

## **Cadmium-induced Functional and Ultrastructural Alterations in Roots of Two Transgenic Cotton Cultivars**

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The toxic effect of cadmium (Cd) at increasing concentrations has been studied with special attention being given to root morphological and ultrastructural changes in two transgenic cotton cultivars viz. BR001 and GK30 and their wild relative cotton genotype viz. Coker 312. In comparison to their respective controls, low concentration (10 and 100 M) of Cd greatly stimulated seed germination, while it was inhibited by highest concentration of Cd (1000 M) in case of two transgenic cultivars. However, in Coker 312 the seed germination percentage progressively decreased over the control at all Cd levels. Various physiological and morphological parameters of the root and whole plant in both transgenic cotton cultivars and their relative wild cotton genotype respond differently towards the Cd toxicity. Bioavailability of Cd was concentration dependent and seedling roots as compared to shoot captured more Cd. BR001 accumulated more Cd followed by GK30, while Coker 312 was less Cd accumulator. The ultrastructural modifications in the root tip cells in both transgenic cotton cultivars and their wild relative also were dose-dependent. With the increase in Cd levels, the fine structures of the root cells also invariably changed. Increase in plasmolysis of the plasma membrane, greater number of nucleoli and vacuoles, and enlarged vacuoles could be observed in both transgenic cotton cultivars. In comparison to them, Coker 312 showed comparably well developed ultrastructures of the root tips and only enlarged vacuoles and greater number of mitochondria could be seen. Moreover, the accumulation of Cd in the form of electron dense granules and crystals both in vacuoles and attached to cell walls were noticed in both transgenic cotton cultivars and their wild relative cotton genotype. These results suggest that both transgenic cotton cultivars and their wild relative cotton genotype responded positively towards Cd stress at seedling stage, the internal Cd-detoxification might be through apoplastic and symplastic binding. Moreover, BR001 is less sensitive whereas, GK30 and Coker 312 were found as tolerant.