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Differential effects of copper and iron nanoparticles on wheat shoot proteomics

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Advances in nanotechnology around the world rapidly increased and focused the effects of nanoparticles (NPs) on plants mechanism. Understanding the complex mechanisms involved in plant response to NPs is indispensable in assessing the ultimate impact of nano-pollutants on environment. Copper (Cu) and iron (Fe) NPs have stimulatory effects on the germination ratio and plant growth of wheat. Wheat variety NARC-11 at early stage was treated with or without Cu and Fe NPs. After investigation of morphology of plant, proteins extracted from shoots were analyzed with gel-free/label-free proteomic technique. The proteomic results were validated with bioinformatics analysis. Venn diagram analysis indicated marked increase in number of proteins on Cu and Fe NPs exposure. Cu NPs increased the number and abundance of proteins related to protein metabolism while Fe NPs increased photosynthesis related proteins in NARC-11. Out of photosynthesis related proteins, light reaction was enhanced in NARC-11 on Fe NPs exposure while did not change on Cu NPs exposure. The number of proteins related to glycolysis and tricarboxylic acid cycle were increased on Cu NPs exposure while did not change on Fe NPs exposure in this wheat variety. These results suggest that Cu and Fe NPs increased the growth of wheat seedling which might be associated with the change in abundance and number of protein metabolism and photosynthesis related proteins in NARC-11 wheat variety. Recommendations are made for further studies at genomic level to recognize the NPs effects on plant genome.

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