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PRODUCTION OF MELON (*CUCUMISMELO* L.) ELDORADO 300 SEEDLINGS GROWN IN DIFFERENT SUBSTRATES AND SOWING DEPTHS

Gustavo Henrique Demari[1], Ivan Ricardo Carvalho[2], Geri Eduardo Meneghello[1], Vinícius Jardel Szareski[1], João Roberto Pimentel[1], Ítala Thaísa Padilha Dubal[1], Cristian Troyjack[1], Tamires da Silva Martins, Valéria Escaio Bubans[3], Velci Queiróz de Souza

[1]Universidade Federal de Pelotas – Doutorado em Ciência e Tecnologia de Sementes; [2]Universidade Regional do Noroeste do Estado do Rio Grande do Sul – Pós Doutorado em Plantas de Lavoura e Ciência e Tecnologia de Sementes; [3] Universidade Federal de Santa Maria – Mestranda em Agronomia

ABSTRACT: Melon (*Cucumis melo* L.) is one of the most consumed vegetables in the world. In recent decades, sustainable production alternatives have been sought, replacing traditional substrates with the use of substrates from organic waste. The objective of this work was to evaluate the initial development of melon seedlings in different substrates and depths of sowing, as well as to identify relationships between the evaluated characters. The experiment was conducted in a greenhouse with a randomized block design in a 3x4 factorial arrangement with three substrates (grape hull, rice hull, commercial substrate) and four sowing depths (1.0; 2; 0; 3.0 and 4.0 cm), with four repetitions. The variables analyzed were emergence speed index, shoot length and root, green and dry root and shoot mass. Variance analysis revealed significant interaction between substrates x sowing depth for the shoot length and root length character. Pearson's linear correlation revealed two significant positive associations. It was concluded that melon seedlings are affected by substrate types and sowing depths. Being the substrate based on grape peel a substitute alternative to commercial substrates. The carbonized rice husk substrate did not have a positive response in the production of melon seedlings. Pearson's correlation showed a positive relationship between the characters.

Keywords**:** Melon, initial development, seeds.

PRODUÇÃO DE MUDAS DE MELÃO (CUCUMISMELO L.) ELDORADO 300 EM SUBSTRATOS DIFERENTES E PLANTAS DE SEMEADURA

RESUMO: O melão (Cucumis melo L.) é um dos vegetais mais consumidos no mundo. Nas últimas décadas, alternativas de produção sustentáveis têm sido buscadas, substituindo os substratos tradicionais pelo uso de substratos a partir de resíduos orgânicos. O objetivo deste trabalho foi avaliar o desenvolvimento inicial de mudas de melão em diferentes substratos e profundidades de semeadura, bem como identificar relações entre os caracteres avaliados. O experimento foi conduzido em casa de vegetação, com delineamento experimental de blocos ao acaso em arranjo fatorial 3x4, com três substratos (casca de uva, casca de arroz, substrato comercial) e quatro profundidades de semeadura (1,0; 2; 0; 3,0 e 4,0 cm), com quatro repetições. As *variáveis analisadas foram: índice de velocidade de emergência, comprimento e raiz da parte aérea, massa verde e seca da raiz e parte aérea. A análise de variância revelou interação significativa entre substratos x profundidade de semeadura para o caráter comprimento da parte aérea e comprimento da raiz. A correlação linear de Pearson revelou duas associações positivas significativas. Conclui-se que as mudas de melão são afetadas pelos tipos de substrato e profundidades de semeadura. Sendo o substrato à base de casca de uva uma alternativa de substituição aos substratos comerciais. Já o substrato de casca de arroz carbonizado não apresentou resposta positiva na produção de mudas de melão. A correlação de Pearson mostrou uma relação positiva entre os personagens.*

Palavras-chave: Melão, desenvolvimento inicial, semente.

ABBREVIATION: Emergency speed index: ESI, shoot and root length: SL and RL, green root mass: GRM, green shoot mass GSM, dry root mass: DRM, dry shoot mass: DSM, cubic centimeters: cm^{-3}.

