The Bioscan
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
20(1): 785-787, 2025 www.thebioscan.com

Population Dynamics of Brinjal Whitefly (*Bemisia tabaci* Gennadius) and Jassid (*Amrasca biguttula biguttula* Ishida) and Their Correlation with Abiotic Factors

Kheev Raj and Lekhu Gehlot

Research Scholar, Department of Zoology, Jai Narain Vyas University, Jodhpur, Rajasthan, India

Assistant Professor, Department of Zoology, Jai Narain Vyas University, Jodhpur, Rajasthan, India

DOI: 10.63001/tbs.2025.v20.i01.pp785-787

KEYWORDS
Population dynamics, whitefly, correlation, abiotic parameter, summer season

Received on:

04-12-2024

Accepted on:

08-01-2025

Published on:

12-02-2025

ABSTRACT

An investigation was carried out to study the population dynamics of brinjal whitefly (*Bemisia tabaci* Gennadius) and jassid (*Amrasca biguttula biguttula* Ishida) and their relation to abiotic parameter in simple plots with at a local farm in the Jodhpur region in Rajasthan, which is situated at an altitude of 26°13 N and a longitude of 73°04 E. The brinjal variety MEBH -10 was cultivated in simple plot during the summer season 2023. During the crop season the jassid and whitefly population was recorded first on fourth week of April and reached to its peak (15.50 jassids/6leaf and 15.50 whiteflies/6leaf) during the third & first week of June, when the mean temperature and relative humidity ranged from 19 °C to 46 °C and 18 to 98 per cent, respectively. The jassids shows positive correlation with maximum temperature, relative humidity, minimum temperature and rainfall. The whiteflies showed positive correlation with maximum and minimum temperature, relative humidity and rainfall.

INTRODUCTION

Brinjal (*Solanum melongena L.*) is a vegetable from the solanaceous family, often referred to as the “King of vegetables.” As a significant vegetable crop in India, brinjal is grown on approximately 6.77 lakh hectares, yielding an annual production of 127.79 lakh tonnes for the year 2021. In Rajasthan, the cultivated area amounted to 0.051 lakh hectares, yielding an annual output of 0.23 lakh tons (Horticulture Statistics Division, Glance 2021).

It is a significant vegetable crop primarily cultivated in many Indian states such as West Bengal, Punjab, Rajasthan, Karnataka, Tamil Nadu, Maharashtra, Bihar, Orissa, and Uttar Pradesh, among others. In the summer and monsoon seasons, the districts in Rajasthan where brinjal is grown include Jodhpur, Sri Ganganagar, Jaipur, Alwar, and Kota. Multiple factors contribute to reduced brinjal yield, but among the most significant is the harm inflicted by insect pests. A variety of insect pests assault it from the nursery stage until harvest (Regupathy et al., 1997). Brinjal is well known for its medicinal value in Ayurveda and is regarded as beneficial for diabetic patients. It has been traditionally recommended for liver-related disorders (Shukla and Naik, 1993). Brinjal is typically classified as a summer crop; however, it can be grown throughout the year in irrigated conditions. This important crop is susceptible to various insect pests from the nursery stage all the way to harvest. Notable pests include the shoot and fruit borer (*Leucinodes orbonalis* Guenee), grasshopper (*Melanoplus differentialis* T.), aphid (*Aphis gossypii* Glov.), whitefly (*Bemisia tabaci* Genn.), Hadda beetle (*Epilachna spp.* (Fab.)), and ladybird beetle (*Coccinella septempunctata* L.) (Ragupathy et al., 1997). Both Jassid and the whitefly are hemiptera and carry parts of the mouth of a piercing type. Both nymphs and adults draw their sap from the lower parts of the leaves. When several insects suck the sap from the same leaf, a yellow spot appears on the leaf, followed by cracking, curling and drying out, or a hop burn. On the other hand, both pests are potential vectors of various viruses and their honeydew attracts black mould, which inhibits photosynthesis and thus reduces yields.

