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GERMINATIVE POTENTIAL OF *Ocimum basilicum* L. SEEDS IN COMMERCIAL SUBSTRATE AND SOIL CONDITIONER

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ABSTRACT - In the production process *Ocimum basilicum* seeds, the substrate selection is an important characteristic in qualitative terms, as way to obtain a great culture development, in addition to reducing the production costs. The objective of this research was to analyze different concentrations of commercial substrate associated with a soil conditioner, based on tanned bovine manure, in the germination of *O. basilicum* seeds. The research was conducted under greenhouse conditions, in a completely randomized experimental design, and composed by six treatments [commercial substrate (100%) (T1); commercial substrate (80%) + tanned bovine manure (20%) (T2); commercial substrate (60%) + tanned bovine manure (40%) (T3); commercial substrate (40%) + tanned bovine manure (60%) (T4); commercial substrate (20%) + tanned bovine manure (80%) (T5); and tanned bovine manure (100%) (T6)], and six replicates, and each replicate was characterized by 10 cells from the tray. The seeds were placed into plastic polyethylene trays, under steel countertops. After filling the cells with each treatment, sowing was carried out, and after second day of planting, evaluation was carried out regarding the average number of germination seeds, germination speed index (GSI) and the average germination time (AGT). The best results were related to the treatments based on commercial substrate and also commercial substrate (80%) + tanned bovine manure (20%), with average seed germination above 78.33%, and addition to higher GSI, with average above 1.21, and lower AGT, whose average was below 6.78 days, showing the positive effect of the addition of up to 20% tanned bovine manure in the commercial substrate Carolina Soil®, regarding the germination of *O. basilicum* seeds.
Keywords: *Ocimum basilicum* L., germination, organic material, aromatic plant, quality.

POTENCIAL GERMINATIVO DE SEMENTES DE Ocimum basilicum L. EM SUBSTRATO COMERCIAL E CONDICIONADOR DE SOLO

RESUMO - No processo de produção de mudas de manjericão (*Ocimum basilicum* L.), a escolha do substrato constitui importante característica em termos qualitativos, como forma de obter um bom desenvolvimento da cultura, atrelado a redução nos custos de produção. O objetivo da pesquisa foi analisar diferentes concentrações de substrato comercial associado a um condicionador de solo, à base de esterco bovino curtido, na germinação de sementes de manjericão. A pesquisa foi conduzida em condições de casa-de-vegetação, em delineamento experimental inteiramente casualizado, composto por seis tratamentos [substrato comercial (100%) (T1), substrato comercial (80%) + esterco bovino curtido (20%) (T2), substrato comercial (60%) + esterco bovino curtido (40%) (T3), substrato comercial (40%) + esterco bovino curtido (60%) (T4), substrato comercial (20%) + esterco bovino curtido (80%) (T5) e esterco bovino curtido (100%) (T6)] e seis repetições, cada qual representada por 10 células da bandeja. As sementes foram dispostas em bandejas plásticas de polietileno, em bancadas de aço. Posteriormente ao enchimento das células com cada tratamento, foi realizada a semeadura e a partir do segundo dia do plantio realizadas as avaliações, quanto ao número médio de sementes germinadas, índice de velocidade de germinação (IVG) e tempo médio de germinação (TMG). Os melhores resultados estiveram relacionados aos tratamentos à base de substrato comercial (100%) e também substrato comercial (80%) + esterco bovino curtido (20%), com germinação média de sementes acima de 78,33%, além de maior IVG, com média acima de 1,21, e menor TMG, cuja média foi abaixo de 6,78 dias, demonstrando o efeito positivo da adição de até 20% de esterco bovino curtido conjuntamente ao substrato comercial Carolina Soil®, no que tange a germinação de sementes de *O. basilicum*.
Palavras-chave: *Ocimum basilicum* L., germinação, material orgânico, planta aromática, qualidade.

INTRODUCTION

Basil (*Ocimum basilicum* L.) belongs to the Lamiaceae family and is considered an aromatic plant, introduced in Brazil through the Italian culture, whose development preference is given to regions with a warmer climate and normally produced by familiar farmers, whose final product is related to the sale of green and fresh leaves (MARQUES et al., 2015).

The planting of this species can be carried out asexually, through the cutting technique, as well as

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sexually, directed by the use of seeds, and in this case, germination can occur in less than 15 days, then directed to the seedlings conduction (BLANK et al., 2014; ALVES et al., 2021). Thus, within the qualitative aspects of seedlings production, aspects closely related to plant vigor and homogeneity must be taken into account, as well as production cost (FERRAZ et al., 2014).

The quality of seedlings production may be related to the type of substrate used, in which the complete or partial replacement of the soil by other substrates can greatly add to the germination and development of a given plant species, whose characteristics may be related to the density, fertility, texture, presence of phytopathogenic microorganisms, and acquisition costs (ARAÚJO et al., 2013; MAGGIONI et al., 2014; HUBER et al., 2016).

