

Algal derivatives may protect crops from residual soil salinity: a case study on a tomato-wheat rotation

Emilio Di Stasio, Giampaolo Raimondi, Michael Van Oosten, and Albino Maggio
Department of Agricultural Sciences, University of Naples Federico II, 80055 Portici, Italy

In coastal areas, summer crops are frequently irrigated with saline water. As a consequence, salts may accumulate in the root zone with detrimental effects on the following winter crops if the rainfall is insufficient to leach them. Two field experiments were performed in 2015-2016 on a field used for tomato (summer) wheat (winter) rotation cropping. The spring-summer experiment was carried in order to evaluate the effect of two algal derivatives (*Ascophyllum nodosum*), Rygex and Super Fifty, on a tomato crop exposed to increasing salinity and reduced nutrient availability. In the autumn-winter experiment we investigated the effect of residual salts from the previous summer irrigations on plant growth and yield of wheat treated with the same two algal extracts. The salt treatment for the irrigated summer crop was 80 mM NaCl plus a non-salinized control. The nutrient regimes were 100% and 50% of the tomato nutritional requirements. With both the seaweeds applications the salt stressed plants were demonstrated improved Relative Water Content and water potential. Nevertheless the total fresh biomass and the fruit fresh weight were enhanced only in the non salinized controls. Application of algal derivatives increased the total fresh weight over controls in the non salinized plants. The seaweed treatments enhanced the fruit fresh weight with an increase of 30% and 46% for Rygex and Super Fifty, respectively. Preliminary analysis of the ion profile in roots, shoots and leaves, indicates that the seaweed extracts may enhance the assimilation of ions in fruits affecting their nutritional value. The residual salinity of the summer experiment reduced the wheat biomass production. However, the seaweed extracts treatments improved growth under salinity. In the salt stressed plants the Super Fifty application increased shoots and ears by 34% and 23% respectively, compared to the non treated plants. Plant height was increased by application of seaweeds extracts for both the species under residual salinity. Our results indicate that the application of seaweed extracts could be considered as a good production strategy for obtaining good growth and yields of valuable crops in resource-limited environments.

Keywords: algal derivatives, residual salinity, wheat, tomato.