

## Original Research Article

### ROLE OF NANO NITROGEN IN INCREASING YIELD OF MAIZE (*Zea mays* L.)

#### ABSTRACT

Nitrogen fertilizers play an important role in the cultivation of crops, excessive and improper usage of fertilizers cause severe issues with respect to human and environment. It is essential to go for alternative sources of nitrogen like nano nitrogen with slow and controlled release of nitrogen. An experiment was conducted in Agriculture Research Farm, Lovely Professional University, Phagwara, during *kharif* 2022 involving the use of nano source of nitrogen in maize crop. The experiment was laid out in the randomized block design with eight treatments replicated thrice. Among the different combinations of recommended dose of fertilizers along with nano urea the treatment applied with 100% N+Nano N applied twice at 30 and 60 days after sowing (T6) was the best treatment in terms of growth and yield (7.2 t/ha).

Key words :- Environment, Fertilizers, Nano Nitrogen, Recommended dose.

#### INTRODUCTION

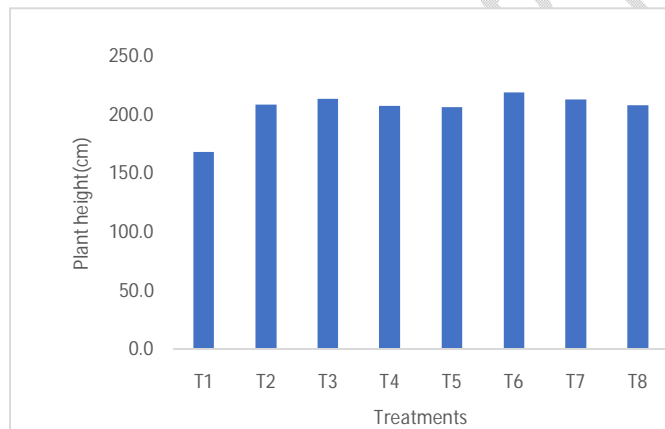
Maize is the third-largest cereal crop in the world after wheat and rice and it grows worldwide in both irrigated and rain-fed regions. Its botanical name is *Zea mays* L., [1]. India produces 21.81 million tonnes of maize in an area of 8.69 million hectares [2]. Maize is cultivated on around 150 million hectares in across 160 nations with a diverse range of soil types, climates, biodiversity, and management techniques, contributing 36% (782 million t) to the world's grain supply. The world's greatest producer of maize, the United States of America (USA), accounts for about 35% of global production [3]. Maize required a lot of nutrients for their growth and development because of the exhaustible nature of the crop. The crop's productivity depends upon the nutrient management system. When fertilizers are applied directly to the soil, nutrients are lost through a wide variety of processes, including photolysis, hydrolysis, leaching, and degradation. Therefore, the fertilizer provided may not be able to reach the desired locations in the plant's system and may not be able to promote the best possible development and productivity of crops. Consequently, an effort was undertaken to improve the effectiveness of fertilizer supplied to the crop as nanofertilizer through foliar spray [4]. Compared to with traditional fertilizers, nanofertilizers are being studied as a strategy to improve plant nutrition and boost nutrient use efficiency. It is a new agricultural input intended for gradually and carefully releasing nutrients into the soil, preventing environmental harm and enhancing crop development and yield [5]. Volatilization is reduced by directly applying Nano urea to the plant. It enables the nutrient to be readily absorbed by the tissues of the plant. The plant components store the leftover nutrients, which could then be progressively used when necessary. Combining nano fertilizers with conventional fertilizers increases the effectiveness of nutrient absorption [8].

## Materials and methods

The experiment was conducted in the Research farm of School of Agriculture, Lovely professional university, Phagwara, Punjab in 2022. The study area is in Chaheru village of Kapurthala district, which lies in the northern plain zone between 31.26° N, 75.70°E. The experiment was planned and laid out using randomised block design, with 8 treatments replicated thrice. Hybrid maize TA 5084 was sown at a rate of 25 kg per hectare. The application of nutrients was done as per package and practices of PAU. Nano nitrogen @ 2ml / litre at knee height and tasselling stages of crop. The irrigation was managed on a regular basis. Observations on various growth parameters like height of the crop, chlorophyll content, and number of leaves were recorded at 30-day intervals. Based on the visual inspections, the crop was harvested at the appropriate stage of maturity. Cobs and stover were weighed separately for their fresh and dry weights and the data was statistically analysed.

