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"Filling gaps and removing traps
for sustainable resource management"

# Allelopathic *Pseudomonas* Consortium: A Sustainable Weed Control Approach in Wheat (*Triticum aestivum* L.)

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## Abstract

Weeds are notorious biological pests reducing crop production by sharing soil nutrient pools, water and space, and through allelopathy. Global annual crop yield losses by weed infestation range from 20–30 % while in Pakistan *Triticum aestivum* L. production loss due to weeds was estimated up to 24 % annually. Environmental pollution, residual effect, weed resistance, health issues in humans and animals are some limitations of using chemicals. This situation calls for adopting sustainable and eco-friendly approaches (biological weed control). *Pseudomonas* bacteria have the potential to minimise yield losses in wheat due to the production of phytotoxic metabolites (cyanide, phenolics, antibiotics and overproduction of Indole-3-acitic acid), environment friendliness, no residual effects and no chances of weed resistance which makes them a suitable candidate for weed control. The present study aimed to use the potential of pre-isolated and characterised (for secondary metabolites production and growth promoting traits) strains i.e. *Pseudomonas fluorescence* (B11), *Pseudomonas fulva* (T19), *Pseudomonas thivervalensis* (T24) and *Pseudomonas fulva* (T75) for *Avena fatua* L., *Phalaris minor* Retz., and *Rumex dentatus* L. suppression in wheat. Three pot studies were conducted in order to check the weed suppression potential of selected combinations i.e. C9 (B11xT24xT75) and C11 (B11xT19xT24xT75) from axenic studies using two application methods (seed coating and fertiliser coating) following completely randomised design replicated thrice in wire house. The results of the experiments depicted significant weed suppression in terms of reducing germination, SPAD contents, photosynthesis, respiration and stomatal conductance, and wheat growth promotion in terms of SPAD contents, photosynthesis, respiration, stomatal conductance, and grain yield by both combinations over their respective un-inoculated controls. The combination C9 performs significantly better for weed suppression and wheat growth promotion than C11 under seed coating treatment while the results under fertiliser coating of both combinations were statistically at par. The use of these combinations to develop a bioherbicidal product for biological control of *A. fatua*, *P. minor* and *R. dentatus* can be a viable option to meet both food security and the sustainable development goals of the UN.

**Keywords:** *Avena fatua*, consortium, food security, *Phalaris minor*, *Pseudomonas*, *Rumex obtusifolius*, sustainability

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