

## Investigating of Ultrastructure and Histology of Leaf and Root castor seeds (*Ricinus communis* L.) under concentrations of multi-walled carbon nanotubes

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### Abstract

The castor plant (*Ricinus communis* L.) belongs to the Euphorbiaceae family and is a very important medicinal plant. Carbon nanotubes act as regulator of germination and growth of plant; and are able to change the morphology and physiology of plant cell. Penetration of carbon nanotubes in plant systems are able to change metabolic acts that lead to increase biomasses and products of seed and fruit. XRD and nanoparticle sizer experiments showed that the major phase of nanoparticle is carbon and its size is range of 35-300 nm. The aim of this study is to investigate the effect of concentrations of multi-walled carbon nanotubes (MWCNTs) (0 and 500  $\mu\text{g ml}^{-1}$ ) alongside the control under laboratory conditions on the characters of histology and ultrastructure. The vegetative growth was done in greenhouse conditions under treatment with 4 replicates. After one week of plants sowing in pots containing soil, foliar spray 500  $\mu\text{g ml}^{-1}$  treatment (MWCNTs and deionized water for 0 treatment) was done. Duration of experiment was 45 days. After that plant was exited from soil, shoot and root were separated. Process of preparation was done and samples go over on grid for study TEM. The result of ultra structure studies of root and leaf showed, there is great aggregation of multi-walled carbon nanotubes with different length in vacuole and cytoplasm which in leaf cells have aggregation of vacuole and increase of plastogloboly in stroma of chloroplast and transformation of chloroplast from globular to ellipsoid and in root cells lead to destruction of mitochondria crista, vacuole and nucleus membrane and low chromatins, also was observed aggregation of vacuole and many diameter of sclereid and xylem wall.

**Keywords:** MWCNT, Ricinus plant, TEM, Ultrastructure of leaf and root, XRD.