



Effect of Nano Urea Foliar Spray on Yield and Yield Attributes of Black Gram (*Vigna mungo* L.)

M. Z. A. Islam^{1*}, S. M. A. Alim², M. M. Hoque³, M. M. Islam³ and S. Adhikary⁴

¹Chapainawabganj Sub-station, Bangladesh Institute of Nuclear Agriculture, Mymensingh, Bangladesh

²Plant Breeding Division, Bangladesh Institute of Nuclear Agriculture, Mymensingh, Bangladesh

³Adaptive Research and Extension Division, Bangladesh Institute of Nuclear Agriculture, Mymensingh, Bangladesh

⁴Gopalganj Sub-station, Bangladesh Institute of Nuclear Agriculture, Mymensingh, Bangladesh

Correspondence: smaalim100@gmail.com, Tel: +8801721796783

Received: 18/01/2023

Accepted: 22/03/2023

Available online: 15/04/2023



Copyright: ©2023 by the author(s).
This work is licensed under a Creative
Commons Attribution 4.0 License.
<https://creativecommons.org/licenses/by/4.0/>

Abstract: Foliar application of nano urea is a good option of nitrogen or a balanced dose of nitrogen to increase the yield of black gram. For that, this study was conducted to evaluate the performance of black gram (*Vigna mungo* L.) under two forms of nitrogen at the Bangladesh Institute of Nuclear Agriculture (BINA) sub-station experimental field, Chapainawabganj during September to December 2022. Black gram variety Binamash-2 and 3 treatments, viz. Control (no fertilizer) (T₁), Farmers practice (recommended fertilizer application as basal dose and top dressing during active growth) (T₂) and Nano urea (2-4 ml of nano urea (4 % N) in one litre of water and sprayed on crop leaves at its active growth stages) (T₃) were used under randomized block design. Yield and yield contributing characters were significantly affected by different forms of nitrogen (urea). The highest grain yield was obtained with T₃ which was 1587.33 kg per hectare whereas T₁ had given the lowest yield (983.33 kg per hectare). It was obvious that grain yield of black gram can be increased substantially with the judicious application of nano urea as foliar spray during active growth stages.

Keywords: Nano urea; Black gram; Foliar spray; Legume crop.

INTRODUCTION

Black gram (*Vigna mungo* L.) is one of the most important food legumes in Bangladesh. It is a widely grown, short duration grain legume crop which is cultivated mostly on marginal lands of north and northwestern areas in Bangladesh. The average yields in the farmers' fields are comparatively lower and range between 1200 to 1600 kg per ha. Since pulses have indeterminate growth habit and continue to grow new flashes the top dressing will be completed in 40-45 days after sowing. The crop completes its first flesh of matured pods during 60-65th day, further their second new flesh within 20-25 days. In addition, the lower rate of dry matter deposition during the pre-flowering phase and poor partitioning potency of assimilates to grain were identified as the main physiological subdues for increasing yields (Pawar and Bhatia, 1980). Root N is optimum for all crops but it varies with species, for example chickpea have almost equal apportionments of N in their roots as they do in their shoots where as faba bean and mung bean have nearly half as much N in their roots as their shoots (Unkovich *et al.*, 2010). Sinclair and de Wit

(1975) reported that only 20 mg N of photosynthate would be available from soil to the developing seed as against the requirement of 26 mg N. It was eminent that Black gram has not the ability to meet, the N demand of its seeds by uptalking from soil or by fixation. Senthil Kumar *et al.*, (2008) found that foliar application of 1% urea at floral initiation stage and 15 days after flowering in black gram positively influenced higher growth, yield contributing characters and yield. Similarly, Verma *et al.*, (2011) reported that an increased grain yield was observed from 27.4 to 31.0% due to foliar application of 2% urea solution at 40 days after sowing in some black gram varieties. The foreign supply of nitrogen, in the form of urea or nano urea would stifle leaf senescence during pod development and contribute to higher seed yield. This is why foliar fertilization is gaining importance in recent time for increasing crop yields and nano urea is getting more attention as it is required less and produces more: Efficacy of one bottle nano urea (500ml) is equivalent to one bag of urea (Baboo *et al.*, 2021). The present investigation was taken to study the effect of foliar spray of nano urea on

yield and yield contributing characters of black gram variety under field condition.