INTRODUCTION

Melon (*Cucumis melo* L.) is one of the most consumed vegetables in the world, and appreciated throughout Brazil due to the composition and nutritional value of its fruits, rich in protein, fiber, calories and vitamins (STOREK et al., 2013). The consumption of this vegetable of appreciable flavor reflects in the growing area destined to its production, occupying 1.27 million hectares in the world. Brazil is the eleventh largest producer with 22 thousand hectares of cultivated area, and Rio Grande do Norte state is the largest Brazilian producer, followed by Ceará, Bahia, Rio Grande do Sul (RESENDE, 2010), remaining unchanged in the last decade.

Melon is a crop that presents production of seedlings before being transplanted to the field. The utilization of excellent quality seedlings guarantees a satisfactory initial establishment, allowing the competitive cultivation with good radicular system and aerial part, which will directly reflect in the final yield. In order to achieve positive results, the substrate must present suitable physical and chemical characteristics, considering that the substrate exerts a soil function, provides nutrients, water, oxygen and support to the seedling avoiding its dumping off (ARAGÃO et al., 2011).

In the last decades, sustainable alternatives have been sought for seedlings production, with the replacement of traditional substrates by the use of substrates from organic residues, which are discarded by farmers and/or industries. Among the desirable characteristics for a substrate, the availability of the residue, low cost, good aeration, cation exchange capacity, water retention, root physiology activity allowance, pH regulation, and root system support influence the seedling emergence (OLIVEIRA et al., 2009).

Another important factor in seedlings production is the depth of sowing, since the root system and shoot development can be limited when carried out at inadequate depths (BRITO, 2005). Deep seeding may harm the emergence of seedlings, while superficial seeding may result in germination failure. In the literature, sowing depth for melon crop is conflicting, ranging from one cm (ARAGÃO et al., 2011) to 8 cm of depth (STROJAKI and ALVES, 2016).

There are some comparative ways to evaluate types of substrates and sowing depth for seedlings production, which allow to determine the best method for seedling development. Among the important variables for evaluation in the early stages of development, the emergence speed index, seedling root length, green and dry mass of shoot and root are highlighted (LIMA et al., 2010; MEDEIROS et al.,2010; BRITO, 2005).

In this context, there is a lack of information revealing the interaction between substrate type and adequate seeding depth for melon crop. Therefore, this work aims to evaluate the initial development of melon seedlings in different substrates and depths of sowing.

MATERIALS AND METHODS

Experimental Conditions

The experiment was conducted in a greenhouse in the Phytotechnology Department of the Faculdade of Agronomy Eliseu Maciel, in the Federal University of Pelotas – RS, from July 2016 to August 2016. Sowing was performed at the beginning of July, in tubes with useful area of 200 cm^{-3}.

Experimental Design

The experimental design was randomized blocks, arranged in a 3x4 factorial scheme, with three substrates (grape skin, rice husk, commercial substrate) and four sowing depths (1.0, 2.0, 3.0 and 4.0 cm) with four repetitions. To ensure the seedlings emergence in the tubes, two seeds were allocated in each tube, and thinned in order to stablish one seedling per tube.

The traits evaluated were

- Emergency speed index (ESI): Determined by the daily counting of emerged seeds, using the Maguire (1962) method to determine emergence speed. Seedlings were considered emerged when they presented fully open and normal cotyledons.

- Shoot and root length (SL; RL): A graduated ruler was used at 35 days after emergence, expressed in centimeters.

- Green root mass (GRM) and green shoot mass (GSM): It was evaluated at the end of seedling production in all tubes, expressed in grams (g).

- Dry root mass (DRM) and dry shoot mass (DSM): Evaluated after the green mass in all seedlings. The seedlings were allocated at the oven at 65ºC until they present constant weight.

Statistical analysis

The data were submitted to variance analysis by the F test at 5% of probability. It was tested the presence of interaction between substrate x seeding depth, and the simple effects were deployed. For the qualitative factor (substrate), the traits were submitted to complementary analysis by the Tukey test. For the quantitative factor (sowing depth) the traits were submitted to linear regression, testing the highest degree of the significant polynomial, the results were presented as individual graphs for each substrate.

Pearson's linear correlation analysis was performed for the traits green and dry mass of shoot and root at 5% of probability, with significance based on the t-test.

RESULTS

Emergency speed index

The variance analysis revealed a significant interaction between substrates x sowing depths for the traits shoot length and root length. In table 1 it can be observed that the substrates grape skin and commercial substrate presented a higher emergency speed index than rice husk, revealing that these substrates are suitable for seedling production (CAMPANHARO et al. 2006).

