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Allelopathy and Agronomy: An integrated Approach for Sustainable Management of Little Seed Canary Grass (*Phalaris minor* Retz.) in Wheat Cropping System of Pakistan**Muhammad Saleem Kashif¹, Zahid Ata Cheema², Muhammad Farooq³ and Hafiz Haider Ali¹**¹Department of Agriculture, Government College University, Lahore-Pakistan²Department of Agronomy, University of Agriculture, Faisalabad-Pakistan³Department of Plant Sciences, College of Agriculture and Marine Sciences, Sultan Qaboos University, Sultanate of Oman**Abstract**

Allelopathy, the chemical interaction between plants, offer a promising approach for sustainable weed management, aligning with the congress's focus on innovative and eco-friendly agricultural practices. This study investigated the influence of wheat cultivars on little seed canary grass (*Phalaris minor* Retz.) through field experiment and a laboratory study. The field study was conducted during 2010-11 and 2011-12 at the Experimental Farm, Department of Agronomy, University of Agriculture, Faisalabad-Pakistan. It examined the impact of wheat cultivars (Shafaq-06 and Sehar-06 representing high and low allelopathic potential, respectively) sowing at 05 different row spacings (10 cm, 15 cm, 20 cm, 25 cm and 30 cm) on weed suppression. Results demonstrated that narrow row spacing (10 cm and 15 cm) significantly reduced little seed canary grass density and biomass accumulation with Shafaq-06 exhibiting superior weed suppression compared to Sehar-06. The laboratory study was conducted during 2012-13 at the Crop and Soil Sciences Department, Oregon State University, USA. It assessed that allelopathic effect of fresh and boiled water extracts from US Wheat cultivars (Marry, Stephen, Shafaq-06 and Sehar-06) on little seed canary grass seedling growth. Boiled extracts, particularly at 45 days after sowing (DAS), showed stronger inhibitory effects, with Marry and Stephen extracts reducing shoot length by 52% and 48%, respectively, and shoot dry weight by up to 37%. Phenolic compounds analysis confirmed their critical role in allelopathic activity. These findings highlights the potential of high-allelopathic wheat cultivars, such as Shafaq-06, Marry, and Stephen, combined with the optimized row spacing, as effective tools for integrated weed management. This approach supports the Congress's emphasis on reducing reliance on chemical herbicides and promoting sustainable agricultural practices, contributing to environmentally friendly and economically viable farming system.

Key words: Allelopathy, Sustainable Weed Management, Weed Suppression, Phenolic Compounds, Eco-friendly Agriculture

