# Production of Slow-Release Fertilizer based on cotton stems biochar and NPK : a sustainable fertilization alternative

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## INTRODUCTION

Mineral fertilization is a common practice used by producers to improve crop yields in poor soils (Xie et *al*., 2011). However, the mismatch between the solubilization of mineral fertilizers and the absorption of nutrients by the plants causes huge losses(AlShamaileh et *al*., 2018). This explains that fertilizer inputs are not always led to a substantial increase of outputs. **This study aims to create a slow release fertilizer (SRF) from cotton stalk biochar and mineral fertilizer NPK.**

## MATERIALS AND METHODS

Biochar was activated by maceration in NPK solution at a volume ratio of 1/0.5 during 48 hours. The resulting macerats were dried under ambient conditions of 40° C during five days. Total amount of P, K Ca and Mg in pristine biochar and adsorbed was evaluated by chemical analysis. Nutrient release dynamics were monitored using a sequential leaching test (Wang and Alba 1996) in distilled water and CaCl2 solution (0.001M). Leachates were collected at 48, 96, 168 and 336 hours before the start of the experiment to quantify P, K, Mg and Ca leaching in the solution.

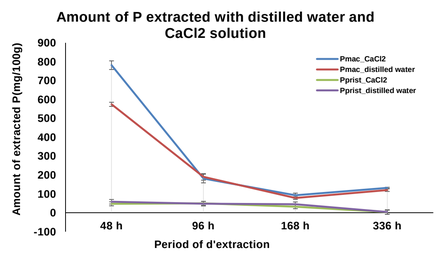
## RESULTS

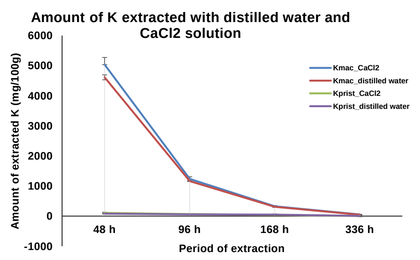
### Concentration of P, K, Ca and Mg of pristine and SRF biochar

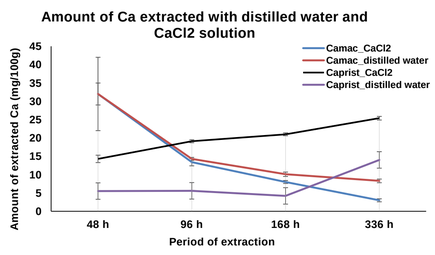
| Treatments | P_total (mg/100g) | K_total (mg/100g) | Ca_total (mg/100g) | Mg_total (mg/100g) |
|---|---|---|---|---|
| Biochar pristine | 398 | 2850 | 1338 | 266 |
| Biochar SRF | 5259 | 5134 | 1031 | 128 |
| Absorption (%) | 1221% | 80% | -23% | -52% |

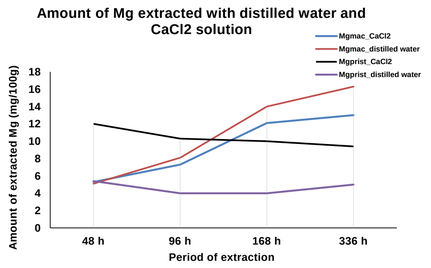
The cotton stalks are initially rich sources of K, Ca and Mg. Their initial concentration influences the adsorption dynamics of these elements. The activation of the biochar allows to enrich it with phosphorus contrary to Ca and Mg which are lost during the process. The biochar of cotton stems can be used as carriers to create SRF to improve the efficiency of mineral fertilizers

### Evolution of P, K Ca and Mg release of biochar pristine and SRF according to the extraction solution




Nutrient release depends on the type of nutrient and the extracting solution. More than 50% of the P and K of the SRF biochar is released after 96 h. The release of Ca and Mg of the pristine and macerate biochar does not follow the same dynamics as the P and K.

## CONCLUSION

In this experiment, biochar showed its potential to absorb and release the nutrients provided by NPK. It should be noted that the dynamics of nutrient absorption depends on the initial concentration of nutrients in the biochar. Macerated biochar with a higher nutrient concentration releases its contents more easily than pristine biochar in 96 hours.

## Acknowledgements

## REFERENCE

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