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STUDY OF IMPACT OF SELECTED BIOSTIMULANTS ON PLANT GROWTH UNDER PH-INDUCED STRESS

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ABSTRACT

This study investigates the impact of biostimulants on the growth, protein content, and proline accumulation of Vigna aconitifolia (moth bean) and Trigonella foenum-graecum (fenugreek) under acidic and alkaline soil conditions. The research aims to evaluate the potential of biostimulants to enhance crop resilience and nutritional quality in challenging soil environments, addressing the growing need for sustainable agricultural practices to meet the demands of an increasing population. The study analyzes plant growth, protein concentration, and stress tolerance (via proline levels) to understand the mechanisms by which biostimulants mediate these effects.

KEYWORDS: *Biostimulants, pH Stress, Vigna Aconitifolia, Trigonella Foenum-Graecum, Protein Content, Proline Accumulation, Sustainable Agriculture.*

Article History

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INTRODUCTION

The increasing global population necessitates higher crop yields with fewer resources. Biostimulants, being natural and eco-friendly, offer a sustainable alternative to conventional agricultural methods. This research evaluates the impact of biostimulants on growth, protein content, and proline accumulation in *Vigna aconitifolia* (moth bean) and *Trigonella foenum-graecum* (fenugreek) under acidic and alkaline soil conditions. These species were selected due to their agronomic importance, protein content, and reported stress tolerance, allowing for the investigation of biochemical and physiological adaptations mediated by biostimulants. Proline estimation was conducted to assess osmotic stress tolerance, while protein estimation evaluated the metabolic health and growth response of the plants under pH-induced stress.

MATERIALS AND METHODS:

Plant Material

Vigna aconitifolia (moth bean) and *Trigonella foenum-graecum* (fenugreek) seeds were used in this study. *V. aconitifolia*, a protein-rich legume, is commonly cultivated in arid regions. *T. foenum-graecum*, an annual herb, is used in various cuisines and traditional medicine.

Protein Estimation

Protein content was determined using the Lowry and Lopez method. Briefly, 1g of seeds was crushed in 10ml of distilled water, filtered, and the filtrate adjusted to 100ml. 1ml of this filtrate was mixed with 5ml of Reagent C, incubated for 10

minutes in a water bath, and then 0.5ml of Folin-Ciocalteu reagent was added. Absorbance was measured at 660nm using a spectrophotometer.

Proline Estimation

Proline accumulation was measured following the method described by Abraham et al. (2010). 1g of seeds was ground and mixed with 10ml of sulphosalicylic acid, filtered, and the filtrate adjusted to 100ml. 1ml of this filtrate was mixed with 2ml of glacial acetic acid and 2ml of ninhydrin, heated for 1 hour, and cooled in an ice bath. 4ml of toluene was added, mixed, and allowed to stand. The toluene layer was transferred to a cuvette, and absorbance was measured at 520nm.

RESULTS

Protein Estimation

In *V. aconitifolia*, protein content was higher in acidic pH conditions compared to alkaline conditions. While protein content decreased in alkaline conditions, the application of biostimulants showed a positive recovery trend. A similar trend was observed in *T. foenum-graecum*, with higher protein concentration in normal alkaline soil

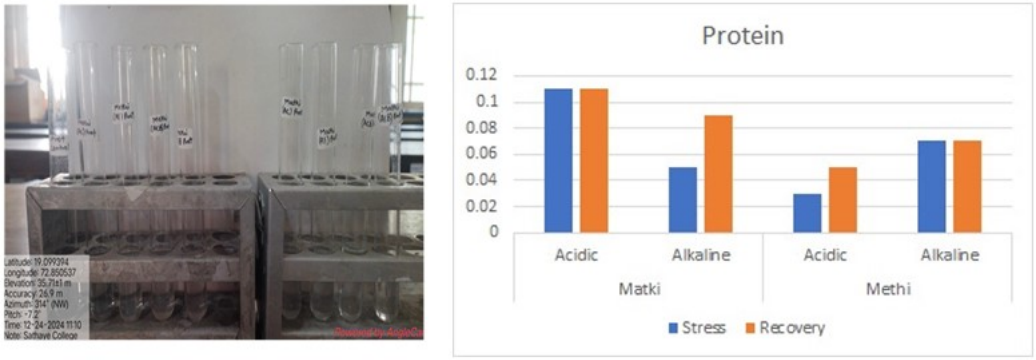

Figure 1

Proline Estimation

Proline concentration, an indicator of stress, increased with pH stress in both *V. aconitifolia* and *T. foenum-graecum*. Biostimulant application helped in recovery by reducing proline concentration. However, the recovery in *V. aconitifolia* was not as positive as anticipated, raising the question of whether the biostimulant itself might be contributing to stress under certain conditions.

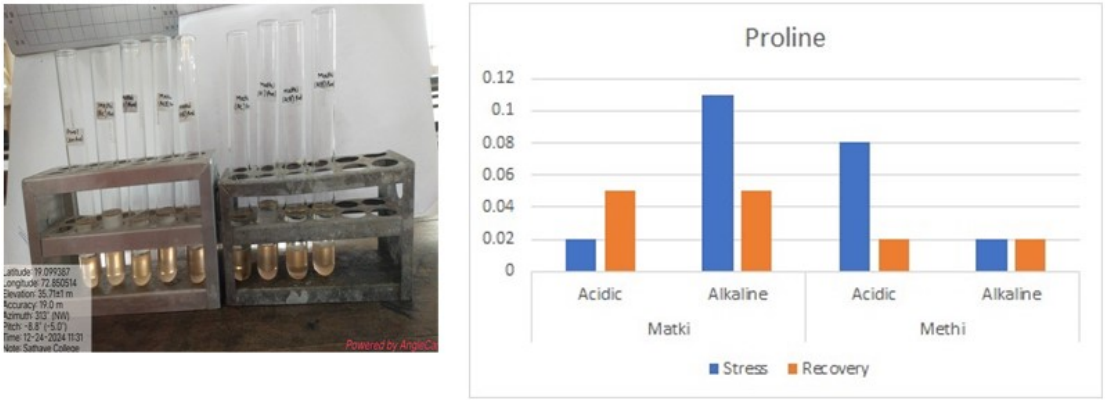

Figure 2

DISCUSSION

The results suggest a promising role for biostimulants in mitigating pH-induced stress. In both species, biostimulants appeared to positively influence protein content, even under stress conditions. The proline data indicates that biostimulants can reduce the stress response, but the less pronounced recovery in *V. aconitifolia*, along with the possibility of the biostimulant itself contributing to stress, warrants further investigation.

CONCLUSION

This study provides preliminary evidence of the potential benefits of biostimulants in alleviating pH-induced stress in *V. aconitifolia* and *T. foenum-graecum*. While the results are encouraging, particularly regarding protein content and proline reduction, further research is needed to fully understand the mechanisms involved and to optimize biostimulant application strategies. Specifically, the observed atypical response in *V. aconitifolia* requires further study to determine the factors influencing its recovery and to ascertain the potential for biostimulant-induced stress under certain conditions.

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