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Initial development of wheat under different nitrogen dosages in Chapecó – SC

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Abstract: The present project aimed to evaluate the initial development of wheat (*Triticum* spp.) under different nitrogen dosages. The experiment was carried out in the experimental area of the Fronteira Sul Federal University - *Campus* Chapecó. The experimental design was a randomized block (DBC) with four treatments and five replications, corresponding to 20 experimental units, each one being represented by a vessel. The treatments were: T1 - control (0,0 mg / dm³), T2 - 80,00 mg / dm³, T3 - 200,00 mg / dm³ and T4 - 400,00 mg / dm³ of nitrogen (source urea). Nitrogen fertilization was applied at 13 and 20 days after emergence - DAE. The variables analyzed were: number of leaves and tillers, plant height, fresh mass and shoot and root dry mass. The evaluation of the number of leaves and tillers, plant height and fresh shoot and root mass were performed at 51 DAE. From the values obtained for shoot and root dry mass the relation shoot/ root was obtained. Shoot and root dry mass were also determined with 51 DAE plants, after drying in an oven of 60°C. To measure the height of plants, a tape measure was used and precision balance were used to determine the masses. The addition of N significantly improved the root and shoot dry mass and the number of leaves and tillers. Therefore, it is an essential element for the development of the wheat crop. The best wheat performance, for the different response variables, occurred between the dosages of 230 to 400 mg dm³ of nitrogen.

Keywords: *Triticum* spp, nitrogen fertilization, plant growth.

Introduction

Considered a culture with millennial history, belonging to the grass family, wheat (*Triticum* spp.) is one of the most commonly used winter cereals for human consumption, mainly through bread making from the transformation of grains into flour. (Souza et al., 2013). In addition, its use is intended for animal feed, as well as part of the composition of non-food products such as drugs, cosmetics and alcohol (Borém & Scheeren, 2015).

The world production of wheat in the 2017/2018 harvest was 758.738 million tons, and Brazil contributed a small portion of 4,299.4 thousand tons in the 2017 harvest. Given this crop the country has much to improve, as it is a of the major importers of cereal (Conab 2018, USDA, 2018).

Cultural management during wheat cultivation is necessary to achieve desirable yield and grain quality. Nitrogen fertilization is an indispensable management, since Nitrogen (N) is involved in all metabolic processes of the plant and is the most absorbed nutrient during the

development of the species, presenting direct effects on the production (Borém & Scheeren, 2015).

Because the quality of wheat grains is related to the protein content contained in them, nitrogen exerts great importance due to its forming component; Along with the increase in protein levels, nitrogen can contribute positively to the gluten strength of the cereal, however, it is noteworthy that these increases are related to the genotype of the crop, the doses to be applied and the cultural successions adopted (Pinnow et al., 2013).

Nitrogen application should be based on the Fertilization and Liming Manual for each State, as the amount to be applied varies according to the percentage of soil organic matter, the previous crop and the expected yield (Reunião da Comissão Brasileira de Pesquisa de Trigo e Triticale, 2018). The indication is that the application of N is split, because the macronutrient bleaches easily, and undergoes changes during its cycle (Manual de Adubação e Calagem, 2016).

Given the worldwide importance of wheat, the present work aimed to evaluate the initial development of wheat plants under different nitrogen dosages.

Methods

The experiment was carried out in the experimental area of the Federal University of Fronteira Sul - Chapecó campus from August 15 to October 25, 2018. For the development of the experiment, the wheat seeds, cultivar ORS Vintecinco, were sown in plastic pots with capacity for 8 dm³ of soil, which was collected in the Experimental Area. The soil of the Experimental Area is classified as Dystrophic Nitosol; the soil in question was previously analyzed and had the following chemical characteristics: pH (water): 5.3; P: 5.9 mg dm⁻³; K: 92 mg dm⁻³; Ca: 5 cmolc dm⁻³; Mg: 1.5 cmolc dm⁻³; Al: 1.2 cmolc dm⁻³; CTC: 11.92 cmolc dm⁻³; base saturation: 56.50%; Organic matter: 3.9%. The climate of the region is Cfa type, according to the Köppen classification, being characterized as subtropical, mesothermal, humid and with hot summer, with annual average temperature of 18-19°C (Collaço, 2003).

