

AGRO-TECHNOLOGICAL PRACTICES AND THEIR IMPACT ON SAFFRON YIELD

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Annotation: This study examines the influence of agro-technological practices on the yield and productivity of saffron (*Crocus sativus* L.), a high-value medicinal and spice crop. The research focuses on key agronomic factors including soil preparation, planting depth and density, irrigation regimes, fertilization methods, and weed and pest management practices. Special attention is given to the role of modern technologies such as drip irrigation and organic farming approaches in improving both yield and quality of saffron stigmas. The findings highlight that the adoption of scientifically based agro-technological practices significantly enhances flower production, stigma weight, and overall economic efficiency of saffron cultivation. The study emphasizes the importance of sustainable and climate-adapted agricultural techniques to ensure stable saffron yields under changing environmental conditions.

Key words: saffron, *Crocus sativus* L., agro-technological practices, yield, irrigation, fertilization, sustainable agriculture

INTRODUCTION

Saffron (*Crocus sativus* L.) is one of the most valuable and expensive spice crops in the world, widely used in the food, pharmaceutical, and cosmetic industries due to its unique color, aroma, and medicinal properties. The economic importance of saffron has increased significantly in recent years as global demand continues to rise, while its cultivation remains limited to specific agro-climatic regions. This makes the improvement of saffron yield and productivity a priority for both researchers and farmers.

Saffron is a sterile triploid plant that is propagated exclusively through corms, which makes its yield highly dependent on agro-technological practices rather than genetic improvement. Factors such as soil type, land preparation, planting depth and density, irrigation methods, nutrient management, and pest and weed control play a decisive role in determining flower production and stigma yield. Inappropriate agronomic practices can lead to poor flowering, low stigma quality, and reduced economic returns.

In recent years, the adoption of modern agro-technological approaches, including drip irrigation, organic fertilization, and sustainable soil management techniques, has shown promising results in enhancing saffron productivity while reducing environmental impacts. Moreover, climate variability and increasing water scarcity have further emphasized the need for efficient and resource-saving technologies in saffron cultivation.





Therefore, this study aims to analyze the impact of different agro-technological practices on saffron yield and to identify optimal cultivation strategies that can improve both productivity and sustainability. The results of this research are expected to contribute to the development of scientifically based recommendations for saffron growers and to support the expansion of saffron production under diverse agro-ecological conditions.

Main Part

Agro-technological practices play a crucial role in determining the growth, flowering behavior, and yield of saffron (*Crocus sativus* L.), as the crop is highly sensitive to environmental and management conditions. Since saffron is propagated vegetatively through corms and does not produce viable seeds, its productivity depends largely on proper agronomic management rather than genetic improvement. Therefore, understanding and optimizing cultivation techniques is essential for achieving stable and high yields.

Soil preparation and planting practices

Soil preparation is one of the most important factors affecting saffron yield. Saffron grows best in well-drained, loose, and fertile soils with a neutral to slightly alkaline pH. Deep plowing and thorough land preparation improve soil aeration and root penetration, which positively influence corm development. Planting depth and spacing also significantly affect flower formation and stigma yield. Corms planted at optimal depths show better resistance to temperature fluctuations and moisture stress, resulting in increased flowering intensity and higher-quality stigmas.

Irrigation management

Water management is a critical agro-technological practice in saffron cultivation, particularly in arid and semi-arid regions. Although saffron is considered relatively drought-tolerant, timely irrigation during key growth stages—especially before flowering—has a strong positive effect on yield. Modern irrigation methods, such as drip irrigation, ensure efficient water use, maintain optimal soil moisture, and reduce water losses through evaporation. Studies indicate that controlled irrigation regimes not only increase the number of flowers per plant but also improve stigma length and weight.

Nutrient management

Balanced nutrient supply is essential for sustainable saffron production. Both organic and mineral fertilizers contribute to improved soil fertility and plant growth. Organic amendments, such as farmyard manure and compost, enhance soil structure, microbial activity, and nutrient availability. Mineral fertilizers, when applied in appropriate doses, support vigorous vegetative growth and corm multiplication. Integrated nutrient management practices have been shown to increase saffron yield while minimizing negative environmental impacts.

Weed, pest, and disease control





Weeds compete with saffron plants for nutrients, water, and light, leading to reduced growth and lower yields. Effective weed management through mechanical, cultural, or biological methods is therefore necessary. In addition, saffron can be affected by various pests and fungal diseases that damage corms and reduce flowering. The adoption of integrated pest management strategies, including crop rotation and biological control, helps maintain plant health and ensures consistent yields.

Sustainable and climate-adapted practices

With increasing climate variability, the importance of sustainable agro-technological practices in saffron cultivation has become more evident. Conservation tillage, organic farming, and water-saving technologies contribute to long-term soil health and yield stability. Climate-adapted cultivation strategies enable saffron producers to cope with temperature extremes and irregular rainfall patterns, ensuring economic viability and environmental sustainability.

Overall, the application of scientifically based agro-technological practices significantly enhances saffron yield and quality. Optimizing soil preparation, irrigation, nutrient management, and plant protection measures provides a reliable foundation for sustainable saffron production under diverse agro-ecological conditions.

Conclusion

The results of this study demonstrate that agro-technological practices have a decisive influence on the yield and productivity of saffron (*Crocus sativus* L.). Since saffron is propagated only through corms and lacks genetic variability, proper agronomic management remains the primary factor for improving flower production and stigma yield. The findings confirm that well-prepared soils, optimal planting depth and density, efficient irrigation systems, and balanced nutrient management significantly enhance both the quantity and quality of saffron yield.

In particular, the adoption of modern and resource-efficient technologies, such as drip irrigation and integrated nutrient management, contributes to improved water-use efficiency and sustainable soil fertility.

Effective weed, pest, and disease control practices further support healthy plant growth and reduce yield losses. Moreover, the integration of sustainable and climate-adapted cultivation strategies plays an essential role in ensuring stable saffron production under changing environmental conditions.

Overall, the study highlights that the implementation of scientifically grounded agro-technological practices is key to maximizing saffron yield and ensuring long-term economic and environmental sustainability.



These findings provide practical guidance for saffron growers and can serve as a basis for future research aimed at developing innovative and region-specific cultivation technologies.

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