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Effects of biochar, compost and biochar-compost on growth and nutrient status of maize in two Mediterranean soils

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During the past years, studies have shown that biochar alone or combined with compost, has the potential to improve soil fertility and maize yield mostly on tropical soils whereas experiments on Mediterranean soils are rare. Therefore, the influence of biochar, compost and mixtures of the two, on maize (Zea mays L.) growth and nutrient status were investigated, in this study. Biochars were produced from 2 feedstocks: grape pomace (GP) and rice husks (RH) pyrolyzed at 300°C. Maize was grown for 30 days in a greenhouse pot trial on two Mediterranean soils amended with biochar or/with compost at application rates of 0% and 2% (w/w) (equivalent to 0 and 16 t ha^{-1}) and N fertilization.
Total aboveground dry matter yield of maize was significantly improved relative to the control for all organic amendments, with increases in yield 43-60.8%, in sandy loam soil, while, in loam soil a statistically significant increase of 70.6-81.3% was recorded for all the amendments apart from compost. Some morphological traits, such as aboveground height of plants, shoot diameter and belowground dry matter yield were significantly increased by the organic treatments. Aboveground concentration of P was significantly increased from 1.46 mg g-1 at control to 1.69 mg g-1 at 2% GP biochar in sandy loam soil, whereas GP biochar combined with compost gave an increase of 2.03 mg g-1 compared to control 1.23 mg g-1. K and Mn concentrations of above ground tissues were significantly increased only in sandy loam soil, while Fe in both soils. N concentration of aboveground tissues declined for all the amendments in loam soil and in sandy loam soil apart from compost amendment. Significant positive impacts of amended soils on nutrients uptake were observed in both soils as compared to the control related to the improved dry matter yield of plant. The current study demonstrated that maize production could be greatly improved by biochar and compost because of the nutrients they supply and their conditioning effect.