The Pharma Innovation Journal 2022; 11(9): 1853-1855

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(9): 1853-1855

www.thepharmajournal.com
Received: 15-06-2022
Accepted: 21-08-2022

Pooja CA
Ph.D., Department of Agronomy, College of Agriculture, University of Agricultural Sciences, Dharwad, Karnataka, India

Dr. Sudha T
Professor, Department of Agronomy, College of Agriculture, University of Agricultural Sciences, Dharwad, Karnataka, India

Corresponding Author:
Pooja CA
Ph.D., Department of Agronomy, College of Agriculture, University of Agricultural Sciences, Dharwad, Karnataka, India

Assessment of green synthesized potassium nanoparticles on wheat priming

Pooja CA and Dr. Sudha T

Abstract
The lab experiment for priming of green synthesized potassium nanoparticles (K NPs) which was synthesized using tulsi was carried out at Green nanotechnology lab, UAS, Dharwad, and Karnataka during 2020-21 in completely randomized design with three replications. The results revealed that, seed priming in green synthesized K NPs at 60 ppm for 8 hours (T_4) recorded significantly higher root length (12.93 cm), shoot length (6.78 cm), root volume (0.72 cm^3), seed germination (96.67%) and root diameter (0.34 mm). Wheat seeds soaked in water for 24 hours (T_{12}) recorded significantly lowest root length (10.03 cm), shoot length (5.05 cm), root volume (0.40 cm^3), seed germination (86.67%) and root diameter (0.23 mm).

Keywords: Germination, green synthesized, nanoparticles, potassium, wheat

Introduction
Triticum aestivum L. commonly called as bread wheat is one of the most important crops of family Poaceae. It is also known as "King of cereals". It occupies a position of foremost importance amongst all worlds' crop plants both in extent of area and magnitude of food production. It is one of the most vital cereal crops provides food for one fifth of the world's population. At global level, wheat accounts for about 220.0 million hectares of total cultivated area with the production of 772 million tons and average productivity of about 3470 kg per hectare providing 21 per cent of food to keep tempo with demand of growing population (Ahmadian *et al*., 2021) [2]. It is the second most produced cereal grain behind maize. Among the different countries, the top wheat producing countries are China, India and Russia and it account for about 41 per cent of the world's total wheat production (Anon., 2021) [4]. In India, wheat stands second after rice as the most predominant crop with an area of 31.45 million hectare and production of 107.80 million tonnes. However, an average productivity of wheat is 3440 kg per hectare. The overriding state of wheat with highest area of 9.68 million hectare and production of 30.78 million tonnes is grabbed by Uttar Pradesh followed by Madhya Pradesh and Punjab. However, Punjab stands first in productivity (5003 kg per hectare) followed by Haryana (4687 kg per hectare).

To overcome the drawbacks of conventional fertilizers in a better way, nanotechnology can be a ray of hope. The lucrative approach of nanotechnology and it´s utilizing in the agricultural sector is prospective. Nano fertilizers are having nano sizes, mainly differ from the conventional fertilizers used in agriculture. They have emerged as an alternative to conventional fertilizers for slow release and efficient use of water and fertilizers by plants. These prevent buildup of the nutrients in the soil there by eliminating the risk of eutrophication and drinking water contamination (Ali, 2019) [3]. The beneficial effects of nanofertilizers include increase in NUE (Nutrient Use Efficiency), enhanced yield and reduced soil pollution (Rawat *et al.*, 2018) [7]. Green mediated syntheses of nanoparticles are the present research in the limb of nanotechnology. It is an eco-friendly approach. The major functions of K in plant cells includes different enzyme activities, photosynthesis, protein synthesis, osmoregulation, energy transfer, stomata movement, cation-anion balance and stress tolerance, thus, it is necessary for several biochemical and physiological responses of plants (Abdallah *et al*., 2019) [1]. Increased application of K has been shown to enhance photosynthetic rate, plant growth and yield in different crops under water stress conditions (Zareian *et al*., 2013) [8]. Keeping the above facts in view, the present investigation was planned.

