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Metabolic Profile of Rice Leaves

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Introduction

One of the promising strategies for encouraging sustainable production is the use of humic compounds as a biostimulant in agriculture. The activation of several molecular, biochemical, and physiological mechanisms leads to improved nutrition uptake and resistance to abiotic stress. To create unique and specialised biostimulation technologies, it is essential to comprehend the changes in plant physiology brought about by humic chemicals. Cell metabolites are the reaction chain's ultimate target, and using a metabolomic technique can help identify the response pathways in plants. This study's goal was to evaluate how humic acids (HA), which are utilised in hydroponic systems, changed the metabolism of rice leaves on a global scale [1].

Description

Humic compounds are increasingly being used in agriculture. The majority of humic substances used in commerce are made from geochemical sediments like peat and coal. However, they can be kept apart from regenerative sources of stabilised organic matter, such vermicompost and compost, providing the farmer more freedom. HS are best described as intricate combinations of thousands of distinct tiny molecules that adopt a supramolecular structure while in aqueous suspension. Key functional groups may cause beneficial physiological reactions in plants when they are present in very small amounts. Two important aspects have contributed to HS biostimulation's growing success Their impacts on ion absorption, nutrient utilisation effectiveness, and plant resilience to abiotic stress have all been well-documented. [2].

Crop productivity can be maintained while using substantially less inorganic fertiliser when HS is applied directly to the crops. As a helpful agent, HS can also be utilised to protect plants against abiotic stress, causing subsequent effects on hormonal signalling pathways and plant growth. Designing and creating biostimulation technology requires a thorough understanding of how plants perceive and react to HS applications. For instance, the source, dose, amount of bioactive compounds, and administration method all have an impact on how HS affects plant growth. Additionally, alterations in metabolism can help in evaluating how HS affects plants. [3].

The principal targets of physiological action are cell metabolites, although few metabolomic investigations have been conducted on plants that have received HS treatment. An earlier metabolomic analysis showed that humic acids (HA) changed the global metabolic distribution, which led to a considerable drop in the content of amino acids. Target analysis, however, has already shown that plants treated with HS have an increase in the synthesis of some particular amino acids. Additionally, HA raised the concentrations of 40 substances, including metabolites linked to the stress response and cellular development (adenine and adenosine derivatives, ribose, ribonic acid, and citric acid).

Additionally, using HS from compost increased the overall extraction yield of basil leaf steam distillation. A key bioactive secondary metabolite of aromatic plants, essential oils, are produced by aromatic plants, although it had little impact on their makeup. Similar results were observed in maize roots treated with HA, which did not alter the content of cell metabolites but simply altered their concentration in root tissues. Understanding the interactions between plants and HA can be aided by mapping global metabolic changes. However, a thorough understanding of the humic-plant interaction mechanism of applied biostimulants on rhizosphere environments may be limited since soil is a multiphase and multicomponent system.

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Conclusion

By retaining soil fertility and minimising the unfavourable environmental effects of present farming practises, the direct application of HA produced from recycled biomasses to plants can be considered as a new approach to increase the sustainability of agricultural production systems. As a result of activating and boosting physiological processes for better plant development and lowering cell metabolite concentration, HA-biostimulants change the metabolism of rice plants to encourage growth. Less substances, notably those linked to defence potentiation and potential candidates for metabolic indicators of HA bioactivity, were discovered in high amounts. A thorough understanding of structural activity correlations utilising cutting-edge metabolomic methods is a necessity given the varied composition of composted biomasses.

Acknowledgement

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Conflict of Interest

None.

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