The experimental design used was randomized blocks (DBC) with four treatments and five replications, corresponding to 20 experimental units (eu); each eu was represented by a vase. The treatments were: T0 - control (0.0 mg / dm⁻³), T1 (80.00 mg / dm⁻³), T2 (200.00 mg / dm⁻³) and T3 (400.00 mg / dm⁻³) of nitrogen (urea source). Nitrogen fertilization was equally split twice at 13 and 20 days after seedling emergence (DAE) 30 days ago. and 06 set, respectively.

For soil preparation, phosphorus and potassium fertilization was performed using 476 mg / dm⁻³ and 250 mg / dm⁻³, respectively, in each pot. In each experimental unit, 35 wheat seeds were sown. After culture establishment, thinning was performed, leaving only eight plants per pot, which were evaluated.

The response variables analyzed were: number of leaves and tillers, plant height, fresh mass (MF) and dry mass (MS) of shoot and root. The number of leaves and tillers, plant height and fresh shoot and root mass were evaluated at 51 DAE. From the values obtained for shoot and root DM, the shoot / root ratio was obtained. The shoot and root dry mass were also determined with 51 DAE plants, after drying in an oven with forced air circulation at 65°C for 72 hours. To measure plant height, a tape measure was used and to determine the mass, precision scales of three decimal places were used.

The collected data were submitted to analysis of variance and when they presented significant difference they were submitted to the Regression test at 5% probability, with the aid of the SISVAR version 5.6 statistical program (Ferreira, 2011).

Results and discussion

Significant difference was observed in all response variables (Figures 1 to 5), except for the plant height variable (Table 1). The same occurred in the experiment conducted by Orso et al. (2014) who concluded that nitrogen addition did not reflect height gains in wheat crop.

Table 1. Average height values of Wheat plants, at 51 DAE, submitted to different nitrogen dosages.

Nitrogen mg dm ⁻³	Height (cm)ns
0	34,25
80	38,68
200	39,47
400	39,58
CV (%) = 13,22	
ns Not significant	

For the variable number of leaves, there was a significant response as a function of the nitrogen fertilization levels used (Figure 1); It was observed that the highest responses for this variable occurred between the dosages of 200 and 400 mg dm⁻³, with the 289.5 mg dm⁻³ dosage expressing the highest efficiency.

Divergences between the data obtained by Souza et al. (2013) and the data from this experiment can be explained by the fact that the projects were conducted in completely different locations in several aspects (photoperiod, temperature, precipitation, soil, etc.), however, with both data it is concluded that the addition Nitrogen yield increases the number of leaves, and the optimal dosage varies as to location and cultivar.

As the number of leaves, the number of tillers was influenced by the nitrogen dosage (Figure 1B). The best values for wheat tillering at 230 mg dm⁻³ were observed. Similar data were observed by Souza et al. (2013) who observed higher tillering of wheat plants with the dose of 193.13 mg dm⁻³ at 47 DAE. However, as highlighted by Valério et al. (2009), not necessarily the largest number of tillers represents a linear increase of grain yield, due to not all emitted tillers being productive.

Orso et al. (2014) did not observe an increase in the number of tillers with N fertilization under cover, justifying the fact that this characteristic is directly linked to the number of plants per area. However, the size of the experimental unit used and the number of plants are ideal for wheat cultivation. What we have different from field planting is the arrangement of the plants within the pot, which were randomly distributed. Another point to be considered about the Orso et al. (2014) was the same as having been performed in the field while this experiment and that of Souza et al. (2013) were conducted in pots.

In addition to the points mentioned above, the cultivars used in the experiments are completely different. According to a study by Fioreze (2011) wheat cultivars differ substantially in their tiller

emission capacity, plant architecture, cycle and yield potential. This directly interferes with the plant's ability to use (absorb, assimilate and convert) nitrogen, ultimately reflecting grain production.

Martuscello et al. (2006) observed when evaluating cv. Massai (*Panicum maximum* x *Panicum infestum*), from the Poaceae family (same family of wheat), submitted to four nitrogen doses, which had up to 61% increase in the number of tillers in the maximum dose of 120 mg dm⁻³, in relation to plants that did not receive nitrogen fertilization. For Milton Ramos (1973) tillering is the period in which nitrogen is very important for determining the number of tillers per plant and, consequently, for the number of ears per plant and grains per wheat ear stadium.

The shoot (MFPA) and root (MFR) fresh matter production of wheat plants were also influenced by nitrogen dosage (Figure 1C); For

MFPA the best dose was 304 mg dm⁻³; already for MFR was 321.27 mg dm⁻³.

