

**Title :** Analysis of Chemical Composition of Sunflower Sprouts Grown with Plasma-Activated Water

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## ABSTRACT

This study analyzed the chemical composition of sunflower sprouts grown with plasma-activated water (PAW), compared to tap water (TW) as the control. PAW was prepared by plasma activation for 60 seconds (PAW60s), 90 seconds (PAW90s), and 5 minutes (PAW5min) before being used for germination. Ion chromatography (IC) analysis revealed that PAW contained higher nitrate ( $\text{NO}_3^-$ ) and nitrite ( $\text{NO}_2^-$ ) levels than TW, enhancing nutrient absorption and photosynthesis in plants. Growth analysis indicated that PAW significantly increased weight of sprouts during the first 8–10 days, but declined by day 12 due to excessive nitrate and nitrite accumulation, which could lead to toxicity in sprouts. Chemical composition analysis showed that PAW increased chlorophyll, total phenolic content (TPC), and total flavonoid content (TFC) in the early growth phase (8–10 days), but their levels decreased in later stages due to nitrate and nitrite accumulation, which may inhibit chlorophyll synthesis. Antioxidant activity analysis using the DPPH assay revealed that PAW90s and PAW5min exhibited higher %inhibition than TW in the early phase, but declined over time due to oxidative stress. Furthermore, gas chromatography-mass spectrometry (GC-MS) analysis identified terpene compounds such as 1S-alpha-Pinene,  $\beta$ -Calarene,  $\beta$ -Bisabolene, and Cyclofenchene, which increased in PAW-treated sprouts. These compounds are known for their antioxidant, antimicrobial, and anti-inflammatory properties, suggesting that PAW may enhance the biosynthesis of beneficial organic compounds in plants. In conclusion, PAW promotes sunflower sprout growth, enhances bioactive compound accumulation, and improves antioxidant activity during early development. However, excessive nitrate and nitrite accumulation in later stages may affect plant quality and food safety. Further studies are recommended to optimize PAW conditions for safe and high-quality agricultural production.

**Keywords:** Plasma-activated water, Sunflower sprouts, Chemical composition, Ion chromatography, Gas chromatography-mass spectrometry

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