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Seasonal Incidence of Major Insect Pests Of Onion in Relation To Biotic And Abiotic Factors

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ABSTRACT
The present study was conducted at Horticultural Research Farm, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya; Raipur (C.G.) during Kharif season 2015-16. The results of field experiments revealed that thrips population 20.78 nymphs and adult per plant during the second week of November (46th SMW). Thereafter, the nymph and adult population gradually declined to 2.14 per plant during the Third week of December (15th SMW). The maximum population of jassids was found (12.60 jassid/plant) in the 2nd week of October (42th SMW). The maximum population of tobacco caterpillar was observed (0.91/plant) in the last week of September (39th SMW). The jassid population showed significant positive correlation with sun shine hours while tobacco caterpillar showed significant positive correlation with minimum, average temperature and morning relative humidity at 5 and 1 per cent level of significance.
***Key words**: Onion, onion thrips, biotic and abiotic parameters.*

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INTRODUCTION

Onion belongs to the family *Alliaceae*, in the genus, *Allium* and known scientifically as *Allium cepa*. Onion is a biennial vegetable grown in temperate zones as an annual. Onion is one of the oldest edible food sources known to humankind, used as salad, recipes, mouth-watering gravies and curries. It has also been used in traditional medicines. Onion is considered as one of the most important vegetable crop produced on small and large scale in India. The major onion producing countries in world are China, India, Pakistan, Bangladesh, Indonesia, Vietnam, Russia, Myanmar, Brazil, Turkey and few other countries like Egypt, Netherlands and Iran etc. In India, onion is cultivated over an area of 1064.00 million hectares with a production of 15118.00 million tonnes. The major onion producing states in India is Maharashtra followed by Madhya Pradesh and Karnataka. Area, production and productivity of onion in Maharashtra is 468.00 thousand ha. 5867 *mt* and 14.3 tonnes/ha, respectively (Anon., 2014-15). In Chhattisgarh, onion occupies 17.95 thousand ha with a production of 269.28 thousand *mt* and productivity is about 15.00 tonnes/ha. (Anon., 2014-15).

The onion plant is attacked by several insect pests like thrips, onion fly, cut worms and tobacco caterpillars etc**.** The major insect pests onion thrips *Thrips tabaci* Lindeman (Thysanoptera: Thripidae) that cause significant yield losses. Onion thrips feeds directly on leaves, causing blotches and as well as distort the bulbs and convert them into under size causing yield loss >50% but can be even more problematic by transmitting viral disease like *Iris yellow spot virus* (IYSV) (Diaz-Montano *et al.,* 2011). The aim of this study was to determine the seasonal incidence of major insect pests on onion between the developments stages of onion and their correlation with weather parameter. It is hoped that the findings from the study can contribute to the more ecological precise ways in dealing with outbreaks and control of insect pests of onion.

MATERIALS AND METHODS

The seasonal incidence of onion insect pest, were recorded weekly on 39 onion genotypes. Crop was transplanted on 25th August with plot size of 6 X 1.2 m and replicated three times. Weekly observations on major insect pest population available in the experimental field were recorded on randomly selected

five plants from experimental plots during the whole cropping season *i.e.* from August 2015 to January 2016. The method modified as according to (Ibrahim and Adesiyun, 2010, Ullah *et al.* 2010). Correlation analysis was worked out as per method given by Gomez and Gomez, (1985).

RESULTS AND DISCUSSION

Seasonal activity of onion thrips (*Thrips tabaci* L.)

Periodical observations on the thrips incidence showed that the first appearance of nymph and adult thrips population was started from 1st week of September (36th SMW). Initially, there were 0.06 thrips per plant which increased up to the maximum 20.78 nymphs and adult per plant during the second week of November (46th SMW). Thereafter, the 2nymph and adult population gradually declined to 2.14 per plant during the third week of December (15th SMW). The thrips population was observed during the entire crop growth period, during this period maximum (33.9 ^{0}C) and minimum temperature (14.8 ^{0}C), morning 94% and evening relative humidity 31%, wind velocity 3 kmph and sunshine 8.1 hours/day prevailed (Table 1&2, fig 1&2). The works of other scientists support the above finding. Contrary to our results that thrips population started from 1st week of September (0.06 thrips/plant) (36th SMW), peaked during month of November (20.78 thrips/plant) and reduced in the third week of December (2.14 thrips/plant). Peak population of *T. tabaci* in onion has been reported during September (122.32 thrips/plant) (Liu, 2004), November (174.6 thrips/plant) (Lorini *et al.*, 1986), November to March (Ibrahim, 2010), Thus, variation in population peak of *T. tabaci* may be due to weather condition, the location and genotypes.

