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Allelopathic Effects of *Pistia stratiotes* L. Leaf Extracts on Germination and Emergence of Rice, Weedy Rice and Saramollagrass Under In-Vitro Conditions

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Background: Allelopathy refers to the biological phenomenon in which plants release chemicals known as allelochemicals into the environment that influence the growth, survival, or reproduction of nearby organisms, typically other plants. *Pistia stratiotes* is a free-floating aquatic plant that frequently invades freshwater ecosystems competing with native vegetation, often becoming a serious ecological concern.

Objective: The objective of the research was to evaluate the allelopathic effect and conduct a phytochemical analysis of aqueous and ethanolic leaf extracts of *P. stratiotes* on the germination parameters of rice (*Oryza sativa* L.), weedy rice (*Oryza sativa* L. f. *spontanea*), and saramollagrass (*Ischaemum rugosum* Salisb.) seeds.

Methods: The experiment was conducted in petri dishes using ten selected seeds of each species, treated separately with different concentrations of plant extracts with five replicates: 250 ppm, 500 ppm, and 1000 ppm. The control treatment was treated with sterile distilled water. The germination parameters including seed germination percentage, plumule length, and radicle length were studied.

Results: The results revealed that the germination percentage of rice seeds was enhanced by 22% with the 500ppm aqueous extract, suggesting a mild stimulatory effect at moderate concentration, while ethanolic extract at 1000 ppm significantly inhibited germination by 42%. The growth of plumule and radicle was positively affected by low-concentration aqueous extracts however suppressed by high-concentration ethanolic extracts (P: 2.84 ± 0.274 ; R: 4.21 ± 0.317 at 250 ppm aqueous vs P: 1.23 ± 0.146 ; R: 1.78 ± 0.208 at 1000 ppm ethanolic). In weedy rice, germination was slightly promoted by the 250ppm aqueous extract; however, inhibited at higher concentrations, particularly with the ethanolic extract, which resulted in a 33% reduction in germination. *I. rugosum* seeds showed the highest sensitivity, with germination reduced by 18% in the aqueous and 90% in the ethanolic treatments at 1000 ppm. Overall, the ethanolic extract exhibited a stronger inhibitory effect on seed germination and emergence compared to the aqueous extract. The inhibitory effect was concentration-dependent ($p < 0.05$), and *P. stratiotes* extracts demonstrated potential selective-allelopathic activity.

Conclusion: These findings underscore the potential application of *P. stratiotes* extracts as a natural herbicide for sustainable weed management in rice cultivation.

Keywords: Allelopathic effect, Aqueous extract, Ethanolic extract, Germination parameters, *Pistia stratiotes*.