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SEASONAL INCIDENCE AND CORRELATION OF ABIOTIC FACTORS AGAINST OKRA SHOOT AND FRUIT BORER (*Earias vittella* Fab.) DURING *KHARIF* SEASON

Agurla Raju[1*], *C. Narendra Reddy*[2], *D. Anitha Kumari*[3] *and D. Srinivasa chary*[4]

[1&2]*College of Agriculture, Dept. of Entomology, PJTSAU, Hyderabad, Telangana*

[3]*Vegetable Research Station, SKLTSHU, ARI, Rajendranagar, Hyderabad, Telangana*

[4]*College of Agriculture, Dept. of Statistics & Mathematics, PJTSAU, Hyderabad, Telangana*

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Abstract: *Field experiment was carried out with a view to study the fluctuations in the population of okra shoot and fruit borer against prevailing weather conditions at student farm, college of Agriculture, Hyderabad, PJTSAU during Kharif-2015. The results recorded that the incidence of okra shoot and fruit borer was commenced in the* 35^{th} *standard week (0.5 per plant), peak incidence were recorded in in terms of shoot infestation in* 40^{th} *standard week (30.63 per cent), fruit infestation on number basis in* 42^{nd} *standard week (58.32 per cent) and fruit infestation on weight basis recorded in* 45^{th} *standard week (33.42 per cent). Maximum larval population was noticed in* 40^{th} *standard week (6.4 per 10 plants). Larval population, fruit damage on number and weight basis were significantly negatively correlated with maximum temperature and non-significantly negatively correlated with minimum temperature, relative humidity and rain fall. Incidence of shoot damage was significantly correlated with maximum temperature and minimum temperature, and non-significantly negatively correlated with rain fall and relative humidity.*

Key Words: *okra shoot and fruit borer, standard week, correlation, seasonal incidence, weather parameters.*

Introduction:

Okra (*Abelmoschus esculentus* (L.) Moench) is an important vegetable crop of family Malvaceae. It plays an important role in human diet and has good nutritional value. The crop is attacked by more than 45 insect pests which infests the crop from seedling to harvest stage (Nair, 1984), among which shoot and fruit borer, *Earias vittella* (Fab) are the most important and serious pest causing direct damage to marketable fruits. The caterpillar passes through 6 stages, becoming full-grown in 10-16 days and the affected fruits become unfit for consumption (Kedar *et al.,* 2014). Eggs and larvae were noticed on five weeks old crop during all the cropping seasons (Siddartha*et al*., 2017). The fruit borer alone to reported cause damage to the extent of 3.5 to 90 per cent to okra in different parts of the country (Mandal *et al*., 2006). Incidence of the fruit borer commenced in 29^{th} standard week and maximum number of larva (7.5 larvae per 10 plants) were recorded in 42^{nd} standard week (Sharma *et al.,* 2010). The maximum damage was caused to fruit in 41^{st} standard week (Nath *et al.,* 2011). Dangi (2004) observed that the incidence of okra shoot and fruit borer commenced from the 4^{th} week of August (6^{th} after sowing).Yadav *et al.* (2007) reported that maximum fruit damage was observed in the 3^{rd} week of September. Yadvendu (2001) reported that maximum damage 86.5 and 72.5 per cent during first and fourth week of September. Pareek *et al.* (2001) reported damage was started in first week of September. Goutham *et al.* (2014), Dhabi *et al.* (2013) and Aziz *et al.* (2011) reported that weather parameters were significantly correlated with population of okra shoot and fruit borer. The incidence and spread of okra shoot and fruit borer largely controlled by various weather factors viz., temperature, relative humidity and rain fall. Information on interaction of weather parameters and insect development can provide vital role in pest surveillance, forecasting, monitoring and management of pest population by timely decision making. Hence, an attempt has, therefore, been made to study the population dynamics of okra shoot and fruit borer in relation to prevailing weather parameters, so that the information can effectively be utilized in formulating pest management programme.

