

## Effects of rice husk biochar application and high moisture condition on decomposition of organic matter (hairy vetch) and the nitrogen cycle in volcanic ash soil

### もみ殻くん炭施用と土壌水分量が黒ボク土における有機物(ヘアリーベッチ)分解とその窒素循環に及ぼす影響

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#### 1. Introduction

Legumes, including hairy vetch (*Vicia villosa* Roth spp. *dasycarpa.*, HV), are widely used as green manures. The decomposition rate was likely to be changed by soil condition and amendments. On one hand, rice husk biochar is widely used as a soil conditioner. To understand the decomposition of HV in soils and the influence of biochar on the process, the fate of organic-N has to be known. To achieve this, high-performance size exclusion chromatography and chemiluminescent nitrogen detection (HPSEC-CLND) has been used because this can separate soluble organic-N into different molecular sizes.

#### 2. Materials and methods

HV was dried, finely cut (< 1 cm length) and applied on the soil surface with and without rice husk biochar (5 wt%). The cores were received one of the eight treatments (with/without biochar × with/without HV × two moisture condition (approximately 52–87 wt%)) with three replicates. The cores were destructively sampled at day 3, 11, 8 and 28 after the HV application, extracted by KCl solution for measurement of inorganic-N ( $\text{NH}_4^+\text{-N}$  and  $\text{NO}_3^-\text{-N}$ ) and by hot-water for the measurement of organic-N.  $\text{N}_2\text{O}$  fluxes were also measured. The correlation of high, middle and low molecular size organic-N with  $\text{NH}_4^+\text{-N}$  and  $\text{NO}_3^-\text{-N}$  were conducted.

#### 3. Results and discussion

Overall, biochar application speeded up the decomposition processes of HV but only at higher soil moisture treatment. Higher molecular sized organic-N increased throughout the experiment without biochar despite the low/high soil moisture. However, with biochar, higher molecular sized organic-N decreased after peaking at day 11. These results suggested that the decomposition of HV to high molecular sized organic-N was slower than the mineralization of the high molecular sized organic-N in high moisture soils with biochar. Additionally, in the high moisture soils with biochar, nitrate also depleted towards the end of incubation period. The cumulative  $\text{N}_2\text{O}$  was significantly higher in the high moisture soil than low moisture soil with biochar but the effect of soil moisture was not observed without biochar. These suggested that overall HV decomposition process became markedly moisture sensitive with biochar and possibly denitrification is playing a role to cause the changes in the moisture sensitivity although further studies are needed.

#### 4. Conclusion

The biochar application increased moisture sensitivity on the soil org-N cycle. The decomposition rates to org-N might be increased by biochar application as well as the mineralization rate or the soluble organic-N.