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Studied the impact of weather parameters on primary insect pest occurrence on okra

Satyam Mandloi, Yogita Dawar, Pushplata Dawar and UC Singh

Abstract
Seasonal occurrence of okra-insect pests and identify okra varieties less vulnerable to *Earias vittella* (F.), the shoot and fruit borer, whitefly, and jassid. The outcomes are listed below in summary form. Whitefly and jassid activity peaked in the first week of July (27th SW) and persisted until the fourth week of November (47th SMW). At (33rd SMW), where the minimum and maximum temperatures as well as the relative humidity were 33.4 °C, 25.9 °C, and 72.3%, respectively, the whitefly and jassid populations were at their peak. Okra shoot and fruit borer activity began in the third week following transplantation (the 29th SMW) and persisted through the fourth week of November (the 47th SMW). At 34th SMW, the highest point for shoot infestation was recorded at 37.6 °C, the lowest for maximum temperature and relative humidity was 26.8 °C and 59.3% at 39th SMW, the highest point for fruit infestation was observed at 36.0 °C, the lowest for maximum temperature and relative humidity was 24.9 °C and 58.3%. The population of jassids and whiteflies in the current study significantly correlated positively with both the minimum and maximum temperatures. Conversely, a statistically significant positive association was noted between the relative humidity and the populations of jassids and whiteflies. Additionally, a highly favourable association between fruit infestation and the lowest and maximum temperatures was found.

Keywords: Okra, meteorological parameters, humidity, whiteflies

Introduction
Okra (*Abelmoschus esculentus* (L.) Moench), a commercial vegetable crop in the Malvaceae family, is sometimes referred to as lady's finger in many English-speaking nations and as bhindi in India. India leads the world in both output and area. Because of the scarcity, it commands a high premium in the summer of the market's other vegetables. Its high level of is very beneficial to its nutritional worth calcium and carotene (Nandihalli and Anitha, 2008) [1] different vegetables that are grown *Abelmoschus esculentus* L. (Moench), a vegetable crop of commercial significance in tropical and sub-tropical regions of the world, is a member of the Malvaceae family. This crop can be grown on big, sophisticated commercial farms or as a kitchen garden crop. India, Turkey, Iran, Western Africa, Yugoslavia, Bangladesh, Afghanistan, Pakistan, Burma, Japan, Malaysia, Brazil, Ghana, Ethiopia, and the Southern United States are among the countries where it is grown commercially. As a source of vitamins, carbohydrates, and minerals necessary for a balanced diet, vegetables are a significant food item.

The prevalence of insect pests is one of the things that restricts okra output. Rawat and Sahu (1973) [9] claim that up to 45 different types of insect pests decimate okra crops during their growing season.

Among these, the cotton jassid (*A. biguttula biguttula* (Ishida), the aphid (A. gossypii) (Glover), and the whitefly (*B. tabaci*) (Gennadius) are significant sucking pests that pose a substantial threat to okra agriculture. According to Krishnaiah (1980) [5], 50–56 percent of okra crops were lost to leaf hopper *A. biguttula biguttula* (Ishida). A. gossypii (Glover), a polyphagous sucking pest, is also a viral vector that spreads the okra diseases mosaic and leaf curl.

Materials & method: The research on okra varietal resistance to the main insect pest, *Abelmoschus esculentus* (L), was carried out in the Department of Entomology's experimental field at the College of Agriculture, Gwalior, during the 2014–2015 kharif season a 2 × 3 m plot of the local type of okra was produced using standard cultural procedures. Jassid and adult whitefly populations were counted on three randomly choosen leaves from the upper, middle, and lower canopy of each plant, using the methodology used by Singh and Kaushik (1990) [10]. Ten randomly chosen plants from each plot were the subject of observations. Weekly intervals

were used to start treatments as soon as the infestation appeared. Weekly counts of the number of whiteflies and jassid were noted beginning with the pest's infestation. Additionally, association studies involving insect population and meteorological variables were conducted.