Tabela 1. Principais efeitos por meio de substratos em relação ao índice de velocidade de emergência (ESI).

Table 1. Main effects by means of substrates regarding emergency speed index (ESI).

Substrate	ESI
Carbonized rice husk	1.218 b
Comercial substrate	10.787 a
Grapeskin	10.775 a
CV	13.768

* Means followed by the same lowercase letter in the column for substrates do not statistically differ by the Tukey test at 5% of probability of error.

Seedling mass

The biomass accumulation is characterized by the efficiency in using and mobilizing the photoassimilates stored in the seeds, revealing the genotype productive potential under growing conditions (DEVIDE et al., 2009). The root green mass (RGM) and root dry mass (RDM) did not statistically differentiate between substrates (Table 2), however, shot green mass (SGM) and shoot dry mass (SDM) presented different behavior among substrates, as grape skin and commercial substrate provided greater fresh and dry mass accumulation. According to Paiva et al. (2010) the use of carbonized rice husk as a substrate negatively interferes with seedlings development. Similar results were found by Saidelles et al. (2009) that evidenceda smaller seedling development with the increase of rice husk.

Tabela 2. Principais efeitos, por meio de substratos, das características massa verde da parte aérea (SGM), massa verde da raiz (RGM), massa seca da parte aérea (SDM) e massa seca da raiz (RDM).

Table 2. Main effects by means of substrates regarding the traits shoot fresh mass (SGM), root green mass (RGM), shoot dry mass (SDM) and root dry mass (RDM).

Substrate	SGM(g)		RGM(g)		SDM(g)		RDM(g)	
Carbonized rice husk	0.425	b	0.297	a	0.022	b	0.010	a
Comercial substrate	1.687	a	0.177	a	0.076	a	0.007	a
Grapeskin	1.697	a	0.163	a	0.065	a	0.008	a
CV(%)	17.73		39.54		25.97		39.60	

* Means followed by the same lowercase letter in the column for substrates do not statistically differ by the Tukey test at 5% of probability of error.

Effect between substrates and depths of sowing

Shoot length (SL) measures the height of the seedlings at the initial stage of development, establishing characteristics relevant to the quality of seedlings

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production (LIMA et al., 2010). The behavior of shoot length was different between substrates and depths of sowing (Figure 1), and it tends to linear behavior when submitted to seeding depths. However, for rice husk, the increase of seeding depths tends to increase shoot length, possibly this response is related to the physical characteristics of this substrate such as density, aeration and porosity, which provide less water retention in the superficial layers (GUERRINI and TRIGUEIRO, 2004), reducing seedlings developmentdue to water deficit. However, the commercial substrate tends to decrease shoot length, with the increase of seeding depth, caused by the physical barrier of this substrate (SOUZA et al., 2007), which induces the seedlings to consume their reserves during emergence in order to overcome this physical barrier (LAIME et al., 2010).