With the gradual increase in costs related to the agricultural production, in special with the acquisition of inputs, and linked to issues related to quality in the seedlings production, and with more accessible costs for family farmers, many researches seek alternatives regarding the use of different sources of substrates for seedlings production, often marked out in regional situations (SANTOS et al., 2015; SALUCI et al., 2017; CORREA et al., 2019; ARAÚJO et al., 2020).

In view of the different sources of substrates that can be used in the seedlings production, those of an organic nature have been shown to have high potential in terms of productive and qualitative aspects, and are often easily available to the farmers in a certain region of the world, depending on the regional agricultural aspects (SALUCI et al., 2017).

However, the information for the correct use of sources and substrate doses in the seedlings production of plant species, especially basil, is still little explored. In this way, directed researches within this context is very important in what concerns the generation of knowledge and its future employment in the field, allowing new alternatives for the production of quality seedlings. In view of the above, the objective of this research was to analyze different concentrations of commercial substrate associated with a soil conditioner, based on tanned bovine manure, in the germination of basil seeds.

MATERIAL E METHODS

The research was conducted at Scholl Farm of University of Araraquara (UNIARA), whereupon, for the experimental installation were used polystyrene trays with dimensions of 25 × 70 cm, in a total of 200 cells each, kept on steel benches, under greenhouse conditions.

After filling the cells of the trays with the respective treatments, the substrate was humidified manually, with subsequent placement of one basil seed per cell, at a depth of 1-cm from the substrate surface. The plants were irrigated daily by an automated sprinkler system, keeping soil moisture close to the field capacity. Weed control was performed by hand weeding.

The treatments carried out in this research were characterized by commercial substrate (100%) (T1), commercial substrate (80%) + tanned bovine manure (20%) (T2), commercial substrate (60%) + tanned bovine manure (40%) (T3), commercial substrate (40%) + tanned bovine manure (60%) (T4), commercial substrate (20%) + tanned bovine manure (80%) (T5), and tanned bovine manure (100%) (T6). The commercial substrate used in the experiment was Carolina Soil® (composition based on Sphagnum peat + expanded perlite + expanded vermiculite + carbonized rice husk).

The number of germinated seeds was counted from the second days after sowing, and seedling with cotyledons above the substrate level were considered normal. The germination speed index (GSI) was analyzed according to the equation proposed by Maguire (1962), and the mean germination time (MGT) through the method of Labouriau (1983).

The experimental design used was completely randomized, consisting by six treatments and six replicates, each one related to 10 cells in the tray. The obtained data were submitted to analysis of variance and the means compared by Tukey's test, at 5% probability error, using the statistical program Sisvar 5.6 (FERREIRA, 2014).

RESULTS AND DISCUSSION

In Figure 1, it was observed that the average germination of basil seeds was statistically higher in the treatments with commercial substrate (80%) + tanned bovine manure (20%), and commercial substrate (100%), whose averages were between 78.33 and 80%, when compared to the treatments based on commercial substrate (20%) + tanned bovine manure (80%), and tanned bovine manure (100%), whose averages were 51.67 ± 1.64% and 43.33 ± 2.72%, respectively ($F = 11.282$; $GL = 5, 30$; $P<0,005$).

The highest germination speed index (GSI) of basil seeds were observed in the treatments with commercial substrate (100%) ($m = 1.30 \pm 0.02$) and commercial substrate (80%) + tanned bovine manure (20%) ($m = 1.21 \pm 0.04$), showing higher germination speed when compared with the other treatments, with statistical differences when compared with commercial substrate (20%) + tanned bovine manure (80%) ($m = 0.68 \pm 0.03$), and tanned bovine manure (100%) ($m = 0.48 \pm 0.04$) ($F = 19.536$; $GL = 5, 30$; $P<0,05$) (Figure 2).

The best result regarding the mean germination time (MGT) of basil seeds was observed in the treatment with commercial substrate (100%), whose average was 5.98 ± 0.13 days, with statistical difference only when compared with the treatments commercial substrate (20%) + tanned bovine manure (80%) ($m = 7.49 \pm 0.11$ days), and tanned bovine manure (100%) ($m = 9.08 \pm 0.20$ days) ($F = 8.811$; $GL = 5, 30$; $P<0,05$) (Figure 3). The other analyzed treatments showed averages between 6.78 and 7.19 days, with statistical difference in relation to the treatment based on tanned bovine manure (100%) (Figure 3).

According Oliveira et al. (2019), the concentrated use of manure bovine as part of substrate composition resulted in a decrease of germination seeds percentage, regarding the tomato crop, corroborating with the results of the present research, whereupon, in addition to reducing the

germination potential of basil seeds (Figure 1), the elevated concentration of manure bovine also reduced the GSI of basil seeds (Figure 2), and increase the MGT (Figure 3).

