Effect of Biochar on Continuously Cropped Sesame (sesamum indicum L.)

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【Background】 Yield decline in sesame when continuously cropped is attributed to many soil-plant interaction factors. Recent studies have shown that biochar enhances soil productivity and increases crop yields but there is still inadequate knowledge on the use of biochar in continuous cropping of sesame. This research was to elucidate whether biochar could help mitigate yield depression in continuously cropped sesame or not, and to determine the adequate amount of biochar application.【Materials and methods】 A field experiment with four established plots of 1, 2, 3 and 4 years of continuous sesame were used to cultivate two sesame cultivars, “Nishikimaru” and “Gomazou” in 2015. Biochar treatments included four rates of rice husk biochar (0, 5, 10, and 15t/ha) with inorganic fertilizer; N: P: K= 70kg, 105kg, 70kg and lime at 1000 kg per ha, respectively in each continuous cropping plot.【Results and Discussion】 Results indicated that plant height, seed yield, and 1000-seed weight were all significantly influenced by biochar application. Compared to control, 10 t/ha rice husk biochar increased yield of sesame by 34% in “Nishikimaru” and 45% in “Gomazou” in 1 year plot. 15t/ha increased yield by 25% in “Gomazou” and 5t/ha by 15% in “Nishikimaru” in 2 years plot while 10t/ha resulted in 45% yield increase in “Nishikimaru” and 5t/ha in “Gomazou” caused 6% yield increment in 3 years plot. 15t/ha increased yield of “Nishikimaru” by 32% while 10t/ha by 4% in “Gomazou” (see graph) in 4years plot. Biochar improved soil porosity, bulk density, compactness and volumetric moisture content more in 2 years of continuous cropping of sesame than in 1, 3 and 4 years. Results of the soil analysis after harvesting indicated increase in the pH, total C, C/N ratio, total N, NO3-N, available P, exchangeable cations, Fe, Cu, Zn, Mn, and Mo in biochar treatments. In conclusion, application of rice husk biochar is not only beneficial for sesame growth and yield but also significantly improves the soil physico-chemical properties thus can be used to suppress yield depression associated with continuous cropping of sesame. We suggest optimum rates of 5t/ha and 7-12t/ha of rice husk biochar when cultivating “Gomazou” and “Nishikimaru” respectively in continuous cropping.