

Agronomic and economic efficiency of urea + NBPT in corn cultivated in the Brazilian Cerrado

Authors: Douglas Ramos Guelfi Silva¹; Luiz Roberto Guimarães Guilherme^{1*}; Fabrício William Ávila¹; Valdemar Faquin¹.

¹Universidade Federal de Lavras, Departamento de Ciência do Solo.

**Potential Speaker.*

Introduction

Maize (*Zea mays* L.) is one of the most important foods in human and animal diets, playing an important role in the economy and social development. The most used nitrogen (N) fertilizer in Brazil is urea [CO(NH₂)₂], in spite of the high loss rates through volatilization that occur with its application in the soil surface. When applied in the soil, is transformed into ammonia (NH₃) through the action of the enzyme urease. As such, when the urea is applied without incorporation in the soil, high N losses to the atmosphere occur in the form of ammonia (NH₃). Although, there are substances with urease inhibitory properties. One of them is N-(*n*-butyl) thiophosphoric triamide (NBPT) that can be mixed with the urea in the fertilizer industry (Keerthisinghe & Blakeley, 1995; Cantarella et al., 2008). The present study aimed to evaluate the effect of different levels of common urea and NBPT-treated urea on the productivity and efficiency of the N fertilization in maize correlated with simple economical analysis.

Material and Methods

The study was conducted in the Brazilian Cerrado. The experiment field design was in complete randomized blocks with six replications, in a 2 x 4 factorial outline, consisting of two N sources (common urea and NBPT-treated urea) and four levels of N as top dressing (60, 120, 180 and 240 kg ha⁻¹). The experimental area was divided in six blocks. Eight parcels per block were randomly distributed and made up of five-meters per five-meters long rows, the useful area having three central rows, eliminating the two lateral rows and 0.50 m at each extremity.

In sowing of the maize hybrid AG 3051, was improved the fertilization as basal dressing. Thirty days after sowing, the treatments were applied, consisting of N levels (60, 120, 180 and 240 kg ha⁻¹) and N sources (common urea and urea treated with 530 mg kg⁻¹ NBPT), placing the fertilizers 10 cm from the sowing line.

After harvest, the productivity of harvested grains was evaluated, corrected for t ha⁻¹, with adjustment for the ideal stand of 55,000 plants ha⁻¹. Based on the average grain productivity in each treatment, the proportionate productivity increase was calculated in relation to the application of common urea in the N level of 60 kg ha⁻¹. Having the data on the N contents and productivity, the agronomic efficiency of the N fertilization was calculated according Fageria (1998).

The data were submitted to variance analyses according to the procedures of the SISVAR 4.3 software (Ferreira, 2003).

Results and Discussion

The interaction of source x applied N levels was significant for grain yield, with linear adjustment for the NBPT-treated urea and quadratic adjustment for the common urea (Figure 1). The grain yield increased with increase in the applied N levels. Until the applied N level of 116.08 kg ha⁻¹, the highest productivity occurred with the use of the common urea. On the other hand, at higher applied N levels the NBPT-treated urea provided higher grain yield.

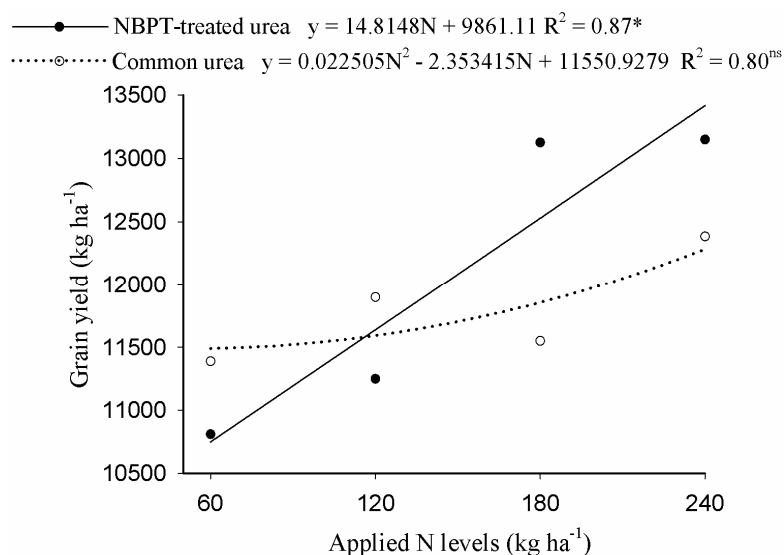


Figure 1. Grain yield fertilized with different levels of common urea and NBPT-treated urea.

The agronomic efficiency was used to demonstrate the amount of grain produced by unit (kg) of applied nutrient, showing significant effect of the interaction between sources x applied N levels. The agronomic efficiency was higher at the lowest applied N levels, in both sources of N used (Table 1). For common urea at the applied N level of 120 kg ha⁻¹ it presented higher agronomic efficiency in relation to the other applied N levels, while, for the NBPT-treated urea, the highest agronomic efficiency occurred at the applied N levels of 120 and 180 kg ha⁻¹. Thus, at the applied N level of 180 kg ha⁻¹, the NBPT-treated urea presented higher agronomic efficiency in relation to the common urea. At the lowest applied N level (120 kg ha⁻¹) the N sources did not have significant effect due to the poor N status in the plant, while at the highest applied N level (240 kg ha⁻¹), probably the high availability of the nutrient did not allow that there were significant differences among the N sources.

Table 1. Agronomic efficiency of the N fertilization in maize fertilized with different levels of common urea and NBPT-treated urea.

Applied N levels (kg ha ⁻¹)	Agronomic efficiency	
	NBPT-treated urea	Common urea
120	19.0 aA	20.8 aA
180	21.3 aA	12.0 bB
240	11.6 bA	12.4 bA

Means followed by the same lowercase letters in columns and capital letters in rows did not differ from each other (Tukey, 5% of probability).

Conclusions

Nitrogen as top dressing positively influences the nutritional and productive performance in maize. The agronomic efficiency of the nitrogen fertilization decreased at high applied nitrogen levels in maize.

References

CANTARELLA, H.; TRIVELIN, P.C.O.; CONTIN, T.L.M.; DIAS, F.L.F.; ROSSETTO, R.; MARCELINO, R.; COIMBRA, R.B.; QUAGGIO, J.A. Ammonia volatilisation from urease inhibitor-treated urea applied to sugarcane trash blankets. *Scientia Agricola*, Piracicaba, v.65, n.4, p.397-401, July/Aug. 2008.

FAGERIA, N.K. Otimização da eficiência nutricional na produção das culturas. *Revista Brasileira de Engenharia Agrícola e Ambiental*, Campina Grande, v.2, n.1, p.6-16, jan./abr. 1998.

FERREIRA, D.F. *Sisvar* versão 4.2. Lavras: UFLA, 2003.

KEERTHISINGHE, D.G.; BLAKELEY, R.L. Inhibition of jack bean urease by phosphoric- and thiophosphoric triamides. *Soil Biology and Biochemistry*, Elmsford, v.27, n.6, p.739-742, June 1995.