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Response of nitrogen on jassid, *Amrasca biguttula biguttula* Ishida, white fly, *Bemisia tabaci* Genn. and mite, *Tetranychus cinnabarinus* Boisduval infesting brinjal

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Abstract
The brinjal crop is attacked by a number of insect pests, mainly from jassid, *Amrasca biguttula biguttula*, Ishida white fly, *Bemisia tabaci* Genn. Aphid, *Aphis gossypii* Glover; lace wing bug, *Urentius echinus* Distant and Ting.; epilachna beetle, *Epilachna vigintioctopunctata* Fab., shoot and fruit borer, *Leucinodes orbonalis* Guen.; and stem borer, *Euzophera perticella* Rag. (Razvi, 1996). As major one while its minor pests as aphid (*Aphis gossypii* Glover), brinjal leaf roller (*Eublemma olivacea* Walker), jassid (*Hishimonas phycitis*) etc. Six nitrogenous fertilizer doses (0, 20, 40, 60, 80 and 100 kg ha-1) were responded against sucking pests (jassid, white fly and mite) infesting brinjal. The mean pests population showed that the fertilizer dose 0 and 100 kg ha-1 nitrogen ha-1 minimum and maximum population, respectively. The rest of the fertilizer doses harboured moderate level of pests population. The orders of different doses in increasing trend of population of pests were: 0, 20, 40, 60, 80 and 100 kg nitrogen ha-1.

Keywords: Nitrogen, jassid, white fly and mite

Introduction
Brinjal was generally grown in all districts of Rajasthan during summer and rainy season. The brinjal crop is attacked by a number of insect pests, mainly from jassid, *Amrasca biguttula biguttula*, Ishida white fly, *Bemisia tabaci* Genn. Aphid, *Aphis gossypii* Glover; lace wing bug, *Urentius echinus* Distant and Ting.; epilachna beetle, *Epilachna vigintioctopunctata* Fab., shoot and fruit borer, *Leucinodes orbonalis* Guen.; and stem borer, *Euzophera perticella* Rag. (Razvi, 1996) [12]. As major one while its minor pests as aphid (*Aphis gossypii* Glover), brinjal leaf roller (*Eublemma olivacea* Walker), jassid (*Hishimonas phycitis*) etc. (Atwal and Dhaliwal, 2005) [6] and non insect pest like red spider mite, *Tetranychus macfarlanei* (Baker and pritchard, 1999) right from germination to harvesting. Aphids, jassids, whiteflies, lace wing bugs and mites are cosmopolitan in distribution and are found wherever brinjal is grown. Population of these pests are often seen on tender parts of the plant, particularly on leaves. The nymphs and adults of these pests suck the cell sap from leaves and tender parts of plants which leads to yellowing, deformation, wilting and ultimately drying of the affected parts. Sucking pests also act as a vector of different diseases in brinjal crop such as little leaf by jassids and shooty mould by aphids and whiteflies. The losses caused by brinjal pests vary from season to season, depending upon environmental factors (Gangawar and Schan, 1981) and Patel *et al*. (1988) [8, 9]. The interaction between pest activity and abiotic factors help in deriving predicative models that in turn forecast the pest incidence. So, the present investigations were undertaken to study the seasonal incidence of different insect pests that occurred in brinjal ecosystem and the most influential abiotic factors that conditioned the pests.

Material and Methods
Methods of observations
The incidence of sucking pests viz; aphid, *Aphis gossypii*, jassid, *Amrasca biguttula biguttula*, white fly *Bemisia tabaci*, lace wing bug, *Urentius echinus* pests were recorded from transplanting to harvest of the crop. Observations on population of sucking pests were recorded on three leaves one each from top, middle and bottom canopy of the five plants selected randomly in each replication. The observations on the incidence of mite, *Tetranychus cinnabarinus*, Boisduval was recorded after one month of transplanting of the crop and later

observations were recorded at weekly interval on five randomly selected plants. For counting of mite population, nine leaves were observed from each plant, i.e., three leaves each from top, middle and bottom portions of the plant with the help of hand lens (Anonymous, 2000).
The population of natural enemies was recorded on five plants selected randomly in each replication and population per plant was calculated. These observations were statistically analyzed using √x +0.5 transformations.

Response of nitrogen against sucking pests on brinjal
To see the response of different doses of nitrogen against sucking pests on brinjal (Table 1), a field trial was laid out at Horticulture Farm, S.K.N. College of Agriculture, Jobner. Pusa purple round variety and most commonly grown in this area was sown in the third week of July 2012. A view of experiment has been depicted in Plate-1. The details of experiment were as under:

General details of experiment
1. Desig : Randomized Block Design
2. Variety : Pusa Purple Round
3. Treatments : 6. (different doses of nitrogen)
4. Replication : 4
5. Total no. of plots : 24
6. Size of plot : 3 m x 3 m
7. Row to row distance : 60 cm
8. Plant to plant distance : 50 cm

Table 1: Details of fertilizer used

Sr. No.	Treatments
A.	**Nitrogen doses kg ha-1**
1.	N0 = 0
2.	N1 = 20
3.	N2 = 40
4.	N3 = 60*
5.	N4 = 80
6.	N5 = 100

* Recommended dose

The dose of nitrogen was given through urea in two splits (50% as basal and remaining 50% at 30 DAS) as per treatment. The recommended dose of phosphorus and potassium was given in all the plots basally through single super phosphate (SSP) and murate of potash (MOP) @ 30 kg ha-1, respectively. All the agronomical practices were followed from time to time.

Method of observations
The observations on the incidence of sucking pests of brinjal was recorded after one month of transplanting of the crop and later observations were recorded at weekly interval on five randomly selected plants. For counting of mite population, nine leaves were observed from each plant, i.e., three leaves each from top, middle and bottom portions of the plant with the help of hand lens and counting of jassid, white fly and aphid population three leaves were observed from each plant i.e. three from top, middle and bottom portions of each plant of the help of hand lens. (Anonymous, 2000).