MATERIALS AND METHODS

Site and soil for the experiment

The field experiment was conducted during Kharif-2, 2022 at BINA sub-station experimental field, Chapainawabganj and the soil was clay loam in texture.

Experiment layout

The experiment was laid out in a simple randomized block design with three replications. Binamash-2 variety was sown at a depth of 2-3 cm by line sowing. Unit plot size was 20 m² (4 m × 3 m). Distance between plant to plant was 5 cm in a row while line to line distance was maintained 40 cm.

Experimental treatment

There were 3 treatments viz. Control (no fertilizer) (T₁), Farmers practice (recommended fertilizer application as basal dose and top dressing during active growth) (T₂) and Nano urea (2-4 ml of Nano urea (4 % N) in one litre of water and sprayed on crop leaves at its active growth stages) (T₃). A fertilizer dose of 20, 40 and 20 kg ha⁻¹ of N, P₂O₅ and K₂O, respectively was applied at the time of sowing as basal dose.

Intercultural operations and Data collection

Intercultural operations; like weeding, thinning, application of pesticides, etc. were done for proper growth and development of plants. Farmers practice fertilizer was applied as basal and top dressing. Nano urea was applied as 4ml/litre dose applied as single spray per row during active growth stages. The crop was harvested by 83 days.

Analysis of data

The collected data was analyzed statistically with the help of R-studio program. The mean differences were adjusted by the Least Significant Different (LSD) test and the treatment means were separated by Duncan's New Multiple Range Test (DMRT) at 5% and 1% levels of significance for the interpretation of the results.

RESULTS AND DISCUSSION

Effect of Nano urea spray on yield and yield attributes of Black gram (Binamash-2)

Plant height (cm): Significantly higher plant height was observed with Nano urea (T₃), followed by Farmers practice (T₂), which were 42 and 39.33 cm (Table-1). Control (T₁) has recorded significantly lower plant height (34.67cm) as compared to other treatments. Application of nano nutrient increase tryptophan in meristematic cells which provoke auxins results higher plant height reported by Abd Alqader *et al.*, 2020.

Table 1. Effect of Nano urea spray on yield and yield attributes of Black gram (Binamash-2)

Treatments	Plant height (cm)	Primary branches /plant (no.)	Pods/plant (no.)	Seeds/pod (no.)	100-seed weight (g)	Seed Yield (kg/ha)
T ₁ (Control)	34.67c	1.33b	40c	3.67c	3.83c	983.33c
T ₂ (Farmers practice)	39.33b	2ab	44b	4.67b	4.57b	1439.67b
T ₃ (Nano urea)	42a	2.33a	48.33a	6a	5.5a	1587.33a
LSD	2.62	0.76	0.76	0.76	0.59	122.03
P-value	0.003	0.049	0.000	0.002	0.003	0.000

Note: Figures in the column having the same letters (s) do not differ significantly; *= significant at 5% level of probability; **= significant at 1% level of probability; T₁= Control (no fertilizer); T₂= Farmers practice (recommended fertilizer application as basal dose and top dressing during active growth); T₃= Nano urea (2-4 ml of Nano urea (4 % N) in one litre of water and sprayed on crop leaves at its active growth stages)

Primary branches per plant:

Number of Primary branches per plant significantly influenced by the nano urea spray at active growth phases of black gram (Table-1). Maximum branching was recorded 2.33 for application of nano urea compare to control (1.33). Application of nano nutrients specially zinc has positive effects on branching development of pea and other pulse crops (Abd Alqader *et al.*, 2020)

Pods per plant:

Pods per plant significantly increased with the application of nano urea (Table-1). Highest pod was recorded for T₃ (48.33) rather than farmers practice (44) and control (40). Hassan and Lehmood, (2019) reported

that number of pods per plant increased by the application of liquid fertilizers with a higher dose in legume crops.

Seeds per pod:

Significant result was found in case of number of seeds per pod in this experiment. The plants giving nano urea produces more seeds in pod (6) compare to other two treatments (Table-1). Higher concentration of nano fertilizer is the cause to increase in the leaf area specially at very high level, making the leaf surface more vulnerable to spray the fertilizer and then absorbing the element more by the leaves and this was reflected in the increase in the number of pods per plant, because it has a major role in increasing the flower nodes and the fertilization process through its role in increasing the speed of transport of

sugars from their source to the places where they are needed in the plant during the reproductive phase, and this result agrees with (Hassan and Lehmoed, 2019).