## Result and Discussion

The effect of different treatments on growth and yield parameters were significant in nano urea application treatments. In terms of plant height, the tallest plants were observed in T6 (Recommended NPK +2 foliar spray nano urea at knee height and silking stage) at par with T7 (50% N + Full dose of PK+2 foliar spray nano urea at knee height and silking stage) and

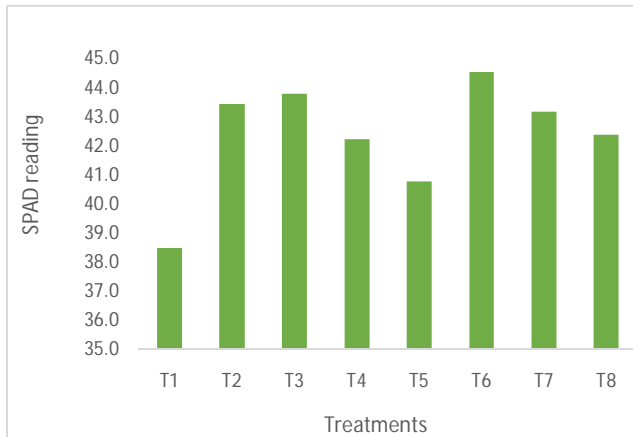


T3 (Recommended NPK +1 foliar spray nano urea at knee height stage).

### Figure 1: Effect of plant height under various treatments

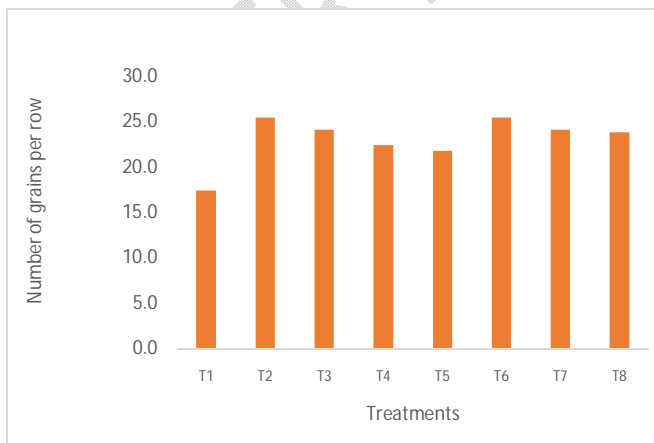
The shortest plants were observed in T1 (control). Radwan *et al.*, 2017 [7] found that highest value of maize plant height was obtained when foliar applications of nano-fertilizer and conventional fertilizer were applied to the soil. In terms of chlorophyll content, the highest values were recorded in T3 and T6, while the lowest values were observed in T1 (control). The highest values of chlorophyll content were recorded in treatments that received nano urea, indicating that nano urea can improve the photosynthetic efficiency of plants, leading to higher chlorophyll content. The reason that nano-fertilizers have a higher surface and reactive area is more because they contain very small or tiny particles, which provide them more sites to promote various metabolic processes in the plant system, leading to

increased photosynthetic production and ultimately increase growth and yield (Dwivedi *et al.*, 2018 [6]).



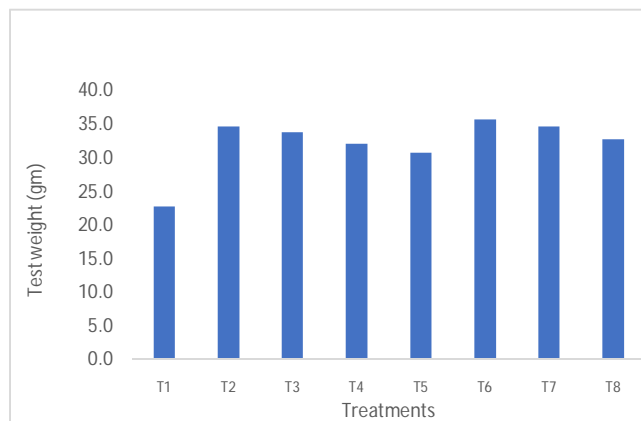
**Figure2: Effect of nano nitrogen on chlorophyll content of maize**

For yield parameters, the highest test weight was recorded in T6, followed by T3 and T2, while the lowest test weight was observed in T1 (control). The highest number of seeds per row of cob was recorded in T6, followed by T3 and T2 (Recommended NPK), while the lowest number of seeds per row of cob was observed in T4 (50% N + Full dose of PK+1 foliar spray nano urea at knee height stage), T5 (25% N + Full dose of PK+1 foliar spray nano urea at knee height stage), T8 (25% N + Full dose of PK+2 foliar spray nano urea at knee height and silking stage) and T1.



**Figure3: Effect of nano nitrogen on number of grains per row of maize**

Kumar *et al.*,2021[9]proved that applicationof nano nitrogen increases the productivity and grain output by enhancing photosynthesis and nutrient translocation.The above reports are supported by Alzreejawiet *al.*,2020[10].The highest values were recorded in treatments that received multiple applications of nano urea (T6), indicating that sustained application of nano urea may provide better results than a single or reduced nitrogen application.



**Figure4: Effect of nano nitrogen on test weight of maize**

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## Conclusion

Based on the research conducted on the effects of nano nitrogen on the growth and yield of maize, it can be concluded that the use of nano nitrogen can positively impact the growth and yield of maize. The application of nano nitrogen has been shown to increase plant height, chlorophyll content, and stem diameter, which ultimately results in an increase in yield. The result concluded that the application of nano urea through a foliar spray can improve the growth and yield parameters of maize and that multiple applications may provide better results than a single application.

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