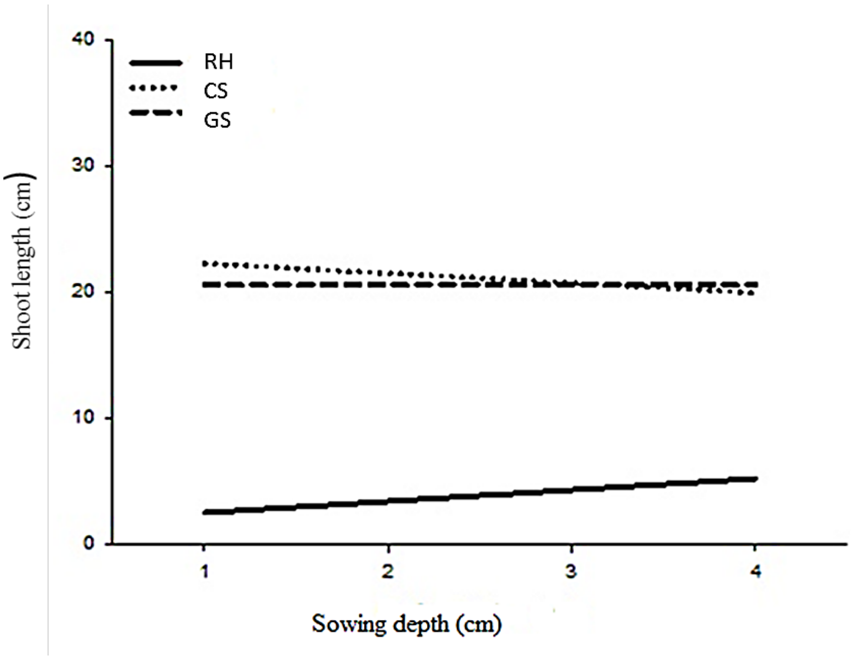

Figura 1. Regressão das profundidades de semeadura x substrato x comprimento da parte aérea. RH (comprimento da parte aérea em casca de arroz carbonizada) y = 1,60 + 0,89x R20.04; CS (comprimento da parte aérea no substrato comercial) y = 23,01-0,77x R20,03; GS (comprimento da parte aérea na casca da uva) y = 20,57 + 0,001x R20,00. As profundidades de semeadura são de 1, 2, 3 e 4 centímetros.

Figure 1. Regression of seeding depths x substrate x shoot length. RH (shoot length in carbonized rice hus) y = 1.60 + 0.89x $R^2$0.04; CS (shoot length in commercial substrate) y = 23.01-0.77x $R^2$0.03; GS (shoot length in grape skin) y = 20.57 + 0.001x $R^2$0.00. The sowing depths are 1, 2, 3, and 4 centimeters.

Regarding the response of plants among substrates, the table 3 presents that, for all sowing depths, rice husk substrate evidenced smaller shoot length, caused by its physical and chemical characteristics (GUERRINI and TRIGUEIRO, 2004), which are not favorable for seedlings production when it is individually used (VALLONE et

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al., 2004). Commercial substrate provided longer seedlings at one cm depth, as well as grape skin at two cm depth. Possibly, the good seedlings development in these substrates is related to their suitable characteristics, providing a balance between aeration and humidity, as well as their nutritional constituents present in these substrates (NEGREIROS et al, 2005).

Tabela 3. Implementação de efeitos simples para o comprimento da parte aérea na profundidade de semeadura de 1 cm (profundidade 1), 2 cm (profundidade 2), 3 cm (profundidade 3) e 4 cm (profundidade 4).

Table 3. Simple effects deployment for the trait shoot length at sowing depth of 1 cm (depth 1), 2 cm (depth 2), 3 cm (depth 3) and 4 cm (depth 4).

Substrate	depth 1(cm)		depth 2 (cm)		depth3 (cm)		Depth 4 (cm)	
Carbonized rice husk	1.625	c	4.865	c	4.010	b	4.905	b
Comercial substrate	23.930	a	18.350	b	21.900	a	20.18	a
Grapeskin	19.380	b	22.550	a	20.230	a	20.16	a

* Means followed by the same lowercase letter in the column for substrates do not statistically differ by the Tukey test at 5% of probability of error.

The root system directly influences water and nutrients absorption, mechanical resistance, as its length and volume are determinant mainly in periods of water deficit (SOUZA et al., 2012). It can be observed in figure 2 that root length had a linear response for sowing depths. However, rice husk and commercial substrate tend to increase root length with the increase of sowing depth. Study carried out by Negreiros et al. (2005) evidenced greater root length and development, and this response was attributed to the substrate chemical and physical characteristics, which provide adequate aeration and drainage. On the other hand, grape skin substrate tends to reduce root length with the increase on sowing depth. This response may be related to substrate limitations, such as chemical imbalance or physical problems that prevent the radicular system development (NÓBREGA et al., 2008).

Tabela 4. Implementação de efeitos simples para o comprimento da raiz da característica nas profundidades de semeadura de 1 cm (profundidade 1), 2 cm (profundidade 2), 3 cm (profundidade 3) e 4 cm (profundidade 4).

Table 4. Simple effects deployment for the trait root length at sowing depth of 1 cm (depth 1), 2 cm (depth 2), 3 cm (depth 3) and 4 cm (depth 4).

