**Modification of Yield and Oil quality of Peppermint by Different Soil Fertility and Water Limitation**

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Abstract

Pepper mint (*Mentha piperita* L.) is an important medicinal plant which is a source of aroma chemicals like menthol, menthone, isomenthone and menthofuran. A field experiment was conducted in 2017 to study the effects of vermicompost and urea fertilizer as a source of nitrogen [Control (without fertilizer), V1U5 (95 kg N ha−1),V2U4 (71.25 kg N ha−1) + (3.3 ton vermicompost ha-1), V3U3 (47.5 kg N ha−1) + (6.75 ton Vermicompost ha-1),V4U2 (23.75 kg N ha−1) + (10.1 ton vermicompost ha-1) and V5U1 (13.5 ton Vermicompost ha-1)] and sustained deficit irrigation impacts [irrigated at 85% of field capacity (no stress, I1), 70% of field capacity (mild stress, I2) and 55% of field capacity (sever stress, I3)] on Biomass, oil yield and oil components of pepper mint (Black Mitchum) in Iran. For this purpose, we used a randomized complete block design with three replications. Plots were irrigated frequently with drip irrigation system to apply deficit irrigation treatment. Irrigation schedule using soil water balance method. The hydro distilled essential oils of pepper mint were analyzed by gas chromatography and gas chromatography-mass spectrometry. The results showed that biomass yield, oil percentage and oil yield were remarkably affected by water deficit stress and oil yield reduced with increasing deficit water stress from 16 to 6 kg/ha. The maximum of biomass yield (2046 kg/ha), oil percentage (0.9%) and oil yield (16.9 kg/ha) were obtained in I1, I2 and I1 respectively. The pepper mint yield was also significantly influenced by fertilizer regimes. The highest of biomass (1709 kg/ha), oil percentage (0.78%) and oil yield (13.5 kg/ha) were obtained in V2U4, V3U3 and V2U4 respectively. In generally, 16 compounds were found in essential oil of pepper mint by means of GC-mass that all of them exhibited a significant change against water limitation and fertilizer treatment. Menthol, menthone and menthofurane were the dominant essential oil compounds which illustrated an enhancing under water deficit irrigation and vermicompost. The results have indicated that oil quality improved due to moderate drought stress and vermicompost.

Keywords: Essential oil, *Mentha piperita* L., Nitrogen, Urea, Vermicompost