Result and Discussion
Influence of nitrogen against jassid
A. biguttula biguttula. The data on the effect of different doses of nitrogen on the population of jassid, *A. biguttula biguttula* has been present in (table 2 and fig. 1). The jassid incidence first appeared on 19th August, 2012 and continued up to 11th November, 2012. The population ranged from 0.60 to 10.40 jassids / 3 leaves in different nitrogen doses. The minimum population was recorded in 0 kg nitrogen ha-1 (0.60 jassid / 3 leaves), which significantly differed from other nitrogen doses. It was followed by 20 and 40 kg nitrogen ha-1, viz., 1.60 and 3.40 jassids / 3 leaves respectively, however, stood significant different from each other. The maximum population appeared in 100 kg nitrogen application (10.40 jassids /3 leaves) and was found significantly different from other nitrogen doses. In ascending order the population of jassid was found to be 0, 20, 40, 60, 80 and 100 kg. The observations recorded on 26th August indicated that the population ranged from 1.40 to 13.60 jassids / 3 leaves. The minimum (1.40 jassids /3 leaves) being in 0 kg nitrogen ha1, followed by 20 and 40 kg nitrogen ha-1, with a population counts of 3.40 and 4.60 jassids/ 3 leaves, respectively and remained at par with each other. In case of 60 kg nitrogen ha-1, such counts were 8.00 jassids/ 3 leaves. The maximum population was found to be in 100 kg nitrogen ha-1 (13.60 jassids / 3 leaves), followed by 80 kg nitrogen ha-1(10.60 jassids /3 leaves) but did not differ to each other. The jassid incidence increased gradually in all the treatments after 2nd September and found to be in the range of 3.20 to 16.80 jassids / 3 leaves, the minimum (3.20 jassids / 3 leaves) being in 0 kg nitrogen ha-1 and maximum (16.80 jassids / 3 leaves) in treatment 100 kg nitrogen ha-1. The treatment 0 kg nitrogen ha-1 was comparable with 20 and 40 kg nitrogen ha-1 with respect to jassid population. The maximum population was observed in treatment 100 kg nitrogen ha-1 (16.80 jassids / 3 leaves). The increasing pattern of jassid population in different treatments of nitrogen doses were found to be in the order of 0, 20, 40, 60, 80 and 100 kg nitrogen ha -1.The jassid incidence reached on 9th September and found to be in the range of 5.60 to 32.00 jassids / 3 leaves, the minimum (5.60 jassids / 3 leaves) being in 0 kg nitrogen ha-1 and maximum (32.00 jassids / 3 leaves) in treatment 100 kg nitrogen ha-1. The minimum being in 0 kg nitrogen ha-1 was at par with 20 kg nitrogen ha-1(7.40 jassids / 3 leaves). The maximum population was observed in treatment 100 kg nitrogen ha-1 (32.00 jassids / 3 leaves), the treatment proved significantly superior over rest of the treatments. The increasing pattern of jassid population in the different treatments of nitrogen doses were found to be in the order of 0,20, 40, 60, 80 and 100 kg nitrogen ha -1. The observations recorded on 16th September indicated that the jassid population ranged from 9.80 to 40.60 jassids / 3 leaves. The minimum (9.80 jassids / 3 leaves) being in 0 kg nitrogen ha-1, followed by 20 and 40 nitrogen ha-1, with the jassid population of 16.20 and 19.40 jassids / 3 leaves, respectively and these were found at par to each other. In case of 60 kg nitrogen ha-1, such counts were 26.80 jassids/ 3 leaves. The maximum population was found to be in 100 kg nitrogen ha-1, (40.60 jassids / 3 leaves) followed by 80 kg nitrogen ha-1(37.00 jassids / 3 leaves) and found to be significant at par to each other. The observations taken on 23rd September indicated that the jassid incidence increased in almost all the treatments. The population was found to be in the range of 16.20 to 58.40 jassids / 3 leaves, the maximum (58.40 jassids / 3 leaves) being in 100 kg nitrogen ha-1 and minimum (16.20 jassids / 3 leaves) in 0 kg nitrogen ha-1. The treatment 100 kg nitrogen ha-1 was found significantly different from all the treatments with respect to jassid population. The treatments 20 and 40 kg nitrogen ha-1 stood

