

Bioactive compounds in potatoes: Accumulation under drought stress conditions

Christina B. Wegener, Gisela Jansen, Hans-Ulrich Jürgens

Julius Kuehn Institute, Federal Research Centre for Cultivated Plants, Institute for Resistance Research and Stress Tolerance, Rudolf-Schick-Platz 3, 18190 Sanitz, Germany

Corresponding Author: Christina B. Wegener, Dr, Julius Kuehn Institute (JKI), Federal Research Centre for Cultivated Plants, Institute for Resistance Research and Stress Tolerance, 18190 Sanitz, Germany

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ABSTRACT

Background: Potato (*Solanum tuberosum*) is a valuable source of bioactive compounds. Besides starch, crude fibre, amino acids (AAS), vitamins and minerals, the tubers contain diverse phenolic compounds. These phenolics and AAS confer anti-oxidant protection against reactive oxygen species, tissue damage, and diseases like atherosclerosis, renal failure, diabetes mellitus, and cancer. Climate change and drought stress may become a major risk for crop production worldwide, resulting in reduced access for those who depend on the nutritional value of this staple crop.

Objective: The aim of this study is to determine the effect of drought stress on water, lipid soluble antioxidants, anthocyanins (Ac), soluble phenols, proteins, free AAS, peroxidase (POD) and lipid acyl hydrolase activity (LAH) in tuber tissue.

Methods: The study was carried out on three potato genotypes comprising one yellow-fleshed cultivar and two purple breeding clones. The plants were grown in pots (from April to September) in a glasshouse with sufficient water supply and under drought stress conditions. After harvest, the tubers of both variants were analysed for antioxidants measured as ascorbic acid (ACE) and Trolox equivalent (TXE) using a photo-chemiluminescent method. Amounts of anthocyanins (Ac), soluble phenols, proteins, as well as POD and LAH activities were analysed using a UV photometer. Finally, free AAS were measured by HPLC.

Results: The results revealed that drought stress significantly reduces tuber yield, but has no significant effect on antioxidants, Ac, soluble phenols and POD. Drought stress significantly increased the levels of soluble protein ($P < 0.0001$) and LAH ($P < 0.001$). Also, total amounts of

free AAS were higher in the drought stressed tubers (+34.2%, on average) than in the tubers grown with a sufficient water supply. Above all, proline was elevated due to drought stress.

Key words: anthocyanins, antioxidants, free amino acids, phenols, proteins, tuber quality