Material and methods

The lab experiment was taken in Green Nanotechnology Laboratory, University of Agricultural Sciences, and Dharwad. This experiment was laid out in completely randomized design (CRD). Wheat seeds of variety UAS 375 were soaked in synthesized potassium nanoparticle (K NPs) solution at 20, 60 and 100 ppm concentration for a period of 8, 12 and 24 hours, respectively with 12 treatments replicated thrice during 2020-21. Treatment consist as follows T_1-Seed soaking in NPs @ 20 ppm for 8 hours.T_2- Seed soaking in NPs @ 20 ppm for 12 hours, T_3- Seed soaking in NPs @ 20 ppm for 24 hours, T_4- Seed soaking in NPs @ 60 ppm for 8 hours, T_5- Seed soaking in NPs @ 60 ppm for 12 hours, T_6- Seed soaking in NPs @ 60 ppm for 24 hours,T_7- Seed soaking in NPs @ 100 ppm for 8 hours, T_8-Seed soaking in NPs @ 100 ppm for 12 hours, T_9- Seed soaking in NPs @ 100 ppm for 24 hours, T_{10}- Seed soaking in water for 8 hours, T_{11}- Seed soaking in water for 12 hours and T_{12}- Seed soaking in water for 24 hours. The germination per cent count was recorded on 8th day of germination. Germination percentage was calculated by taking the ratio of number of seeds germinated to the number of seeds used and expressed as percentage. The root characteristics of wheat were measured using WinRhizo software.

Results and discussion

The data on various seed characteristics were significantly influenced by priming treatments with green synthesized potassium nanoparticles are presented in the Table 1 and Plate 1. Among the various priming treatments, seed priming in green synthesized KNPs @ 60 ppm for 8 hours (T_4) recorded significantly highest root length, shoot length and root volume (12.93 cm, 6.78 cm and 0.72 cm^3, respectively) followed by T_5 where seeds primed with green synthesized K NPs at 60 ppm for root length, shoot length and root volume (11.82 cm, 6.22 cm and 0.66 cm^3, respectively) for 12 hours and seed priming in green synthesized KNPs @ 20 ppm for 8 hours for root length, shoot length and root volume (11.70 cm, 6.18 cm and 0.65 cm^3, respectively), while significantly lowest root length, shoot length and root volume (10.03 cm, 5.05 cm and 0.40 cm^3, respectively) was recorded in the control (T_{12}) which was soaked in water for 24 hours. The results on germination and root diameter of wheat seeds which was priming with various concentrations of green synthesized potassium nanoparticles did not differed significantly with different time of soaking are represented in Table 7. It might be because potassium, which is necessary to maintain ionic balance and is also needed for a number of biochemical and physiological activities (Mridha *et al.*, 2021) [5]. Priyamvada *et al.* (2016) [6] reported that potassium chloride is the most used source of potassium for crops. In order to improve cereals germination, emergence and growth, potassium chloride has been added as the osmoticum.

Conclusion

Wheat seeds to priming in green synthesized potassium nanoparticles at 60 ppm for 8 hours are ideal to increase the various seed characteristics and significant difference is not seen with respect to seed germination and root diameter. Priming of seeds in KNPs has been shown to stimulate quicker emergence rates, faster seedling establishment and vigorous seedling growth. Additionally, priming reduces the impact of abiotic stress during the germination phase, which ultimately promotes increased seedling emergence and robust seedling establishment.

Table 1: Root length, shoot length, root volume, germination and root diameter of wheat as influenced by different priming hours in different concentration of potassium nanoparticles under lab condition.