Substrate	depth 1 (cm)		depth2(cm)		depth 3(cm)		depth 4(cm)	
Carbonized rice husk	0.490	b	1.061	b	1.645	b	1.357	c
Comercial substrate	3.860	a	3.154	a	3.017	a	4.648	a
Grapeskin	3.685	a	4.201	a	2.960	a	3.059	b

* Means followed by the same lowercase letter in the column for substrates do not statistically differ by the Tukey test at 5% of probability of error.

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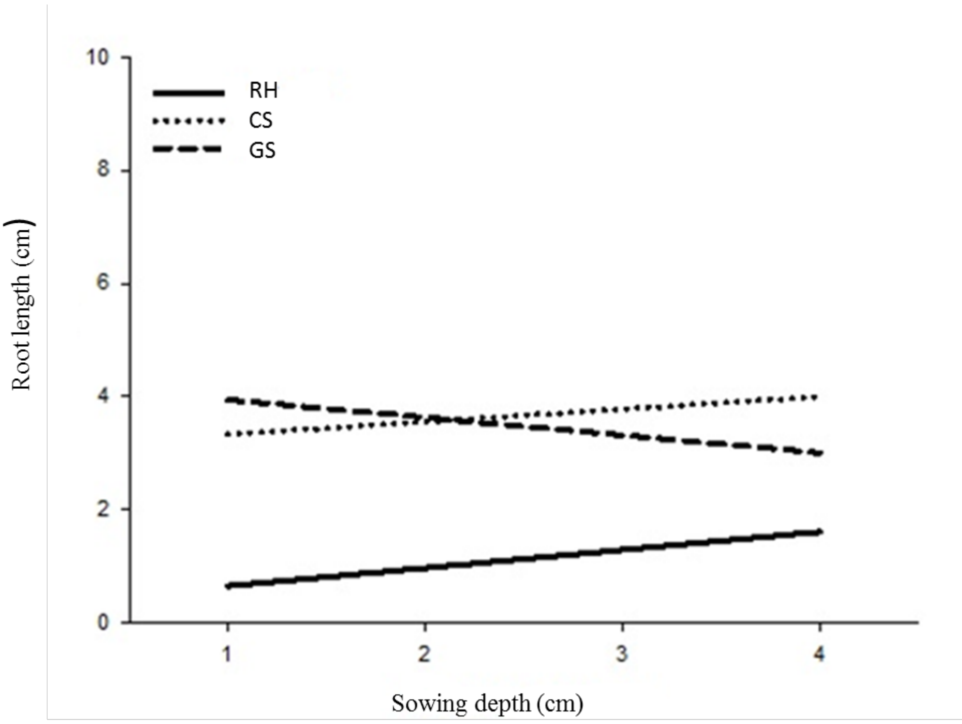

Figura 2. Regressão das profundidades de semeadura x substrato x comprimento da raiz. RH (comprimento da raiz no substrato da casca de arroz) y = 0,28 + 0,34x R20,06, CS (comprimento da raiz no substrato comercial) y = 3,17 + 0,20x R20, 01, GS (comprimento da raiz na casca da uva) e = 4,22-0,29 x R20.02. As profundidades são de 1, 2, 3 e 4 centímetros.

Figure 2. Regression of seeding depths x substrate x root length. RH (root length in rice husk substrate) y = 0.28 + 0.34x $R^2$0.06, CS (root length in commercial substrate) y = 3.17 + 0.20x $R^2$0, 01, GS (root length in grape skin) and = 4.22-0.29x $R^2$0.02. The depths are 1, 2, 3, and 4 centimeters.

When verifying root system length in the substrates, it can be observed in table 4 that for both sowing depths, grape skin and commercial substrate evidenced superior root length, compared to rice husk. These results corroborate with those presented by Cruz et al. (2013), who found little radicular system development when rice husk was used as substrate. On the other hand, according to Pelizza et al. (2013) rice husk has a good response for seedlings production when associated with another compound.

DISCUSSION

Pearson's Correlation

The correlation estimates allow to understand the interrelationships between traits, as well as to elucidate the actions of cause and effect of the trait, to partition direct and indirect effects of the response by the analyzed variables, and to quantify each trait contribution (CARVALHO et al., 2016). Pearson's linear correlation (table 5) revealed two significant positive associations. Regarding shoot green mass (SGM), the coefficient of positive relation revealed by shoot dry mass (SDM) was verified (r = 0.949). Regarding root greenmass (RGM), positive coefficient of relation (r: 0.789) was verified with root dry mass (RDM), indicating the dry mass increment with the increase of green mass (LIMA et al., 2007).The importance of correlation between traits for melon crop seedling production determines the cultivation viability according to the initial characteristics of the evaluated seedlings, which can be used in a sustainable system of seedling production.

