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Doses of organomineral fertilizer in soybean

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Abstract. Organomineral fertilizers are the mixture of an organic fertilizer with an industrialized mineral fertilizer, they are fertilizers that activate the soil microbiota, provide nutrients and help retain moisture in the soil. The experiment was implemented at Confiança I farm, in the city of Sorriso-MT. The objective of the work was to evaluate the productive performance of soybean when submitted to different doses of the organomineral fertilizer Green Factor® in the presence or not of the organomineral fertilizer PT4-O® in the dose 250 ml ha-1. The experimental design used was a randomized block design (DBC) in a 2x5 factorial scheme with 4 replications. The first factor was the presence or absence of "PT4-O®", and the second factor is the different doses of Green Factor® (0, 1, 2, 4 and 6 L ha-1). First, half of the seeds were treated with the product "PT4-O®", starting from the recommended dose, while the other half did not receive any dose. Subsequently, soybean seeds were sown. At 25 days after emergence, doses of the product "Green Factor®" were applied to the plants. The parameters were quantified: leaf area, number of leaves, dry mass of the aerial part and grain yield. The data were submitted to statistical analysis, using the statistical software "Sisvar®". Through the obtained data, it was observed that: for all the evaluated characteristics in which there was interaction between the factors, the presence of PT4-O® when associated with the dose of 6 liters per hectare of Green Factor®, showed the highest values for the evaluated characteristics.
Keywords: Organomineral fertilizers, PT4-O®, Green Factor®, Productivity.

Introduction

One way to increase soybean productivity is by providing adequate mineral nutrition in plants. Soy is considered a crop that has a high nutritional demand and is also considered efficient in using and absorbing the nutrients contained in the soil, mainly nitrogen, phosphorus, potassium, magnesium and sulfur (SILVA et al., 2017).

Nitrogen (N) is the macronutrient most required by the crop, which can be absorbed in the form of ammonium (NH4 +) or predominantly, in the form of nitrate (NO3-). It is estimated that to produce 100 kg of grains, it is necessary to apply approximately 8 kg of N. In the plant, 90% of N is in organic form, as free amino acids, proteins, nucleotides, amines, purines, coenzymes, among others (SFREDO; BORKERT, 2004).

The decomposition of organic matter, nitrogen fertilizers and biological fixation (the main source of N for the crop), are the sources capable of making N available for the soybean crop (DOMINGOS et al., 2015).

The N reservoir in organic matter is not infinite, that is, it can be depleted. In addition, due to the temperature and humidity conditions of Brazilian soils, the decomposition of organic matter can be accelerated, consequently leading to losses of large amounts of N. In its deficiency, a generalized, uniform chlorosis of the older leaves occurs, followed by necrosis and may cause low levels of protein in the grains (SFREDO; BORKERT, 2004).

Nitrogen fertilizers are assimilated more quickly by plants, however the cost is higher. One of the problems with the use of nitrogen fertilizers is their low efficiency in plants, which rarely exceeds 50% will be lost through leaching, denitrification, volatization processes, among others. So, to provide the necessary amount of N for the crop, we will need to apply a double amount of N (if the efficiency is 50%), which will result in a high cost. These fertilizations should always be done following the recommendations of soil analysis, in order to maximize production. In view of this, the use of nutrients from mineral fertilizers, organic fertilizers or the mixture of these, organic mineral fertilizers, is essential (ALMEIDA JÚNIOR et al., 2016).

The organomineral fertilizer corresponds to a mixture of organic fertilizers of vegetable and / or animal origin with industrialized mineral fertilizers, being able to replace partially or totally the use of conventional fertilizer. It has numerous advantages such as the activation of the soil biota, supply of nutrients, moisture retention and, with the potential to improve the physical characteristics of the soil. In addition, their use can be considered innovative, since they can reduce production costs and generate savings (SILVA et al., 2006).

Green Factor® is a fertilizer produced from the grouping of multiple ions that form bonds with enzymes, through the amino acid sequence of the peptides, transforming inorganic matter into organic, with phosphorus, copper and organic carbon in its formulation (LBE, 2014). It activates in plants the ability to assimilate atmospheric nitrogen, through an enzymatic assimilation process, using metallic catalysts together with amino acids. In this way, without the need for symbiotic association with rhizobacteria, in any culture, by an active metabolic pathway the action of the enzyme nitrogenase, allowing the plant to supply itself with nitrogen, similar to legumes. (LBE, 2017). Its purpose is to replace 100% the supply of inorganic nitrogen. The plant starts to assimilate atmospheric nitrogen continuously and according to its needs. Thus obtaining a crop with high quality, which does not degrade the environment and with more sanity.

