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Evaluation of Growth Media Incorporating Cotton Ginning By-products for Vegetable Production

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The suitability of by-products from the cotton ginning industry for incorporation into growth media for three vegetable crops was examined. Composts were prepared by mixing the by-product with soil in 5 ratios (20:80, 40:60, 60:40, 80:20, 100:0, v/v compost and soil). Seeds of lettuce (*Lactuca sativa* L.), radish (*Raphanus sativus* L.) and spinach (*Spinacia oleraceae* L.) were sown directly within the composts and in 100% peat (control) in October (autumn crop) and December (winter crop). Plant growth (height, leaf number, dry and fresh weight, chlorophyll content) was recorded 19 and 17 days after transplantation (first and second sowing respectively) and at harvest. Fresh and dry weight was recorded at harvest. Overall, plant height and leaf number were higher when the growth media consisted principally of compost (higher ratios of cotton by-product: soil) than in the control (peat), whereas among the various ratios of compost: soil significant differences were recorded, media with a high compost content showing better growth in most cases. Similar results were reported for fresh and dry weight and chlorophyll content, except for dry weight in the second sowing, where growth media with a lower compost content had a higher dry weight. In conclusion, the incorporation of the cotton ginning by-product into compost resulted in better growth of lettuce, spinach and radish, suggesting that the use of this material may be of economical value as a spin-off product for the cotton ginning plant and also as a means of reducing present pollution of the environment due to the accumulation of waste material.

Introduction

Cotton is a major industrial crop in Greece covering 233,000 hectares with a total yield of 600,000 MT of cotton lint (Statistical data of the Ministry of Rural Development and Food, Greece, 2009). The cotton processing industry also produces about 50-60,000 MT of by-products per year, some of which is of potential value for agricultural exploitation.

In other cotton growing regions of the world (e.g. South Carolina, USA) a portion of the cotton waste is used to produce soil amelioration composts and pellets, as well as pellets for fodder and fuel. Alburquerque *et al.* (2006) described the use of cotton waste as a bulking agent in composts composed mainly of "alperujo" (an olive industry by-product) for greenhouse pepper production. In comparison with cattle manure and sewage sludge composts, there were no significant differences in crop yield. However the cotton waste compost resulted in a higher organic matter content than the other two growth media. Anthony (1994) proposed the use of cotton ginning by-products to remove oil spills from water surfaces with a high level of efficiency, while in Greece cotton waste in the region of Veroia is now being used to generate composts for soil amelioration.

The exploitation of cotton ginning waste not only offers economical benefits to compost producers but also lessens the burden of waste on the local environment. In addition, there is an increasing need to reduce the dependence of horticultural growers on peat and peat-based substrates since large-scale peat excavation also poses a threat to the natural environment of traditional peat bogs (Joosten 1995, Rochefort and Lode 2006). Tsakonas *et al.* (2005) proposed the use of kenaf (*Hibiscus cannabinus* L.) as a substrate to produce compact horticultural plants. Mahamud and Manisah (2007) described a combination of sago waste (sago palm by-product) and coco peat as a growth medium for tomatoes, while Sánchez-Monedero *et al.* (2004) described the potential value of composts prepared from sweet sorghum bagasse, pine bark and urea or brewery sludge for vegetable seedling production as alternatives to sphagnum peat substrates. Indeed, distillery wastes of up to 20-50% may substitute peat in composts provided that suitable remediation is applied (Bustamente *et al.* 2008).