

THE BIO-STIMULATING EFFECTS OF INVASIVE *CAULERPA RACEMOSA* VAR. *CYLINDRACEA* EXTRACT ON *ORYZA SATIVA*

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Abstract

The effect of *Caulerpa racemosa* var. *cylindracea* extract on ascorbate peroxidase activity and lipid peroxidation levels of *Oryza sativa* seeds were determined.

Keywords: Aegean Sea, Biotechnologies, Enzymes

Introduction

Caulerpa racemosa var. *cylindracea* is one of the well-known invasive species in the Mediterranean Sea. This seaweed showed invasive character and observed in 13 Mediterranean countries after 1990 [1]. Seaweeds have various vitamins, amino acids, trace elements and hormone-based compounds in their tissues which are important for plant growth. Therefore, seaweeds extracts can be evaluated as a natural organic fertiliser [2]. Reactive oxygen species (ROS) are by-products of aerobic cell metabolism. ROS play vital roles in various aging and disease processes. Unscavenged ROS can easily attack and damage the important components of cell such as DNA, lipids and proteins [3]. Ascorbate peroxidase (APX) transforms the hydrogen peroxide to water via ascorbate. The disordered balance between oxidants and antioxidants is resulted with peroxidation of polyunsaturated fatty acids of the cell membrane. In these cases, antioxidant supplementation is needed for healthy crops [4]. The aim of this study was to investigate the effect of *Caulerpa racemosa* var. *cylindracea* extracts on APX activity and LPO levels in root and leaf of *Oryza sativa*.

Material and Methods

C. racemosa was collected from Dikili-Izmir in May 2009. The seaweeds were transported to the laboratory immediately, washed and then stored at -20 °C until used. Seaweed fertilizer was prepared according to Sivasankari et al.'s method [5]. *Oryza sativa* seeds were obtained from Ege Tarimsal Arastirma Enstitüsü (Aegean Agricultural Research Institute) Izmir, Turkey. After sterilization and soaked treatments, the seeds were watered with 15 ml 5%, 10%, 15%, 20% concentration of seaweed extracts every 24 h for 15 days in a growth chamber (Nuve ID 501). The conditions of growth chamber were 25 °C and 55% humidity level. After 15 days, germinated *Oryza sativa* were collected and 0.10 g of wet root and leaf were homogenized by adding 50 mM 2.0 ml phosphate buffer (pH 7.0). The activity of APX was measured according to the oxidation of ascorbate in the presence of hydrogen peroxide [6]. LPO level was estimated according to Zhu et al. [7].

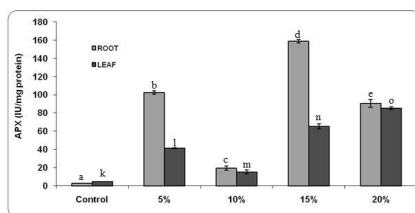


Fig. 1. The APX activities of *Oryza sativa* root and leaf. Different letters above the error bars indicate significant differences at $p < 0.05$. The results are the means of three different experiments

Results and Discussion

According to Figure 1 maximum APX activity was found in root of *Oryza sativa* which was grown in the existence of 15% extract concentration (158.6 ± 1.9 IU/mg protein). As can be seen from Figure 2 maximum LPO levels were observed in control groups root and leaf however the minimum LPO levels were found at 5% extract group. Abiotic factors are important sources of ROS. In these abnormal conditions, ROS are increased in plant metabolism and resulted in bad quality and low yield of agricultural product [8]. In the literature there are many reports on the effect of seaweeds extract to the plant growth. According to a recent paper, *Caulerpa chemnitzia* increases the biochemical parameters of *Vigna sinensis* [5]. This report was also well in line with the latter report. The present paper also revealed that *C. racemosa*

extract supplemented seeds showed lower LPO levels compared to control groups. Therefore, it could be said that *C. racemosa* extract could be applied as antioxidant booster in organic agriculture.

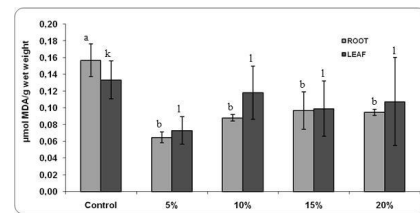


Fig. 2. The LPO levels of *Oryza sativa* root and leaf. Different letters above the error bars indicate significant differences at $p < 0.05$. The results are the means of three different experiments

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