Correlation to weather parameters

The population of thrips was correlated with weather parameters *viz*. temperature, rainfall, relative humidity, wind velocity and sunshine hours. The thrips population was negatively non-significant with morning relative humidity (r=-1.003), maximum (r=-0.64) and minimum temperature (r=-4.42), rainfall (r=-1.66), evening relative humidity (r=-4.07) and wind velocity (r=-2.05) were non- significantly positively correlated with sunshine house (r =1.78) (**Table 3)**.

Lorine *et al*. (1986) reported the similar finding of seasonal trends with respect to the population level of *T. tabaci* on the onion cultivar. Population increased during early October onwards at the time of withdrawal of monsoon and the increase of temperature induced the positive relation between the temperature and thrips population. The present findings are in agreement with the work of Reddy (1976) who observed that higher thrips infestation on the crop was noticed during summer or dry weather conditions. Waiganjo *et al.* (2008) supports the finding with temperature and reported that dry weather (30.3 mm rainfall) with moderately high temperatures (15.6-28.2 ^{o}C) favour higher seasonal thrips population. However, thrips population was negatively correlated to wet season (391mm rainfall) with moderately high relative humidity. Domiciano *et al.* (1993) reported that typical weather condition of low temperature (20.29 ^{0}C) and the absence of rainfall in Brazil favoured rapid increase of thrips population. Hammon (2002) reported that thrips population appeared in onion in early June and peaked at about 600 thrips per plant in mid-July and less than 10 thrips/plant in early August.

Seasonal activity of jassid (*Amrasca bigutula bigutula*)

Perusal of data presented (**Table 1&2, fig 1&2)** on the incidence of jassid showed that the first appearance of jassid was started from 1st week of September (36th SMW). Initial population of jassid was 3.20 per plant and reached to the maximum (12.60 jassid/plant) in the 2nd week of October (42th SMW). The jassid population was observed during the entire crop growth period with the prevalence of maximum (32.9 ^{0}C) and minimum (15.5 ^{0}C) temperature, morning (94%) and evening (31%) relative humidity, wind velocity (3 kmph) and sunshine hours (8.1 hours/day) respectively. Thereafter, the population gradually decreased to 2.70 jassid/plant during the second week of April**.**

Correlation to weather parameters

The mean jassid population was correlated with weather parameters *viz*. temperature, rainfall, relative humidity, wind velocity and sunshine hours. The jassid population was correlated significantly positive with sun shine hours (r=2.327) and was non-significantly positive with maximum temperature (r=1.72). The negative non significant correlation with minimum temperature (r=-2.045), rainfall (r=-1.439), morning relative humidity (r=-0.140), evening relative humidity (r=-1.736) and wind velocity (r=-1.811), respectively (**Table 3)**. The similar findings were recorded by Gupta (2015).

Seasonal activity of Tobacco caterpillar (*Spodoptera litura)*

Periodical observations on the *S. litura* incidence showed that the first appearance of *S. litura* population was noticed from 1st week of September (36th SMW). Initial incidence of *S. litura* was 0.1 per plant which reached to maximum (0.91/plant) in the last week of September (39th SMW). During this period, there was prevalence of maximum (34.1^{0}C) and minimum (19.9^{0}C) temperature, morning (88%) and evening relative humidity (37%), wind velocity (4.4 kmph) and sunshine hours (8.3 hours/day), respectively.

Thereafter, the population of *S. litura* was gradually declined (0.1/plant) during the last week of November (48th SMW) (**Table 1&2, fig 1&2)**.