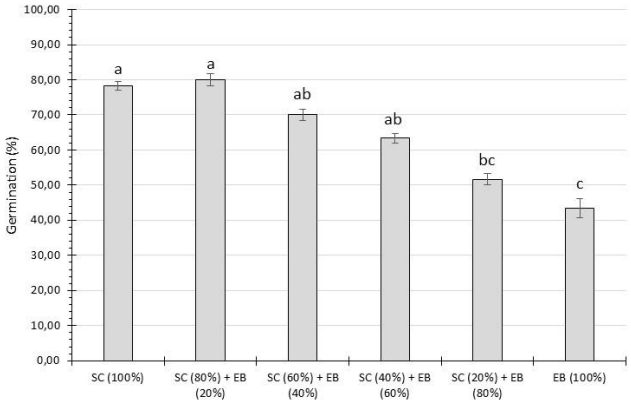

FIGURE 1 - Germination of basil seeds submitted to the substrate concentrations and soil conditioner (tanned bovine manure). Values followed by the same letter do not differ significantly from each other, by Tukey's test, at 5% probability error. The error bar corresponds to the standard error (±EP). SC = commercial substrate Carolina Soil®, EB = tanned bovine manure.

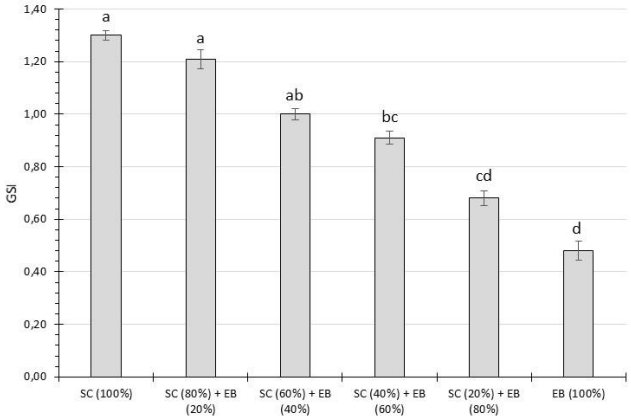

FIGURE 2 - Germination speed index (GPI) of basil seeds submitted to the substrate concentrations and soil conditioner (tanned bovine manure). Values followed by the same letter do not differ significantly from each other, by Tukey's test, at 5% probability error. The error bar corresponds to the standard error (±EP). SC = commercial substrate Carolina Soil®, EB = tanned bovine manure.

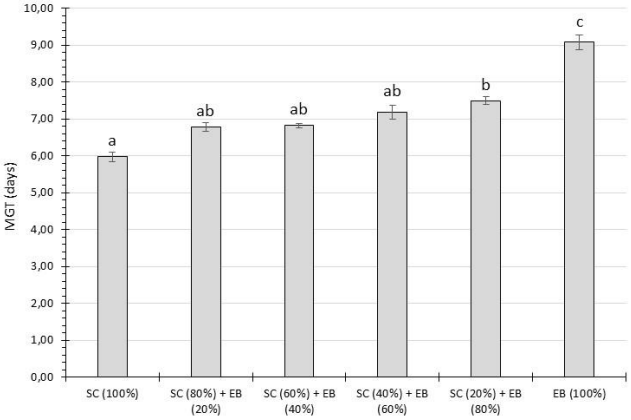

FIGURE 3 - Mean germination time (MGT) of basil seeds submitted to the substrate concentrations and soil conditioner (tanned bovine manure). Values followed by the same letter do not differ significantly from each other, by Tukey's test, at 5% probability error. The error bar corresponds to the standard error (±EP). SC = commercial substrate Carolina Soil®, EB = tanned bovine manure.

In a study conducted by Araújo et al. (2020), a reduction in the germination percentage of arugula seeds was observed when adding bovine manure together with earthworm humus, and that, according to Vieira Neto (1998), these results may be closely related to the presence of inhibitory compound produced by microorganisms present in the bovine manure, which can lead to a decrease in the seeds germination process.

In addition to this biotic factor, others can contribute to the germination process, such as substrate density, texture, and water retention capacity, as reported by Araújo et al. (2013) and Maggioni et al. (2014). Thus, according Trani et al. (2007), the use of commercial substrate tends to assist in greater aeration of the substrate, which provides better conditions for cellular respiration of the root system, with improvements in the seedlings production.

For the present research, the use of commercial substrate in the production of basil seedlings presented positive results regarding the analyzed parameters, and that, with the gradual increase of the tanned manure concentration, a progressive reduction was observed regarding the seeds germinative aspects, possibly linked to the increase in water retention capacity by the substrate, and consequent negative influence on the germination process.

The use of tanned bovine manure at a concentration of 20%, together with the commercial substrate Carolina Soil®, showed very promising results regarding the germination parameters of basil seedlings, and that, in addition, the tanned bovine manure may be an initial source of nutrients for the development seedlings of this plant species, as a strategy to assist family farmers, mainly in reducing costs regarding the seedlings formation, given that the aforementioned organic substrate constitutes and easily obtainable and viable alternative as a source of potential substrate for use in the cultivation of basil seedlings.

CONCLUSION

The additon of 20% of tanned bovine manure together with the commercial substrate Carolina Soil®, provided a positive effect on the germination of *Ocimum basilicum* seeds.

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