The objective of the work was to evaluate the productive performance of soybean when submitted to different doses of the organomineral fertilizer Green Factor® in the presence or not of the organomineral fertilizer PT4-O® in the dose 250 ml ha-1.

Methods

The experiment was carried out in the municipality of Sorriso - MT, in a commercial area of the Confiança I farm. Sowing was carried out on October 25, 2017, in a farm plot, with 21 soybean seeds per linear meter. The spacing used was 0.5 m between rows and the cultivar used was Desafio RR. The climate is of the Tropical Equatorial type, with well-defined dry and rainy seasons, with an average annual rainfall of 1883 mm enabling the cultivation of soybeans and their good development during the summer, where there is a greater volume of rainfall (SOUZA et al., 2013).

The experimental design used was a randomized block design (DBC) in a 2x5 factorial scheme, where the first factor is the presence or absence of “PT4-O”, and the second factor is the different doses of Green Factor (0, 1, 2, 4 and 6 liters per hectare). The experiment has 10 different treatments and 4 repetitions (blocks), totaling 40 plots, where the distribution of treatments in the field are shown in table 1. Each plot had 16 lines in the spacing of 0.5 m between lines and 15 m in length per line. For the evaluation of the characteristics, 2 lines of 5 m in length were considered as useful plot.

Before sowing, a seed treatment process was carried out, at a dose of 250 mL ha-1, with a product called “PT4-O®”, which has zinc, organic carbon and phosphorus in its composition and which has the function of activate the soil microbiota and favor the development of plant roots and radicles. Twenty-five days after planting, the doses of the product “Green Factor” were applied to the bottom of each plant, with the help of a backpack sprayer.

The 10 treatments applied in the experiment were:

Treatment 1 (Control 1): no dose of “Green Factor” and no dose of “PT4-O”.
Treatment 2: dose of 1 L ha-1 of “Green Factor”, but no dose of “PT4-O”.

Treatment 3: dose of 2L L ha-1 of “Green Factor”, but no dose of “PT4-O”.
Treatment 4: dose of 4 L ha-1 of “Green Factor”, according to the manufacturer's recommendations, but no dose of “PT4-O”.
Treatment 5: dose of 6 L ha-1 of“Green Factor”, but no dose of “PT4-O”.
Treatment 6 (Control 2): no dose of “Green Factor”, but a 250ml dose for seed treatment.
Treatment 7: dose of 1 L ha-1 of “Green Factor”, but 250ml dose in seed treatment.
Treatment 8: dose of 2 L ha-1 of “Green Factor”, but 250ml dose in seed treatment.
Treatment 9: dose of 4 L ha-1 of “Green Factor”, according to the manufacturer's recommendations, but 250ml dose in seed treatment.
Treatment 10: dose of 6 L ha-1 of “Green Factor”, but 250ml dose in seed treatment.

Weed control was performed with two applications of Crucial® at a dose of 2 L ha-1. In addition, cultural management was also adopted.

For pest control, two applications of Orthene 750 BR® were performed at a dose of 1 Kg ha-1, two applications of Nuprid 700 WG® at a dose of 0.1 L ha-1, an application of Exalt® at a dose of 0.1 L ha-1 and two applications of Tracer® at a dose of 0.06 L ha-1.

Disease control was performed with two applications of Aproach Prima® at a dose of 0.3 L ha-1, an application of Unizeb Gold® at a dose of 1.5 Kg ha-1, an application of Unizeb Glory® at a dose of 1.5 kg ha-1 and an application of Fox® in the dose of 0.4 L ha-1.

The harvest was carried out manually for each plot. To perform the threshing, a stationary trailing machine located at UFMT-SINOP was used. The samples were stored in raffia bags for further analysis.

The evaluated and quantified parameters of the experiment were: leaf area, number of leaves, shoot dry matter of the aerial part and grain productivity.

For the number of leaves, the average of 3 plants from the useful plot was obtained 40 days after emergence at the flowering stage, with the leaves (trefoil), which make up each plant, being counted.

After counting the number of leaves, they were highlighted to measure the leaf area, with the leaf area integrator Licor LI-3100 Area Meter, the result being expressed in cm² and converted to m².

