GERMINATION OF CHAPOLIN® TOMATO USING DIFFERENT SUBSTRATES AND SHADING

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Abstract

Vegetable production is a great source of Brazilian income and has been widely studied. Thus, the formation of substrates that promote better seedling cultivation conditions and the amount of light received become important research factors for better results in the final product. The use of coconut fiber (FC) has been widely used in the production of seedlings of many vegetable species. Thus, the objective of this work was to evaluate the interaction of different substrate compositions and different shading levels in the germination of tomato of the Chapolin® variety. For this, the experiment was conducted at three different shading levels (70 and 90%) and 5 different mixtures of substrates with different concentrations of clay (A) and coconut fiber (FC): T1 (100% A), T2 (80 % A + 20% FC), T3 (60% A + 40% FC), T4 (40% A + 60% FC) and T5 (100% FC), in a completely randomized design, with four replications for each level of shading and substrate concentration. The beginning of germination occurred on the seventh day after sowing (DAS) and lasted until the fourteenth DAS. The type of substrate concentration with the highest germination percentage was the T2 substrate and the shading was 70%. Thus, for such experimental conditions, the concentration of 80% clay with 20% coconut fiber is indicated, when conducted in 70% shading and for 90% shading conditions, the composition of 60% clay and 40% fiber of coconut.

Keywords: Solanum lycopersicum; coconut fiber; clay; luminosity

INTRODUCTION

The production of vegetables is one of the most laborious, requiring monitoring from the production of seedlings to the final consumer. In this context, in addition to being a widely consumed vegetable in Brazil, it has an agro-industrial chain that is among the most important in the Brazilian agribusiness (ANDRADE et al., 2010). Vegetables have a relatively shallow root system and require a greater availability of water in the soil for better performance and productivity. Generally, they are plants that can be cultivated in all seasons of the year, however, in the dry period, irrigation to promote water availability becomes essential (SILVA; SILVA, 2005). Thus, the use of suitable substrates for the culture promote better conditions for excellent results in productivity.

The use of coconut fiber (RAMOS et al., 2008) and coconut powder (CARVALHO DE OLIVEIRA et al., 2019) has been reported in the literature as an important factor for the production of seedlings, especially for vegetables (COSTA et al., al., 2007; SAMPAIO et al., 2008). Applying these materials on the soil has shown advantages from a nutritional point of view and greater availability of water, in addition to contributing to reduce the range of soil temperature (MIRANDA et al., 2004). In addition, it is an important solution to minimize the environmental impact caused by the disposal of urban waste and the economic use of these materials, which often have potential for agricultural use, especially as substrates in the production of seedlings

(SOUZA, 2001; SAINJU et al. al., 2001; SAMPAIO et al., 2008).

The availability and quality of light offered to tomato plants directly affects their productivity, since in environments with greater shading it presents positive results (OTONI et al., 2012), especially when compared to the full sun environment (SANTIAGO et al., 2018) . Thus, the objective of this work was to evaluate the interaction of different substrate compositions and different shading levels in the germination of tomato of the Chapolin® variety.

MATERIALS AND METHODS

The experiment was carried out in the experimental area of Campus Gragoatá, Federal Fluminense University, Niterói, RJ, whose coordinates are Lat.: 22º 54´ 00´´S, Long.: 43º 08´ 00´´W and Alt: 8m. Climatically, the region has an Aw climate, according to Köppen's classification, that is, a tropical climate with dry winter and rainy summer, with an average annual temperature of 23ºC and average annual precipitation of 1200 mm. However, air humidity and temperature (outside and inside the greenhouse) were also recorded for the experimental period with ASKO®'s AK28 new Digital Thermo-Hygrometer for each day (May 26, 2021 to June 11, 2021).

The treatments consisted of different substrate compositions and different shading levels (70 and 90%), using tomato seeds (Solanum lycopersicum) of the variety Híbrido Chapolin®, ISLA®, with sowing carried out on May 26, 2021.

For the compositions of the different substrates clayey soil (A): classified as clayey texture, by the physical analysis of the soil (Soil Analysis Laboratory, Vegetal Tissue and Fertilizer, Federal University of Viçosa); and coconut fiber (FC): Geolia® produced by Holamgrow Comércio e Beneficiamento de Fibras Vegetais Ltda Me., with concentrations of each type of substrate being prepared with different proportions (v/v): T1 (100% A; 0% FC); T2 (80% A; 20% FC); T3 (60% A; 40% FC); T4 (40% A; 60% FC) and T5 (0% A; 100% FC). According to the chemical analysis of the soil, it was necessary to correct the pH according to the Lime and Fertilizer Manual of the Rio de Janeiro State (2013).

