

Our first SECUREFOOD2050 production of tomatoes and strawberries from biochar-added cultivation substrates

Notwithstanding the adverse climatic conditions (very high temperatures from May to August 2022, and the heavy storms occurred during mid of August), as monitored by the weather station located at the experimental DAGRI - Site, our team of agronomists (A. Lenzi and E. Giordani - Researchers at DAGRI, W.A. Petrucci - Grant holder of SECUREFOOD2050 and L. Bini - PhD. Student at DAGRI – UNIFI) was able to produce strawberries and tomatoes. Supported also by our technicians and master students of Agricultural Sciences and Nutrition Science of the University of Florence, plant growth and fruit production were monitored and finally samples were collected for analysis.

Certified fridge stored strawberry plants of the cultivar "Camarosa" and tomato seedlings ("Rio Grande" cultivar) were grown in pots filled with different substrates adopting a randomized experimental design (**Figure 1**). The substrates differed in the concentration of biochar, from 0 % (control substrate, i.e., a traditional peat based commercial substrate enriched with pumice) to 100% biochar (v/v), as reported in **Table 1**.

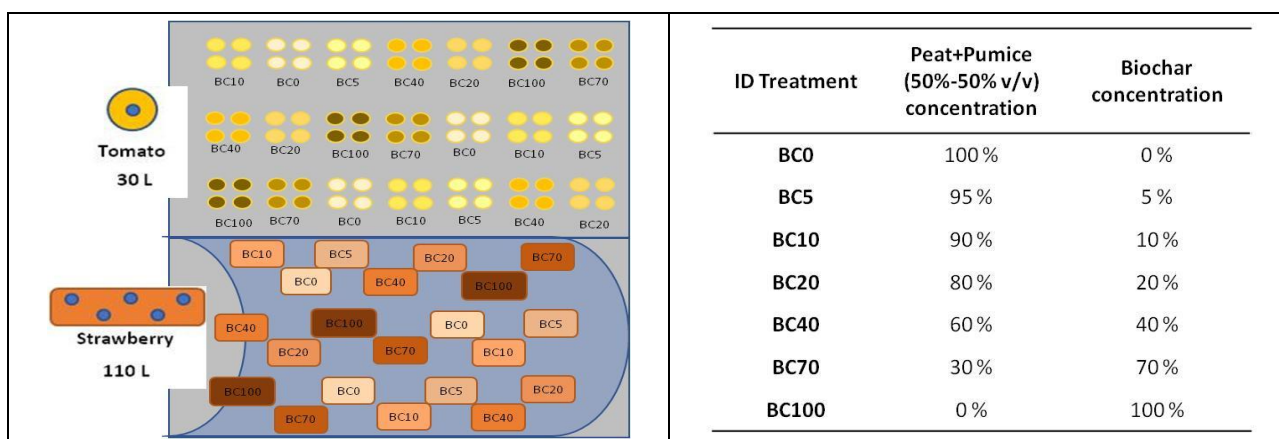


Figure 1 – Experimental design for tomato and strawberry production carried on at the Experimental Area of DAGRI – University of Florence (Italy).

Table 1 – Substrate composition: biochar concentrations (v/v) adopted in 2022 season for strawberry and tomato plants.

Along the plant growth and development (**Figure 2**), several parameters were monitored at different time intervals until fruit ripening and harvesting. More in detail, physiological parameters (e.g., gas exchanges; chlorophyll and flavonoid contents), morphological and productive parameters (e.g. leaf and fruit colour, fruit weight and dimension, solid soluble content, flesh firmness) and biomass (e.g., total and partitioned plant fresh and dry weights), as well as phenological stages (e.g. flowering and ripening time), were assessed.



Figure 2 – Experimental site at DAGRI-UNIFI. Olive trees and tomato plants and fruits (top) and growing plants of strawberry (bottom).

Some first results are shown in **Figures 3** and **4** for tomato. BC70 and BC100 showed to be unsuitable for tomato plant growth at the tested environmental and management conditions. The use of 20-40% of biochar resulted to be suitable for tomato production even though with a lower productivity.

Conversely, a percentage of 5-10% of biochar can be used without compromising tomato productivity.

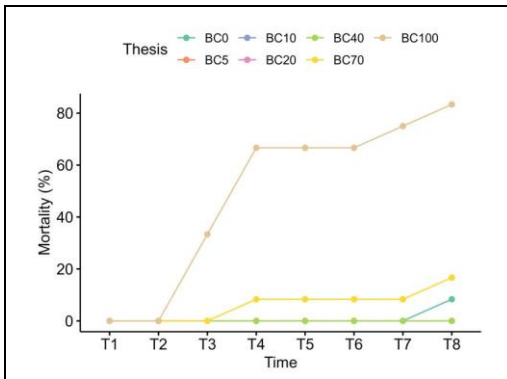


Figure 3 – Mortality rate of tomato plants with different percentages (v/v) of biochar in the substrate.

