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Impact of Nano Nitrogen Application on Yield and Profitability of Oats (*Avena sativa* L.)

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Recently, Nano nitrogen fertilizer have developed by IFFCO India Ltd. for enhance nutrient efficiency and minimization of cost of cultivation. A field experiment was conducted to see the effect of nano nitrogen application on yield and farm profitability in oats (*Avena sativa* L.) was grown in the experimental field of Research Farm of Agronomy Section, ICAR-National Dairy Research Institute, Karnal during *rabi* 2020. Experiment was conducted in randomized block design with six treatments as follows: T_1= control (no nitrogen), T_2= 100% RDN through urea, T_3= (75% N substituted by urea + 25% N through nano nitrogen), T_4= (50% N substituted by urea + 50% N through nano nitrogen), T_5= (25% N substituted by urea + 75% N through nano nitrogen), T_6= (100% RDN through nano nitrogen). Results revealed that the application of 100% RDN through urea (T_2) shows highest green fodder yield of oats *i.e.* 57.25 t/ha. The maximum net monetary returns *viz.*, gross return, net return and B: C ratio was also recorded with application of 100% RDN through urea.

Introduction

Oats (*Avena sativa* L.), commonly referred to as "Javi or Jai," seems an important *rabi* cereal fodder crop, which can be cultivated under a wide range of climatic conditions of north, central and western zones of the country. It has an excellent growth habit and is an economical source of dietary energy. On average, it contains 10-11.5 per cent crude protein, 55-63 per cent neutral detergent fibre, 30-32 per cent acid detergent fibre, cellulose 22-23.5 per cent, and hemicelluloses 17-20 per cent (Kumar *et al.*, 2019). Nitrogen, due to its high consumption by the crop, is critical for fodder production in addition to improving the quality of herbage. Urea is a major source of nitrogen fertilizer in agricultural production (Mahil *et al.*, 2019).

Nano fertilizers are mostly synthetic or modified forms of conventional fertilizers, bulk fertilizers ingredients, or botanical, microbial, or animal extracts (Iqbal *et al.*, 2019). Because nutrients are released at a slower pace throughout the crop growth period, plants may absorb the maximum of nutrients without wasting them in leaching (Guru *et al.*, 2015). These intelligent fertilizers can be easily absorbed by plants because of their high surface area to volume ratio (Al-Juthery *et al.*, 2018) and can reduce the loss of nutrients which gives higher (20-30 per cent) use efficiency as compared to conventional fertilizer (Siddiqui *et al.*, 2015; Kah *et al.*, 2018)

Figure 1: Uses of Nano Nitrogen in Oats Field

Collection of Nano Nitrogen

Collection of nano nitrogen was undertaken from ICAR-Central Soil Salinity Research Institute, Karnal, Haryana with the help of IFFCO nano nitrogen project during September, 2020. The nano nitrogen is available in liquid form with 500 ml. bottle was further used for field experiment.

Sowing of Oats Crop

Sowing of oats cultivar Kent was carried out during the month of October (2nd week) and harvested two fodder cuttings in the month of December (2nd week) and January (last week). Doses of N:P_2O_5:K_2O based on soil test for maize were 120:40:40 kg/ha, respectively. Full recommended dose of phosphorus and potassium were applied uniformly to all plots as basal dressing whereas, nitrogen was applied to the plots according to the treatment in split (3 equal) doses. Three equal doses of nitrogen (1/3rd) were applied at the time of sowing (depth 2-3 cm), foliar spray at 30 DAS, and at 1st cut.

Effect of Nano Nitrogen and Fertilizer Application on Green Fodder Yield

A critical examination of data presented that both nitrogen sources significantly improved the green fodder yield (GFY) of oats over control at Ist as well as at IInd cut and their total. At Ist cut, application of 100% RDN through Urea (32.81 t/ha) and 75% RDN + 25% N through Nano-N (32.05 t/ha) resulted in significantly higher GFY over remaining N management practices. Further results revealed that at this cut, application of 50% RDN + 50% N through Nano-N (29.06 t/ha) showed at par GFY with 25% RDN + 75% N through Nano-N (27.78 t/ha) and observed significantly higher over 100% RDN through Nano-N (27.13 t/ha) and control (23.99 t/ha). At IInd cut, 100% RDN through Urea (24.44 t/ha), 75% RDN + 25% N through Nano-N (23.65 t/ha) and 50% RDN + 50% N through Nano-N (22.74 t/ha) resulted at par GFY and recorded considerably higher than rest of treatments.

Figure 2 Measures of Plant Geometry

Effect of Nano Nitrogen Application on Farm Profitability of Oats Fodder Crop

The highest cost of cultivation of oats was recorded with T_6 (100% RDN through Nano-N) (Rs. 27293₹/ha) and incurred slightly higher cost of cultivation followed by 75% RDN + 25% N through Nano-N (27290 ₹/ha) over other treatments. The maximum gross return (Rs. 91601₹/ha), net return (Rs. 64313₹/ha) and B: C ratio (2.36) was reported with T_2 (100% RDN through urea). In case of T_3 (75% N RDN through urea + 25% N through Nano-N), gross return (Rs. 89132₹/ha) and net return (Rs. 61842₹/ha) and B: C ratio (2.27) proved to be second best option for farmers after T_2 *i.e.*100% RDN through urea.

Conclusions

On the basis of present field experimentation conducted during *rabi* season of 2020, it may be concluded that application of 100% RDN through Urea (T_2) to oats gave markedly higher growth, and green fodder yield, dry fodder yield and nutrients uptakes with better quality parameters and higher net return and B: C ratio. This treatment was found statistically at par with 75% RDN + 25% N through Nano-N treatment. So, we may say that 25% RDN replacement through nano nitrogen equally effective.

References

1. De Rosa M C. 2010. Nanotechnology in fertilizers. *Nature Nanotechnology* **5**: 91.
2. Guru T, Veronica N, Thatikunta R. and Reddy N S. 2015. Crop nutrition management with nano fertilizers. *International journal of environmental science and Technology* **1**(1): 4–6.
3. Iqbal M and Umar S. 2019. Nano-fertilization to Enhance Nutrient Use Efficiency and Productivity of Crop Plants. **In**: Nanomaterials and Plant Potential, Husen A., and Iqbal M. (Eds). pp. 473–505.
4. Kah M, Kookana R S, Gogos A and Bucheli T D. 2018. A critical evaluation of nano pesticides and nano fertilizers against their conventional analogues. *Nature Nanotechnology* **13**:677–684.
5. Kumar A, Sahoo B, Panda A K, Samal P, Sarangi D N and Srivastava S K. 2019. Forage crops in eastern India for improved livestock productivity. pp.7.
6. Kumar Y, Tiwari K N, Nayak R K, Rai A, Singh S P, Singh A N, Kumar Y, Tomar H, Singh T and Raliya R. 2020. Nano fertilizers for increasing nutrient use efficiency, yield and economic returns in important winter season crops of Uttar Pradesh. *Indian Journal of Fertilizers* **16**(8): 772–786
7. Mahil E I T and Kumar B N A. 2019. Foliar application of nano fertilizers in agricultural crops– A review. *Journal of Farm Science* **32**(3): 239–249.
8. Siddiqui M H, Al–Whaibi M H, Firoz M and Al–Khaishany M Y. 2015. Role of nanoparticles in plants. *Nanotechnology and Plant Sciences (Eds)*,M.pp.19–35.