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Climate change mitigation and adaptation by biochar: mechanisms and regulatory trend in the rhizosphere

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Climate change represents a key challenge to the sustainability of global ecosystems and human prosperity in the twenty-first century. The impacts of climate change combined with natural climate variability are predominantly adverse, and often exacerbate other environmental challenges such as degradation of ecosystems, loss of biodiversity, and air, water and land pollution. Besides, rapid industrialization and increasing adaption of agrochemical based crop production practices since green revolution have considerably increased the heavy metal contaminations in the environment.

Assessing the impacts of climate change on our planet and addressing risks and opportunities is essential for taking decisions that will remain robust under future conditions, when many climate change impacts are expected to become more significant.

Here, we established a review survey to assess the impact of biochar amendment and agroforstry system on CO_2 sequestration and methaloid remediation.

Our data base showed that Agroforestry-based solutions for carbon dioxide capture and sequestration for climate change mitigation and adaptation in long-term is more practical and realistic options for a sustainable ecosystem and decreasing negative effect of climate change. This was more supported in arid and semi-arid regions as well as area with saline and alkaline soil (20%).

From a soil remediation standpoint, the general trend has been shifting from reduction of the total concentration to reduction of the physic-chemically and/or biologically available fractions of metals. This regulatory shift represents a tremendous saving in remediation cost. While metals are not degradable, their speciation and binding with soil through biochar amending reduced their solubility, mobility, and bioavailability. While agroforestry showed high efficiency in C sequestration (32%), biochar amendment raveled significant mitigation in heavymetals bioavailability (42%). However, studies which coupled both approaches are limited. Thus, we conclude that combined Agroforestry and biochar amendment regulates C sequestration and metalloids remediation more efficiently.