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Urea and nano-urea impact on population of *Bemisia tabaci* gennadius and *Aphis gossypii* Glover in sunflower, *Helianthus annus* L.

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Abstract
An experiment on "Urea and Nano-Urea impact on the population of *Bemisia tabaci* Gennadius and *Aphis gossypii* Glover in *Helianthus annus* L." was carried out in north bank plain zone of Brahmaputra, Biswanath district during 2021-2022. The experiment was laid out in randomized block design with 3 replications and 10 treatments. The treatments consist of different nitrogen management combinations including conventional urea and foliar application of conventional and nano urea. *B. Tabaci* and *A. Gossypi* population were found more in conventional urea-treated plots as compared to nano urea. Foliar application of nano urea is a better substitute for traditional urea in terms of lower insect population and increase yield.

Keywords: Application, experiment, nitrogen, treatment, management and urea.

Introduction
Sunflower (*Helianthus annus* L.), a compositae plant native to North America, is one of the world's most widely farmed oil seed crops. Surajmukhi is a well-known name in India. It is the largest producer of vegetable oil in the world. Sunflower oil is superior to other vegetable oils due to its high linoleic acid content and lack of linolenic acid. Sunflower oil is high in linoleic acid (68%), but it is also beneficial to heart patients. Nitrogen has a significant impact on the intensity of insect pests. Pest populations were high at high level when compared to low nitrogen doses as well as control (Biswas, *et al.,* 2009) [3]. Nitrogen improves individual insect performance, most likely due to deposition-induced changes in host plant chemistry. Increased nitrogen and decreased carbon-based defence chemical concentrations are among the improvements in insect. plant nutrition has a considerable impact on the population of crop herbivores also defined nutrition as the chemicals necessary by an organism for growth, tissue maintenance, and reproduction, in addition to the chemicals required to sustain these processes (Bala, *et al.,* 2018) [1]. The relative availability of various nutrients influences the growth and fitness of herbivores (Boswell, *et al.,* 2008) [4]. It is considered that increasing nitrogen in plant nutrition can alter plant quality and impair plant resistance to aphids in cotton (Godfrey, *et al.,* 1999) [6]. The organic amendments boosted the total phenols in the plant, as well as the activity of enzymes like poly phenol oxidase and peroxidase, which might explain the lower insect occurrence (Ravi, *et al.,* (2006) [8]. Host plant nutrition may be used to manipulate host plant ecology and provide resistance in plants to insect pest. Nitrogen fertilizer can boost herbivore eating preference, food consumption, survival, growth, reproduction, and population density (Zhong-xian *et al.,* 2007) [10]. Nitrogen is an abiotic factor that could affect the emission of volatiles from crop plants and further affect the behaviours of insects (Berenbaum, 1995; Duffey and Stout, 1996) [2, 5].

Material and Methods
The experiment was laid out in randomized block design (RBD). Each treatment was replicated 3 times. Thirty days after germination of the crop, weekly observation was recorded at different stages of the crop for insect infestation till the harvesting of the crop. For estimating the *Bemisia tabaci* Gennadius and *Aphis gossypii* Glover population. Five plants

were selected randomly, and from each plant, nine leaves were randomly selected, three from upper canopy, three from middle canopy and rest three from lower canopy. After that the presence of insect pest was observed visually from each randomly selected plants in weekly Interval. The experiment was conducted in Randomized Block Design (RBD) viz. T1: Control check (No Nitrogen), T2: Soil application of 50% N, T3: Soil application of 100% N, T4: 3 foliar application of 0.6% nano urea, T5: Soil application of 50% N + 2 foliar application of 1% conventional urea, T6: Soil application of 50% N + 2 foliar application of 2% conventional urea, T7: Soil application of 50% N + 2 foliar application of 3% conventional urea, T8: Soil application of 50% N + 2 foliar application of 0.2% nano urea, T9: Soil application of 50% N + 2 foliar application of 0.4% nano urea, T10: Soil application of 50% N + 2 foliar application of 0.6% nano urea and statistically analysed by using SPSS-20 software 28. For Analysis of Variance the experimental data recorded were analysed statistically. Significance of difference due to treatment effects in field were estimated by calculating the respective 'F' values and by comparing the treatment means with appropriate CD values.