As for the other variables, the shoot dry mass (MSPA) and root dry mass (MSR) production increased according to nitrogen dosages, with maximum yield at 270 mg dm⁻³ and 400 mg dm⁻³, respectively. Souza et al. (2013) also obtained increase in shoot and root dry mass with the addition of nitrogen (165 mg dm⁻³ and 54.44 mg dm⁻³, respectively).

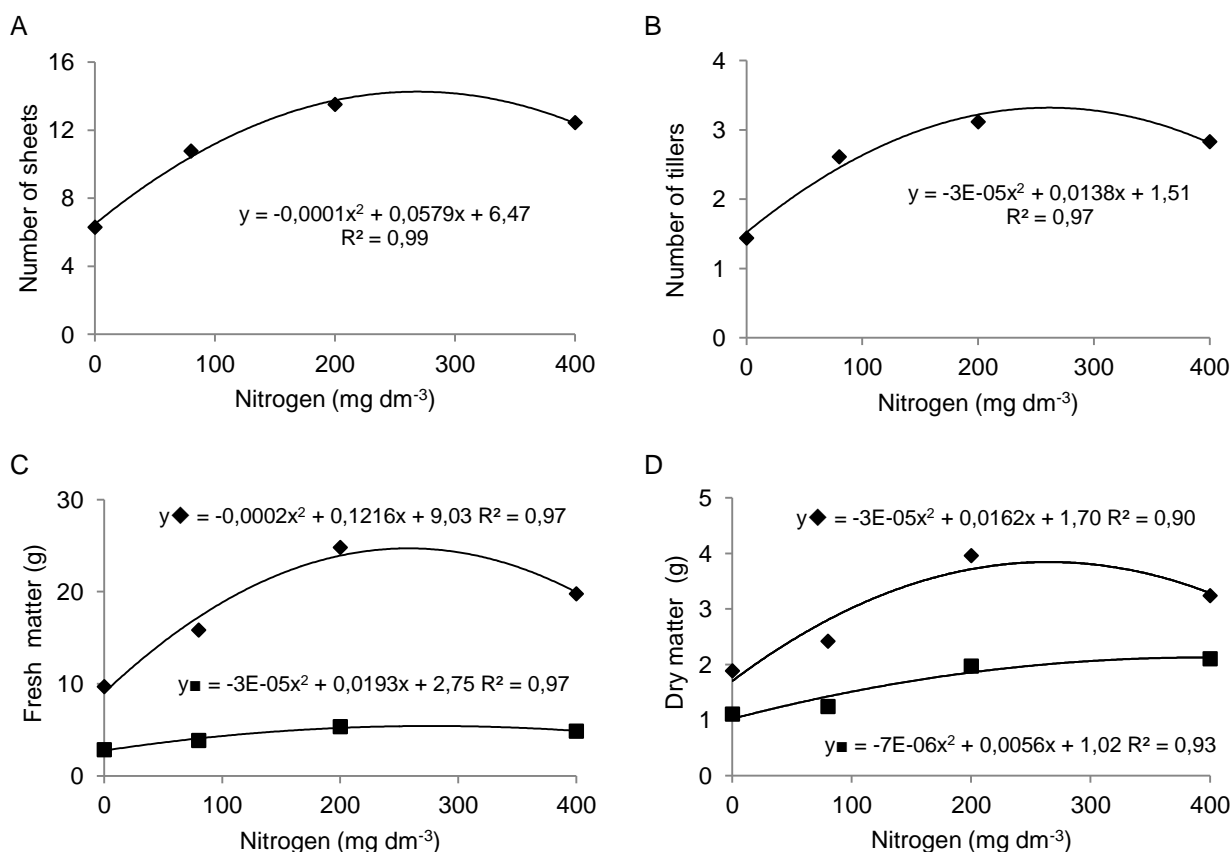


Figure 1. Average values of number of leaves (A), number of tillers (B), fresh (C) and dry (D) mass of shoots (◆) and roots (■) of wheat plants submitted to different nitrogen doses.

The lack of other works in wheat crop with different nitrogen dosages makes it difficult to take a deeper approach to the subject, but there are works with other species, such as *Brachiaria decumbens*, for example; Silveira et al. (2011) also observed increases in root dry mass with increases in N addition.