at par, however, 60 and 80 kg nitrogen ha-1were not comparable to each other. The increasing pattern of jassid incidence in different treatments of nitrogen doses were found to be in the order of 0, 20, 40, 60, 80 and 100 kg nitrogen ha-1. The population as evident on 30th September revealed a range of 19.80 to 62.40 jassids/ 3 leaves. The minimum (19.80 jassids / 3 leaves) being in 0 kg nitrogen ha-1, followed by 20 kg nitrogen ha-1 (25.80 jassids /3 leaves). The treatment 80 kg nitrogen ha-1 had a count of 56.00 jassids / 3 leaves and remained significant different from 40 and 60 kg nitrogen ha-1 viz., 25.00 and 32.40 jassids / 3 leaves, respectively. The treatment 100 kg nitrogen ha-1 had maximum jassid population (80.00 jassids / 3 leaves) and remained at par with 80 kg nitrogen ha-1. Almost in all the treatments, a gradual decrease in population was evident in the observations recorded after 07th October onward. The population decreased and was minimum (18.40 jassids / 3 leaves) in treatment 0 kg nitrogen ha-1, followed by 20, 40, 60 kg nitrogen ha-1 with a population counts of 24.20, 29.40 and 29.60 jassids / 3 leaves, respectively,however,20 kg nitrogen ha-1 was at par with 0 kg nitrogen ha-1 and was also comparable with 40 kg nitrogen ha-1. Similarly 40 kg and 60 kg nitrogen ha-1 were also comparable. The maximum population was observed in treatment 100 kg nitrogen ha-1 (61.00 jassids /3 leaves), followed by 80 kg nitrogen ha-1 with a counts of 53.80 jassids /3 leaves and significantly at par to each other. The increasing trend of jassid incidence in different treatments of nitrogen doses were found to be in the order of 0, 20, 40, 60, 80 and 100 kg nitrogen ha-1. The population recorded on 14th October ranged from 16.60 to 54.00 jassid / 3 leaves. The minimum(16.60 jassids/ 3 leaves) in treatment 0 kg nitrogen ha-1 The treatments 20 and 40 kg nitrogen ha-1 gave a population of 20.40 and 21.60 jassids / 3 leaves, respectively and remained at par with 0 kg nitrogen ha-1. The maximum population was observed in treatment 100 kg nitrogen ha-1 (54.00 jassids /3 leaves) and significantly superior to other treatments. The increasing trend of jassid incidence in different treatments of nitrogen doses were found to be in the order of 0, 20, 40, 60, 80 and 100 kg nitrogen ha-1. The observations recorded on 21st October indicated that population was minimum in treatment 0 kg nitrogen ha-1 (14.00 jassids / 3 leaves), followed by in 20, 40 and 60 kg nitrogen ha-1, viz., 16.80, 18.00 and 18.80 jassids/ 3 leaves, respectively and these treatments remained at par with 0 kg nitrogen ha-1. The maximum population was observed in treatment 100 kg nitrogen ha-1 (43.00 jassids /3 leaves) and significant differed from 80 kg nitrogen ha-1 with jassid population of 32.00 jassids /3 leaves. The increasing trend of jassid incidence in different treatments of nitrogen doses were found to be in the order of 0, 20, 40, 60, 80 and 100 kg nitrogen ha-1. The population on 28th October was minimum in treatments 0 kg nitrogen ha-1 (10.40 jassid / 3 leaves), followed by 20, 40 and 60 kg nitrogen ha-1 viz. 11.40, 12.40 and 13.60 / 3 leaves, respectively, and these treatments remained at par with 0 kg ha-1. The maximum population (25.80 jassids /3 leaves) was observed in treatment 100 kg nitrogen ha-1 and was followed by 80 kg nitrogen ha-1 with a population of 20.40 jassids /3 leaves and stood at par with each other. The increasing trend of jassid incidence in different treatments of nitrogen doses were found to be in the order of 0, 20, 40, 60, 80 and 100 kg nitrogen ha-1. The population count of jassids on 4th November was minimum (6.60 / 3 leaves) in treatment 0 kg nitrogen ha-1 followed by 20, 40 and 60 kg nitrogen ha-1, viz. 7.60, 8.60 and 9.80 / 3 leaves, respectively, and these treatments remained at par with 0 kg nitrogen ha-1. The maximum population was observed in treatment 100 kg nitrogen ha-1 (17.00 jassids /3 leaves), followed by 80 kg nitrogen ha-1(14.20 jassids/ 3 leaves) and remained at par to each other. The increasing trend of jassid incidence in different treatments of nitrogen doses were found to be in the order of 0, 20, 40, 60, 80 and 100 kg nitrogen ha-1. The last observation was recorded on 11th November in which the jassid population was very low in different treatments of nitrogen doses and, however, ranged from 4.40 to 12.00 /3 leaves, the minimum (4.40 jassids / 3 leaves) being in 0 kg nitrogen ha-1, followed by 20 and 40 kg nitrogen ha-1 with population viz., 5.00 and 6.60 jassids /3 leaves, respectively and found at par. However, it was maximum in 100 kg nitrogen ha-1 (12.00 jassids /3 leaves), followed by 80 kg nitrogen ha-1(10.60 jassids / 3 leaves) and were comparable to each other. The treatments 40 and 60 kg nitrogen ha-1 remained a population 6.60 and 7.40 jassids / 3 leaves and were comparable. The increasing numbers of jassid in different treatments of nitrogen doses were found to be in the order of 0, 20, 40, 60, 80 and 100 kg nitrogen ha-1. Based on overall mean population in the season in different treatments of nitrogen doses ranged from 9.77 to 34.38 jassids / 3 leaves, the minimum (9.77 jassids / 3 leaves) being in 0 kg nitrogen ha-1, followed by 20 kg nitrogen ha-1(12.68 jassids / 3 leaves) and remained at par to each other. Next treatment 40 kg nitrogen ha-1(15.15 jassids / 3 leaves) stood at par with 20 kg nitrogen ha-1 and 60 kg nitrogen ha-1 (18.80 jassids / 3 leaves), however, it was comparable to 40 kg nitrogen ha-1. The maximum population (34.38 jassids / 3 leaves) was found to be significantly different from rest of other treatments. The increasing trend was in the order of 0, 20, 40, 80 and 100 kg nitrogen ha-1.

Influence of nitrogen against whitefly, *Bemisia tabaci*

The data presented in table 3 and Fig. 2 Indicated that the incidence first appeared on 19th August, 2012 and the population continued up to 11th November, 2012. However it ranged from 1.40 to 15.00 whiteflies / 3 leaves in different nitrogen doses. The minimum population was recorded in 0 kg nitrogen ha-1 (1.40 whiteflies/ 3 leaves), followed by 20 kg (2.60 whiteflies/ 3 leaves), 40 kg (4.20 whiteflies/ 3 leaves),60kg (9.20 whiteflies/ 3 leaves) and 80 kg (10.00 whiteflies/ 3 leaves). However no significant difference was observed between 0 kg and 20 kg nitrogen ha-1, 20 kg and 40 kg nitrogen ha-1 and 60 kg and 80 kg nitrogen ha-1. The maximum population was recorded in the treatment of 100 kg nitrogen ha-1, which proved significantly superior over rest of other treatments. In ascending order population of whitefly was found to be 0, 20, 40, 60, 80 and 100 kg. The observations recorded on 26th August indicated that the population ranged from 3.80 to 19.60 whiteflies / 3 leaves. The minimum being in 0 kg nitrogen ha1, followed by 20 and 40 kg nitrogen ha-1, with a population of 5.60 and 7.80 whiteflies /3 leaves, respectively and remained at par with each other. In case of 60 kg nitrogen ha-1, such counts were 14.60 whiteflies/ 3 leaves and was not significantly different from 80 and 100 kg nitrogen ha-1. The maximum population was found to be 100 kg nitrogen ha-1(19.60 whiteflies / 3 leaves). The incidence increased gradually in all the treatments after 02nd September and found to be in the range of 5.40 to 27.00 white flies / 3 leaves, the minimum (5.40 whiteflies / 3 leaves) being in 0 kg nitrogen ha-1 and maximum (27.00 whiteflies / 3 leaves) in treatment 100 kg