Results and Discussion

During the study period maximum number of *Bemisia tabaci* Gennadius population observed in in 3rd week of observation and population gradually decrease till maturity of the crop. There is significant difference between the treatment and in first week of observation maximum *B. Tabaci* population was found in T3 (Soil application of 100% N) after that maximum number found in T7 (soil application of 50% N with 2 foliar application of 3% conventional urea). First foliar application of urea and nano urea in between 1st and 2nd week of observation. In 11th and 12th week of observation nonsignificant difference between the treatments. Corroborating with the results of the present studies Sethi *et al.,* (1978) [9] observed that when sunflower grew to its full potential, the *B. Tabaci* population decreased.

Maximum number of *Aphis gossypii* Glover population was observed during vegetative stage in 2nd and 3rd week of observation and gradually decreased from 4th and 5th week of observation to harvest of the crop. The population of *A. gossypii* was observed in first week of observation there was no significant difference between the treatment and found maximum population in T3 (soil application of 100% N) and 2nd week of observation to harvesting of the crop in T7 (soil application of 50% N with 2 foliar application 0f 3% conventional urea) found maximum number of aphid population. Statically significant difference among the treatment was found in 2nd to 10th week of observation. In 11th and 12th week of observation nonsignificant difference between the treatments it's due to N losses by various way and crop almost reach maturity. Hussain (2017) [7] mentioned that infestation of *A. gossypii* increased from 1st week up to 2nd week and slightly decreased with the passage of time. The *A. gossypii* density was decreased in 5th week and onward till harvest of the crop.

Table 1: Effect of different nitrogen management practices on *Bemisia tabaci* population per leaf weekly interval data on sunflower in field condition during 2021-2022

Treatment	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12
T1	0.99	1.00	1.51	1.16	0.99	0.95	0.87	0.98	0.85	0.88	0.85	0.75
T2	1.2	0.93	1.46	1.20	1.04	0.92	1.03	1.04	0.90	0.91	0.89	0.77
T3	1.51	1.49	1.57	1.34	1.14	1.14	1.09	1.14	0.96	0.98	0.92	0.84
T4	1.02	0.97	1.12	1.20	0.93	0.92	0.96	0.99	0.89	0.83	0.85	0.75
T5	1.13	1.55	1.45	1.29	0.98	0.95	0.98	1.08	0.90	0.86	0.82	0.76
T6	1.09	1.53	1.48	1.32	1.06	1.03	1.01	1.10	0.94	0.97	0.91	0.81
T7	1.18	1.56	1.67	1.43	1.16	1.17	1.36	1.24	0.97	1.03	0.96	0.86
T8	1.03	1.23	1.41	1.11	0.96	0.94	0.99	0.99	0.88	0.99	0.82	0.76
T9	1.14	1.24	1.39	1.02	0.92	0.89	0.88	0.93	0.86	0.89	0.79	0.75
T10	1.13	1.46	1.44	1.33	1.05	1.02	0.99	1.00	0.92	0.93	0.80	0.81
S.E.D (±)	0.12	0.09	0.06	0.09	0.04	0.03	0.07	0.04	0.03	0.04	0.05	0.04
CD (p = 0.05)	0.24	0.19	0.13	0.18	0.09	0.06	0.14	0.08	0.06	0.08	NS	NS

T1: Control Check (no nitrogen).
T2: Soil application of 50% N.
T3: Soil application of 100% N
T4: 3 foliar application of 0.6% nano urea.
T5: Soil application of 50% N + 2 foliar application of 1% conventional urea.
T6: Soil application of 50% N + 2 foliar application of 2% conventional urea.
T7: Soil application of 50% N + 2 foliar application of 3% conventional urea.
T8: Soil application of 50% N + 2 foliar application of 0.2% nano urea.
T9: Soil application of 50% N + 2 foliar application of 0.4% nano urea.
T10: Soil application of 50% N + 2 foliar application of 0.6% nano urea.
W: Week number of observation. Data are mean of 3 replications.
Figures in parentheses are square root transformed values.

