Can the Agronomic Efficiency of Biochar Based Urea Fertilizers Applied in Maize Cultivation be Improved by Incorporating Urease Inhibitors?

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Urea (U) has less than 50% of Nitrogen (N) Use Efficiency (NUE) in most Maize (*Zea mays)* growing environments. Unutilized N in U can be lost to environment as reactive N causing number of environmental issues. This research was conducted to develop a new enhanced efficiency N fertilizer using U, a urease inhibitor (Limus®) and rice husk biochar (BC). Urea and Limus® (I) were intercalated into BC and pelletized to produce the novel fertilizer (EEU-I). Effect of EEU-I on changes in pore water NO_3^--N and NH_4^+ - N contents with time in an Alfisol was studied in leaching column experiment. Three treatments with same N rates: U, efficiency enhanced urea fertilizer without inhibitors (EEU), and U+I was used with no N (0U) control treatment. A field experiment was conducted with Maize plants using 0%, 50%, 75% and 100% of recommended N as U (0U, 50U, 75U and 100U, respectively), 50% and 75% N as EEU-I (50EEU-I and 75EEU-I, respectively), and 75% N as EEU (75EEU). In the leaching column experiment, rate of NH_4^+-N release during 20 to 30 days after incubation was significantly higher in EEU-I, suggesting better slow-release properties. In the field experiment, SPAD meter readings at V12 stage in EEU treatments were statistically not different ($P>0.05$) from 100U. But at R1 stage 50EEU-I resulted significantly lower ($P<0.1$) SPAD meter reading than that of 100U while other EEU treatments were not statistically different ($P>0.1$) from 100U. Yield and dry matter contents were not statistically different ($P>0.1$) among N added treatments. While agronomic efficiency was significantly high in 50% N added treatments, there was no significant difference between the novel EEU-I and U or EEU. Results suggest that there is no added advantage from incorporating Limus® under the experimental conditions used in this study.

Keywords: Agronomic Efficiency, Maize, Nitrogen Dynamics, Efficiency Enhanced Fertilizer, Urease Inhibitors

We acknowledge Dimo Agribusiness for their immense support for the field experiment.