Table 1: Meteorological data during the crop season 2014-15

Standard Meteorological Week	Temperature (°C)		Humidity (%)	Rainfall (mm)
	Max.	Min.		
27	39.5	26.4	62.5	027.0
28	41.5	28.8	58.9	000.0
29	34.1	25.2	82.1	070.6
30	33.3	25.5	57.1	070.6
31	33.9	25.3	87.6	180.1
32	31.5	24.7	85.4	068.4
33	33.4	25.9	72.3	000.0
34	37.6	26.8	59.3	000.0
35	36.0	25.4	75.5	006.6
36	32.0	24.3	82.9	032.0
37	32.3	23.6	83.3	115.4
38	34.7	24.9	67.1	004.0
39	36.0	24.9	58.3	000.0
40	36.8	21.9	65.1	000.0
41	34.7	19.4	68.8	003.2
42	31.9	16.7	68.4	000.0
43	33.7	16.5	64.5	000.0
44	33.1	15.8	62.8	000.0
45	32.6	15.4	63.1	000.0
46	29.1	10.4	68.2	000.0
47	29.8	8.6	72.5	000.0

Result & Discussion

Table 2: Population of Jassid, [*Amrasca biguttula biguttula* (Ishida)] on different varieties of okra

Varieties	Population of jassid at										
	25 DAS	32 DAS	39 DAS	46 DAS	53 DAS	60 DAS	67 DAS	74 DAS	81 DAS	88 DAS	Mean
Varsha	2.37 (1.69) **	2.66 (1.78) **	3.04 (1.88) **	2.58 (1.75) **	2.63 (1.77) **	2.82 (1.82) **	2.40 (1.70) **	2.80 (1.81) **	2.74 (1.80) **	3.07 (1.89) **	2.71 (1.79)
Green Rangeri	2.23 (1.65)	2.45 (1.72)	2.39 (1.70)	2.04 (1.59)	2.18 (1.63)	2.33 (1.68)	1.98 (1.57)	2.36 (1.69)	2.26 (1.66)	2.53 (1.74)	4.28 (2.18)
US-7109	2.87 (1.83)	3.14 (1.90)	3.09 (1.88)	2.62 (1.76)	2.81 (1.81)	2.99 (1.86)	2.54 (1.74)	3.04 (1.87)	3.01 (1.86)	3.25 (1.92)	2.94 (1.84)
Karishma	2.00 (1.58)	2.20 (1.64)	2.57 (1.75)	2.19 (1.64)	2.34 (1.68)	2.55 (1.75)	2.17 (1.63)	2.58 (1.75)	2.55 (1.74)	2.85 (1.83)	2.40 (1.70)
Arka abhay	3.37 (1.97)	3.72 (2.05)	3.59 (2.02)	3.05 (1.88)	3.26 (1.94)	3.43 (1.98)	2.91 (1.85)	3.41 (1.98)	3.27 (1.94)	3.67 (2.04)	3.37 (1.97)
Arka Anamika	1.53 (1.42)	1.69 (1.48)	2.03 (1.59)	1.73 (1.49)	1.85 (1.53)	2.01 (1.58)	1.71 (1.48)	2.00 (1.58)	1.92 (1.55)	2.15 (1.62)	1.86 (1.53)
VRO-6	4.20 (2.17)	4.64 (2.27)	4.50 (2.23)	4.05 (2.13)	4.13 (2.15)	4.34 (2.20)	3.69 (2.04)	4.31 (2.19)	4.14 (2.15)	4.64 (2.26)	2.2 7(1.66)
Local	4.67 (2.27)	5.15 (2.37)	4.95 (2.33)	4.21 (2.17)	4.59 (2.26)	4.82 (2.31)	4.09 (2.14)	4.87 (2.32)	4.80 (2.30)	4.94 (2.33)	4.7 1(2.28)
SE(m)±	(0.07)	(0.07)	(0.08)	(0.08)	(0.08)	(0.08)	(0.07)	(0.08)	(0.09)	(0.09)	(0.08)
CD at 5%	(0.20)	(0.22)	(0.25)	(0.23)	(0.24)	(0.24)	(0.22)	(0.26)	(0.26)	(0.28)	(0.23)