100 seed weight (g):

A good significant response was observed in case of 100 seed weight while nano urea was applied maximum weight was recorded 5.5 g, control and farmer practice showed lower weight 3.83 g and 4.57 g respectively (Table-1). Hassan and Lehmoed, (2019) also found similar result in broad bean.

Seed yield (t/ha): Significantly highest yield (1587.33 kg) had was observed with nano urea spray (T₃), followed by farmers practice (T₂) (1439.67 kg) (Table-1). The enhanced seed yield was due to increase in mature pods per plant, 100-seed weight and seeds per pod with nano urea spray at active growth stages. Control (T₁) had least seed yield (983.33kg) (Table-1). Seed yield was increased by foliar application of urea through retarding the decrement of chlorophyll and leaf nitrogen with tumid photosynthetic efficiency (Mitra *et al.*, 1987). This result agrees with the results of other studies that showed the positive effect of nano nitrogen on seed yield and for different legume crops (Drostkar *et al.*, 2016) and (Gomma *et al.*, 2016).

CONCLUSION

The study indicated that foliar application of nano urea at active growth stages has recorded significantly higher yield in black gram as compared to farmers practice or control. Thus, for getting higher yield and black gram, foliar fertilization of nano urea can be recommended and further studies can be initiated for findings that are more convenient.

Conflict of Interest

There are no conflicts of interest declared by the authors.

REFERENCES

- Abd Alqader, O.A., Al-Jobouri, S.M. and Eshoaa, L.M. 2020. Effect of nitrogenous and urea nano-hydroxyapatite fertilizer on growth and yield of two cultivars of broad bean (*Vicia Faba L.*). *Euphrates Journal of Agriculture Science* 12(2) 202-227.
- Baboo, P. 2021. Nano urea the philosophy of future (Online). Available at: https://www.researchgate.net/publication/353260539_Nano_Urea_the_Philosophy_of_Future (Accessed on 28 March 2023).
- Drostkar, E., Talebi, R. and Kanouni, H. 2016. Foliar application of Fe, Zn and NPK nano-fertilizers on seed yield and morphological traits in chickpea under rainfed condition. *Journal of Research in Ecology* 4(2) 221-228.
- Gomaa, M.A., Kandil, E.E., Abuo Zeid, A.A. and Bilkess, M.A. 2016. Response of Some Faba Bean to Fertilizers Manufactured by Nanotechnology. *Journal of Advanced Agriculture Research* 21(3) 384-397.
- Hassan, R.K. and Lehmoed, A.M. 2019. Effect of spraying time and concentration of liquid fertilizer on the growth and yield of broad bean (*Vicia faba L.*). *Research on crops* 20(3) 501-506.
- Mitra, R., Pawar, S.E. and Bhatia, C.R., 1987. Nitrogen: the major limiting factor for mung bean yield. In: proceedings of second international symposium in mung bean held at Bangkok, Thailand, November 16-20.
- Pawar, S.E. and Bhatia. 1980. The basis for grain yield differences in mung bean cultivars and identifications of yield limiting factors. *Theo. Appl. Genet* 57 171-175.
- Senthil, K., Muthukrishnan, G.P., Ramasamy, S. and Chandragiri, K.K. 2008. Effect of organic and inorganic foliar spray on growth and yield of blackgram. *Madras Agricultural Journal* 95 57-60.
- Sinclair, T.R. and de Wit, C.D. 1975. Photosynthate conditions and nitrogen requirements for seed production by various crops. *Science* 189 565 – 567.
- Unkovich, M., Baldock, J. and Peoples, M. 2010. Prospects and problems of simple linear models for estimating symbiotic N₂ fixation by crop and pasture legumes. *Plant and Soil* 329 75-89.
- Verma, C.K., Yadav, R.B., Dhyani, B.P. and Tomar, S.S. 2011. Effect of seed rates and foliar spray of urea on performance of blackgram (*Vigna mungo*) varieties. *Indian Journal of Agricultural Sciences* 81(9) 881-882.

