**Study of seed germination and morphophysiologic characteristics of *Anethum graveolens* L. by NaCl-induced salt stress**

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**Introduction**

Salt stress is one of the limiting factors of crop production, particulary in arid areas. Salinity causes the damage of seed germination, the decrease of plant growth and finally the decrease of crop yield. Successful growth of seedling depends on the volume of precipitation, the germination and growth ability of seed species during the decrease of soil moisture. The osmotic effects of salt stress disrupt seedling establishment and seed germination. In vegetative plants, the decrease of cell turgescence and elongation rate of different plant parts are the consequences of salt stress. These effects suggest that soil salinity initially affects water uptake. In addition to, the cell division and extension are inhibited through intracellular concentrations of Na+ and Cl- ions. Salt stress inhibits the cell growth through biochemical and physiological mechanism such as photosynthesis and antioxidant processes, accumulation of stable osmolytes and proline synthesis. The osmoprotectants are containing polyols, sugars, proline, sugar alcohols, , inositols that accumulate in cells under salinity. These compounds maintain the integrity of cell membrane by the scavenge of free radicals and inhibit of lipid peroxidation. Phenolic compounds are intracellular antioxidants that accumulate in cells under biotic/abiotic stresses. Reactive oxygen species (ROS) injure to cells in stress conditions. Hydroxyl, superoxide anion radicals and hydrogen peroxide are the main ROS that produce in the plants during respiration process. Because of high reactivity of the free radicals, they easily react with lipids, DNA and hence bearing about malfunction of the cells. The enzymatic protective mechanisms for removing destructive effects of ROS in plant cells are catalase (CAT), ascorbate peroxidase (APX), polyphenol oxidase (PPO) and superoxide dismutase (SOD). The current study, we investigated the salinity effect on seed germination and [morphophysiological](https://www.google.com/search?client=firefox-b&biw=1024&bih=639&q=morphophysiological&spell=1&sa=X&ved=0ahUKEwiGy5H_pLfPAhWEORoKHUgCDuwQvwUIGSgA) properties of medicinal plant (*Anethum graveolens* L.).

**Methods**

Initially, seedlings of dill were subjected different concentrations of NaCl. Afterwards, morphological and physiological properties such as the content of proline, chlorophyll, soluble carbohydrates, phenolic compounds, malondialdelyde (MDA) and the activity change of antioxidant enzymes (CAT, APX and PPO) were measured in pot conditions.

**Results**

Results showed that when NaCl concentrations increased, plumule and radical length, seed germination and dry weight decreased. With the salinity increase, morphological triats like, number of leaves, root and shoot length, dry weight in shoot and root decreased. Mean camparison of treatments showed that with increasing salt stress, amounts of proline, soluble carbohydrates, phenolic compounds and enzymes activity (CAT, APX, PPO) increased in shoot and root, while, concentration of chlorophyll of leaves decreased. In conclusion, the result of this experiment indicates that the increased synthesis of proline, total phenolic content and as well as the activity increase of antioxidant enzymes in dill caused the protection of cells against free radicals.