Regarding the ratio of dry weight of shoots (MSPA) and roots (MSR) of wheat plants, values from 1.70 to 2.00 were observed, and the highest proportion of MSPA corresponds to 175 mg dm⁻³ of nitrogen. In the study by Souza et al. (2013) MSPA / MSR ratio ranged from 0.91 to 2.05, with the highest proportion of MSPA in soil with high N availability.

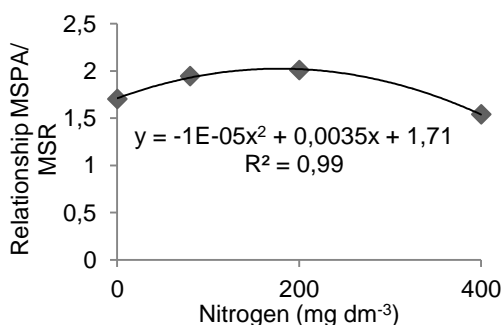


Figure 2. Relationship between dry matter of shoots (MSPA) and roots (MSR) of wheat plants, with 51 DAE, as a function of nitrogen doses.

Conclusion

Nitrogen addition significantly improved leaf and tiller number and root and shoot dry mass. In all variables, there is a maximum point of nutrient efficiency and, from that point, there was a decrease in plant response, except for root MS which had the highest accumulation in the highest dosage.

The best performance of wheat plants at 51 DAE, for the different response variables, occurred between the doses of 230 to 400 mg dm³ of nitrogen.

References

BORÉM, A., SCHEEREN, P. L. . Trigo: do plantio à colheita. Viçosa: Universidade Federal de Viçosa, 260 p., 2015.

COLLAÇO, M. . Caracterização Regional. Secretaria de Estado e Desenvolvimento Regional - SDR. Chapecó: Instituto Cepa/SC, mai. 2003.

COMPANHIA NACIONAL DE ABASTECIMENTO. Acompanhamento da safra brasileira de grãos. Brasília: Conab, v. 5, SAFRA 2017/18, n. 10, p. 1-178, jul. 2018.

FIGUEIREDO, S. L. . Comportamento produtivo do trigo em função da densidade de semeadura e da aplicação de reguladores vegetais 2011. 86f. Dissertação (Mestrado em Ciências Agrônomicas) - Unesp - Campus de Botucatu, Botucatu, 2011.

Manual de Calagem e Adubação para os Estados de Rio Grande do Sul e Santa Catarina/ Sociedade Brasileira de Ciência do Solo – Núcleo Regional Sul.

Comissão de Química e Fertilidade do Solo – RS/SC, 376 p. 2016.

MARTUSCELLO, J. A. et al. Características morfogênicas e estruturais de capim-massai submetido a adubação nitrogenada e desfolhação. Revista Brasileira Zootecnia, v.35, p.665-671, 2006.

ORSO, G. et al. . Comportamento da cultura do trigo sob efeito de fontes e doses de nitrogênio. Revista Cerrado Agrociências, Patos de Minas, n. 5, p. 44-52, nov. 2014.

PINNOW, C. et al. . Qualidade industrial do trigo em resposta à adubação verde e doses de nitrogênio. Revista Bragantia [Online], v. 72, n. 1, p. 20-28, 2013.

RAMOS, M. . Efeitos do nitrogênio e fósforo sobre características agrônomicas da variedade de trigo IAS 54 e suas relações com a produção. Pesquisa Agropecuária Brasileira, v.8, p.213-216, 1973.

Reunião da Comissão Brasileira de Pesquisa de Trigo e Triticale: Informações técnicas para trigo e triticale – safra 2018. Editores Técnicos - Cascavel, PR, Comissão de Pesquisa de Trigo e Triticale. 258 p. 2018.

SILVEIRA, C. P. et al. Two years of nitrogen and sulfur fertilizations in a signal grass pasture under degradation: changes in the root system. Revista Brasileira de Zootecnia, v.40, p.1195-1203, 2011.

SOUZA, W. P. et al. . Desenvolvimento inicial de trigo sob doses de nitrogênio em Latossolo Vermelho do Cerrado. Revista Brasileira de Engenharia Agrícola e Ambiental, Campina Grande, v. 17, n. 6, p. 575-580, 2013.

USDA. Produção Mundial de Trigo. Foreign Agricultural Service - United States Department of Agriculture 15/10/2018.

VALÉRIO, I. P. et al. . Fatores relacionados à produção e desenvolvimento de afilhos em trigo. Revista Ciências Agrárias, Londrina, v. 30, p. 1207-1218, 2009.