

Effect of Nanoparticles on Wheat Seed Germination and Seedling Growth

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Abstract : Wheat is an important cereal crop for food security. Boosting the wheat production and productivity is the major challenge across the nation. Good quality of seed is required for maintaining optimum plant stand which ultimately increases grain yield. Ensuring a good germination is one of the key steps to ensure proper plant stand and moisture assurance during seed germination may help to speed up the germination. The tiny size of nanoparticles may help in entry of water into seed without disturbing their internal structure. Considering above, a laboratory experiment was conducted during 2012-13 at G.B. Pant University of Agriculture and Technology, Pantnagar, India. The completely randomized design was used for statistical analysis. The experiment was conducted in two phases. In the first phase, the appropriate concentration of nanoparticles for seed treatment was screened. In second phase seed soaking hours of nanoparticles for better seed germination were standardized. Wheat variety UP2526 was taken as test crop. Four nanoparticles (TiO_2 , ZnO, nickel and chitosan) were taken for study. The crop germination studies were done in petri dishes and standard package and practices were used to raise the seedlings. The germination studies were done by following standard procedure. In first phase of the experiment, seeds were treated with 50 and 300 ppm of nanoparticles and control was also maintained for comparison. In the second phase of experiment, seeds were soaked for 4 hours, 6 hours and 8 hours with 50 ppm nanoparticles of TiO_2 , ZnO, nickel and chitosan along with control treatment to identify the soaking time for better seed germination. Experiment revealed that the application of nanoparticles help to enhance seed germination. The study revealed that seed treatment with nanoparticles at 50 ppm concentration increases root length, shoot length, seedling length, shoot dry weight, seedling dry weight, seedling vigour index I and seedling vigour index II as compared to seed soaking at 300 ppm concentration. This experiment showed that seed soaking up to 4 hr was better as compared to 6 and 8 hrs. Seed soaking with nanoparticles specially TiO_2 , ZnO, and chitosan proved to enhance germination and seedling growth indices of wheat crop.

Keywords : nanoparticles, seed germination, seed soaking, wheat

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