

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

Fantinatti, JB<sup>a</sup>; Morales, MM<sup>a</sup>; Mesa-Perez, JM<sup>a</sup>; Rocha, JD<sup>b</sup>; Martins, RC<sup>a</sup>

<sup>a</sup> Bioware Ltda, Campinas-SP, Brazil; <sup>b</sup> Embrapa-Agroenergy, Brasilia-DF, Brazil

\*E-mail: jussara@bioware.com.br

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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  $\pm 500^{\circ}$  C, was submitted to thermochemical reactions with  $(\text{NH}_2)_2\text{CO}$  (F1) and bio-oil with  $\text{NH}_4\text{OH}$  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<sup>-1</sup>, plus a treatment with sandy by itself.

### Results and Discussions

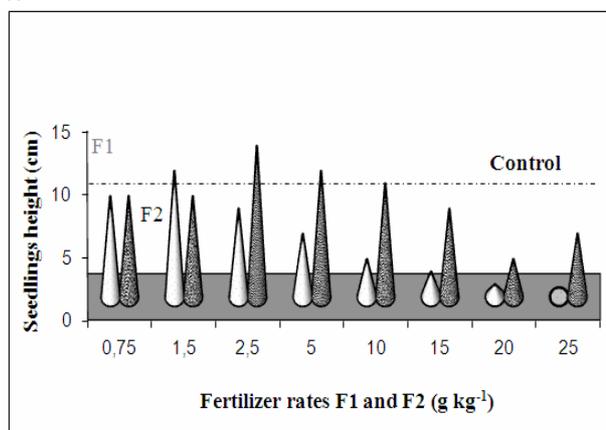
Both fertilizers F1 and F2 are rich in N and K, Table 1.

**Table 1.** Elementary analysis of fertilizers F1 and F2

| Elementos      | F1 (g kg <sup>-1</sup> ) | F2 (g kg <sup>-1</sup> ) |
|----------------|--------------------------|--------------------------|
| 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<sup>-1</sup> rate (equivalent to 4 t ha<sup>-1</sup>), supplying 111 kg ha<sup>-1</sup> of nitrogen and 2880 kg ha<sup>-1</sup> 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<sup>-1</sup> 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<sup>-1</sup> doses (equivalent to 2.4 t ha<sup>-1</sup>) providing levels of nitrogen and potassium, respectively 230 kg ha<sup>-1</sup> 159 kg ha<sup>-1</sup>, 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.

### Acknowledgements

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