Tabela 5. Estimativas de correlação linear de Pearson de quatro características morfológicas das mudas de melão. SGM: Atire massa verde; RGM: massa verde da raiz; SDM: massa seca da parte aérea; RDM: massa seca da raiz.

Table 5. Pearson’s linear correlation estimates of four morphological melon seedling traits. SGM: Shoot green mass; RGM: root green mass; SDM: shoot dry mass; RDM: root dry mass.

	SGM	RGM	SDM	RDM
SGM	.	-0.473	0.949*	-0.117
RGM		.	-0.483	0.789*
SDM			.	-0.099
RDM				.

* Pearson's linear correlation coefficients (n = 12) significant at 5% of probability by the t-test.

CONCLUSION

The development of melon seedlings is affected by the types of substrates and depths of sowing. The grape skin substrate can replace commercial substrates in the production of melon seedlings.The carbonized rice husk does not present a positive response for melon seedlings production.

Pearson correlation showed a positive relationship between characters.

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REFERENCES

ARAGÃO, C.A.; PIRES, M.M.M.L.; BATISTA, P.F.; DANTAS, B.F. Quality of melon seedlings produced in different substrates. **Revista Caatinga**, v. 24, p. 209-214, 2011.

BRITO, A.B. **Influence of types of trays, stadiums of growth and mineral fertilization, in the performance of seedlings of squash (*Cucurbita pepo* L.)**. Dissertation Federal University of Piauí. 33p, 2005.

CARVALHO, I.R.; NARDINO, M.; DEMARI, G.H.; SZARESKI, V.J.; AUMONDE, T.Z.; PEDÓ, T.; MONTEIRO, M.A.; PELEGRIN, A.J.; OLIVOTO, T.; FERRARI, M.; MEIRA, M.; SOUZA, V.Q. Biometry and genetic breeding of dual-purpose wheat. International **Journal of Current Research,** v. 8, p. 34539-34545, 2016.

CAMPANHARO, M.; RODRIGUES, J.J.V.; LIRA, M.A.J.; ESPINDULA, M.C.; COSTA, J.V.T Physical characteristics of diferente substrates for tomato seedlings production. **Revista Caatinga**. v. 19, p. 140-145, 2006.

CRUZ, F.R.S.; ALVES, E.U.; SILVA, R.S.; ANDRADE, L.A.; ARAÚJO, L.R. Emergency and initial growth of seedlings *Enterolobium contortisiliquum* (Vell.) Morong on different substrates. **Science Plena**.v. 9, p. 1- 9, 2013.

DEVIDE, A.C.P.; RIBEIRO, R.L.D.; VALLE, T.L.; ALMEIDA, D.L.; CASTRO, C.A.; FELTRANJ, C. Yield of cassava roots intercropped with corn and cowpea in an organic system. **Bragantia**. v. 68: 145-153, 2009.

GUERRINI, I.A.; TRIGUEIRO, R.M. Physical and chemical attributes of substrates composed of biosolids and carbonized rice chaff. **Brazilian journal of soil science**. v. 28, p. 1069-1076, 2009.

LAIME, E.M.O.; ALVES, E.U.; GUEDES, R.S.; SILVA, K.B.; OLIVEIRA, D.C.S.; SANTOS, S.S. Emergency and initial growth of seedlings of Inga ingoides (Rich.) Willd.in function of the position and depth of sowing. **Semina Ciências Agrárias**, v. 31, p. 361-372, 2010.

LIMA, C.G.R.; CARVALHO, M.P.; MELLO, L.M.M.; LIMA, R.C. Correlação linear e espacial entre a produtividade de forragem, a porosidade total e a densidade do solo de Pereira Barreto. **Scientific Journal**, v. 31, p. 1233-1244, 2007.

LIMA, J.F.; SILVA, M.P.L.; TELES, S.; SILVA, F.; MARTINS, G.N. Avaliação de diferentes substratos na qualidade fisiológica de sementes de melão de caroá [Sicanaodorifera (Vell.) Naudim]. **Revista Brasileira de Plantas Medicinais**.v.12, p. 163-167, 2010.

