EFFECTS OF THE ADDITION OF BIOCHAR ON THE CHEMICAL PARAMETERS OF A VINEYARD SOIL IN SOUTH TIROL, ITALY

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Abstract:

Context and purpose of the study – The usage of pyrogenic carbon (or biochar) to change the chemical and physical properties of agricultural soil has been carried out since many centuries. In the South Tirol region in northern Italy wood gasification plants are used for mainly district heating purposes and generate a fair amount (1.300 t/year) of biochar with varying characteristics as byproducts. The ERDFfunded project «WoodUp» has as one of its goals the characterization and reutilization of the locally produced biochars for agricultural purposes and climate change mitigation. The Free University of Bolzano/Bozen as its lead partner is collaborating with the Laimburg Research Centre for the field trials in viticulture and fruit growing involving biochar from wood gasification plants. The changes of the chemical parameters in soil of a vineyard following the application of biochar has shown some interesting results.

Material and methods – In an existing vineyard of Müller Thurgau (planted 2007, on SO4) (Fig. 1) 5 different treatments plus a control with 4 repetitions each have been carried out. The treatments were: 3,9 kg/ m² dry matter compost (C), 2,5 kg/m² dry matter biochar (B1), 5 kg/m² dry matter biochar (B2), 2,5 kg/m² dry matter biochar plus 3,9 kg/ m² dry matter compost (B1C), 5 kg/m² dry matter biochar plus 3,9 kg/ m² dry matter compost (B2C) and the control which was left untreated (N). The biochar was incorporated between the rows with the use of a spade plough and a rotating harrow at approx. 30 cm depth. The soil samples were taken 2 months and 1 year after the incorporation of the biochar at 2 different dept ranges: 0 – 30 cm and 30 – 60 cm. For every repetition 4 single soil samples were taken and mixed together. The soils were analyzed to determine pH, total organic carbon, plant available phosphorus, potassium, magnesium, boron, manganese, copper and zinc.

Results – The soil analysis show that the incorporation of biochar affects a wide range of soil parameters such as an increase in pH ([1]Hass et al, 2012) and total organic carbon content and increases the plant availability of potassium, magnesium, boron, slightly increases phosphorous and zinc and interestingly decreases the manganese and copper availability in the vineyard soil. The changes appear to be stable in time and are present also in the deeper layers of the soil where the biochar has not been directly incorporated. These changes show a potential for ameliorating vineyard soils ([2]Schmid et al, 2014, [3]Genesio et al, 2015), in part by increasing the organic carbon content and with it the water holding capacity and by increasing the availability of nutrients such as boron, magnesium and potassium, while also rendering less available ([4]Park et al,2011) through adsorption heavy metals like copper and manganese often present in higher concentrations in vineyard soils due to plant protection products.

1. Introduction.

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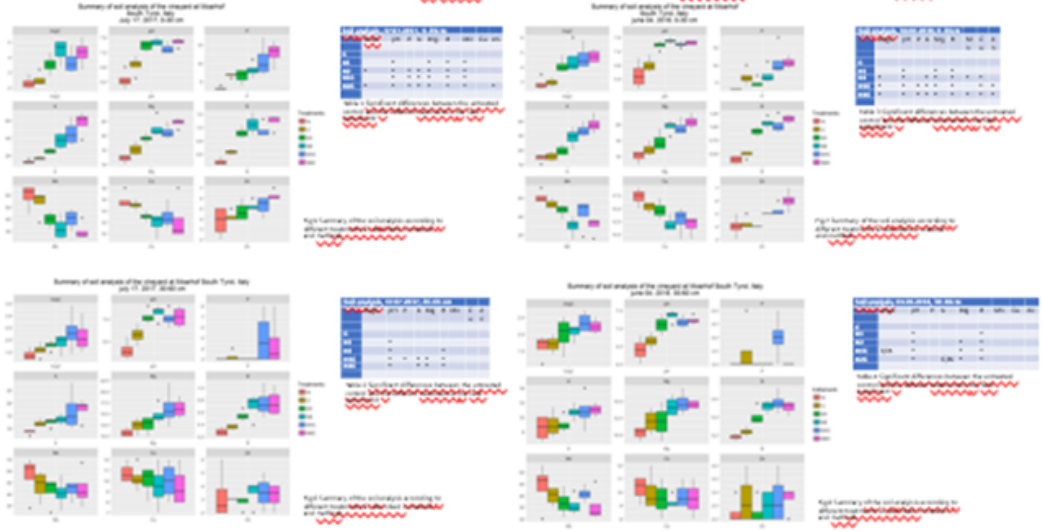
Fig. 1 The experimental plot after the distribution of biochar

Fig. 2 Incorporating of biochar in the vineyard

Fig. 3 The vineyard one months after germination

Fig.4 Shortly before the harvest in 2017



Conclusion – The soil analysis show that the incorporation of biochar affects a wide range of soil parameters such as an increase in pH ([1]Hass et al, 2012) and total organic carbon content and increases the plant availability of potassium, magnesium, boron, slightly increases phosphorous and zinc and interestingly decreases the manganese and copper availability in the vineyard soil. The changes appear to be stable in time and are present also in the deeper layers of the soil where the biochar has not been directly incorporated. These changes show a potential for ameliorating vineyard soils ([2]Schmid et al, 2014, [3]Genesio et al, 2015), in part by increasing the organic carbon content and with it the water holding capacity and by increasing the availability of nutrients such as boron, magnesium and potassium, while also rendering less available ([4]Park et al,2011) through adsorption heavy metals like copper and manganese often present in higher concentrations in vineyard soils due to plant protection products.

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References