

## Effects of *Ascophyllum nodosum* in Tomato in the Tropical Caribbean Climate: Effects and Molecular Insights into Mechanisms

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**Abstract :** Seaweed extracts have been reported as plant biostimulants which could be a safer, organic alternative to harsh pesticides. The incentive to use seaweed-based biostimulants is becoming paramount in sustainable agriculture. The current study, therefore, screened a commercial extract of *A. nodosum* in tomatoes, cultivated in Trinidad to showcase the multiple beneficial effects. Foliar treatment with an *A. nodosum* commercial extract led to significant increases in fruit yield and a significant reduction of incidence of bacterial spots and early blight diseases under both greenhouse and field conditions. Investigations were carried out to reveal the possible mechanisms of action of this biostimulant through defense enzyme assays and transcriptome profiling via RNA sequencing of tomato. Studies into disease control mechanisms by *A. nodosum* showed that the extract stimulated the activity of enzymes such as peroxidase, phenylalanine ammonia-lyase, chitinase, polyphenol oxidase, and  $\beta$ -1,3-glucanase. Additionally, the transcriptome survey revealed the upregulation and enrichment of genes responsible for the biosynthesis of growth hormones, defense enzymes, PR proteins and defense-related secondary metabolites, as well as genes involved in the nutrient mobilization, photosynthesis and primary and secondary metabolic pathways. The results of the transcriptome study also demonstrated the cross-talks between growth and defense responses, confirming the bioelicitor and biostimulant value of seaweed extracts in plants. These effects could potentially implicate the benefits of seaweed extract and validate its usage in sustainable crop production.

**Keywords :** *A. nodosum*, biostimulants, elicitor, enzymes, growth responses, seaweeds, tomato, transcriptome analysis

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