Humic Substances and Moisture Content in Media Alter Biomass Production and Bioactive Constituents of *Thymus vulgaris* L.

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Abstract

Humic substances (HS) are a natural product that increase biochemical interactions, and have beneficial effects on soil and growth plant. But it is unknown whether they can improve the yield and composition of bioactive constituents in thyme (*Thymus vulgaris* L.). To test the effect of these substances, thyme seedlings were obtained from seeds growing under different doses of HS from a commercial product: 100, 200, 300 and 400 mg/L. Thyme plants were grown using three moisture levels 20, 40, 60% of pot capacity. Changes in plant growth were determined in terms of height of plant, fresh and dry matter. The bioactive constituents were determined in terms of yield and composition of essential oils, antioxidant activity, total phenolic content and flavonoids. Morphological variables showed significant differences \(P \leq 0.05\) among source variation, except to the fresh weight of the aerial part. The essential oil yield and composition were dependent of moisture percent and HS supplied. In general, the antioxidant activity, total phenol content and total flavonoids were modified by water content and HS levels supplied.

INTRODUCTION

*Thymus vulgaris* is a small woody shrub 10-30 cm tall aromatic plant. This is characterized by great chemical intraspecific variability among plants (Figueiredo et al., 2008). Several works indicate that the humic substances (HS) used in plant nutrition, show enhanced root, leaf, shoot growth and fruit yield (Chen et al., 2004; Siminis et al., 1998). These positive effects are explained by the direct interaction of humic substances with physiological and metabolism processes (Eyheragui et al., 2008). Their effects appear to be exerted on cell membrane functions, promoting nutrient uptake or plant growth and development, because of acting as hormone-like substances (Nardi et al., 2002). Among other effects drought conditions can limit photosynthesis in plants, alter nutrient uptake and decrease secondary metabolite production (Figueiredo et al., 2008). Therefore, the purpose of this study was to determine biomass production and bioactive constituents affected by humic substances and media moisture.

MATERIALS AND METHODS

This study was conducted in the winter season 2009 in a greenhouse of Medicinal and Aromatic Plants of the University of Massachusetts, Amherst, MA. The average temperature and daylight of greenhouse during the experiment were 20±2°C and 10 h respectively. The plants of thyme (*Thymus vulgaris* L.) were obtained from seeds growing under different doses of humic substances (HS1: 100; HS2: 200, HS3: 300 and HS4: 400 mg/L). The humic substances were obtained from a commercial products HumiSolve USA® derived from free water cretaceous humate deposits (humic acids 57%) and TM-7USA® (fulvic acids 10.5%, soluble potash 3.7%, sulfur 5%, copper 0.31%, iron: 1.2%.

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