nitrogen ha-1. The treatment 20 kg nitrogen ha-1 (7.60 whiteflies / 3 leaves) was comparable with 0 kg nitrogen ha1 with regards to white fly population. The maximum population in treatment 100 kg nitrogen ha-1 (27.00 whiteflies / 3 leaves) was at par with 80 kg nitrogen ha-1(23.80 whiteflies / 3 leaves). The treatments 40 kg (14.40 whiteflies /3 leaves) and 60 kg nitrogen ha-1 (14.40 whiteflies /3 leaves) were found significantly different from each other. The increasing pattern of whitefly population in the different treatments of nitrogen doses were found to be in the order of 0, 20, 40, 60, 80 and 100 kg nitrogen ha-1. The incidence recorded on 9th September and found to be in the range of 7.80 to 38.60 whiteflies / 3 leaves, the minimum(7.80 whiteflies / 3 leaves) being in 0 kg nitrogen ha-1 and maximum (38.60 whiteflies /3 leaves) in treatment 100 kg nitrogen ha-1. The treatment 0 kg nitrogen ha-1 (7.80 whiteflies /3 leaves) was at par with 20 kg nitrogen ha1 (9.69 white flies /3 leaves) in respect to whitefly population. The maximum population was observed in treatment 100 kg nitrogen ha-1 (38.60 whiteflies / 3 leaves), followed by 80 kg nitrogen ha-1 (35.00 whiteflies / 3 leaves) but did not differ with each other. The treatments 40 kg nitrogen ha-1 and 60 kg nitrogen ha-1 had a significant difference between them. The increasing pattern of whitefly population in the different treatments of nitrogen doses were found to be in the order of 0, 20, 40, 60, 80 and 100 kg nitrogen ha-1. The observations recorded on 16th September indicated that the population ranged from 9.40 to 53.80 whiteflies / 3 leaves. The minimum (9.40 whiteflies / 3 leaves) being in 0 kg nitrogen ha1, followed by 20 kg nitrogen ha-1, with the population of 11.80 whiteflies /3 leaves and were comparable to each other. In case of 60 kg nitrogen ha-1 (41.00 whiteflies/ 3 leaves) had a significant difference with 40 kg nitrogen ha-1 (19.40 whiteflies/ 3 leaves). The maximum population was found to be 100 kg nitrogen ha-1 (53.80 whiteflies / 3 leaves), followed by 80 kg nitrogen ha-1 (45.40 whiteflies / 3 leaves) and found to have non-significant difference with each other. The observations taken on 23rd September indicated that the incidence increased in almost all the treatments. The population was found to be in the range of 11.60 to 69.00 whiteflies / 3 leaves, the maximum (69.00 whiteflies/ 3 leaves) being in 100 kg nitrogen ha-1 and minimum (11.60 whiteflies/ 3 leaves) in 0 kg nitrogen ha-1. The treatment 100 kg nitrogen ha-1 was found at par with 80 kg nitrogen ha-1(60.40 whiteflies/ 3 leaves). The treatments 20 and 40 kg nitrogen ha-1 had a population counts of 13.80 and 17.00 whiteflies/ 3 leaves, respectively and stood at par with 0 kg nitrogen ha-1. The increasing pattern of whitefly incidence in different treatments of nitrogen doses were found to be in the order of 0, 20, 40, 60, 80 and 100 kg nitrogen ha-1. The population as evident on 30th September revealed a range of 15.40 to 80.00 whiteflies/ 3 leaves. The minimum being in 0 kg nitrogen ha-1 (15.40 whiteflies / 3 leaves) followed by 20 kg nitrogen ha-1 (19.20 whiteflies / 3 leaves) and remained at par to each other. The treatments 40 and 60 kg nitrogen ha-1 had a population counts of 41.00 and 60.80 whiteflies / 3 leaves and significantly different from 0 and 20 kg nitrogen ha-1. The treatment 80 kg nitrogen ha-1 had a count of 77.00 whiteflies / 3 leaves and was comparable with 60 kg nitrogen ha-1. The treatment 100 kg nitrogen ha-1 had maximum population (80.00 whiteflies / 3 leaves) and did not differ from 80 kg nitrogen ha-1 (77.00 whiteflies / 3 leaves).

Almost in all the treatments, a decrease in population was evident in the observations recorded after 07th October onward. The population was minimum in treatment 0 kg nitrogen ha-1 (15.00 whiteflies / 3 leaves), followed by 20 kg nitrogen ha-1 (16.00 whiteflies / 3 leaves) and found to be non significant. The treatments 40 and 60 kg nitrogen ha-1 had a population counts of 34.00 and 52.40 whiteflies / 3 leaves and existed a significantly difference between them. The maximum whitefly population was observed in treatment 100 kg nitrogen ha-1 (79.60 whiteflies /3 leaves) but did not differ from 80 kg nitrogen ha-1. The increasing trend of whitefly incidence in different treatments of nitrogen doses were found to be in the order of 0, 20, 40, 60, 80 and 100 kg nitrogen ha-1. The population on 14th October was minimum in treatments 0 kg nitrogen ha-1(12.60 white flies / 3 leaves), followed by 20 kg nitrogen ha-1 (14.80 whiteflies/ 3 leaves) and these treatments remained at par with each other. However, 20 kg nitrogen ha-1 (14.80 whiteflies / 3 leaves) and also remained at par with 40 kg nitrogen ha-1 (25.00 white flies / 3 leaves). The treatment 60 kg nitrogen ha-1(39.20 whiteflies/ 3 leaves) was comparable with 40 kg nitrogen ha-1. However, the treatment 80 kg nitrogen ha-1 (60.00 whiteflies/ 3 leaves) had a significant difference from 60 kg nitrogen ha-1(39.20 whiteflies/ 3 leaves).The maximum population was observed in treatment 100 kg nitrogen ha-1 (65.40 whiteflies /3 leaves) and remained at par with 80 kg nitrogen ha-1 having a population (60.00 whiteflies /3 leaves). The increasing trend of whitefly incidence in different treatments of nitrogen doses were found to be in the order of 0, 20, 40, 60, 80 and 100 kg nitrogen ha-1. The observations recorded on 21st October indicated that the population was minimum in treatments 0 kg nitrogen ha-1(10.40 whiteflies / 3 leaves) followed by 20 and 40kg nitrogen ha-1, viz. 12.00 and 19.00 whiteflies/ 3 leaves, respectively, and these treatments remained at par with 0 kg nitrogen ha-1.The treatment 40 kg nitrogen ha-1(19.00 whiteflies /3 leaves) also stood at par with 60 kg nitrogen ha-1 (25.80 whiteflies /3 leaves). The maximum population (59.00 whiteflies /3 leaves) was observed in treatment 100 kg nitrogen ha-1 and did not differ significantly from 80 kg nitrogen ha-1 (53.00 whiteflies /3 leaves). However, the treatments 60 and 80 kg nitrogen ha-1 had a counts of 25.80 and 53.00 whiteflies/ 3 leaves, respectively and found to be significantly different. The increasing trend of whitefly incidence in different treatments of nitrogen doses were found to be in the order of 0, 20, 40, 60, 80 and 100 kg nitrogen ha-1. The population as evident in the observations recorded on 28th October indicated that it was minimum in treatments 0 kg nitrogen ha-1(6.40 whiteflies / 3 leaves) followed by 20 kg nitrogen ha-1(9.00 whiteflies/ 3 leaves) and these treatments remained at par to each other. However, the treatments 40 kg nitrogen ha-1 (15.00 whiteflies/ 3 leaves) and 60 kg nitrogen ha-1 (20.80 whiteflies/ 3 leaves) were also comparable to each other. The maximum whitefly population was observed in treatment 100 kg nitrogen ha-1 (43.00 whiteflies /3 leaves) The doses of 0,20,40 and 60 kg nitrogen ha-1 with whitefly population of 6.40,9.00,15.00 and 20.80 whiteflies /3 leaves respectively, remained comparable to 80 kg nitrogen ha-1 (40.00 whiteflies /3 leaves). The increasing trend of whitefly incidence in different treatments of nitrogen doses were found to be in the order of 0, 20, 40, 60, 80 and 100 kg nitrogen ha-1. The population recorded on 4th November indicated that the population was minimum4.20 whiteflies / 3 leaves) in treatments 0 kg nitrogen ha-1(followed by 20 kg nitrogen ha-1 (6.00 whiteflies/ 3 leaves) and these treatments did not differ to each other. The treatment 40 kg nitrogen ha-1(9.00 whiteflies/ 3 leaves) also did not differ from 20 kg nitrogen

