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Synthetic polyploidisation promising tool in crop management: Induces enhanced phytochemical profile and biological activities in *Thymus vulgaris*

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Abstract

Consumption of medicinal and aromatic plants is broadening and boosting globally. However, the primary supply of raw materials in developing nations due to wild harvesting is destroying habitats, resulting in a loss of genetic diversity. This situation makes the development and application of breeding programmes imperative. Polyploidisation has emerged as a promising tool in plant breeding and crop management to generate genotypes with novel genetic combinations that can confer enhanced desirable biochemical, morphological, physiological, and biological and increased resistance to both biotic and abiotic stresses. Polyploidisation in medicinally and economically important herbs has a plethora of benefits. Essential oil from *Thymus vulgaris* L. has valuable therapeutic potential that is highly desired in the pharmaceutical, food, and cosmetic industries. Considering these advantages and the rising market demand, induced polyploids were obtained using oryzalin to enhance essential oil yield. However, their therapeutic values were unexplored. So, this study aims to assess the phytochemical content, and antimicrobial, antioxidant, and anti-inflammatory activities of tetraploid and diploid thyme essential oils. Induced tetraploids were found to have higher essential oil yield with enhanced thymol and -terpinene content than diploid. Tetraploids exhibited higher antibacterial activity against respiratory pathogens than the diploid. Similarly, in DPPH radical scavenging assay tetraploid essential oil was more potent than diploid. Tetraploids exhibited more effective inhibition of *in vitro* catalytic activity of the pro-inflammatory enzyme cyclooxygenase-2 (COX-2) than diploids. In conclusion, these results suggest that synthetic polyploidisation using oryzalin could effectively enhance the quality and quantity of secondary metabolites, produce genotypes that are highly tolerant to abiotic and biotic stress, and develop more efficient essential oil-based commercial products using this induced genotype.

Keywords: Medicinal plants, plant breeding, polyploidisation, thyme

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