Deployment of olive-mill waste as a substitute growing medium component in nurseries

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Abstract

The research work was conducted in order to investigate the possibility of using olive-mill wastes (OS-olive stone) in different ratio (10%, 30% or 50% v/v) with peat or perlite in the production of broccoli (*Brassica oleracea* L. var. cymosa), cauliflower (*Brassica oleracea* L. var. caulifora), anise (*Anethum graveolens* L.) and tomato (*Solanum lycopersicum* Mill.) seedlings. OS extracts at 10^{-1} – 10^{-6} accelerated seedling emergence and radicle length. Under nursery conditions, the addition of OS up to 30% into peat, stimulated to some extent seed germination for cauliflower and anise but suppressed tomato seed germination. Adding 50% of OS into peat suppressed seed germination for all the examined species. Olive stone combined with perlite in different ratio (10-30%) performed better regarding seed germination compared with mixtures of OS and peat. Mean germination time increased in peat+50%OS in broccoli, tomato and anise (including the perlite+50%OS) but was unaffected in cauliflower. In anise, ≤30% OS in peat, promoted seed germination, having the lower mean germination time. The addition of OS in perlite and/or peat reduced plant height, leaf number and fresh biomass for broccoli. In tomato, anise and cauliflower, the peat+10%OS (and occasionally the peat+30%) maintained plant growth parameters. The present study suggests 10-30% OS can substitute peat in nurseries, while the use of perlite in case of peat in combination with OS is not recommended.

Keywords: *Olea europaea*, olive stone, emergence, growth, peat, perlite, plant

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In Mediterranean countries large amounts of olive oil, derived from olives (*Olea europaea* L.), represents ca. 98% of the entire worldwide production, are produced by traditional and industrial olive mills over a limited time period (usually from October to December) (Paredes et al., 2005). Application of wastes (solid and liquid) on agricultural land have caused imbalances in ecosystems and adds to a growing concern about the impact on the environment and human health (Xu et al., 2006). Moreover, application of olive wastes (OW) into the soil revealed beneficial effects to soil and attract several attention and research interest. Alburquerque et al. (2007) detected an overall positive effect and improvement of soil conditions by adding olive mill by-products compost to soil; Ghosheh et al. (1999) assessed herbicidal activity of olive husks; D'Addabbo et al. (1997) reported suppression of *Meloidogyne incognita* in soil amended with olive residues, and Kotsou et al. (2004) and Altieri & Esposito (2008) demonstrated suppressive effects of olive-mill wastewater on *Rhizoctonia solani*.

Partial replacement of peat as a growing medium with an organic material, such as olive-mill waste (OW) for seedlings may improve rapid and uniform seedling germination-emergence and plant development in nurseries and in greenhouses. The OW is an economic and available material. However, OW that had not been through a decomposition process should be added in soil at a lower ratio than that which had been completely composted. The impact of OW on plant phytotoxicity need to be evaluated, as it is fluctuated in different substrates used (Ouzounidou et al., 2008; Kelepesi and Tzortzakis, 2009). The high EC of media with OW at the beginning of the culture period may have been a reason for hindered plant development.

The objective of this study was to evaluate the amount of peat that could be replaced by olive-mill wastes (olive stone and pulp) in a growing medium including peat with perlite and the impact on seed emergence of broccoli, cauliflower, anise and tomato in nursery tests.

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