Material and Methods

The field experimentwas conducted at Prof. Jayashankar Telangana State Argicultutral University, Hyderabad, Telangana during *Kharif*-2015. The experimental field was located at Southern Telangana Zone with longitude '78.415503', latitude '17.316171' and Mean Sea Level 546 m. A popular okra variety "Arka Anamika" was selected to conduct the experiment. Sowing was taken up on 15th July 2015 at 60 × 30 cm spacing. Seed rate followed was 4 kilograms per acre. The crop was raised as per the package and practices of PJTSAU.Ten plants from each plot were randomly selected and tagged. Weekly observations on was taken on entire tagged plants thought the season.Incidence of okra shoot and fruit borer was recorded in terms of per cent infested plants, no of larva per ten plants, per cent fruit damage on number and weight basis. Incidence of okra shoot and fruit borer in terms of percentage of damaged fruits on number and weight was recorded by counting and weighing healthy and damaged fruits at each picking separately using formula "Per cent fruit damage on number/weight = Number/weight of damaged fruits/Total number/weight of fruits×100". The weekly meteorological data during the period of experiment were collected from Agro meteorological Observatory, Agricultural Research Institute, Rajendranagar, Hyderabad, Telangana. Weekly mean Maximum temperature, minimum temperature, mean relative humidity and total weekly rainfall were used to work out the association of weather parameters on infestation of the pest on okra. In order to study the influence of key abiotic factors on pest incidence, simple correlations were worked out between the pest incidence and meteorological factors.

Results and Discussions

Population of dynamics of okra shoot and fruit borer was conducted at department of Entomolology, College of Agriculture, PJTSAU, Telanagana. The results indicated that *Earias vittella (Fab)* infestation on okra was commenced in 35th standard week (3rd week of August) that continuously increased till the last picking in the 46th standard week (3rd week of November) (Table 1) (Figure 1). It was observed that the infestation of okra shoot and fruit borer was started in the 4thweek of September with an average larval population 0.5 larvae per 10 plants in *Kharif* 2015. This infestation continuously increased and reached to the peak 6.4 larvae per 10 plants in 40th standard week at maximum temperature 31.4^{o}C (Figure 2), relative humidity 75.5% (Figure 3), number of rainy days 4.9 (Figure 4) and thereafter decreased gradually upto 44th week standard week with average population of 6.1 larvae per 10 plants (Table 1)(Figure 1). Similarly results was recorded by Dangi (2004) 10.3 larvae per 10 plants in first week of October. Siddartha *et al.* (2017) also recorded average larval population of *Earias* spp 1.34±0.18 larvae per plant. Similarly Sharma *et al* (2010) noticed 0.3 and 0.5 larvae per 10 plants during *Kharif* 2005 and 2006, respectively.

The shoot infestation was commenced on 3rd week of August (35th standard week) with 5.1 per cent shoot damage. This per cent shoot damage was continuously increased up to 40th standard week (1st week of October) and maximum shoot damage was recorded 30.63 per cent in 40th standard week at maximum temperature 31.4^{o}C (Figure 2), relative humidity 75.5% (Figure 3), number of rainy days 4.9 (Figure 4) and gradually decreased till the end of crop up to 46th standard week with average shoot infestation 19.14 per cent (Table 1) (Figure 1). Similar results reported by Siddarth *et al.* (2017) with mean shoot damage 4.61±0.11 per cent and peak infestation was recorded in 45th standard week 91.6 per cent (Sharma *et al.*, 2010).The fruit infestation on number was commenced on 4th week of August (36th standard week) andmean fruit damage was recorded 10.35 per cent. The mean fruit damage on number was continuously increased up to 42nd standard week and maximum damage was recorded 58.32 per cent in the 42nd standard week at maximum temperature 32.4^{o}C (Figure 2) and relative humidity 66.85%

