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CROP PRODUCTION

Material evaluation for bagging of cantaloupe melons

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ABSTRACT: *The objective of this study was to evaluate different materials for field bagging with respect to the physicochemical changes caused in cantaloupe melon fruits. The study was conducted in a protected environment in the city of Goiânia, Goiás in Brazil. The experiment consisted of five treatments, with bagging of cantaloupe melon fruits with four materials (newspaper, Kraft paper, NWF, and polyethylene) and a control treatment without bagging, in a randomized block design with five replications of one plant with a fruit each. Fruits were evaluated for physicochemical characteristics. Number of days from bagging to harvest was also recorded and visual aspects of the fruit were observed. The materials as well as the time interval between the bagging and harvest affect physicochemical characteristics such as accumulation of soluble solids and thickness of the green pulp halo and visual aspects of the fruit. This study recommends bagging cantaloupe melons using white non-woven fabric or to not use the technique at all, under the conditions similar to those used in the study. In addition, using polyethylene for the bagging of fruit is not recommended, because this material has a deleterious effect on the characteristics essential for commercialization of melons.*
Key words: *Cucumis melo L., noble melon, organoleptic quality.*

Avaliação de materiais para ensacamento de melões cantaloupe

RESUMO: *Objetivou-se com este estudo avaliar diferentes materiais para ensacamento a campo quanto às alterações físico-químicas causadas em frutos de meloeiro Cantaloupe. O estudo foi conduzido em ambiente protegido localizado na cidade de Goiânia, Goiás. O experimento foi composto por cinco tratamentos, referentes ao ensacamento de frutos de meloeiro Cantaloupe com quatro materiais (papel jornal, papel Kraft, TNT e polietileno) e um tratamento controle, sem ensacamento, dispostos em blocos casualizados, com cinco repetições, representadas por uma planta com um fruto cada. Os frutos foram avaliados quanto às características físico-químicas. Também foi contabilizado o número de dias desde o ensacamento até a colheita e observados os aspectos visuais dos frutos. Verificou-se que os materiais influenciaram as características relativas ao acúmulo de sólidos solúveis e espessura do halo verde da polpa, o intervalo de tempo entre o ensacamento e a colheita e os aspectos visuais dos frutos. Recomenda-se o ensacamento de melões Cantaloupe com a utilização do TNT ou a não utilização da técnica, em condições semelhantes às do estudo. Em complemento, não é recomendada a utilização do polietileno para o ensacamento dos frutos, uma vez que esse material tem efeito deletério sobre as características essenciais à comercialização.*
Palavras-chave: *Cucumis melo L., melão nobre, qualidade organoléptica.*

Cantaloupe melon is one of the most commercialized melon species worldwide. Its striking characteristics with respect to aroma, visual appearance, taste, and texture culminate in a growing demand among consumers (VARGAS et al., 2010).

To obtain fruits for *in natura* consumption, improvisations in the cultivation techniques are essential for quality maintenance. For some species, it is common to use fruit bagging, not only to protect against biotic and abiotic damages but also for changes in

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physicochemical characteristics by creating microclimates around the fruit (MAZARO et al., 2005; TEIXEIRA et al., 2011). For cantaloupe melons, fruit bagging appears to be an alternative to insecticide application; preliminary studies have reported a high incidence of pests causing damage to the epidermis and fruit pulp, such as the pickleworm (*Diaphania nitidalis*), thus making insecticide application unsuitable for melon commercialization (SOBRINHO et al., 2011).

Despite the constant search for high quality fruits, which will lead to higher commercial value of cantaloupe melons, research on fruit bagging is very limited, and there are no technical recommendations about this culturing practice. Hence, the generation of this information is of great value to researchers, technicians, and rural producers, because this technique can positively affect the final product quality.

The objective of this study was to evaluate different materials for bagging in the field with respect to the physicochemical changes in cantaloupe melons. They were cultivated in Goiânia, Goiás, Brazil, in a protected environment (arc model) 21m long, 7m wide, and 4m height, covered with a transparent canvas, and with white anti-aphid nets on its sides. The city is located in the central region of the state (16°40′S, 49°15′W) at an altitude of 750m.

The dystroferric Red Latosol present in the experimental area had the following characteristics: 0.7% of Organic matter, pH 4.6, 3.5mg dm^{-3} P (Mehlich), 131.0mg dm^{-3} K, 2.0cmolc dm^{-3} Ca, 0.81cmolc dm^{-3} Mg, 2.5cmol dm^{-3} H + Al, 0.0cmolc dm^{-3} Al, 5.6cmolc dm^{-3} CTC, M% = 0.0, and V% = 55.7. During the study period, the average relative humidity of air was 66.7% and the average temperature was 24.9°C.

Cantaloupe melon Trinity cultivar seedlings were obtained by sowing seeds in 128-cell-trays containing commercial substrate and hardened manure (3:1), on February 20, 2016. Seedlings were transplanted to beds where they were staked with plastic ribbon, 25 days after sowing. The beds were previously prepared and fertilized based on soil analysis.

The experiment had a randomized block design, five treatments with five replicates, represented by one plant with one fruit each. Treatments consisted of bagging the fruit in the field, when the fruits presented a transverse diameter between 2 and 3cm, using four materials: white non-woven fabric (NWF), Kraft paper, newspaper and polyethylene with a thickness of 10 microns. In addition to the experimental treatments with the four materials, a control treatment was conducted in which fruits were not bagged.