ha-1.The maximum population was observed in treatment 100 kg nitrogen ha-1 (36.40 whiteflies /3 leaves), followed by 80 kg nitrogen ha-1(33.00 whiteflies/ 3leaves) and stood at par to each other. The increasing trend of white fly incidence in different treatments of nitrogen doses were found to be in the order of 0, 20, 40, 60, 80 and 100 kg nitrogen ha-1. The last observation recorded on 11th November in which the population was very low in different treatments of nitrogen doses, however, ranged from 3.40 to 32.40 whiteflies /3 leaves, the minimum being in 0 kg nitrogen ha-1 (3.40 whiteflies/ 3 leaves) followed by 20 kg nitrogen ha-1(5.00 whiteflies/ 3 leaves) and were comparable to each other. However, the treatments 40 kg nitrogen ha-1 (7.40 whiteflies/ 3 leaves) remained at par with 20 kg nitrogen ha-1.The treatments 40 and 60 kg nitrogen ha-1 with population 7.40 and 10.80 whiteflies/ 3 leaves respectively also remained at par to each other. The maximum (32.40 whiteflies /3 leaves) in 100 kg nitrogen ha-1 and significantly superior over rest of other treatments followed by 80 kg nitrogen ha-1(21.00) but remained significantly different. The increasing numbers of white flies in different treatments of nitrogen doses were found to be in the order of 0, 20, 40, 60, 80 and 100 kg nitrogen ha-1. Based on overall mean population in the season in different treatments of nitrogen doses ranged from 8.22 to 47.58 whiteflies / 3 leaves, the minimum (8.22 whiteflies / 3 leaves) being in 0 kg nitrogen ha-1, followed by 20 kg nitrogen ha-1(10.23 whiteflies / 3 leaves) and remained at par with each other. Next treatment 40 kg nitrogen ha-1(17.23 whiteflies / 3 leaves) and 60 kg nitrogen ha-1 (30.50 whiteflies / 3 leaves) were also found to be significantly different from 0 and 20 kg nitrogen ha-1. The maximum (47.58 whiteflies / 3 leaves) population was observation in 100 kg nitrogen ha-1 followed by 80 kg nitrogen ha-1 (42.28 whiteflies / 3 leaves) and were comparable to each other. The increasing trend was in the order of 0, 20, 40, 80 and 100 kg nitrogen ha-1.

Influence of nitrogen against mite, *T. cinnabarinus* on brinjal

The population of mite, *T. cinnabarinus* in the experiment response of nitrogen was recorded at weekly interval starting from pest appearance till its disappearance (Table 4 and Fig. 3). The mite incidence first appeared on 23rd September, 2012 and continued up to 4th November, 2012 and ranged from 1.15 to 11.20 mites / 9 leaves in different nitrogen doses. The minimum population was recorded in 0 kg nitrogen ha-1 (1.15 mite / 9 leaves), which stood at par with 20 kg nitrogen ha-1 (1.28 mites / 3 leaves). The treatment 40 kg nitrogen ha-1 (3.20 mites / 3 leaves) was comparable to 20 kg nitrogen ha-1. Treatment 80 kg nitrogen ha-1 (5.65 mite / 9 leaves) remained at par with 60 kg nitrogen ha-1(4.85 mites / 9 leaves) The maximum population (11.20 mites / 9 leaves) appeared in 100 kg nitrogen ha-1 application and was found significantly different from other nitrogen doses. In ascending order population of mite was found to be in nitrogen dose 0, 20, 40, 60, 80 and 100 kg nitrogen ha-1. The observations recorded on 30th September indicated that the population ranged from 7.80 to 52.00 mites / 9 leaves. The minimum being in 0 kg nitrogen ha-1 (7.80 mites / 9 leaves), followed by 20 kg nitrogen ha-1 with the mite population of 24.75 mites / 9 leaves and there existed a significant difference between them. However, 60 and 80 kg nitrogen ha-1 with a population of (38.60 and 48.35 mites / 9 leaves, respectively) remained at par with 40 kg nitrogen ha-1 (36.20 mites / 9 leaves). The maximum population (52.00 mites / 9 leaves) was found to be in 100 kg nitrogen ha-1 followed by 80 kg nitrogen ha-1 (48.35mites /3 leaves) and did not differ with each other. The mite incidence increased gradually in all the treatments after 7th October and found to be in the range of 105.00 to 226.60 mites / 9 leaves, the minimum (105.00 mites / 9 leaves) being in 0 kg nitrogen ha-1 and maximum (226.60 mites / 9 leaves) in treatment 100 kg nitrogen ha-1. The treatments 20, 40, 60 and 80 kg nitrogen ha-1 viz., 157.60, 159.60, 170.60 and 188.65 mites / 9 leaves, respectively stood at par with each other. The maximum population was observed in treatment 100 kg nitrogen ha-1 (226.60 mites / 9 leaves) however, remained at par with 80 kg nitrogen ha-1. The increasing pattern of mite population in the different treatments of nitrogen doses were found to be in the order of 0, 20, 40, 60, 80 and 100 kg nitrogen ha-1. The observations taken on 14th October indicated that the incidence increased in almost all the treatments. The population was found to be in the range of 220.60 to 398.75 mites / 9 leaves, the maximum being in 100 kg nitrogen ha-1 and minimum in 0 kg nitrogen ha-1. The treatments 0, 20,40,60 and 80 kg nitrogen ha-1 viz.,220.60, 240.90, 266.30, 299.50 and 320.40 mites / 9 leaves, respectively remained at par with each other. The treatment 100 kg nitrogen ha-1 (398.75 mites / 9 leaves)) remained at par with 80 kg nitrogen ha-1. The increasing pattern of mite incidence in different treatments of nitrogen doses were found to be in the order of 0, 20, 40, 60, 80 and 100 kg nitrogen ha-1. The increasing trend in the population of mite was evident on 21st October and found to be in the range of 372.75 to 623.00 mites / 9 leaves. The minimum (372.75mites/ 9 leaves) being in 0 kg nitrogen ha-1 followed by 20, 40, 60 and 80 kg nitrogen ha-1 (413.65, 456.40, 478.40 and 543.00 mites / 9 leaves, respectively) and had non-significant difference. The treatment 80 kg nitrogen ha-1 had a count of 543.00 mites / 9 leaves and was comparable to 100 kg nitrogen ha-1 (623.00 mites / 9 leaves). In ascending order population of mite was found to be in nitrogen dose 20, 0, 40, 60, 80 and 100 kg nitrogen ha-1. In all the treatments, a gradual decrease in population was evident in the observation recorded on 28th October The population was minimum in treatments 0 kg nitrogen ha-1 (246.00 mites / 9 leaves), followed by 20,40, 60 and 80 kg nitrogen ha-1, viz., 256.00, 260.75, 348.40 and 364.30 mites / 9 leaves, respectively and these treatments were comparable to each other. The maximum mite population was observed in treatment 100 kg nitrogen ha-1 (513.70 mites / 9 leaves) and did not differ from 80 kg (364.30 mites / 9 leaves). The increasing trend of mite incidence in different treatments of nitrogen doses were found to be in the order of 0, 20, 40, 60, 80 and 100 kg nitrogen ha-1. The last observation was recorded on 4th November in which the population was very low in different treatments of nitrogen doses and ranged from 135.75 to 260.50 mites / 9 leaves, the minimum (135.75 mites/ 9 leaves) being in 0 kg nitrogen ha-1 followed by 20 and 40 kg nitrogen ha-1.viz., 138.25 and 173.25 mites / 9 leaves, respectively and remained at par to 0 kg nitrogen ha-1 (135.75 mites / 9 leaves). The population counts were 196.75 & 212.25 mites / 9 leaves in 60 & 80 kg nitrogen ha-1, respectively and comparable with 40 kg nitrogen ha-1 (173.25 mites /9 leaves). However, the maximum population in 100 kg nitrogen ha-1 (260.50 mites/ 9 leaves) and stood at par with 80 kg nitrogen ha-1(212.25 mites / 9 leaves). The increasing numbers of mite in different treatments of nitrogen doses were found to be in the order of 0, 20, 40, 60, 80 and 100 kg nitrogen ha-1. Based on overall mean population of mite in the season in different treatments of nitrogen doses ranged from 155.57 to 297.96 mites / 3

