

# Fresh yield and phytochemical accumulation on spinach grown in different coir types

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## Abstract

The objective of this study was to evaluate if coir can replace peat as growing media in spinach production in phytonutrient content and antioxidant activity terms. The effects of four commercial substrates peat; and three coir types: cocopeat, coir-crush chips, and coir medium, on growth, chlorophyll *a* and chlorophyll *b*, total:carotenoids, flavonoids, anthocyanins, proline, glutathione content, and glutathione reductase activity were evaluated in spinach (*Spinacia oleracea* L. 'Manatee'). Soil blocked spinach seedlings (five seedlings per block) were transplanted into styrofoam planting boxes (100-cm long × 25-cm wide × 10-cm high) filled with 14 L of substrate. Each planting box was irrigated daily by drip with a complete nutrient solution. Yield (fresh yield) in cocopeat and coir medium were similar to those obtained in peat. Leaf-blade total chlorophyll was higher in peat than in the other substrates. However, leaf-blade total carotenoids and anthocyanins were not affected by substrate type and leaf-blade flavonoids and total glutathione (GSH+GSSG) contents were higher in plants grown in the different types of coir than in peat. Leaf-blade proline levels in plants grown in different types of coir were similar to that recorded in plants grown in peat ranging from 3.5 to 4.5 mg 100 g<sup>-1</sup> FW. The findings of this study indicate that coir could be an alternative to peat but depends on the coir type.

**Keywords:** *Spinacia oleracea*, substrates, soilless cultivation systems, flavonoids, glutathione

## INTRODUCTION

Spinach is one the most consumed green-leafy vegetable worldwide (Massa et al., 2018) and it is one of the horticultural crops with the highest aggregate nutrient density index (ANDI) (Dias, 2019; Barker and Stratton 2020), a measure of how much nutrients you get per calorie eaten. Nutrients include vitamins, photosynthetic pigments, antioxidants, and other essential constituents for human health. Antioxidants such as flavonoids, proline, and glutathione also play an important role in protecting plants against oxidative damages (Panche et al., 2016; Saini et al., 2017). Nutrient density in soilless substrate culture can be influenced by growing media. Peat is the growing media more used in soilless culture on substrates, but its use must be limited since it is a non-renewable resource and it has negative impacts on the environment. Coir is more environmentally friendly, and it is a renewable resource (Gruda, 2019). In the market, there are various types of coir with different physicochemical properties that affect plant nutrition and water uptake. This can influence phytonutrient accumulation and antioxidant activity, which commonly increase under stress conditions (Per el al., 2017). Coir has been shown great capacity to replace peat as growing media, although it depends on the type of coir used, allowing it to obtain high spinach fresh yields (Machado et al., 2019). However, the influence of the use of coir as growing media on the phytonutrient content and antioxidant activity accumulation on spinach is less known. Therefore, this study has as a goal to evaluate the effects of four commercial substrates: peat and three coir types (cocopeat, coir medium, and coir-crush

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