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### **Ammonia volatilization from nitrogen fertilizer formulated with biochar**

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Ammonia (NH<sub>3</sub>) volatilization results in low N use efficiency by crops. The aim of this study were to evaluate NH<sub>3</sub> volatilization from nitrogen fertilizer formulated (F) with biochar (BC). In a incubation experiment the fertilizers were applied to soil surface. NH<sub>3</sub> volatilized was captured by H<sub>2</sub>SO<sub>4</sub> solution. BC used in the production of fertilizers is from eucalyptus (charcoal fines). Two types of formulated fertilizers were tested: granulated (F6 and F8; mixture of BC, urea and additives) and coated granulated fertilizers (F17 and F19; coating of urea granule with BC, acidified or not, and additives). Treatments tested were: 1) blank; 2) control; 3) soil + urea; 4) soil + F6 (10% N, 51% BC); 5) soil + F8 (20% N, 29% BC); 6) soil + F17 (20% N, 29% BC) and 7) soil + F19 (32% N, 20% BC). Granulated fertilizers (F6 and F8) and F17 coated fertilizer volatilized lower amounts of NH<sub>3</sub> than urea, indicating greater efficiency when applied to the surface. In the case of F17, where the BC was previously acidified prior covering urea granule, acidification must have influenced the reduction of NH<sub>3</sub> losses. In total urea volatilized 71% of N applied while F6 and F8 showed losses of 60% and 66%, respectively. F8 was produced with 20% N and 29% BC, while F6 with the lowest NH<sub>3</sub> loss had 10% N and 51% BC. Proportion of BC in the fertilizer and the BC/N ratio appear as important in reducing N loss by NH<sub>3</sub> volatilization. F19 showed worse performance than urea, volatilizing 80% of the applied N. However, F17 which was coated with previously acidified BC, presented lower volatilization (64%) compared to F19 and urea. In the equations of first-order chemical kinetics model describing the urea NH<sub>3</sub> volatilization process of BC granulated and BC-coated fertilizers, it was found that the lowest N<sub>0</sub> values (indicates the stabilization value of the volatilization process) belong to F6 and F8 (@64%), 12% lower than urea (N<sub>0</sub>=73%). It was observed that the highest value of N<sub>0</sub> was of F19 (84%), confirming the BC alkalinity effect (pH@ 7.7) favoring N losses when fertilizer production technology was the coating of urea granule with BC without prior acidification. F6 and F8 tested in this study demonstrated potential to be applied in top dressing fertilization, due to lower volatilization rates, providing lower risk of N losses due to volatilization of NH<sub>3</sub>. Granulated F6 and coated F17 provided reductions between 10 and 15% for NH<sub>3</sub> losses compared to urea.

**Keywords:** N losses, increased efficiency, NH<sub>3</sub>, mitigation

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