leaves, the minimum (155.57 mites / 3 leaves) being in 0 kg nitrogen ha-1, followed by 20, 40 and 60 kg nitrogen ha-1 viz., 176.20, 193.67 and 219.59 mites / 3 leaves, respectively and remained not differ. The maximum population (297.96 mites / 3 leaves) in 100 kg nitrogen ha-1 was comparable with 80 kg nitrogen ha-1(240.37 mites / 3 leaves). Similarly, the treatments 60 and 80 kg nitrogen ha-1 remained at par to each other. The increasing trend was in the order of 0, 20, 40, 80 and 100 kg nitrogen ha-1.

Table 2: Response of nitrogen on jassid, *Amrasca biguttula biguttula* Ishida. infesting brinjal

S. No.	Nitrogen doses (kg ha^{-1})	Jassid population/ 3 leaves at different interval												
		19/08/ 2012	26/08/ 2012	02/09/ 2012	09/09/ 2012	16/09/ 2012	23/09/ 2012	30/09/ 2012	07/10/ 2012	14/10/ 2012	21/10/ 2012	28/10/ 2012	04/11/ 2012	11/11/ 2012	Mean
1.	0	0.60	1.40	3.20	5.60	9.80	16.20	19.80	18.40	16.60	14.00	10.40	6.60	4.40	9.77
		(1.05)	(1.38)	(1.92)	(2.47)	(3.21)	(4.09)	(4.51)	(4.35)	(4.14)	(3.81)	(3.30)	(2.66)	(2.21)	(3.20)
2.	20	1.60	3.40	5.80	7.40	16.20	19.20	25.80	24.20	20.40	16.80	11.40	7.60	5.00	12.68
		(1.45)	(1.97)	(2.51)	(2.81)	(4.09)	(4.44)	(5.13)	(4.97)	(4.57)	(4.16)	(3.45)	(2.85)	(2.35)	(3.63)
3.	40	3.40	4.60	7.60	9.40	19.40	25.00	31.00	29.40	21.60	18.00	12.40	8.60	6.60	15.15
		(1.97)	(2.26)	(2.85)	(3.15)	(4.46)	(5.05)	(5.61)	(5.47)	(4.70)	(4.30)	(3.59)	(3.02)	(2.66)	(3.96)
4.	60*	4.80	8.00	11.40	19.20	26.80	32.40	37.80	29.60	24.80	18.80	13.60	9.80	7.40	18.80
		(2.30)	(2.92)	(3.45)	(4.44)	(5.22)	(5.73)	(6.19)	(5.48)	(5.02)	(4.39)	(3.75)	(3.21)	(2.81)	(4.39)
5.	80	7.80	10.60	13.80	25.00	37.00	39.40	56.00	53.80	39.40	32.00	20.40	14.20	10.60	27.69
		(2.88)	(3.33)	(3.78)	(5.05)	(6.12)	(6.32)	(7.51)	(7.37)	(6.32)	(5.70)	(4.57)	(3.83)	(3.33)	(5.31)
6.	100	10.40	13.60	16.80	32.00	40.60	58.40	62.40	61.00	54.00	43.00	25.80	17.00	12.00	34.38
		(3.30)	(3.75)	(4.16)	(5.70)	(6.41)	(7.67)	(7.93)	(7.84)	(7.38)	(6.59)	(5.13)	(4.18)	(3.54)	(5.91)
	S.E.m±	0.07	0.15	0.33	0.17	0.23	0.29	0.32	0.35	0.29	0.23	0.19	0.25	0.14	0.18
	CD at 5%	0.22	0.45	0.99	0.53	0.69	0.87	0.98	1.07	0.87	0.71	0.59	0.75	0.43	0.54

* Recommended dose
Values in parentheses are $\sqrt{x + 0.5}$

Table 3: Response of nitrogen on white fly, *Bemisia tabaci* Genn. infesting brinjal

