et al.*, 2015 [15], Where maximum temperature (r = 0.660), minimum temperature (r = 0.143), and morning relative humidity (r = 0.112) showed a positive but non-significant influence on pod damage, rainfall (r = -0.228) and evening relative humidity (r = -0.007) exhibited a negative and non-significant impact.

Fig. 4 Correlation matrix of pod borers in relation to weather parameters



4. CONCLUSION

The study shows the population dynamics of key pests like pod bugs, pod borers and aphids, affecting cowpea, with weather parameters. It proves that *R. pedestris* and *M. vitrata* populations exhibited peak incidence during the 16th SMW with a positive correlation with temperature and a negative correlation with humidity. This study highlights the important role of abiotic factors in pest outbreak that is usually favoured by the activity of pests. The results of pest correlation with climatic factors indicates that higher temperatures are responsible for increased pest population, whereas presence of rainfall has a negative impact on their population. Adequate monitoring of these pests and their environmental correlations are essential for developing effective management practices to reduce yield losses in cowpea cultivation.

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