Correlation to weather parameters

The mean population of *S. litura* was correlated with weather parameters *viz.* temperature, rainfall, relative humidity, wind velocity and sunshine hours. The *S. litura* population was highly significant positively with the minimum temperature (r= 2.99) and significant positively with morning relative humidity (r =2.16) and average temperature (r=2.52). There was non significant positive correlation with maximum temperature (r=2.12), wind velocity (r=0.36), rainfall (r= 1.18), sun shine hours (r =1.10), and evening relative humidity (r=1.14), respectively **(Table3).**

Correlation co-efficient between major insect pest of onion and biotic parameters

Perusal of data presented (**Table 4)** revealed that the trips population showed highly significant positive correlation to lady bird beetle (r=3.474**) and non significant to spider (r=0.813) while non significant negative correlate to green lacewings(r=-0.920). Jassids population showed significantly positive correlation with lady bird beetle (r=2.658*) and highly positive correlation with spider (r=4.005**) and green lacewings(r= 2.228*). The tobacco caterpillar population showed non-significant positive and negative correlation with natural enemies.

Table 1: Seasonal incidence of major insect pests on onion during *Kharif*, 2015-16

Population of weekly natural enemies/plant				
SMW	**Date**	**Green lacewing**	**Spider**	**Lady bird beetle**
35	Aug 27-02	0.00	0.00	0.00
36	Sep 03-09	0.00	0.84	0.01
37	Sep 10-16	0.00	1.10	0.12
38	Sep 17-23	0.01	0.50	0.61
39	Sep 24-30	0.90	0.70	0.72
40	Oct 01-07	1.40	0.61	1.10
41	Oct 08-14	1.30	1.20	1.50
42	Oct 15-21	0.90	1.25	1.72
43	Oct 22-28	1.50	1.45	2.12
44	Oct 29-04	0.70	0.71	1.84
45	Nov 5-11	0.40	0.84	0.92
46	Nov 12-18	0.10	0.93	2.42
47	Nov 19-25	0.20	0.78	1.72
48	Nov 26-02	0.10	0.92	1.96
49	Dec 03-09	0.60	0.73	2.34
50	Dec 10-16	0.70	0.65	1.21
51	Dec 17-23	0.80	0.33	1.02
Seasonal Mean		**0.57**	**0.80**	**1.25**

Table 2: Period of activity and population of major insect pests of onion crop during *kharif* 2015-16

S.N.	**Major insect pests**				
	Name of insect	**Scientific name**	**Population range/plant**	**Active period**	**Peak activity period**
1	Thrips	*Thrips tabaci*	0.06-20.78	1st week of September to 3rd week of December	2nd week of November
2	Jassid	*Amrasca bigutula bigutula*	1.1-12.6	1st week of September to 3rd week of December	3rd week of October
4	Tobacco caterpillar	*Spodoptera litura*	0.01-0.95	1st week of September to last week of November	Last week of September

Table 3: Correlation between major insect pests of onion and weather parameters

Correlation coefficient of major insect pests of onion			
Weather parameter	**Thrips**	**Jassid**	**Tobacco caterpillar**
Maximum Temperature	-0.644	1.726	2.127
Minimum Temperature	-4.415	-0.245	2.996**
Average temperature	-3.276	0.676	2.528*
Rainfall (mm)	-1.658	-1.439	1.186
Morning Relative Humidity (%)	-1.003	-0.140	2.167*
Evening Relative Humidity (%)	-4.070	-1.736	1.140
Average Relative Humidity (%)	-3.635	-1.501	1.490
Wind velocity (Kmph)	-2.054	-1.811	0.363
Sunshine (hrs)	1.777	2.327*	1.104

Table 4: Correlation coefficient between population of natural enemies and insect pests of onion during *Kharif* season 2015-16

Correlation between onion insect pests and natural enemies			
Natural enemy	Thrips	Tobacco caterpillar	Jassid
Lacewing	-0.920	-	2.228*
Spider	0.813	-	4.005**
Lady bird beetle	3.474**	-	2.658*

