

Effect of fertilizer produced from bio oil, nitrogen and biochar on maize growth

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Introduction

Agricultural production in Brazil is increasing due to growing demand for food, in response to this agricultural residues increase proportionally requiring a recycle practices to decrease economics and environmental debits, once residues are an abundant and cheap alternative to supply soil nutrients as a fertilizer and energy source. The overall objective of the proposed study is to produce bio-oil from agricultural wastes to produce two high added value slow release fertilizers.

Bio-oil produced from sawdust by fast pyrolysis at $\pm 500^{\circ}\text{C}$, was submitted to thermochemical reactions with $(\text{NH}_2)_2\text{CO}$ (F1) and bio-oil with NH_4OH plus biochar (F2), both mixtures were reacted until powder formation [1]. The hypocotyls growth in maize seedling were monitored in mixtures of sandy and fertilizer additions equivalent to 1.2, 2.4, 4.0, 8.0, 16.0, 24.0, 32.0 e 40.0 t ha⁻¹, plus a treatment with sandy by itself.

Results and Discussions

Both fertilizers F1 and F2 are rich in N and K, Table 1.

Table 1. Elementary analysis of fertilizers F1 and F2

Elementos	F1 (g kg ⁻¹)	F2 (g kg ⁻¹)
Nitrogen (N)	96,1	27,8
Phosphorus (P)	0,01	0,09
Potassium (K)	66,6	720,0

The fertilizers were distinctly different from each other in their ability to growth maize ($p > 0.05$). The F2 had the greatest physiological development for maize seedlings. The best performance in seedling growth was 2.5 g kg⁻¹ rate (equivalent to 4 t ha⁻¹), supplying 111 kg ha⁻¹ of nitrogen and 2880 kg ha⁻¹ of potassium to the plants, both above the recommended level for corn crop, it does not cause damage to plant development, since the

F2 release N and K slowly to the soil solution. Although doses above 4 t ha⁻¹ showed a depressing effect on seedlings development, Figure 1.

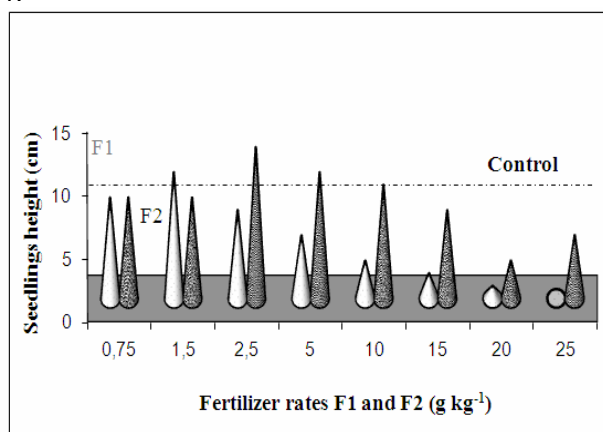


Figure 1. Fertilizers F1 and F2 responses on maize seedlings growth.

The F1 had its better effect on 1.5 g kg⁻¹ doses (equivalent to 2.4 t ha⁻¹) providing levels of nitrogen and potassium, respectively 230 kg ha⁻¹ 159 kg ha⁻¹, both higher than the recommended for corn production. Higher doses presented negative effect on seedling development, it probably happened because the process of F1 formation provide a fast bioavailability N and K to soil solution, becoming toxic to the plant.

Conclusions

Both fertilizers are nitrogen and potassium sources for plant nutrition. However F2 presented better development for maize seedlings than fertilizer F1.

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¹ Bridgwater, A.V.; Meier, D.; Radlein, D. An overview of pyrolyses fast for biomass, *Organic Geomestry*, v.3, p.1479-1493, 2000.