Journal of Elementology ISSN 1644-2296

Arslan, B., Culpan, B. and Culpan, E. (2026)
'Influence of phosphorus fertilizer forms and application doses on seed yield, oil content, and fatty acid composition of safflower',
Journal of Elementology, 31(4), ,
available: https://doi.org/10.5601/jelem.2026.31.2.3897

RECEIVED: 22 June 2026
ACCEPTED: 28 October 2026

ORIGINAL PAPER

Influence of phosphorus fertilizer forms and application doses on seed yield, oil content, and fatty acid composition of safflower*

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Abstract

Phosphorus is an essential plant nutrient that plays a critical role in root development, seed filling, and crop productivity. This study evaluated the effects of phosphorus fertilizer forms and application doses on seed yield, oil content, quality characteristics, and yield components of safflower under the ecological conditions of Tekirdağ, Türkiye, during the 2024 and 2025 growing seasons. The experiment was conducted in a split-split plot design within a randomized complete block design with three replications, using two safflower cultivars (Dinçer and Olas), two phosphorus fertilizer formulations (18-46-0 DAP and 7-21-0 Structure), and four phosphorus doses (0, 30, 60, and 90 kg ha^{-1}). Phosphorus fertilization significantly increased seed and oil yields, whereas its effects on oil content and fatty acid composition were generally non-significant. The highest seed and oil yields were obtained with 90 kg ha^{-1} phosphorus, particularly with 7-21-0 fertilizer, indicating superior performance under the study conditions. However, the 60 kg ha^{-1} dose produced comparable yields, suggesting its suitability for low-input production systems. Significant cultivar differences were observed for most yield-related traits, with Olas generally outperforming Dinçer. Oil content and fatty acid composition were mainly determined by genotype rather than phosphorus treatments. Unsaturated fatty acids, primarily oleic and linoleic acids, accounted for more than 90% of the total oil profile in both cultivars. Overall, phosphorus fertilization at 90 kg ha^{-1} substantially improved safflower yield without negatively affecting oil quality under semi-arid conditions.

Keywords: *Carthamus tinctorius* L., fertilization, phosphorus, yield component, oil quality

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* This research received no external funding.