(Figure 3) (Table 1). Sharma *et al.* (2010) reported fruit damage on number was started in first week of August and recorded maximum damage 54.3 per cent in the 3rd week of October (42nd standard week).The fruit infestation on weight was started on 4th week of August (36th standard week) and mean fruit damage on weight was recorded 8.07 per cent. Fruit infestation on weight was continuously increased till the end of crop growth and maximum damage on weight was recorded in the 46th standard week (33.26 per cent) at maximum temperature 31.4°C (Figure 2) and relative humidity 82.1% (Figure 3) (Table 1). Similar results reported by Sharma *et al.*(2010) that maximum damage noticed on weight basis was 54.7 per cent when the crop was 18 weeks old in 42nd standard week. Dangi (2004) also reported maximum fruit damage 72.20 per cent on weight basis.

It is evident from Table 2 that mean larval population was non significantly negatively correlated with maximum temperature (r=-0.310668), significantly negatively correlated with minimum temperature (r=-0.57949), non-significantly negatively correlated with mean relative humidity (r=-0.53234) and significantly negatively correlated with rain fall (r=-0.64478). Similar results were reported by Sharma *et al.*(2010) in terms of larval population showed significant negative correlation with mean temperature (-r=0.678) and mean relative humidity(r=-0.241), but non-significant correlation with rain fall (r=-0.241). Siddartha *et al.*(2017) also noticed maximum temperature showed negative correlation (r=-0.51) with larval population. Mandal *et al.* (2006) also reported maximum temperature had negative impact on larval population.Incidence of shoot damage was significantly negatively correlated with maximum (r=-0.29381) and minimum temperature (r=-0.39122), whereas non significantly negatively correlated with relative humidity (r=-0.617) and rain fall (r=-0.56084). Similar results reported by siddarth *et al.* (2017) in terms of shoot infestation, showed that significant negative correlation with maximum temperature (r=-0.21), minimum temperature (r=-0.08), relative humidity (r=-0.45) and rainfall (r=-0.05).

Incidence of fruit damage on number basis was significantly correlated with maximum temperature, non-significantly correlated with minimum temperature, relative humidity and rain fall (where, r=-0.153141, r=-0.74543, r=-0.57037 and r=-0.61888, respectively). Incidence of fruit damage on weight basis significantly negatively correlated with, maximum temperature, non-significantly correlated with minimum temperature, relative humidity and rainfall(r=-0.13657, r=-0.81850, r=-0.64345 and r=-0.69557, respectively). Similar results were reported by Mandal *et al.* (2006) in terms of fruit damage on weight basis, results noticed that maximum temperature had negatively correlated with fruit damage on weight basis (r=-0.496). Siddarth *et al.* (2017) also reported that the fruit damage on weight basis was negatively correlated maximum temperature (r=-0.35), relative humidity (r=-0.04) and rain fall (r=-0.02).

Conclusions

The incidence of okra shoot and fruit borer was commenced in the 35th standard week, peak incidence were recorded in terms of shoot infestation in 40th standard week, fruit infestation on number basis in 43rd standard week and fruit infestation on weight basis recorded in 45th standard week. Maximum larval population was noticed in 40th standard week. Larval population, fruit damage on number and weight basis were significantly negatively correlated with maximum temperature and non-significantly negatively correlated with minimum temperature, relative humidity and rain fall. Incidence of shoot damage was significantly correlated with maximum temperature and minimum temperature, and non-significantly negatively correlated with rain fall and relative humidity.

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Table 1: Seasonal incidence of okra shoot and fruit borer (*Earias vittella*, Fabricius) during *Kharif*-2015

