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Population dynamics of major sucking pests infesting niger and their relation to weather parameters

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ABSTRACT

Investigations were carried out on population dynamics of major insect pests on niger (*Guizotia abyssinica* L.) at College Farm, Navsari Agricultural University, Navsari during winter 2011-12. For the purpose, 20 plants were randomly selected from an experimental area of 20×20 m. Observations were recorded at weekly interval. For recording the population of aphid (*Uroleucon compositae*), jassid (*Amrasca biguttula biguttula*), and whitefly (*Bemisia tabaci*), three leaves from top, middle and bottom portion of the randomly selected plants were critically observed and number of aphids, jassids and whiteflies were counted and population per leaf was worked out. The data on population of sucking pests was correlated with weather parameters *viz.*, maximum, minimum and average temperature, morning, evening and average humidity, sunshine hours, wind velocity and evaporation. The results revealed that the incidence of sucking pests *viz.*, aphid, *Uroleucon compositae* (Theobald) started from second week of December which reached peak (63.20 aphids/leaf) during first week of February. The incidence of jassid, *Amrasca biguttula biguttula* (Ishida) started from second week of December with a peak (8.52 jassids/leaf) during fourth week of January and thereafter, steadily declined and finally disappeared. Whereas, whitefly, *Bemisia tabaci* (Gennadius) started from second week of December with a maximum level during (14.56 whiteflies/leaf) fourth week of January. Among various weather parameters *viz.*, maximum, minimum and average temperature had highly significant negative influence on the population of all the major sucking insect pests of niger.

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INTRODUCTION

Niger (*Guizotia abyssinica* L.) belongs to family Asteraceae, is a major oilseed crop of southern and central India, Ethiopia, east Africa. Niger originated from Ethiopia is commonly known as Ramtil, Kalatil, Tilangi and Nug. In India, niger is grown in an area of 4.2 lakh hectares with an annual production of 1.12 lakh tonnes (Anonymous, 2005; Damodaran and Hedge, 2003). In Gujarat, niger is locally known as Kharsani or Ramtil grown exclusively in tribal and hilly areas of Panchmahals, Bharuch, Surat, Navsari, Valsad and Dangs districts during *Kharif* season. A total of 24 insects are recorded on niger in both Ethiopia and India. Out of these, the niger fly (*Dioxyna sororcula* and *Eutretosoma* spp.) and black pollen beetles (*Meligethes* spp.) are the most important (Bayeh

and Medhin, 1992). In India, control measures for niger caterpillar, semilooper, hairy caterpillar and surface grasshopper have been developed. Insect attack on niger flowers causing severe seed set reduction has been reported in India. The niger fly is a serious insect pest which feeds on flower heads, interfering in seed-set and pollination (Schmutterer, 1971). Another serious insect which fed on flower heads, thereby reducing seed-set in Ethiopia, was black pollen beetles (Bayeh and Medhin, 1992). Among all the above pests, aphid (*Uroleucon compositae*), jassid (*Amrasca biguttula biguttula*), and whitefly (*Bemisia tabaci*) are observed in south Gujarat conditions in winter season. For knowing population dynamics of these sucking pests on niger an investigation was carried out at Navsari Agricultural University, Navsari during winter season of 2011-12. The information on population dynamics can be used for initiating the plant protection measures for successful management of these insect pests so that economic damage can be avoided.

MATERIAL AND METHODS

Investigations on population dynamics of major sucking pests infesting niger and their relation to weather parameters were conducted during winter 2011-12 on niger (*Guizotia abyssinica* L.) variety Gujarat Niger-1 at College Farm, Navsari Agricultural University, Navsari. The niger crop was grown and 20 plants were randomly selected from an experimental area of 20×20 m. Observations were recorded at weekly interval. For recording the population of aphids, jassids and whitefly, three leaves each from top, middle and bottom portion of the randomly selected plants were critically observed and number of aphids, jassids and whiteflies were counted and population per leaf was worked out. The data of population of sucking pests were also correlated with weather parameters *viz.*, maximum temperature, minimum temperature, average temperature, morning relative humidity, evening relative humidity and average relative humidity, sunshine hours, wind velocity and evaporation.

RESULTS AND DISCUSSION

The data on population of various sucking pests in niger are presented in Table 1. Perusal of the data indicated that the population of aphid started from the fourth week after sowing (WAS) *i.e.* the second week of December (0.39 aphid/leaf). The population of aphid increased gradually and reached to the peak level (63.20 aphids/leaf) at 13th WAS co-inciding with first week of February. Thereafter, population was steadily declined and finally disappeared. In past, Rathore and Pathak (1981) had reported that the aphid appeared in safflower crop in 1st SMW of January and pest disappeared with the crop maturity. Thus, the results of present investigation are in confirmation with the past report.

The correlation co-efficients observed between aphid population and weather parameters (Table 2) revealed that maximum temperature (r = -0.590), minimum temperature (r = -0.550), average temperature (r = -0.601) and evaporation rate (r= -0.543) had significant negative influence on aphid population. While, evening relative humidity (r= 0.114) and sunshine hours (r=0.593) had positive impact, whereas morning relative humidity (r = -0.364) and average relative humidity (r= -0.048) had non-significant negative correlation with aphid

Table 1 : Population dynamics of major sucking insect pests on niger during winter season 2011-12