The substrates were added in bags for the production of seedlings, with a capacity of approximately 1 kg, in different greenhouses containing the different shading levels, with irrigation being carried out the day before the seeds were added, maintaining the field capacity of the substrates (100 ml of water per unit). Subsequently, 3 tomato seeds per polyethylene bag and 4 repetitions were sown.

The germination rate was measured daily, until the fourteenth day after the beginning of germination, when all treatments stabilized. The germination percentage and the germination speed index (IVG) were determined. The germination percentage was calculated by the formula proposed in the Rules for Seed Analysis (BRASIL, 2009) and the IVG according to the equation proposed by Maguire (1962) adapted from Moraes et al. (2012).

RESULTS AND DISCUSSION

Climatic data obtained at the experiment site demonstrated that, in general, the temperature and relative humidity inside the generating houses of close average values, regardless of the shading level (Table 1). Emphasizing that the initial days are hotter and drier, a factor that can affect germination and greater need for irrigation.

Tabela 1: Climatological data obtained at the experiment site – Campus Gragoatá – Fluminense Federal University – Niterói – RJ

Date	Temp. out (ºC)	UR out (%)	Shading Percentage			
			70%		90%	
			Temp. in (ºC)	UR (%)	Temp. in (ºC)	UR (%)
02/06/2021	24,30	71	27,9	67	26,4	74
03/06/2021	26,20	69	24,9	83	26,4	80
04/06/2021	25,90	74	24,6	79	24,5	84
05/06/2021	26,80	59	29,1	58	27,5	69
06/06/2021	28,10	55	25,3	77	26	73
07/06/2021	27,80	60	29,3	75	28,1	70
08/06/2021	27,60	64	28,9	65	29,8	50
09/06/2021	22,50	88	22,2	89	22	96
10/06/2021	24,00	86	23,9	80	23,4	85
11/06/2021	22,40	83	22,5	90	22,3	96

The beginning of germination occurred seven days after sowing (DAS), on June 2nd, and ended on June 11, 2021, on the fourteenth day after sowing (Figure 1 and 2).

Figure 1: Germination percentage on different substrates and shading levels in relation to days after sowing. Substrates: (T1, T2, T3, T4 and T5). Shading levels (70%).

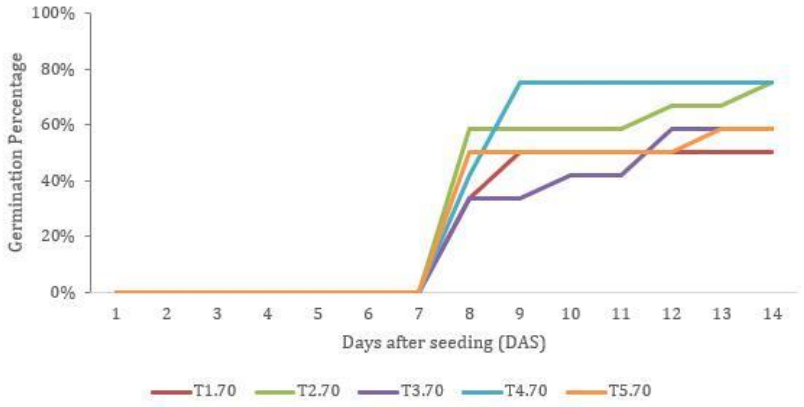
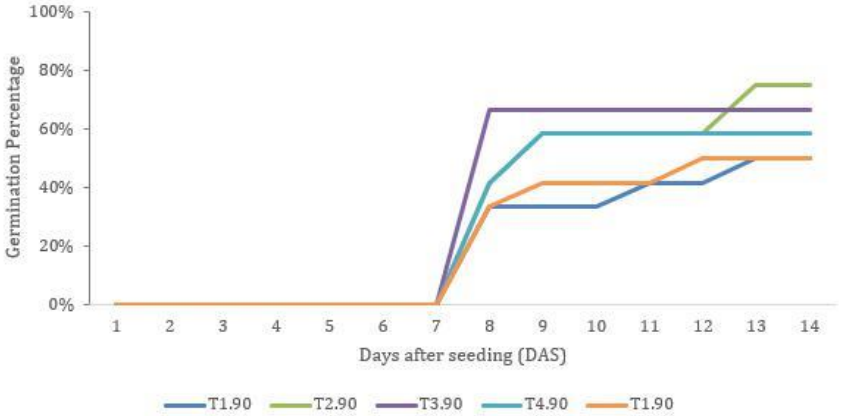


Figure 2: Germination percentage on different substrates and shading levels in relation to days after sowing. Substrates: (T1, T2, T3, T4 and T5). Shading levels (90%).