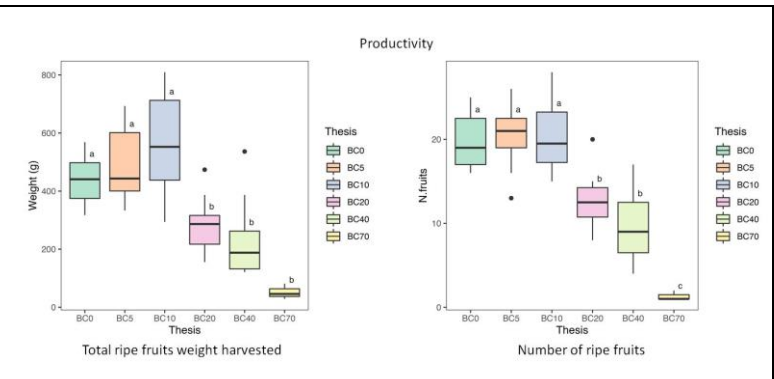


Figure 4 – Productivity of tomato plants as total fruit weights and number of ripened fruits.

Similar results have been obtained for strawberry, since productivities observed for BC5, BC10, and BC20, were comparable to those of control (BC0), as pictorially illustrated in **Figure 5**.

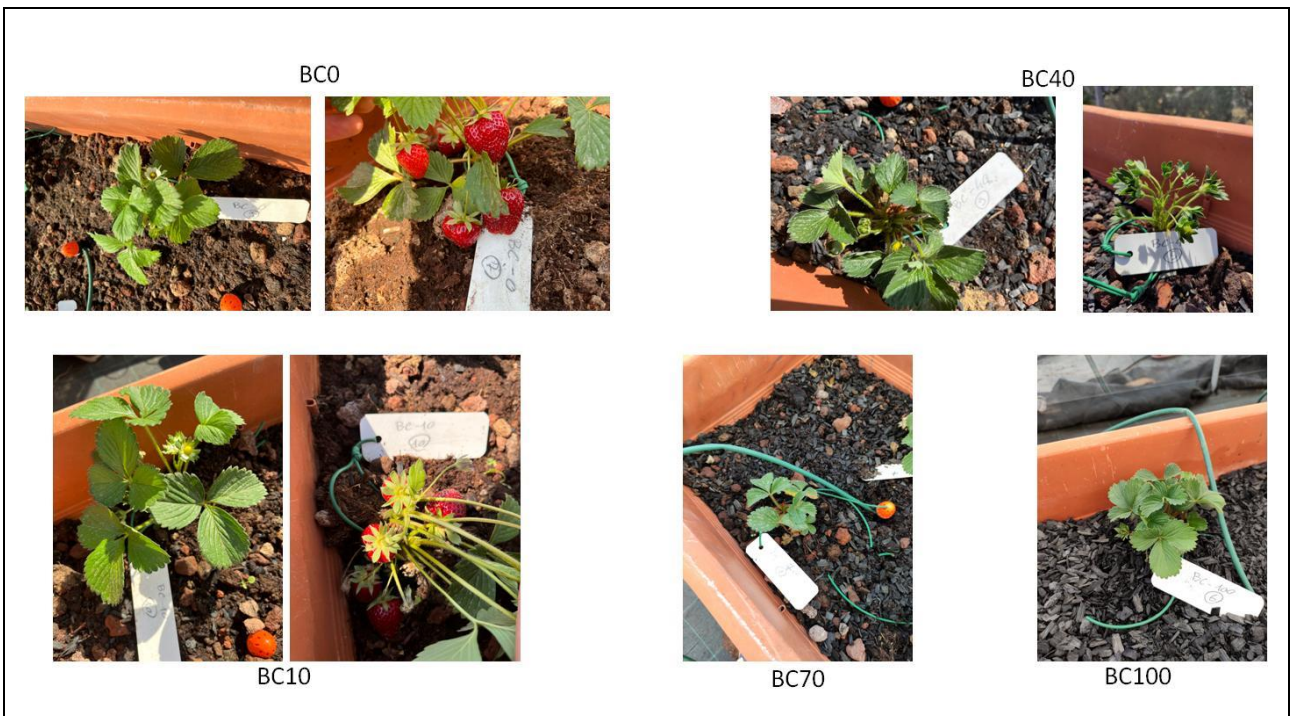


Figure 5 – Strawberry plants growing in substrates with different percentages of biochar.