The dry mass of the aerial part was obtained by drying 3 plants (taken in the field during the flowering phase) from the wet sample in an oven with forced circulation, for 48 hours at a temperature of 65º C.

For the quantification of grain productivity, the number of plants per hectare was estimated by calculating the plant population from the count of the number of plants in 5 linear meters of the portion of the useful area. The samples of each portion of the useful area passed through the stationary trailing machine, where there was a process of manual cleaning and weighing of the samples, for later calculation of productivity. Grain productivity was calculated at 13% of humidity, according of Brasil, 2009 with using the average mass of samples collected in 5 linear meters, where grain yield was converted into the unit of kg ha-1.

The data obtained were subjected to analysis of variance at the level of 5% probability by the F test, with the aid of the SISVAR® software (FERREIRA, 2011). For quantitative variables, the models were chosen based on the significance of the regression coefficients and using the “t” test and adopting the 5% level of determination probability as well as the R^2 value (SQRegression/ SQtreatments).

Results and Discussions

It is possible to verify, according to Figure 1, that for the leaf area there was an interaction of factors that was considered significant. The leaf area (m²) when evaluated at a dose of 0, 2 and 6 L ha-1 was greater in the presence of PT4-O® than in its absence. However, at doses of 1 and 4 L ha-1, the leaf area was superior in the absence of PT4-O®. The highest leaf area obtained, 2.2 m2, was in the dose of 6 L ha-1 of Green Factor® being in the presence of PT4-O®. For the number of leaves according to Figure 2, it is possible to verify the significant interaction between the factors under study. The number of leaves when evaluated at a dose of 2 and 6 L ha-1 was higher in the presence of PT4-O® than in its absence. However, at doses of 0, 1 and 4 L ha-1 the number of leaves was higher in the absence of PT4-O®. The highest number of leaves was 32 leaves and was obtained at a dose of 6 L ha-1 of Green Factor® being in the presence of PT4-O®.

For shoot dry matter for all studied doses associated with the use of PT4-O®, there were the highest values for the variable in relation to the non-use of PT4-O® (Figure 3). The highest values of dry matter of the aerial part in relation to the other doses of Green Factor®, were in the dose 2 L ha-1 associated or not with the use of PT4-O®.

When the grain productivity factor was analyzed, it was possible to verify, according to Figure 4, a significant interaction between the factors under study.

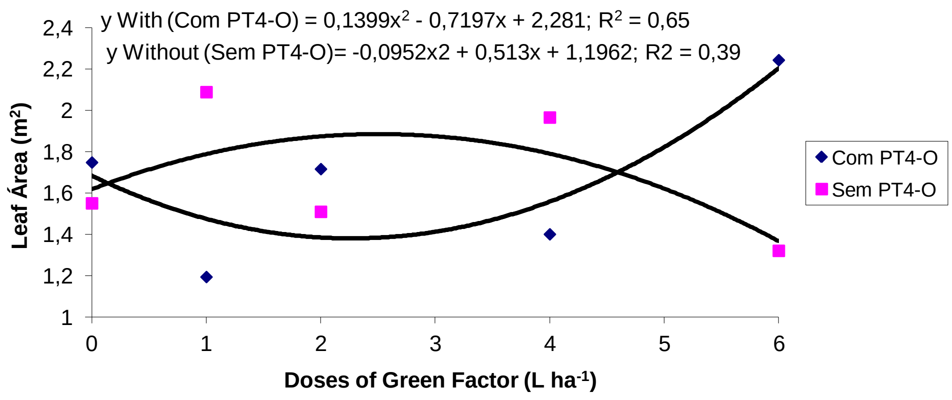

Figure 1. Leaf area breakdown according to the presence or absence of PT4-O®, associated with different doses of Green Factor®.

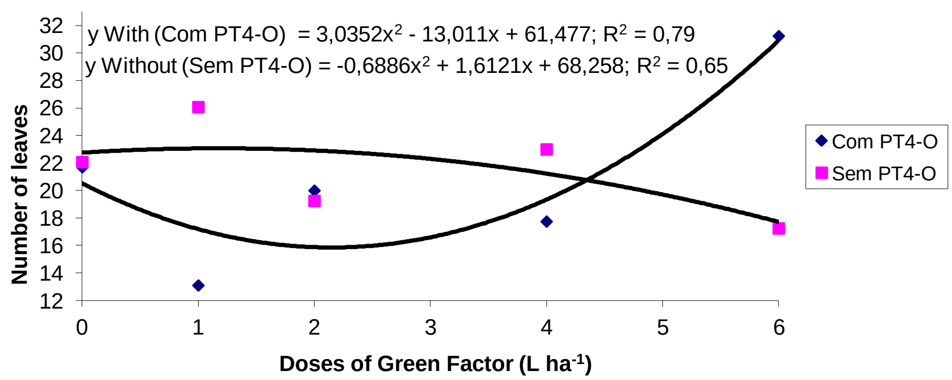

Figure 2. Breakdown of the number of leaves according to the presence or absence of PT4-O® associated with doses of Green Factor®.

