Production of forage by corn hybrid BM 3066 in function of magnesium doses

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Introduction The mineral nutrition influences the corn metabolism, reflecting in the tillage's productivity and in the silage's quality. Several physiological processes are affected by the magnesium, including the ionic absorption, the photosynthesis, the respiration, the storage and the energy transfer, the organic synthesis, the electrolyte balance and the ribosome stability. Therefore, this study aimed to evaluate the nutritional status of maize plants, the production and the quality of the forage of corn hybrid BM 3066 PRO2, for the silage, in function of magnesium doses.

Material and Methods This study was conducted at a dairy farm located in the municipality of Mercês, Zona da Mata of the Minas Gerais state, from October 2016 to March 2017, medium texture soil. The experimental design was a randomized block with four replicates. Each plot was constituted of five furrows of six meters in length, spaced out by 0,7 m. The treatments were four doses of Mg: 30; 60; 90 and 120 kg per hectare, plus a control treatment. Prior to the implantation of the study soil samples were collected in the layers of zero to 20 and 20 to 40 cm. The bases saturation in the layer from zero to 20 cm was 59%, being 46% in the layer from 20 to 40 cm. The P and K contents in the soil in the layer from zero to 20 cm were, respectively, of 8 and 51 mg dm^{-3}, considered as average. In the 0 to 20 cm depth profile no exchangeable aluminum was detected. In the 0 to 20 and 20 to 40 cm layers the magnesium contents were 0.50 and 0.22 cmolc dm^{-3}, respectively. In the first week of October the soil was plowed and barred. Three days later it was done the sowing of the corn hybrid BM 3066 PRO2. In the fertilization of the planting it was used the fertilizer 10-30-10 at a dose of 450 kg per hectare. Ten days after sowing the corn, the interweave was grooved and magnesium was applied, using as a source of Mg the magnesium oxide. For the weed control, after the maize emergence, it were used glyphosate and atrazine at a dose of 3.0 liters of the commercial product of each herbicide. In the phenological stage of three pairs of leaves it was performed the fertilization in cover using 1,000 kg of fertilizer 20-00-20 per hectare. The fertilizer was buried in the interweave of the corn to avoid possible losses by volatilization. In the phase of the female inflorescence emission it was evaluated the nutritional state of the plants, following methods described by Raij (2011), being sampled in the three central lines of the plot. When the aerial biomass of the plants showed an average of 33% of dry matter, it was evaluated the height of the plants, the height of spike insertion and, also, the production of crop fodder, being sampled in the three central rows of each plot, disregarding one meter in each head of the plot. The corn was cut about 20 cm above the ground and the vegetable material was weighed and passed in through a forage cutter. Subsample of the material were oven dried and analyzed for mineral nutrient, protein and carbohydrate contents.

Results and Discussion The fertilization with magnesium oxide did not influence the nutritional status of plants. With the exception of the copper and manganese contents, which had coefficient of variation, respectively, 15.18 and 13.63%, for all other nutrients the coefficients of variation were lower than 10%. The figure 1 shows average values of macro and micronutrient foliar contents of the hybrid BM 3066 PRO2, compared to the minimum and maximum levels by Raij (2011). By the analysis of the figure 1, it can be observed that the leaf concentrations were in suitable ranges for all the nutrients. The average value content of the magnesium foliar was 1,93g per kg of dry matter of foliar limb, exceeding by 30% the minimum content considered by Raij (2011), which is 1.50 g kg^{-1} of matter dry.

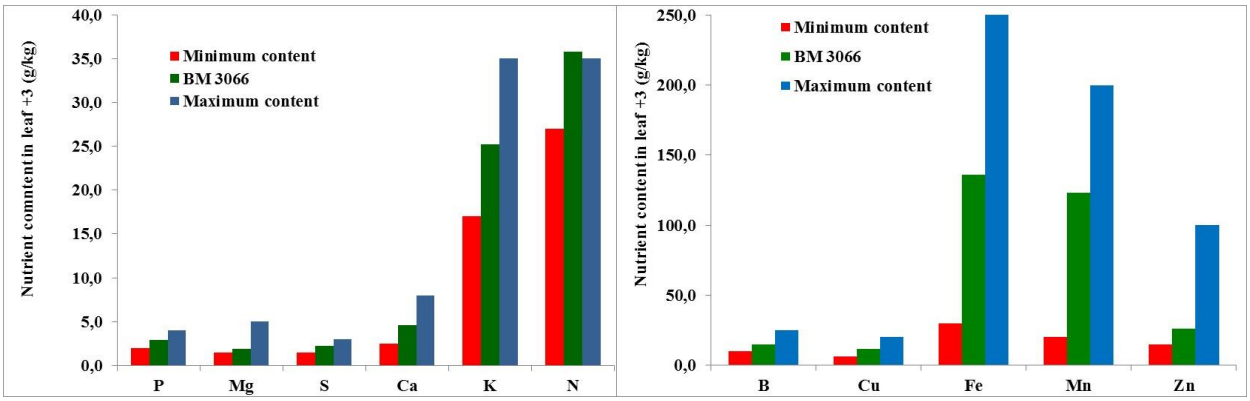

Figure 1 Mean values of macro and micronutrient foliar contents compared to the minimum and maximum levels reported in the national literature.

The production of forage and the contents of crude protein, P, Ca, Mg and sulfur in this biomass were also not influenced by the fertilization with magnesium oxide. The aerial biomass productivity of BM 3066 PRO2 was 59.5 t of natural matter ha^{-1}, with an average content of dry matter of 33.2%. The tillage was very uniform and the coefficient of variation for aerial biomass productivity was 8.61%. The average values of the content of crude protein in the dry matter of forage were 7.76%. Thus, the average accumulation of protein in the aerial biomass of the BM 3066 PRO2 was 1,533 kg ha^{-1}. For the contents of P, K, Ca, Mg and S, in g per kg of dry matter in the biomass, it was obteined, respectively, 1,80; 9,88; 1,55; 1,28 and 1,20. Thus, the average nutrient removal by corn harvest was 245; 36; 195; 31; 25 and 24 kg ha^{-1} of N, P, K, Ca, Mg and S. The structural carbohydrates were also not influenced by the application of magnesium oxide. The average percentages of acid detergent insoluble fiber and neutral detergent insoluble fiber were respectively 47.36 and 23.4%. For the average height of the plant and the spike insertion, values of 263 cm and 145 cm were obtained.

Conclusions The application of magnesium oxide, in the interweaving of corn, in soil with 0.50 $cmol_c\ dm^{-3}$ did not influence the nutritional status of the plants and the production and quality of the forage. The absence of response was not due to experimental variability, since the coefficient of variation of almost all analyzed variables was less than 10%.

References

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