MATERIALS AND METHODS

The population dynamics of brinjal whitefly (*Bemisia tabaci* Gennadius) and jassid (*Amrasca biguttula biguttula* Ishida) and their relation to abiotic parameter was studied from the unprotected control plots at a local farm in the Jodhpur region in Rajasthan, which is situated at an altitude of 26˚13 N and a longitude of 73˚04 E. The brinjal variety MEBH -10 was cultivated in simple plot during the summer season 2023. The plot size measures 4.5m x 8m maintaining the row-to-row and plant-to-plant spacing as 50cm x 50cm respectively. The incidence of selected pests was recorded from sowing to harvesting of the crop. Observations on the population of sucking pests were recorded on three leaves one each from the top, a middle and bottom canopy of the five plants selected randomly in each replication. Weekly data on different abiotic parameters were also recorded. Data so obtained were then subjected to statistical analysis for the correlation coefficient (Mathur *et al*, 2012). The meteorological data were also collected throughout the crop summer season 2023. The data on weather parameters like maximum temperature, minimum temperature, rainfall and relative humidity have been collected from the meteorological Center CAZRI Jodhpur and correlated with the dynamics of brinjal whitefly (*Bemisia tabaci* Gennadius) and jassid (*Amrasca biguttula biguttula* Ishida).

RESULTS AND DISCUSSION

Population dynamics of whitefly in relation to abiotic parameters

Table 1: Weekly recorded meteorological data during the summer season April to September-2023

Date of Observation	Standard week	Mean no. Jassid /6/leaves/plant	Mean no. Whitefly /6/leaves/plant	Min Temp. (°C)	Maxi. Temp. (°C)	Relative Humidity (%)			Rainfall (mm)
						Min.	Max.	Avg.	
25/04/2023	17	1.5	5.83	19	41	18	28	28.89	0.57
09/05/2023	19	4.3	9.3	20	45	27	48	38.71	2.2
23/05/2023	21	9.6	10.16	21	46	28	50	39	2.4
05/06/2023	23	12.16	15.5	24	42	54	74	64.52	7.05
19/06/2023	25	15.5	13.6	25	43	56	76	66.02	8.2
03/07/2023	27	13.6	11.83	25	38	69	89	79.49	6.18
17/07/2023	29	11.3	9.5	24	37	78	98	88.12	8.88
02/08/2023	31	8.6	7.6	22	35	64	85	75.99	0.56
16/08/2023	33	6.3	5.16	21	34	61	82	72.36	0.88
03/09/2023	35	3.1	3.16	21	39	58	79	69.04	2.39

The population of whitefly, *Bemisia tabaci* (Gennadius) on brinjal crop along with meteorological observation during summer session 2023 has been presented in Table 1 the data showed that the population of *Bemisia tabaci* appeared first on fourth week of April *i.e*. 17th standard week and continued till first week of September *i.e*. 35th standard week the pest population recorded as number of whitefly per 6leaf. The whitefly population was low during the month of April to fourth week of May, which varied between 5.83 to 10.16 whitefly/6leaf. The pest population increased from fourth week of May and reached its peak (15.50 whitefly/6leaf) during 23rd standard week *i.e*. first week of June. During this period weather parameters like mean temperature and relative humidity ranged from 19 ˚C to 46˚C and 18 to 98 per cent, respectively. The pest population declined from third week of June (25th standard week) to first week of September (35th standard week) and varied from 13.60 to 3.16 whitefly/ 6leaf. During this period mean temperature and relative humidity ranged from 21˚C to 43 ˚C and 56 to 98 per cent, respectively.

According to Chandra Kumar *et al*. (2008), the incidence of the whitefly, *Bemisia tabaci*, peaked at 15.13 per three leaves per plant during the 50th standard week, or the third week of December. These observations are consistent with their earlier findings. Syed *et al*. (2016) also noted that whitefly appearance started in the third week of March, and overall, *Bemisia tabaci* reached its peak around the third week of December. The whitefly peaked during the 10th SMW in the second week of March, according to Bhattacharyya *et al*. (2019). Research examining the relationship between the *Bemisia tabaci* population and meteorological factors revealed a positive link between the whitefly population and the highest (r=0.429) and lowest (r=0.715) temperatures, relative humidity (r=0.098), and rainfall (r=0.724) (Table 2).

