

**EFFECT OF BIOCHAR ON SOIL pH AND pH
BUFFERING CAPACITY OF RUBBER
GROWING SOILS**

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ABSTRACT

Purpose The effect of biochar on pH and pH buffering capacity of rubber growing soils, and the effect of nitrogen fertilizers on pH in biochar amended rubber growing soils were investigated in this study.

Materials and methods Three soils with contrasting properties i.e. RYP from Paiyagala estate, RBL from Parambe estate, and RBE from Thanamalwila, were collected from traditional and non-traditional rubber growing areas and amended with three different biochar types (Gl, PH and RW) and three different rates (0, 2 and 5%). After incubation of soils at 70% WHC, the change in pH was measured with time. The pH buffering capacity was determined using $\text{Ca}(\text{OH})_2$ titration method. The values of pH buffering capacity were obtained from the slope of titration curves of alkali additions plotted against pH in the pH range 4- 8.5. Two N fertilizers (urea and sulfate of ammonia) were applied into soils from Thanamalwila and Paiyagala that were amended with 0 and 2% rubberwood biochar by weight. The change in pH was measured with time after mixing soils with BC and N fertilizers.

Results and Discussion Application of biochar increased soil pH. Once after the addition of biochar, higher soil pH was in Thanamalwila soil compared to the Paiyagala and Parambe. But pH change was higher in Paiyagala soil (~ one point pH increase) than Parambe (less than one point) and Thanamalwila soils (less than 0.5). With the time pH changes were different in different soils with different biochar types and biochar rates. As incubation time increased from 1 to 12 weeks, the pH did not increase significantly ($P < 0.05$) in Thanamalwila and Paiyagala soils, and the gap decreased in significantly ($P < 0.05$) Parambe soils. pH buffering capacity had a range of 4.7-11.8 $\text{mmol kg}^{-1} \text{pH}^{-1}$ for three soils from rubber growing areas. The pH buffering capacity was highly correlated ($R^2 = 0.8696$) with soil cation exchange capacity. Addition of rubber wood biochar, which itself had a higher CEC and alkalinity increased soil CEC, and thus increased pH buffering capacity more compared with that of Gliricidia and paddy husk biochar. For Thanamalwila soil, biochar rate*N rate interaction and biochar rate*N source interaction were not significant different ($P < 0.05$). Thanamalwila soil pH (6.1) was the highest out of three soil types. pH was negatively related with urease activity.

Conclusion The application of biochar increased soil pH in all three soils. Thanamalwila had the highest soil pH buffer capacity and paiyagala had the lowest pH buffering capacity as well as CEC. pH buffering capacity of rubber growing soils could be increased by amending them with biochar. Addition of biochar generated from rubber wood, gliricidia and paddy husk not only ameliorate soil acidity, but also increased soil pH buffering capacity. The pH increase in biochar amended paiyagala soil could be arrested by addition of sulphate of ammonia and urea, but not in Thanamalwila soil.

Key words Biochar, Nitrogen fertilizer, pH buffering capacity, CEC, pH, WHC