The substrate composed of 40% clayey soil and 60% coconut fiber (T4) showed the best result in the lowest level of shading, followed by the T2 treatment composed of 20% coconut fiber in the highest level of shading. The late start of germination may have occurred due to climatic factors, since at higher temperatures with little moisture retention in the substrate, sowing problems may occur. This fact may also have influenced the total percentage of germination, which was generally low.

Coconut fiber has a low particle density and, therefore, the water tends to infiltrate slowly, taking preferential paths. Thus, the substrate composition that best brought results in the different treatments was the T2 treatment.

The tukey tests related to the Germination Speed Index were not significant (results not present). However, in figures 4 and 5, the IVG of each treatment is listed.

Figure 3: Germination speed index on different substrates and shading levels in relation to days after sowing. Substrates: (T1, T2, T3, T4 and T5). Shading levels (70%).

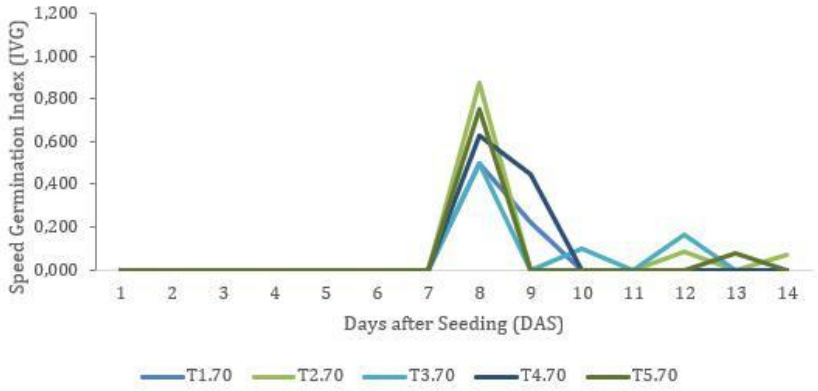
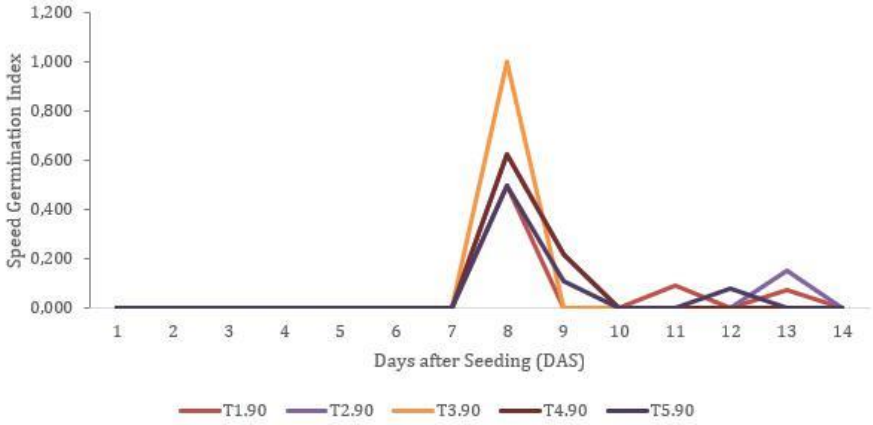


Figure 4: Germination speed index on different substrates and shading levels in relation to days after sowing. Substrates: (T1, T2, T3, T4 and T5). Shading levels (90%).



All treatments reached their apex in a similar way on the eighth day, and for the condition with less shading there were better results for the treatment T2 and in the condition of greater shading for the medium treatment, T3.

It can be verified that according to the shading, germination occurred in a different way. This can occur because even being quite similar in terms of temperature and humidity as shown in table 1, the variation throughout the day at extreme times is greater, requiring greater control of climate data inside the greenhouses.

The use of coconut fiber as a substrate, when used alone, provides good seed germination, but in the long term it results in low seedling growth, mainly due to its low nutrient content (Silveira et al., 2002). Thus, its use must be carried out in combination with nutrient-rich materials, enabling better seedling growth and reducing production costs (Ramos et al., 2012).