Treatment details	Root length (cm)	Shoot length (cm)	Root volume (cm^3)	Germination (%)	Root diameter (mm)
T_1- Seed priming in NPs @ 20 ppm for 8 hours	11.70	6.18	0.65	96.97	0.33
T_2- Seed soaking in NPs @ 20 ppm for 12 hours	11.62	6.15	0.64	93.33	0.33
T_3- Seed soaking in NPs @ 20 ppm for 24 hours	11.20	5.68	0.57	90.00	0.31
T_4- Seed soaking in NPs @ 60 ppm for 8 hours	12.93	6.78	0.72	96.67	0.34
T_5- Seed soaking in NPs @ 60 ppm for 12 hours	11.82	6.22	0.66	96.67	0.34
T_6- Seed soaking in NPs @ 60 ppm for 24 hours	11.38	5.81	0.59	93.33	0.32
T_7- Seed soaking in NPs @ 100 ppm for 8 hours	11.56	6.05	0.62	93.33	0.33
T_8- Seed soaking in NPs @ 100 ppm for 12 hours	11.41	5.92	0.60	93.33	0.32
T_9- Seed soaking in NPs @ 100 ppm for 24 hours	11.15	5.47	0.54	90.00	0.30
T_{10}- Seed soaking in water for 8 hours	11.00	5.15	0.46	90.00	0.27
T_{11}- Seed soaking in water for 12 hours	10.16	5.09	0.42	86.67	0.25
T_{12}- Seed soaking in water for 24 hours	10.03	5.05	0.40	86.67	0.23
S.Em.±	0.35	0.18	0.02	2.88	0.03
C.D. (p=0.05)	1.03	0.54	0.06	NS	NS

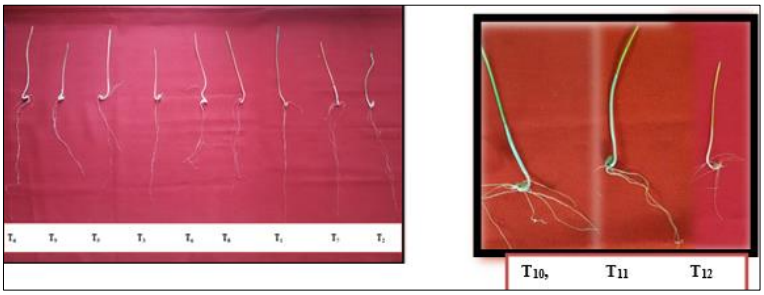

Plate 1: Primed wheat seeds as influenced by different priming hours in different concentration of potassium nanoparticles under lab condition.

References

1. Abdallah MMS, El-Bassiouny HMS, AbouSeeda MA. Potential role of kaolin or potassium sulfate as anti-transpirant on improving physiological, biochemical aspects and yield of wheat plants under different watering regimes. Bulletin of the National Research Centre. 2019; 43(1):134-146.
2. Ahmadian K, Jalal J, Alireza P. Nano fertilizers improved drought tolerance in wheat under deficit irrigation. Agricultural Water Management; c2021,244-257.
3. Ali. Nano-fertilizer application to increase growth and yield of sweet pepper under potassium levels. Agricultural Research & Technology. 2019;19(4):145-157.
4. Anonymous a. Faostat.fao.org; c2021.
5. Mridha D, Ishita P, Ayan De, Iravati R, Antara D, Madhurima J, *et al*. Rice seed (IR64) priming with potassium humate for improvement of seed germination, seedling growth and antioxidant defense system under arsenic stress. Ecotoxicology and Environmental Safety; 2021,219-229.
6. Priyamvada C, Geeta P, Pradeep KP. Priming with potassium solutions improves seedling growth and vigor in forage sorghum (*Sorghum bicolor* L.). Journal of Applied and Natural Science. 2016;8(4):1937-1940.
7. Rawat A, Kumar R, Bhatt B, Ram P. Nanotechnology in Agriculture-A Review. International Journal of Current Microbiology and Applied sciences. 2018;7(8):969-978.
8. Zareian A, Heidari SAH, Hamidi A, Mohammadi GN, Tabatabaei SA. Effect of drought stress and potassium foliar application on some physiological indices of three wheat (*Triticum aestivum* L.) cultivars. Annals of Biological Research. 2013;4(5):71-74.