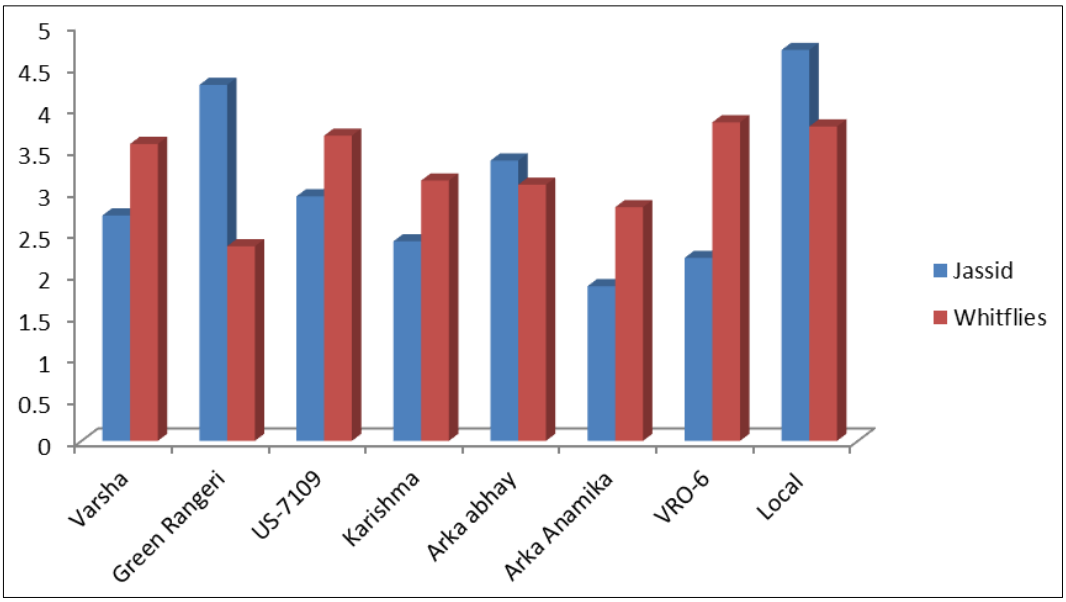

Fig 1: Mean population of Jassid, [*Amrasca biguttula biguttula* (Ishida)] and whiteflies [*Bemisia tabaci* (Gern)] on different varieties of okra

Table 2: Population of whitefly [*Bemisia tabaci* (Gern)] on different varieties of okra

Varieties	Population of whitefly at										
	25 DAS	32 DAS	39 DAS	46 DAS	53 DAS	60 DAS	67 DAS	74 DAS	81 DAS	88 DAS	Mean
Varsha	2.69 (1.79) **	2.92 (1.85) **	3.47 (1.99) **	3.16 (1.91) **	3.31 (1.95) **	3.62 (2.03) **	3.38 (1.97) **	4.14 (2.15) **	4.31 (2.19) **	4.65 (2.27) **	3.57 (2.02) **
Green Ranger	1.61 (1.45)	1.96 (1.57)	2.20 (1.64)	1.98 (1.57)	2.14 (1.62)	2.34 (1.68)	2.29 (1.67)	2.73 (1.80)	2.87 (1.84)	3.27 (1.94)	2.34 (1.68)
US-7109	2.83(1.82)	3.08 (1.89)	3.58 (2.02)	3.26 (1.94)	3.39 (1.97)	3.70 (2.05)	3.45 (1.99)	4.23 (2.17)	4.40 (2.21)	4.75 (2.29)	3.67 (2.04)
Karishma	2.35(1.68)	2.54 (1.74)	2.95 (1.86)	2.78 (1.81)	2.92 (1.85)	3.19 (1.92)	2.99 (1.86)	3.65 (2.04)	3.84 (2.08)	4.14 (2.15)	3.13 (1.90)
Arka abhay	2.30 (1.67)	2.50 (1.73)	2.91 (1.84)	2.75 (1.80)	2.87 (1.83)	3.14 (1.90)	2.92 (1.85)	3.59 (2.02)	3.77 (2.06)	4.07 (2.14)	3.08 (1.89)
Arka Anamika	2.10(1.61)	2.28 (1.67)	2.65 (1.77)	2.49 (1.73)	2.61 (1.76)	2.86 (1.83)	2.67 (1.78)	3.27 (1.94)	3.43 (1.98)	3.78 (2.07)	2.81 (1.82)
VRO-6	2.94 (1.85)	3.12 (1.90)	3.7 1(2.05)	3.41 (1.98)	3.52 (2.01)	3.90 (2.10)	3.64 (2.03)	4.46 (2.23)	4.64 (2.27)	4.97 (2.34)	3.83 (2.08)
Local	2.90 (1.84)	3.07 (1.89)	3.66 (2.04)	3.36 (1.97)	3.48 (1.99)	3.85 (2.08)	3.59 (2.02)	4.40 (2.21)	4.58 (2.25)	4.90 (2.32)	3.78 (2.07)
SE(m) ±	(0.04)	(0.05)	(0.06)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)	(0.05)
CD at 5%	(0.12)	(0.15)	(0.18)	(0.13)	(0.12)	(0.16)	(0.14)	(0.16)	(0.16)	(0.17)	(0.15)