Week after sowing (WAS)	Date	Meteorological week (SMW)	Mean number of population per leaf		
			Aphid, *U. compositae*	Jassid, *A. biguttula biguttula*	Whitefly, *B. tabaci*
3.	02/12/2011	48	0.00	0.00	0.00
4.	08/12/2011	49	0.39	0.27	0.86
5.	14/12/2011	50	3.42	0.80	2.72
6.	20/12/2011	51	6.49	2.48	3.60
7.	26/12/2011	52	14.28	3.55	4.74
8.	01/01/2012	1	16.12	4.60	6.16
9.	08/01/2012	2	19.24	4.95	8.20
10.	15/01/2012	3	29.35	6.16	8.46
11.	22/01/2012	4	37.40	8.23	10.24
12.	29/01/2012	5	49.23	8.52	14.56
13.	05/02/2012	6	63.20	5.43	8.22
14.	12/02/2012	7	41.13	3.87	5.27
15.	19/02/2012	8	29.30	2.58	3.10
16.	26/02/2012	9	15.40	1.23	1.12
17.	05/03/2012	10	5.44	0.58	0.24
18.	12/03/2012	11	0.00	0.00	0.00

population. In past, Kamath and Hugar (2001) found that the maximum temperature and relative humidity had significant negative correlation on population of safflower aphid (*U. compositae*). Thus, the results of present findings are in agreement with the past reports.

The results further showed that the population of jassid also started from the fourth WAS *i.e.* second week of December (0.27 jassid/leaf). Initially the population of this pest was increased slowly and reached the peak level (8.52 jassids/ leaf) at 12th WAS coinciding with 5th week of January. In past, Chandrakumar *et al*. (2008) stated that the leaf hopper attained peak in the months of December with maximum temperature. Thereafter, population was steadily declined and reached to level of disappearance. The results of present findings are more or less in agreement with past reports.

The correlation co-efficients existed between jassid population and weather parameters revealed that maximum temperature (r= -0.733), minimum temperature (r= -0.646), average temperature (r= -0.727) and evaporation rate (r= -0.803) had highly significant negative influence on jassid population. While, evening relative humidity (r=0.518), average relative humidity (r=0.399) and wind velocity (r=0.504) exhibited significant positive correlation with jassid population. In past, Mall *et al*. (1992) reported that an average temperature ranging between 20 to 25°C and relative humidity between 50 and 75 per cent showed significant impact on the population build up of the pest. Thus, the present findings are in corroboration with past reports.

It can be further inferred from Table 1 and 2 that the population of whitefly also started from fourth WAS *i.e.* the second week of December (0.86 whitefly/leaf) and reached to a peak level (14.56 whiteflies/leaf) during 12th WAS coinciding with fourth week of January. Thereafter, the whitefly population was gradually declined and disappeared. In past, Chaudhary *et al*. (2001) found that the population of whitefly, *B. tabaci* on tomato reached at highest level during middle of February and high level was maintained from mid February to mid March. Thus, the results of present investigation are in close agreement with past report. Patel and Jhala (1992) reported the infestation of *B. tabaci* on brinjal in the month of July-August (12.51 whiteflies/leaf).

The results presented in Table 2 indicated that maximum temperature (r= -0.714) and evaporation rate (r= -0.791) had highly significant negative correlation with whitefly population. While, minimum temperature (r= -0.602) and average temperature (r= -0.694) had significant negative correlation. The evening relative humidity (r= 0.426) and sun shine hours (r= 0.299) had significant positive correlation. Whereas, average relative humidity (r= 0.292) and wind velocity (r= 0.533) had significant positive correlation. In past, Chaudhary *et al*. (2001) found that temperature, relative humidity and rainfall were negatively correlated with *B. tabaci* population on tomato. Thus, the results of present investigation are in close agreement with the past report.

From the above results it can be inferred that population of aphid, jassid and whitefly was initiated from 4th week after sowing of niger. The population of aphid, jassid and whitefly reached to peak level at 13th, 12th and 12th week after sowing, respectively. The population of all the three sucking pests disappeared at 18th week after sowing. Looking to correlation co-efficients, maximum temperature, minimum temperature and average temperature had significant negative correlation with the population of all the three sucking pests indicating that as temperatures increased, the population of sucking pests decreased (Vinod *et al.*, 2012; Hole *et al.*, 2013 and Saner *et al.*, 2013). Further, evaporation rate also had significant negative correlation with population of sucking pests in niger indicating that as evaporation rate increased, the population of sucking pests decreased. Wind velocity had significant positive correlation with population of sucking pests in niger which indicated that as wind velocity increased, population of sucking pests increased in niger. As far as relative humidity is concerned, evening relative humidity had significant positive correlation with aphid and jassid population indicating that as evening relative humidity increased, the population of aphid and jassid increased. While average relative humidity had significant positive correlation with jassid and whitefly population, indicating that as average relative humidity increased the population of jassid and whitefly increased in niger. Sun shine hours had significant positive correlation with population of aphid in niger indicating that as sun shine hours increased, the population of aphid increased.

A number of reports are available from India and abroad on the incidence of *Bactroceras cucurbita*, *Dacus ciliatus*, fruit flies and jassids, *Dacus dorsalis* and melonfly in relation to weather parameters (Banerji *et al.*, 2005; Patel and Patel,

Table 2 : Correlation matrix of the relationship between weather parameters and population of insect pests of niger during winter 2011-12

Insect pests	Temperature (^{0}C)			Relative humidity (%)			Sunshine hours	Wind velocity (km./hr)	Evaporation
	Max.	Min.	Ave.	Morning	Evening	Ave.			
Aphid	-0.590*	-0.550*	-0.601*	-0.364	0.114*	-0.048	0.593*	0.714**	-0.543*
Jassid	-0.733**	-0.646**	-0.727**	0.006	0.518*	0.399*	0.299	0.504*	-0.803**
Whitefly	-0.714**	-0.602*	-0.694*	-0.093	0.426	0.292*	0.299	0.533*	-0.791**

** and * indicate significance of values at P=0.01 and 0.05 is (r=± 0.497); (r=± 0.623), respectively

1996; Palnaik *et al.,* 2004; Shukla and Prasad, 1985 and Su, 1984).

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