S. No.	Nitrogen doses (kg ha^{-1})	White fly population/ 3 leaves at different interval												
		19/08/ 2012	26/08/ 2012	02/09/ 2012	09/09/ 2012	16/09/ 2012	23/09/ 2012	30/09/ 2012	07/10/ 2012	14/10/ 2012	21/10/ 2012	28/10/ 2012	04/11/ 2012	11/11/ 2012	Mean
1.	0	1.40	3.80	5.40	7.80	9.40	11.60	15.40	15.00	12.60	10.40	6.40	4.20	3.40	8.22
		(1.38)	(2.07)	(2.43)	(2.88)	(3.15)	(3.48)	(3.99)	(3.94)	(3.62)	(3.30)	(2.63)	(2.17)	(1.97)	(2.95)
2.	20	2.60	5.60	7.60	9.60	11.80	13.80	19.20	16.00	14.80	12.00	9.00	6.00	5.00	1023
		(1.76)	(2.47)	(2.85)	(3.18)	(3.51)	(3.78)	(4.44)	(4.06)	(3.91)	(3.54)	(3.08)	(2.55)	(2.35)	(3.28)
3.	40	4.20	7.80	9.60	15.60	19.40	17.00	41.00	34.00	25.00	19.00	15.00	9.00	7.40	17.23
		2.17)	(2.88)	(3.18)	(4.01)	(4.46)	(4.18)	(6.44)	(5.87)	(5.05)	(4.42)	(3.95)	(3.08)	(2.81)	(4.21)
4.	60*	9.20	14.60	21.60	30.80	41.00	55.00	60.80	52.40	39.20	25.80	20.80	15.60	10.80	30.58
		(3.11)	(3.89)	(4.70)	(5.59)	(6.44)	(7.45)	(7.83)	(7.27)	(6.30)	(5.13)	(4.61)	(4.01)	(3.35)	(5.57)
5.	80	10.00	17.00	23.80	35.00	45.40	60.40	77.00	74.00	60.00	53.00	40.00	33.00	21.00	42.28
		(3.24)	(4.18)	(4.93)	(5.95)	(6.77)	(7.80)	(8.80)	(8.63)	(7.78)	(7.31)	(6.36)	(5.79)	(4.64)	(6.54)
6.	100	15.00	19.60	27.00	38.60	53.80	69.00	80.00	79.60	65.40	59.00	43.00	36.40	32.40	47.58
		(3.94)	(4.48)	(5.24)	(6.24)	(7.37)	(8.34)	(8.97)	(8.95)	(8.12)	(7.71)	(6.60)	(6.07)	(5.74)	(6.93)
	S.E.m±	0.15	0.21	0.14	0.19	0.28	0.26	0.34	0.36	0.41	0.40	0.27	0.29	0.19	0.25
	CD at 5%	0.45	0.60	0.45	0.57	0.85	0.78	1.03	1.08	1.25	1.22	0.83	0.89	0.58	0.75

* Recommended dose
Values in parentheses are $\sqrt{x + 0.5}$

Table 4: Response of nitrogen on mite, *Tetranychus cinnabarinus* Boisduval. Infesting brinjal

S. No.	Nitrogen doses (kg ha^{-1})	Mean mite population/9 leaves at different interval							
		23/09/2012	30/09/2012	07/10/2012	14/10/2012	21/10/2012	28/10/2012	04/11/2012	Mean
1.	0	1.15	7.80	105.00	220.60	372.75	246.00	135.75	155.57
		(1.28)	(2.88)	(10.27)	(14.87)	(19.32)	(15.70)	(11.67)	(12.56)
2.	20	2.25	24.75	157.60	240.90	413.65	256.00	138.25	179.61
		(1.65)	(5.02)	(12.57)	(15.54)	(20.35)	(16.02)	(11.78)	(13.42)
3.	40	3.20	36.20	159.60	266.30	456.40	260.75	173.25	188.67
		(1.92)	(6.06)	(12.65)	(16.33)	(21.38)	(16.16)	(13.18)	(13.75)
4.	60*	4.85	38.60	170.60	299.50	478.40	348.40	196.75	219.59
		(2.31)	(6.25)	(13.08)	(17.32)	(21.88)	(18.68)	(14.04)	(14.84)
5.	80	5.65	48.35	188.65	320.40	543.00	364.30	212.25	240.37
		(2.48)	(6.99)	(13.75)	(17.91)	(23.31)	(19.10)	(14.59)	(15.52)
6.	100	11.20	52.00	226.60	398.75	623.00	513.70	260.50	297.96
		(3.42)	(7.25)	(15.07)	(19.98)	(24.90)	(22.68)	(16.16)	(17.27)
	S.E.m±	0.11	0.31	0.71	1.17	1.49	1.26	0.70	0.96
	CD at 5%	0.33	0.94	2.15	3.55	4.50	3.80	2.10	2.91

0*****Recommended dose
Values in parentheses are $\sqrt{x + 0.5}$

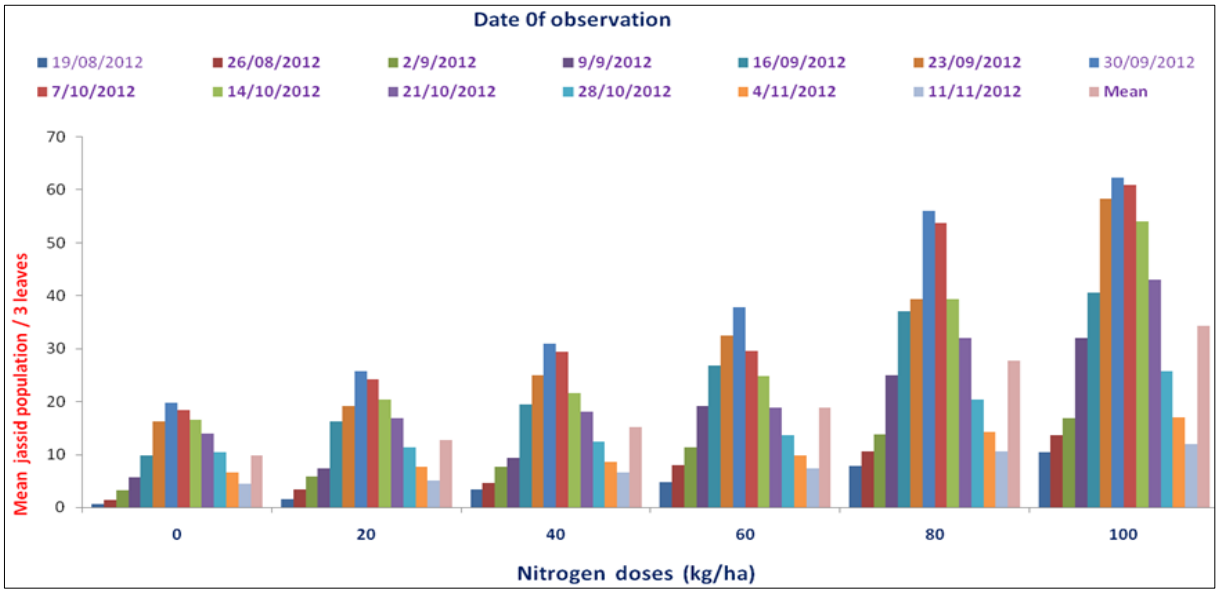

Fig 1: Response of nitrogen on jassid, *Amrasca bihuttula bihuttula* Ishida. Infesting bringal