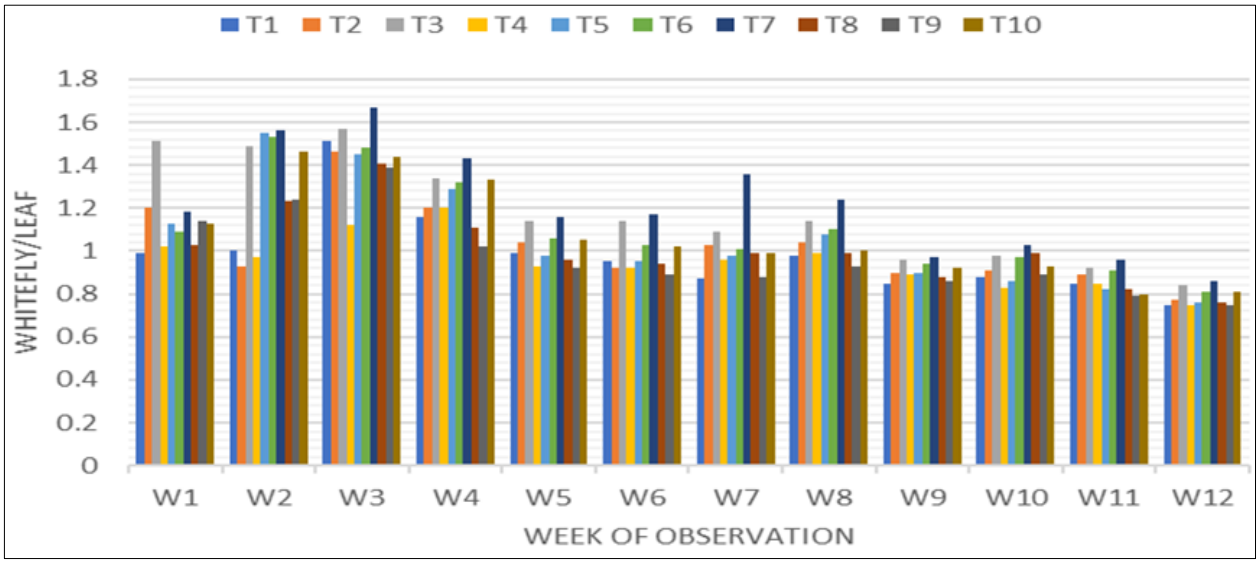

Fig 1: Effect of different nitrogen management practices on *Bemisia tabaci*

Table 2: Effect of different nitrogen management practices on *Aphis gossypii* population per leaf weekly interval data on sunflower in field during 2021-2022

Treatment	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12
xT1	xx	0.73	0.73	0.74	0.74	0.74	0.73	0.73	0.73	0.73	0.74	0.75
T2	0.99	0.74	0.75	0.79	0.74	0.8	0.77	0.75	0.74	0.74	0.77	0.77
T3	1.32	0.97	0.91	0.92	0.87	0.86	0.84	0.78	0.81	0.79	0.79	0.80
T4	0.97	0.74	0.74	0.78	0.76	0.76	0.77	0.76	0.76	0.75	0.77	0.75
T5	1.10	0.82	0.83	0.77	0.77	0.77	0.79	0.77	0.78	0.76	0.76	0.79
T6	1.00	0.93	0.79	0.90	0.74	0.81	0.82	0.77	0.76	0.76	0.78	0.77
T7	1.01	1.09	1.04	1.00	0.92	0.9	0.91	0.82	0.83	0.82	0.80	0.81
T8	1.04	0.82	0.77	0.79	0.76	0.76	0.79	0.75	0.75	0.74	0.76	0.77
T9	0.97	0.74	0.76	0.74	0.73	0.74	0.75	0.74	0.74	0.75	0.75	0.74
T10	0.97	0.79	0.78	0.79	0.76	0.75	0.78	0.75	0.76	0.74	0.74	0.75
S.E.D (±)	0.19	0.11	0.08	0.08	0.05	0.05	0.03	0.02	0.03	0.02	0.02	0.03
CD (p = 0.05)	NS	0.22	0.17	0.16	0.10	0.10	0.06	0.04	0.05	0.05	NS	NS

T1: Control Check (no nitrogen).
T2: Soil application of 50% N.
T3: Soil application of 100% N.
T4: 3 foliar application of 0.6% nano urea.
T5: Soil application of 50% N + 2 foliar application of 1% conventional urea.
T6: Soil application of 50% N + 2 foliar application of 2% conventional urea.
T7: Soil application of 50% N + 2 foliar application of 3% conventional urea
T8: Soil application of 50% N + 2 foliar application of 0.2% nano urea.
T9: Soil application of 50% N + 2 foliar application of 0.4% nano urea.
T10: Soil application of 50%N + 2 foliar application of 0.6% nano urea
W: Week number of observation.
Data are mean of 3 replications
Figures in parentheses are square root transformed values.

