

## Physiological Effects of The Brown Seaweed (*Ascophyllum nodosum*) and Humic Substances on Growth and Some Enzyme Activities of Pepper Plants Growing under Salt Stress

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**Aim of the study:** Seaweed extract (SW) products known as the Brown algae and Humic acid (HA) are utilized commercially in the fraction of soluble dust. In this study, we examined that physiological and biochemical parameters for instance product yield, DW%, protein, proline, LPO and antioxidative enzyme activities of pepper plants (*Capsicum annuum* L.) were considered under salinity condition.

**Material and Methods:** A entire design experiment with triplicates was planned at application area of the Muğla Sıtkı Kocman University, Turkey. A greenhouse pot investigate was enforced from 02 March to 20 May 2015 with pepper plants (*Capsicum annuum* L.). Three seedlings of same size were planted into each pot filled with 20 L of a medium including peat and perlite in 1 to 3 ratio. Pepper plants treated with salt and various levels of seaweed and humic acid. Experiment design: Control, Salt (100mM), 3 different doses of humic acid (0.5; 1; 1.5 g L<sup>-1</sup>), seaweed (1; 2; 3 g L<sup>-1</sup>), salt+humic acid (0.5; 1; 1.5 g L<sup>-1</sup>) and salt+seaweed (1; 2; 3 g L<sup>-1</sup>) with 3 repetitions; as a whole 42 samples. The control group was only irrigated by nutrient solution and irrigation water. During the study, dry matter %, total yield, total protein and proline, MDA (lipid peroxidation), and SOD (superoxide dismutase), POD (peroxidase), CAT (catalase) activity, were analysed in the leaves.

**Results:** MDA, proline, SOD, POD and CAT activities were increased with salt treatment when the control group was compared with the pepper seedlings of the sample leaves. On the other hand, dry matter, total yield and protein contents were notably decreased. However, these parameters increased with all treatments of both HA and SW. These increases were highest in pepper plants applied with high doses of HA for both dry matter and product yield (1.5 g L<sup>-1</sup>). Highest content of proline was found after the treatment of salt (109.02 unit mg protein<sup>-1</sup>) while least decrease was observed in the HA3 treated samples (44.82 unit mg protein<sup>-1</sup>). Salt treated samples showed highest increase in SOD activities (57.80 %) while least decrease was shown by HA3 treated samples (44.30 %). POD activities showed highest increase by salt (54.48 unit protein<sup>-1</sup>) while least amount by HA3 (6.62 unit protein<sup>-1</sup>). Salt caused highest increase in CAT activities (25.22 unit protein<sup>-1</sup>) while HA3 caused least (8.87 unit protein<sup>-1</sup>).

**Keywords:** Oxidative stress, Antioxidative enzymes, *C. annuum* L., Seaweed, Humic acid.