Okra's seasonal incidence of insect pests

The activity of whiteflies began in the second week of July (27th SMW) and continued until the crop termination, or the last week of November. The maximum number of whiteflies (19/3 leaves/plant) was recorded in the third week of August (33 SMW), when the maximum and minimum temperatures and humidity were 33.4 °C, 25.9 °C, and 72.3 percent, respectively. The activity of jassids began in the second week of July (27th SMW) and continued until the crop termination, or the last week of November. The maximum number of jassids (10/3 leaves/plant) was recorded in the third week of August (33 SMW), when the maximum and minimum temperatures and humidity were 33.4 °C, 25.9 °C, and 72.3 percent, respectively. Studies examining the association between the minimum and maximum temperatures and the populations of jassid and whiteflies revealed a strong positive relationship. Conversely, a statistically significant negative association was noted between the relative humidity and the number of jassids and whiteflies.

Okra varieties screened for whiteflies

Ten-week observations that were taken at various times following the seeding of several types. With the exception of Arka Anamika, the variety with the lowest recorded amount of whiteflies (2.34%) was Green Rangeri. This variety had considerably fewer whiteflies than the other kinds. With the exception of Local, US-7109, and Varsha, the largest recorded whitefly population (3.83 adults/leaf) was observed in VRO-6, a variety that was considerably higher than the others. Variations in climatic conditions from year to year and region to area may contribute to the variance in susceptibility among varieties, as may some hereditary traits.

Pawar and Varma (2014) [7], reported Varietal V3 (Gujarat Okra-2) yielded the lowest quantity of white flies—3.77 white flies/3 leaves - at 30 DAS during the wet season. The variety V3 (Gujarat Okra-2) had the lowest observed white fly population during the summer, with 1.23 white flies/3 leaves at 60 DAS, comparable to the types V5 (Perkins Long Green) and V4 (Arka Abhay). According to Matson *et al*. (2013) [6] on okra's varietal resistance to white fly (Benicia abaci),

Noori-786 harbored the highest pest population (4.46 insects/leaf), whereas okra variety substandard harbored the lowest (3.17 insects/leaf). According to Sharma *et al*. (2001) [10] and Ghosh *et al*. (1999) [3], Arka Anamika and Parbhani Kranti exhibited a moderate level of resistance against aphids, jassids, and whiteflies. Seven okra types were compared against *Amrasca biguttula biguttula*, *Bemisia tabaci*, and *Earias vitella* by Raut *et al*. (2013) [8]. When it came to whitefly infestation, types VRO 3 and VRO 4 had the lowest levels, along with Bhendi vaphy, llVR 11, VRO 3, and EMSB 1.

Okra varieties being screened for jassid

The average results from ten-week observations that were taken at various times following the seeding of several types. While the maximum jassid population (4.94/leaf) was recorded in Local, it was found to be significantly higher than the rest of the varieties except VRO-6. The minimum jassid population (2.15/leaf) was recorded in Arka Anamika, which was found to be significantly lesser than the rest of the varieties except Karishma, Green Rangeri, and Varsha. Seven okra types were compared against *Amrasca biguttula biguttula*, *Bemisia tabaci*, and *Earias vitella* by Raut *et al*. (2013) [8]. It was discovered that the varieties VRO 3 and Kasha Pratti were resistant to jassid infestation. Various Arka Parbhani Kranti and Anamika shown a moderate level of resistance to aphids, jassids, and whiteflies (Sharma *et al*., 2001; Ghosh *et al*., 1999) [10, 3]. According to Srinivasa and Sugeetha (2001) [11], KS 410 had the fewest hoppers, but GOH-1 was the most favored by hoppers. Based on nymphal abundance and leafhopper injury index, (Hooda *et al*., 1997) [4] discovered two resistant genotypes (Siswal Local and IC 7194).

Conclusion

Okra pests included fruit borer, jassids, and whiteflies. Whitefly and jassid incidence peaked in the third week of August and remained until the fourth week of November. It began in the first week of July. There was a substantial positive correlation established between the number of whiteflies and jassids and the minimum and maximum temperatures. Arka Anamika and Green Ranger were the varieties that were shown to be less vulnerable to whiteflies. The variety Arka Anamika was discovered to be less prone to jassid, and it was followed by Varsha, Karishma, and Green Ranger.

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