Shaikh and Patel (2013) discovered that the population of whiteflies had a negative correlation with factors such as rainfall, maximum and minimum temperatures, and mean relative humidity. Deole (2015) also identified a correlation between the whitefly population and weather conditions, noting a positive trend across all measured parameters. Devi *et al*. (2015) indicated a non-significant positive correlation with maximum and minimum temperatures as well as sunshine hours. The current study is partially corroborated by earlier research, where Khilari (2020) and Bharat (2020) found that while maximum temperature showed a positively non-significant correlation, rainfall exhibited a negatively non-significant relationship.

Population dynamics of jassid in relation to abiotic parameters

Table 2: Correlation between jassid, whitefly population and weather data.

Season	Weather parameter	Correlation coefficient (r)	
		Jassid	Whitefly
Summer	Max. Temp. (˚C)	0.037	0.429
	Min. Temp. (˚C)	0.935	0.715
	Relative humidity (%)	0.531	0.098
	Rainfall (mm)	0.796	0.724

The population of jassid, *Amrasca biguttula biguttula* (Ishida), on brinjal crops along with meteorological data for the summer season of 2023 is detailed in Table 1. The information indicates that *Amrasca biguttula biguttula* was first observed in the fourth week of April, specifically during the 17th standard week, and persisted until the first week of September, which corresponds to the 35th standard week. The number of jassids was recorded as individuals per 6 leaves. The jassid population remained low from April to the first week of June, fluctuating between 1.50 and 12.16 jassids per 6 leaves. From the second week of August, the pest population began to rise and reached its highest point (15.50 jassids per 6 leaves) in the 25th standard week, which corresponds to the third week of June. During this time, the weather conditions, including mean temperature and relative humidity, ranged from 19 ˚C to 46 ˚C and 18% to 98%, respectively. The pest numbers decreased from the first week of July (27th standard week) to the first week of September (35th standard week), ranging from 13.60 to 3.10 jassids/6 leaves. Throughout this time frame, average temperature and relative humidity varied between 21˚C and 35˚C and 58 to 98 percent, respectively

These observations align with the previous findings of Chandra Kumar *et al*. (2008), who indicated that the jassid population peaked in the 4th week of December. Mathur *et al*. (2012) noted the highest occurrence of the leaf hopper, *Amrasca biguttula biguttula*, during December, specifically in the 52nd Standard Week (SW). Conversely, Shaikh and Patel (2013) documented the highest peak of jassid at 7.93 per leaf during the 4th week of December. Additionally, Kumar *et al*. (2016) observed that a significant population of jassid emerged on the crop during the 3rd to 4th week of March.

The correlation analyses conducted between the jassid population and various weather parameters revealed a positive correlation with maximum temperature (r = 0.037) and a strong positive correlation with minimum temperature (r = 0.935). Additionally, relative humidity exhibited a positive correlation (r = 0.531), while rainfall also demonstrated a positive correlation (r = 0.796) with the jassid population (see Table 2).

Mathur *et al.* (2012) found that jassid exhibited a significant negative correlation with both maximum and minimum temperatures, while showing a positive correlation with mean relative humidity and total rainfall. Similarly, Shaikh and Patel (2013) reported that jassid were significantly negatively correlated with rainfall (-0.61506), maximum temperature (- 0.65722), minimum temperature (-0.88218), and mean relative humidity (-0.64429). In contrast, Devi *et al.* (2015) indicated that the jassid population had a significantly positive correlation with both maximum and minimum temperatures. Mathur *et al.* (2012) found that jassid exhibited a significant negative correlation with

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Plate 1: Whitefly (*Bemisia tabaci* Gennadius)

Plate 2: Jassid (*Amrasca biguttula biguttula* Ishida)

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