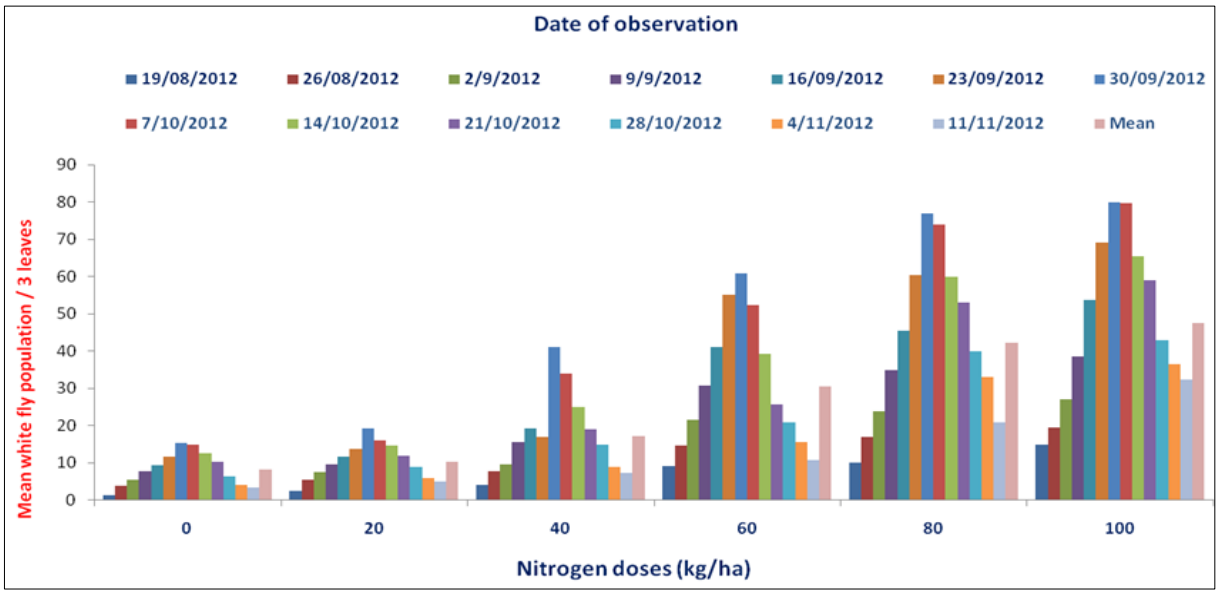

Fig 3: Response of nitrogen on white fly, *Bemisia tabaci* genn. Infesting brinjal

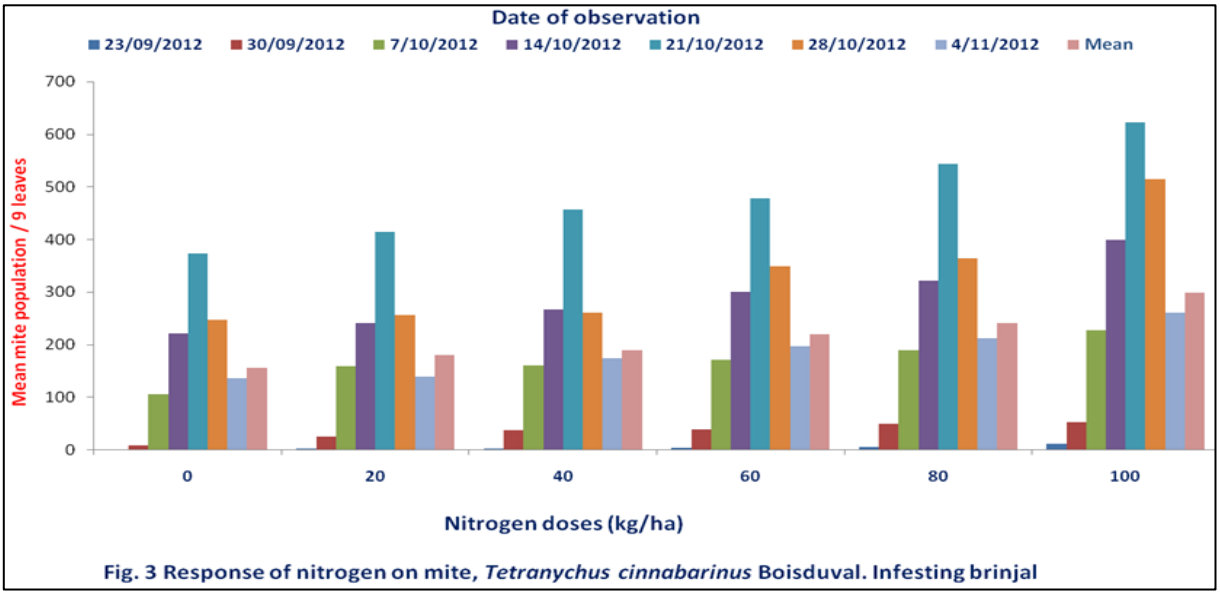

Fig 3: Response of nitrogen on mite, *Tetranychus cinnobarinus* Boisduval. Infesting brinjal

Summery and Conclusion

Six nitrogenous fertilizer doses (0, 20, 40, 60, 80 and 100 kg ha-1) were responded against sucking pests (jassid, white fly and mite) infesting brinjal. The mean pests population showed that the fertilizer dose 0 and 100 kg ha-1 nitrogen ha-1 minimum and maximum population, respectively. The rest of the fertilizer doses harboured moderate level of pests population. The orders of different doses in increasing trend of population of pests were: 0, 20, 40, 60, 80 and 100 kg nitrogen ha-1.

1. During the population dynamics studies of jassid, *A. biguttula biguttula* whitefly, *B. tabaci* and mite, *T. cinnabarinus* were observed as major sucking pests.
2. The peak incidence of jassid, whitefly on brinjal were observed in (41th SMW) 4th week of September and mite and predators population peaked in the (44th SMW) 3rd week of October.
3. Significant difference existed between the different doses of nitrogen and sucking pests population.

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