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Use of macaúba-derived biochar as a carrier in *rhizobium* tropici inoculant

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Abstract

Peat remains a commonly utilised carrier in the formulation of rhizobial inoculants, particularly for *Phaseolus vulgaris* (common bean) cultivation. Given that peat is a finite resource, there is a significant demand for sustainable alternatives. This study aimed to assess the potential of using Macaúba biochar as a carrier for *Rhizobium tropici*. The shelf life of inoculants based on peat and Macaúba biochar was evaluated over a period of 180 days. Parameters like number of nodules (NN), nodule dry weight (NDW), root dry weight (RDW), root volume (RV), and shoot dry weight (SDW) were measured in common bean under *in vitro* and greenhouse conditions. Treatments included Peat-based inoculant (P), Macaúba biochar-based inoculant (B), Macaúba biochar-based inoculant with pH adjusted using HCl (B+HCl), Macaúba biochar-based inoculant supplemented with glycerol as a carbon source (B+Gl), and Macaúba biochar-based inoculant with both pH adjustment and glycerol supplementation (B+HCl+Gl). Control treatments were non-inoculated (ni) and inoculated (i) with shelf life tested at 15 (15) and 180 days (180). The B+HCl+Gl and B+Gl inoculants exhibited a similar shelf life to the P inoculant. In the *in vitro* assays, the Bi-180, Bi+HCl⁻180, and Bi-HCl+Gl-180 inoculants resulted in comparable NN and NDW in common bean to those observed with Pi-180. In the greenhouse experiments, the Bi-180 inoculant showed similar NN and NDW as the Pi-180, while the Bi+HCl⁻180 inoculant showed similar RV. Additionally, the Bi-180, Bi+HCl⁻180, and Bi-HCl+Gl-180 inoculants produced RDW and SDW values akin to those of the Pi-180. These findings suggest that Macaúba biochar is a viable alternative to peat in microbial inoculant formulation, providing an environmentally friendly and sustainable option.

Keywords: *Acrocomia aculeata*, biochar, inoculant, organic residues