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PHYSIOLOGICAL AND BIOCHEMICAL EFFECTS OF UV-RADIATION AND SODIUM DODECYL SULPHATE (SDS) MUTAGENS ON GROWTH AND METABOLISM OF GARLIC PLANTS

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ABSTRACT

The effects of enhanced UV_A (320-380), UV_C (280nm) and SDS, as mutagenic substances, on growth parameters and certain metabolic changes, during vegetative and flowering growth stages of garlic (*Allium sativum* var. Seds 40) were investigated. Root length, shoot length, fresh mass, dry mass accumulation and leaf area in garlic, treated with UV- radiation (A and C), and SDS (0.1 M and 0.3 M) as mutagenic substances, throughout the entire period of the experiment, showed significant variable changes below the control levels. Photosynthetic pigments (chl a, chl b, carotenoids, total chl a+b, and total pigment) contents of the variously treated garlic plants showed significant changes as compared with control plants throughout the duration of the experiment. The ratio of chl a / b showed variable changes in UV- and SDS- treated plants in relation to control. UV- absorbing compounds (total phenolic compounds and anthocyanins contents) of the UV- and SDS- treated garlic plants, showed significant increase above the control levels during vegetative and flowering growth stages. As compared with control nucleic acid levels, nucleic acid contents (DNA and RNA) of UV- and SDS- treated plants, at vegetative and flowering growth stages, showed significant decrease.

Keywords: UV_A and UV_C radiation, SDS, garlic, photosynthetic pigments, total phenolic compounds and anthocyanins, nucleic acids (DNA and RNA).

INTRODUCTION

Several physiological and biochemical constituents in plant cells undergo drastic changes as a result of exposure of the plants to supplementary UV radiation or treatment of plant tissue with chemical mutagenic substances (Bronman and Teramura, 1993). These changes occur at relatively high doses of UV radiation whereas other effects and responses are manifested at a dose of about one magnitude lower (Strid *et al.*, 1997). In *Pisum sativum*, these low dose effects include increased ion permeability of the thylakoid membrane and alterations in the mRNA transcript levels of photosynthetic and defensive protein components (Kalbin *et al.*, 1997).

Comparable amounts of genetic variation were induced by chemical mutagenic material (EMS), gamma rays and UV- radiation, but larger responses to selection and realized heritabilities followed EMS treatment of *Arabidopsis thaliana* plants. The most extreme mutants for latenes were selected after EMS treatment and for plant weight after EMS and radiation treatment (Brock, 2007). These results support the hypothesis that mutagenic treatment by chemical mutagens or physical mutagens (UV- radiation), gives