Standard week	Maximum temperature (°c)	Minimum temperature (°c)	Mean RH (%)	No. of Rain fall (mm)	No. of larvae/10 plants	Percent shoot infestation	Percent fruit damage on number basis	Per cent fruit damage on weight basis
34	30.4	22.43	79.35	4.29	-	-	-	-
35	31.5	22.71	77.57	7.06	0.5	5.1	-	-
36	33.4	22.9	73.75	4.4	1.5	11.61	10.35	8.07
37	28.4	21.9	90.8	13.1	2	14.59	25.42	13.56
38	30.4	22.2	75.3	6.2	1.3	13.5	30.16	16.31
39	31.9	22.3	73.5	0.3	4.2	25.9	32.64	21.53
40	31.4	21.1	75.7	4.9	6.4	30.63	42.56	23.46
41	33.4	19.6	62.9	0	6.3	29.25	46.76	25.89
42	32.4	19.1	66.85	0	5.2	23.16	58.32	28.42
43	32.4	18.1	66.45	0	4.4	22.87	56.21	30.16
44	31.4	20.7	71.3	2.6	5.2	20.42	50.75	31.26
45	31.4	17.4	82.1	0	6.1	21.32	49.17	33.42
46	30.8	15.8	69	0	4.1	19.12	48.12	31.21

Table 2: Correlation coefficient (r) of pest population and damage of *Earias vittella*(Fabricius) against prevailing weather parameters

Weather parameters	No. of larvae per 10 plants	Per cent shoot damage	Per cent fruit damage on number basis	Fruit damage on weight basis
Maximum temperature	-0.31066*	-0.29381*	-0.153141*	-0.13657*
Minimum Temperature	-0.57949**	-0.39122*	-0.74543	-0.81850
Mean Relative Humidity	-0.53234**	-0.617**	-0.57037**	-0.64345**
No.of Rain fall	-0.64478**	-0.56084**	-0.61888**	-0.69557

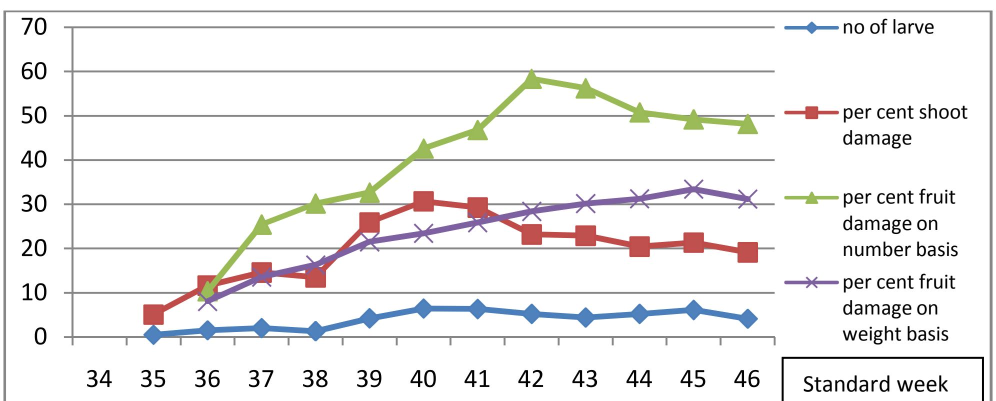

Figure 1: Seasonal incidence of okra shoot and fruit borer (*Earias vittella*, Fabricius) in different standard weeks during kharif-2015

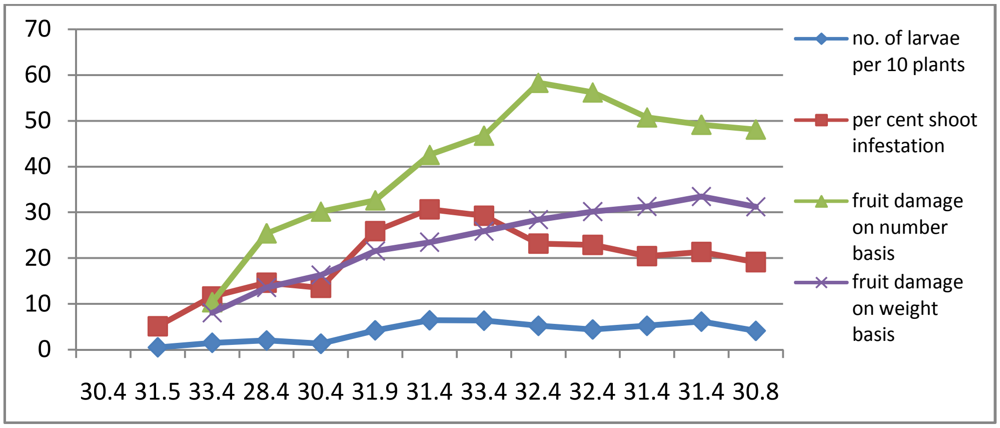

Figure 2: Population dynamics of okra shoot and fruit borer against prevailing temperatures in different standard weeks (from standard week 34 to 46, respectively)

