Name of the candidate: Amna
Name of the supervisor: Dr. Mohammad Irfan Qureshi
Department: Department of Biotechnology
Title of Thesis: Ecophysiological and proteomic response of *Spinacea oleracea* to sulfur-deficiency and arsenic stress
Keywords: Proteomic, Metabolomic, Biochemical, *In-silico,* Spinach, Arsenic

Abstract

This study was performed to analyze response of spinach to arsenic stress and sulfur deficiency via proteomic, biochemical, physiological and histochemical analysis along with health risk assessment of treated samples.

Oxidative stress was highest in combination stress, followed by arsenic and sulfur-deficiency alone. There was elevation in glutathione biosynthesis pathway and also better growth and anti-oxidative response in presence of sulfur and arsenic stress. Proteomic results showed upregulation and downregulation of 36 and 21 proteins under arsenic stress; 19 and 36 proteins under sulfur-deficiency; 38 and 31 proteins under combined stress, respectively. 87 proteins identified were associated with important functions. Changes in proteome of plant executes proper signaling and adaptation to stress, thus strengthening plant defence. Plant thus may enhance expression of defence proteins along with decreased expression of biosynthetic and catabolic proteins. Spinach plant tried to modulate glutathione metabolic pathway and proteome; upregulating defence associated proteins. Arsenic stress decreased growth parameters and chlorophyll. Arsenic treated plants supplemented with sulfur improves antioxidant system along with proteomic profile of thylakoids, decreases lipid peroxidation, H_2O_2 and limits arsenic-associated health risk. Results suggested negative impact caused by As stress on spinach, but sufficient level aids spinach in combating harmful effects of arsenic.