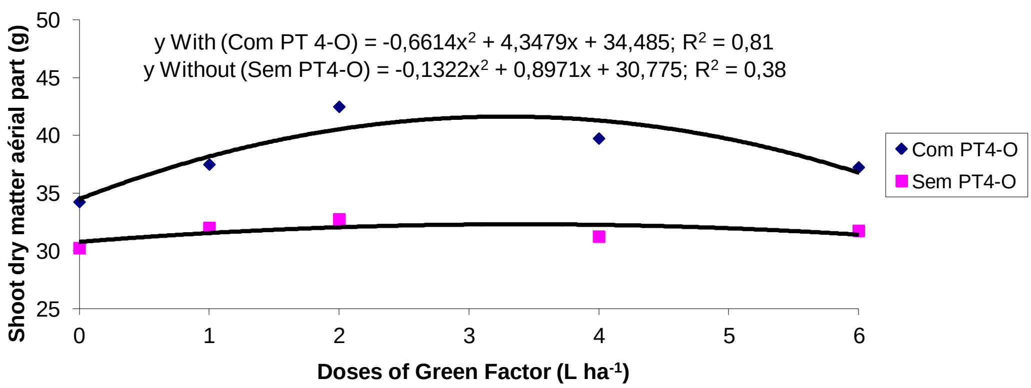

Figure 3. Dry mass of the aerial part according to the presence or absence of PT4-O® associated with doses of Green Factor®.

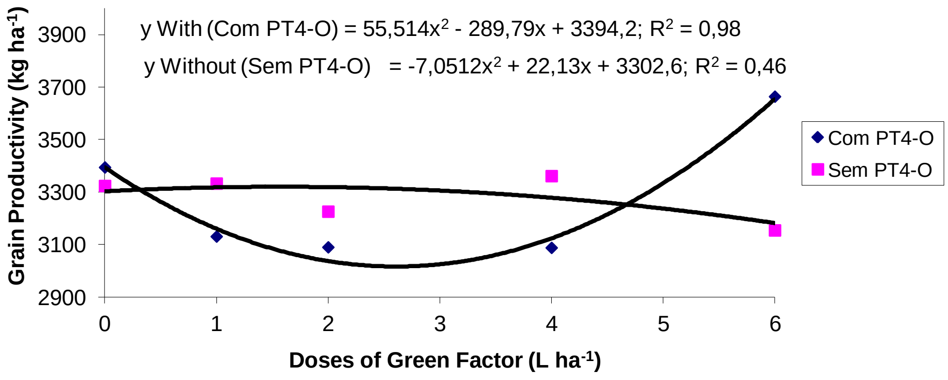

Figure 4. Breakdown of grain yield according to the presence or absence of PT4-O® associated with doses of Green Factor®.

The productivity when evaluated at the dose of 0 and 6 L ha-1 was higher in the presence of PT4-O® than in its absence. However, at doses of 1, 2 and 4 L ha-1, productivity was higher in the absence of PT4-O®. The highest productivity value was obtained at a dose of 6 L ha-1 of Green Factor®, approximately 3700 kg per hectare, being in the presence of PT4-O®.

In addition, the productivity obtained with the use of PT4-O® at a dose of 6 L ha-1 of Green Factor®, was 400 kg ha-1 higher than the control (without dose of Green Factor® and without treatment of seeds with PT4 -O®), totaling 6 bags more of soybean.

Conclusions

For all characteristics where there was interaction, the presence of PT4-O®, associated with the dose 6 L ha-1 showed the highest values for the evaluated characteristics.

The leaf area was shown to be larger in the presence of PT4-O® in 3 of the 5 doses used.

The number of leaves was higher in the presence of PT4-O® in 2 of the 5 doses used.

Productivity was higher in the presence of PT4-O® in 2 of the 5 doses used.

The dry mass of the aerial part was always superior when using seed treatment with PT4-O®, however, there was no significant interaction with the use of Green Factor®.

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