Harvest started 93 days after sowing, and lasted for 17 days, taking the appearance of abscission zone in the fruit peduncle as a point of harvest. The fruits were harvested and evaluated for fresh mass (kg), shell thickness (mm), pulp (mm) and green halo outlining the pulp (mm), transverse diameter of the internal cavity (mm) and soluble solids content (°Brix), through manual refractometer reading. Number of days from bagging to harvesting was also counted. For the fruits in the control treatment, we recorded the number of days between a transverse diameter of 2cm and the harvest.

The data were analyzed with analysis of variance, the Tukey's test to analyze the qualitative factor of harvest point, and the regression analysis to account for the number of leaves, with the significance level set at 5%.

We found that bagging with different materials did not significantly affect the variables such as fruit mass, ratio between longitudinal and transverse circumference, shell thickness, pulp thickness, and internal cavity diameter (Table 1). However, the greatest accumulation of soluble solids was verified in the melons bagged with NWF, whereas no difference was observed in between the fruits bagged with Kraft paper and those without bagging (Table 1). For the above three treatments, we observed that the concentrations of soluble solids in the fruits were above the threshold required for commercialization in international markets (10 °Brix) (SALES JUNIOR et al., 2004). These three treatments allowed the fruit to remain on the plant for a longer time (Table 1), increasing the amount of photoassimilates acquired through photosynthesis in the leaves, which interferes with the amount of accumulated sugars (COELHO et al., 2008).

Because of increased temperature and low gas exchange inside polyethylene bags, gases such as ethylene (MAZARO et al., 2005) accumulated and; therefore, the harvest point was reduced by approximately 11 days, compared to that in control. Thus, there was no statistical difference for this measure between

Table 1 - Mass of fruits (MF), soluble solids (SS), ratio of transverse and longitudinal circumference (RCC), bark thickness (BT), green halo pulp thickness (HPT), pulp thickness (PT) transversal diameter of the internal cavity (DIC) and number of days between bagging and harvesting (DBH) of melon fruits Cantaloupe, var. Trinity, bagged with different materials.

Type of Proteccion	MF (kg)	SS (°Brix)	RCC	BT (mm)	HPT (mm)	PT (mm)	DIC (mm)	DBH
Control	1.33a	10.10abc	1.03a	0.82a	4.59ab	34.84a	28.74a	38.75a
NWF	1.50a	11.68a	1.01a	0.91a	4.37abc	36.95a	29.86a	40.20a
Kraft Paper	1.51a	10.95ab	1.01a	0.74a	3.57bc	36.72a	30.31a	35.75ab
Newspaper	1.43a	9.15bc	1.04a	0.81a	2.70c	40.11a	26.80a	29.25bc
Polyethylene	1.45a	8.35c	1.03a	0.65a	5.29a	35.58a	29.73a	27.50c
CV %	23.19	12.52	3.15	26.39	21.20	12.28	11.38	11.85

Means followed by the same letter in the column do not differ significantly at 5% probability. CV = coefficient of variation.

the use of polyethylene and newspaper bags. Previously, the same effect was observed in fig fruits (MAZARO et al., 2005) and Fuji Suprema apples (TEIXEIRA et al., 2011). However, there were signs of rot and netting malformation, unpleasant flavors and odors, just after the fruit formation started, characteristics which affect the commercialization of cantaloupe melons (SANTOS et al., 2015).

Bagging of fruits with newspaper led to a decrease in thickness of the green halo of pulp by 70% when compared to unbagged fruits. Yet, there was no statistical significance between this treatment and the fruits that were bagged with NWF or Kraft paper (Table 1). The decrease of green halo of the pulp is related to the higher ripeness of the cantaloupe melons at harvest time (GIEHL et al., 2008).

Fruits not bagged or bagged with NWF presented favorable characteristics for commercialization (Figure 1a and 1b), such as good netting, color typical of the species, and absence of damage and unpleasant odor. Fruits bagged with newspaper and Kraft paper bags suffered alterations in coloration, showing a yellow color, despite the good netting and exemption of other deleterious factors that would disadvantage commercialization (Figure 1c and 1d). This change is expected owing to the lack of light incidence on the fruits. Thus, there is less development of chlorophyll in the fruit epidermis, because light is a determinant for the reaction that transforms protochlorophyll into chlorophyll (HALL & RAO, 1980).

Consequently, we recommend bagging of cantaloupe melons with either white non-woven fabric or to not use bagging at all, under conditions similar to those presented in this study. In addition, we do not recommend the use of polyethylene for fruit bagging, as this material has a deleterious effect on the characteristics essential for cantaloupe melon commercialization.

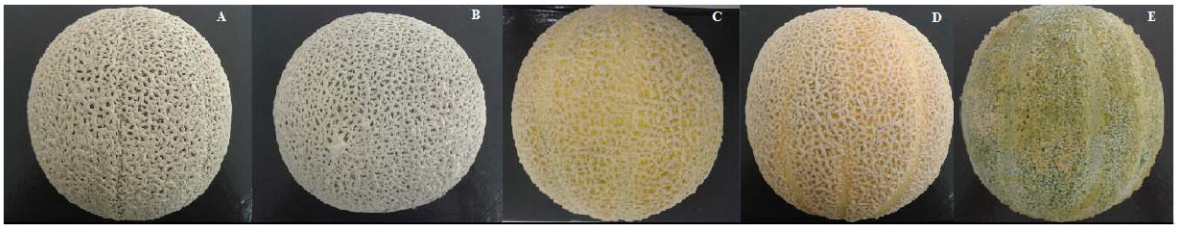

Figure 1 - Cantaloupe melon fruits, variety Trinity, under the effect of bagging with: A) Control; B) NWF; C) Newspaper; D) Kraft paper; E) Polyethylene.

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