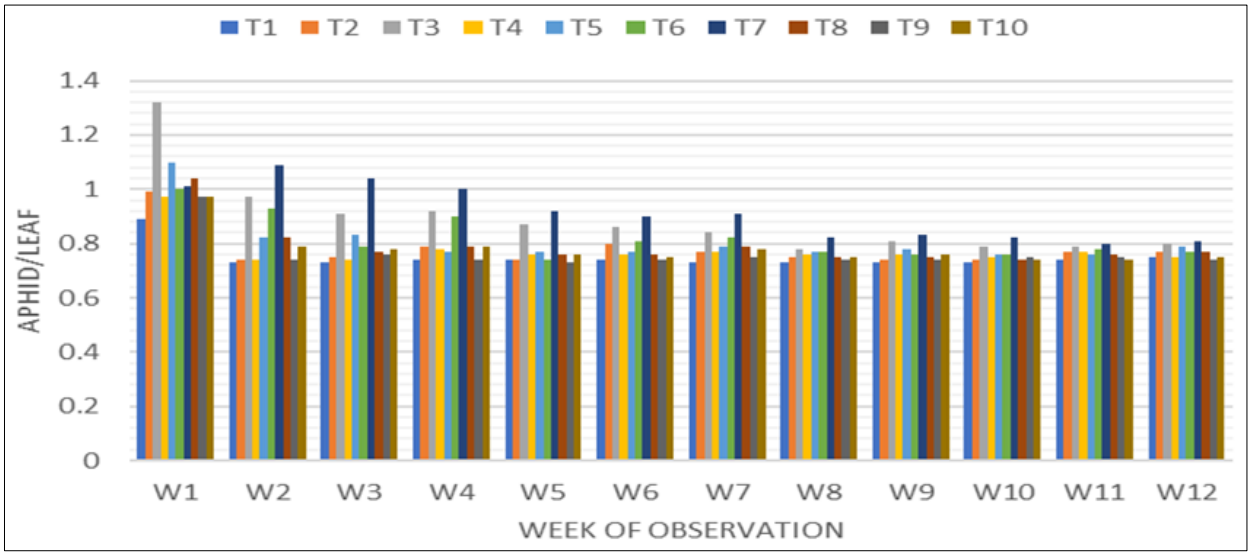

Fig 2: Effect of different nitrogen management practices on *Aphis gossypii*

Conclusion

The experiment finding showed that yield in Nano urea applied plots were higher compared to other plots. *Bemisia tabaci* Gennadius and *Aphis gossypii* Glover population attack was higher in T7 (soil application of 50% N + 2 foliar application of 3% conventional urea) and T3 (soil application of 100% N) compared to other treatments. In control T1 (no N) and T2 (Soil application of 50% N) found less insect pest compared to other and nano urea applied plot and there is no significant difference and in T1 (1055.00 kg/ha seed yield), T2 (1190.00 kg/ha seed yield) yield was found less because yield is not determined only by insect pest other factors like nitrogen is also a component of the chlorophyll molecule, which allows the plant to capture sunlight energy through photosynthesis, hence promoting plant growth and grain yield. Insect pest was higher in foliar application of conventional urea applied plot compared to nano urea. In T10 (Soil application of 50% N with 2 foliar application of 0.6% nano urea) highest nano urea was applied plot insect pest is higher compared to T9 (Soil application of 50% N + 2 foliar application of 0.4% nano urea) due to high use of nitrogenous fertilizer leads excessive vegetative growth which have negative impact on yield and occurrence of insect pest was higher in T10 (1471.67 kg/ha seed yield) compared to T9. T9 (1505.00kg/ha seed yield) was best treatment followed by T10 in case of yield. Foliar application of nano urea is a better substitute for traditional urea in terms of lower insect population and increase yield.

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