

Abstract

The established concept of plant nutrition with NO_3^- and NH_4^+ ions, as the only absorbable forms of nitrogen, has been expanded in recent years to find that some plants are also able to use amino acids and peptides as a nitrogen source.

In this work, the content of proteins, phenolic compounds and flavonoids, antioxidant capacity and activity of antioxidant enzymes in leaf extracts of six groups of tobacco plants grown *in vitro* were observed. The nutrition of these plants varied in the form and concentration of nitrogenous compounds. The experimental groups included: control plants grown on complete Murashige-Skoog agar rich in NH_4^+ and NO_3^- ions (MS), plants grown in the presence of NO_3^- ions, with reduced nitrogen concentration compared to MS (AD), plants grown in the presence of casein hydrolysate as the sole nitrogen source (H), plants grown in presence of both NO_3^- ions and casein hydrolysate (AD+H) and AD and H plants grown in the presence of polyethylene glycol simulating drought stress (AD+PEG and H+PEG).

Of all groups, plants H showed the highest content of phenolic compounds and flavonoids and the highest values of antioxidant capacity and antioxidant enzyme activity (catalase, glutathione reductase, superoxide dismutase, total peroxidases, ascorbate peroxidase, glutathione-S-transferase) together with NADP-dependent malate dehydrogenase (oxaloacetate-decarboxylating). Plants H showed a slightly lower protein content than plants AD, which were comparable to AD+H. Compared to the other groups, the AD and MS groups showed a reduced antioxidant capacity and a reduced amount of phenolic compounds and flavonoids. The activity of most of the monitored antioxidant enzymes was particularly low in MS plants. The groups of plants exposed to drought throughout the growing period showed an increased amount of proteins compared to the parallel groups AD and H. In the case of AD+PEG plants, there was also a slight increase in the amount of phenolic compounds and antioxidant enzyme activities, while the antioxidant capacity was similar. However, in H+PEG plants, all measured parameters were reduced compared to H plants. although the values were in most of the cases higher in AD+PEG plants.

The measurements performed indicate an increased ability of the antioxidant system of plants grown in the presence of amino acids and peptides to cope with oxidative stress.

Key words: nitrogen uptake, organic nitrogen nutrition, antioxidant capacity, antioxidant enzymes