CONSIDERATIONS

The relationship between clayey soil and coconut fiber proved to be effective in the formation of substrates for the production of tomato seedlings, with emphasis on the relationship of 80% clay with 20% coconut fiber, which obtained positive results in the different shadings.

Presentation: https://youtu.be/5K_DAWT0LrU

REFERENCES

ANDRADE, G. C. R. M.; OETTERER, M.; TORNISIELO, V. L. O tomate como alimento – cadeia produtiva e resíduos de agrotóxicos. **Pesticidas: Revista de ecotoxicologia e meio ambiente**. v. 20, p. 57-66, 2010.

BRASIL. Ministério da Agricultura, Pecuária e Abastecimento. **Regras para análise de sementes. Ministério da Agricultura, Pecuária e Abastecimento**. Secretaria de Defesa Agropecuária. Brasilia: MAPA/ACS, p. 395, 2009.

COSTA, C. A. *et al.* Fibra de coco e resíduo de algodão para substrato de mudas de tomateiro. **Horticultura Brasileira**, Brasília , v. 25, n. 3, p. 387-391, 2007.

MAGUIRE, J. D. Speed germination-aid in selection and evaluation for seedling emergence and vigor. **Crop Science**, v. 2, p. 176–177, 1962.

MIRANDA, F. R. *et al.* Efeito da cobertura morta com a fibra da casca de coco sobre a temperatura do solo. **Revista Ciência Agronômica**, v. 35, n. 2, p. 335-339, 2004.

MORAES, D. M. *et al.* **Práticas laboratoriais em Fisiologia Vegetal. Pelotas**. Editora Copias Santa Cruz Ltda, v. 1, 162p, 2012.

OLIVEIRA, M. C. de *et al*. Mudas de tomateiro produzidas à base de pó de coco e esterco bovino curtido. **Revista Brasileira de Agropecuária Sustentável**, v. 9, n. 3, p. 87-95, 2019. https://doi.org/10.21206/rbas.v9i3.8660.

OTONI, B. S. *et al*. Produção de híbridos de tomateiro cultivados sob diferentes porcentagens de sombreamento. **Revista Ceres**, v. 59, p. 816-825, 2012.

RAMOS, A.R.P.; DIAS, R.C.S.; ARAGÃO, C.A.; MENDES, A.M.S. Mudas de melancia produzidas com substrato à base de pó de coco e soluções nutritivas. **Horticultura Brasileira**, v.30, p.339-344, 2012.

RAMOS, S. J. *et al.* Tomato seedling production in substrate containing coconut fiber and mushroom culture waste. **Revista Brasileira Ciência Agrária**. Recife, v.3, n.3, p.237-241, 2008.

SAINJU, U. M. *et al*. Evaluating hairy vetch residue as nitrogen fertilizer for tomato in soilless medium. **HortScience** v. 36, n. 1, p. 90-93, 2001.

SAMPAIO, R. A. *et al*. Produção de mudas de tomateiro em substratos contendo fibra de coco e pó de rocha. **Horticultura Brasileira**, v. 26, n.4, p. 499-503, 2008.

SANTIAGO, E. J. *et al*. Yield characteristics of cherry tomato cultivated with and without shading screen at different irrigation levels. **Pesquisa Agropecuária Tropical**, Goiânia, v. 48, n. 4, p. 374-381, 2018.

SILVA, C. A; SILVA, C.J. Avaliação de uniformidade em sistemas de irrigação localizada. **Revista Científica Eletrônica de Agronomia**. Publicação científica da Faculdade de Agronomia e Engenharia Florestal de Garça/ FAEF, ano IV, n. 8, 2005.

SILVA, J. H. K.*et al.*Germinação e crescimento inicial de tomate italiano (Lycopersicon esculentum Mill.): efeitos do fotoperíodo. **Natureza On Line**, Santa Teresa, v. 10, n. 4, p. 183-185, 2012.

SILVEIRA, E.B.; RODRIGUES, V.J.L.B.; GOMES, A.M.A.; MARIANO, R.L.R.; MESQUITA, J.C.P. Pó de coco como substrato para produção de mudas de tomateiro. **Horticultura Brasileira**, v.20, n.2, p.211-216, 2002.

SOUZA, F.X. 2001. **Materiais para formulação de substratos na produção de mudas e no cultivo de plantas envasadas.** Fortaleza: Embrapa-CNPAT. 21p. (Documentos 43).