MAGUIRE, J.B. Speed of germination-aid in selection and evaluation for seedling emergence vigor. **C Sci**., v. 2, p. 176-177, 1962.

MEDEIROS, D.C.; MARQUES, L.F.; DANTAS, M.R.S.; MOREIRA, J.N.; AZEVEDO, C.M.S.B. Melon seedling production with fish farming wastewater in different types of substrates and tray. **Revista Brasileira de Agroecologia**. v.5, p. 65-71, 2010.

NEGREIROS, J.R.S.; BRAGA, L.R.; ÁLVARES, V.S.; BRUCKNER, C.H. Different substrats for a production of papaya tree (*Carica papaya* L.) group solo seedlings. **Revista Brasileira de Agrociência**.v. 11, p. 101-103, 2005.

NÓBREGA, R.S.A.; PAULA, A.M.; BOAS, R.C.V.; NÓBREGA, J.C.A.; MOREIRA, F.M.S Morphological parameters of *Sesbania virgata* (Caz.) and *Anadenanthera peregrina* (L.) seedlings cultivated in substrate fertilized with urban waste compost. **Revista Árvore.**32:597-607, 2008.

OLIVEIRA, A.B.; MEDEIROS, S.F.; BEZERRA, A.M.E.; BRUNO, R.L.A. Emergency of Copernicia Hospita Martius seedlings depending on the size seed, of the substrate and environment. **Revista Brasileira de Sementes**. v. 31, p. 281-287, 2009.

PAIVA, S.S.; LUZ, P.B.; SILVEIRA, T.L.S.; RAMOS, D.T.; NEVES, L.G.; BARELLI, M.A.A Substrates in the seedling production of three tree species in the Cerrado. **Revista Brasileira de Ciências Agrárias,** v.5, p. 238-243, 2010.

PELIZZA, T.R.; SILVEIRA, F.N.; MUNIZ, J.; ECHER, A.H.B.; MORSELLI, T.B.G.A. Production of yellow melon seedlings in different substrates under protected cultivation. **Revista Ceres**. v. 60, p. 257-261, 2013.

RESENDE, G.M.; COSTA, N.D (2010) Melonproduction systems. **Embrapa Semi-arid**, n5., 2010. http://www.cpatsa.embrapa.br:8080/sistema_producao/spmelao/socioeconomia.html.

SAIDELLES, F.L.F.; CALDEIRA, M.V.W.; SCHIRMER, W.N.; SPERANDIO, H.V. Carbonized rice hull as substratum to produce tamboril-da-mata and garapeira seedlings. **Semina Ciências Agrárias**. v. 30, p. 1173-1186, 2009.

SOUZA, A.H.; RIBEIRO, M.C.C.; MENDES, V.H.C.; MARACAJÁ, P.B.; COSTA, D.M. Depths and sowing positions in the emergency and development of water-cooler seedlings. **Caatinga**. v. 20, p. 56-60, 2007.

SOUZA, G.S.; SOUZA, Z.M.; SILVA, R.B.; ARAÚJO, F.S.; BARBOSA, R.S. Soil compressibility and root system of sugarcane with and without controlled‑traffic farming. **Brazilian Journal of agricultural research**. v. 47, p. 603-612, 2012.

STORCK, C.R.; NUNES, G.L; OLIVEIRA, B.B.; BASSO, C. Leaves, stalk, pell and seeds of vegetables: nutritional composition, utilization and sensory analysis in food preparations. **Ciência Rural**, v. 43, p. 537-543, 2013.

STROJAKI, T.V.; ALVES, L.A. Effect of sowing depth on vigor index of two seed lots of melon (*Cucumismelo*). **Enciclopédia Biosfera**. v. 13, p. 448-456, 2016.

VALLONE, H.S.; GUIMARÃES, R.J.; SOUZA, C.A.S.; CARVALHO, J.A.; FERREIRA, R.S.; OLIVEIRA, S. Replacement of the commercial substrate by carbonized rice husk in the coffee tree seedlings production in tubes in the presence of hydroretentivepolymer. **Ciência e Agrotecnologia**. v. 28, p. 593-599, 2004.