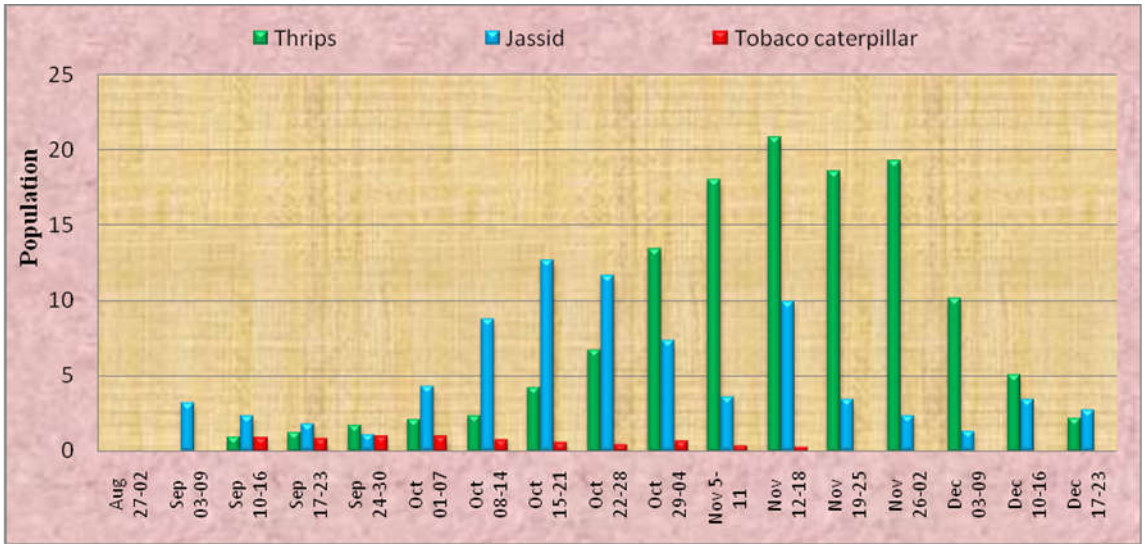

Fig 1:- Seasonal incidence of major insect pests on onion at weekly interval during (*Kharif* 2015)

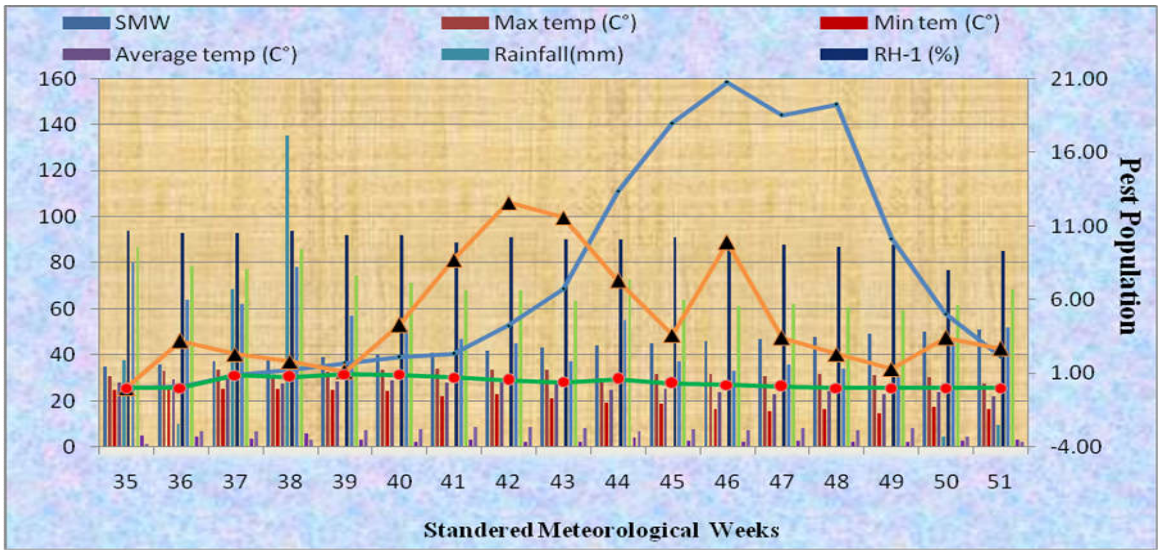

Fig 2:- Relation between major insect pests on onion with weather parameters (*Kharif* 2015)

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