

ABSTRACT

Title of Thesis : **STUDIES OF SAFFRON (*Crocus sativus* L.) CULTIVATED UNDER SOIL AND SOILLESS GROWING CONDITIONS**

Name of the Student : Marvi Sharma

Registration No. : J-20-D-50-BS

Major Subject : Plant Physiology

Name and Designation of Major Advisor : Dr. Gurdev Chand,
Professor & Head (Plant Physiology)

Degree to be awarded : Ph.D. (Plant Physiology)

Year of award of degree : 2025

Name of University : Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu

The present investigation entitled "Studies of Saffron (*Crocus sativus* L.) cultivated under soil and soilless growing conditions" was undertaken to compare the growth, yield, and quality parameters of saffron under traditional soil-based systems in Kashmir and Kishtwar with soilless hydroponic cultivation at SKUAST-Jammu. This study aimed to assess the morphological, floral, biochemical, and antioxidant characteristics influenced by different concentrations of plant growth regulators (PGRs) such as gibberellic acid and kinetin, thereby establishing climate-resilient strategies for saffron production. The experiment was laid out at three distinct agro-ecological zones i.e. Pampore (Kashmir), Matta (Kishtwar), and SKUAST-Jammu, with saffron corms being subjected to controlled hydroponic conditions in the latter for two consequent year 2022 and 2023 in the division of Plant Physiology, Faculty of Basic Sciences, SKUAST-Jammu. The experimental set up factorial completely randomised design. This study examined the morphophysiological observations which revealed significantly higher vegetative parameters under hydroponics number of leaves per plant (up to 24.00), plant height (37.83 cm), chlorophyll content (45.78 SPAD), and leaf fresh and dry weight (5.16 g and 0.86 g, respectively) as compared to conventional systems. Reproductive traits such as number of flowers per corm (1.86), stigma length (3.62 cm), and total stigma yield (0.56 g/100 corms) were also markedly enhanced under hydroponics. The biochemical quality of saffron was superior in hydroponic samples, with increased levels of crocin (4.12%), crocetin (2.37%), picrocrocin (1.85%), and safranal (1.95%) recorded. Furthermore, antioxidant profiles showed higher total phenolic content (up to 6.87 mg GAE/g DW) and flavonoid content (4.52 mg QE/g DW) in hydroponically grown saffron, alongside reduced IC₅₀ values in DPPH assays, suggesting potent radical scavenging activity. Principal Component Analysis (PCA) and correlation matrices reinforced the influence of PGRs on quality traits under soilless cultivation. The findings confirm that hydroponic farming, combined with optimized PGR treatments, significantly improves saffron productivity and quality in lowland, water-scarce regions, providing a sustainable alternative to conventional hill farming.

Key words: *Flavonoids, Plant growth regulators, Stigma, Yield, Metabolites*

Signature of the Major Advisor

Signature of the Student