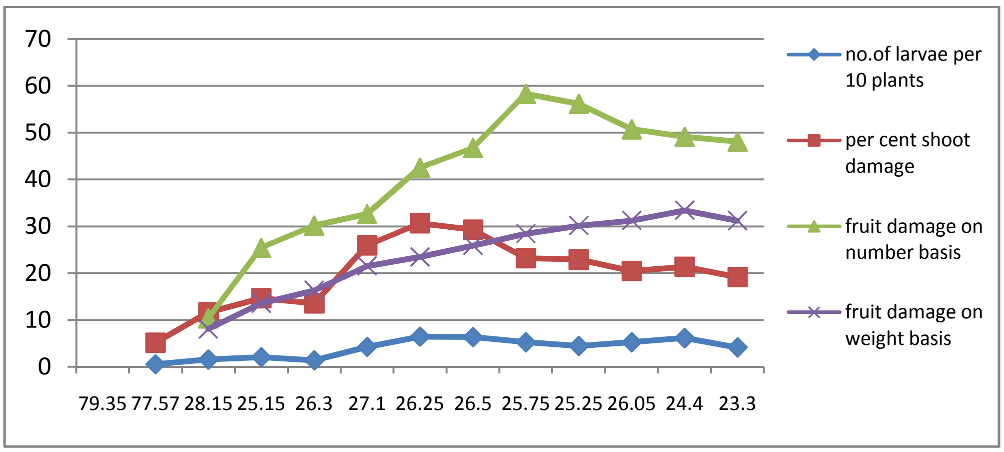

Figure 3: Population dynamics of okra shoot and fruit borer against prevailing relative humidity in different standard weeks (from standard week 34 to 46, respectively)

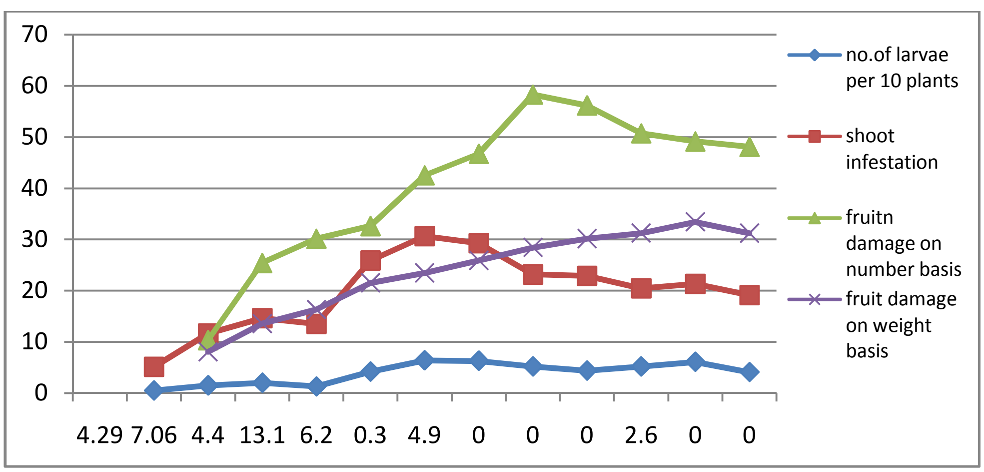

Figure 4: Population dynamics of okra shoot and fruit borer against prevailing rain fall (mm) in different standard weeks (from standard week 34 to 46, respectively)