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Using Biochar composts for improving sandy vineyard soils while reducing the risk of

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In recent years, biochar has increasingly been discussed as an option for sustainable environmentalmanagement, combining C sequestration with the aim of soil fertility improvement. Biochar has shownpositive effects in viticulture before (Genesio et al. 2015) which were largely attributed to improved water supply to the plants. However, in fertile temperate soils, the use of pure, untreated biochar does not guarantee economic benefits on the farm level (Ruysschaert et al., 2016). Hence, recent approaches started introducing biochar in management of nutrient-rich agricultural waste, e.g. in compost production (Kammann et al. 2015). Compost is frequently used in German vineyards for humus buildup and as a slow-release organic fertilizer. This, and increasingly mild, precipitation-rich winters, promoting mineralization, increase the risk of unwanted nitrate leaching losses into surface and ground waters during winter.
To investigate if biochar pure, or biochar-compost mixtures and -products may have the potential to reduce nitrate leaching, we set up the following experiment: Either 30 or 60 t ha-1 of the following additives were mixed into the top 30 cm of sandy soil in large (120 L) containers, and planted with oneRiesling grapevine (Clone 198-30 GM) per container: Control (no addition), pure woody biochar, pure compost, biochar-compost (produced from the same organic feedstock than the compost, with 20 vol. - % of a woody biochar added), and pure compost plus pure biochar (same mixing ratio as in the former product). Once monthly, containers were exposed to simulated heavy rainfall that caused drainage. Leachates were collected from an outlet at the bottom of the containers, and analyzed for nutrients. The nutrient-rich additives containing compost all improved grape biomass and yield, most markedly pure compost and biochar-compost; same amendments were not significantly different. However,while the addition of the lower amount (30 t ha-1) of compost reduced nitrate leaching compared to the
control (where nearly all mineral N was lost), the larger application amount in pure compost caused rising nitrate loss rates, likely due to compost mineralization. Interestingly, this was not the case when
biochar was included, either co-composted or mixed into the substrates afterwards. However, after three years, the biochar-compost treatment still showed the highest grape yield of all treatments, while
the treatment with biochar mixed in after compost production did not have the same effect. The results suggest that biochar-composts, for example produced from vine making residue and greenwaste, may
reduce the risk of nitrate leaching while increasing the soil organic content more permanently than other amendments.

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