

JUICE EXTRACTION FOR TOTAL SOLUBLE SOLIDS CONTENT DETERMINATION IN MELON

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ABSTRACT - The total soluble solids content (TSSC) shows high positive correlation with sugars content, and therefore is generally accepted as an important quality trait of fruits. In melon, this evaluation is usually done by grinding a slice of the fruit's pulp in a household food processor, straining the ground material and then proceeding the TSSC determination in the resulting juice. This evaluation is labor-intensive and takes a long time to complete. An alternative process was delineated for obtaining the juice: the pulp of the fruit slice would be transversally cut one or more times, and longitudinally pressed by hand to obtain the juice. The objective of this work was to compare processes for obtaining juice to evaluate TSSC in melons. Fifty, 15, and 15 fruits of the Galia, Yellow, and Cantaloupe type melons were evaluated, respectively. Each fruit was considered as a block, and was longitudinally split into six fractions with similar sizes, which corresponded to the plots. The following treatments were evaluated: fraction without cuts, fractions with one, three, five, or seven transversal cuts, and the fraction treated by the conventional process. It was concluded that the procedure by which the melon slices of Galia, Yellow and Cantaloupe types are pressed for obtaining the juice to evaluate TSSC can overestimate this content. This would probably be due to the fact that the most internal section of the mesocarp presents greater TSSC than the portions closer to the epicarp.

Index terms: *Cucumis melo* L., Yellow, Galia, Cantaloupe, Brix.

EXTRAÇÃO DO SUCO PARA DETERMINAÇÃO DO TEOR DE SÓLIDOS SOLÚVEIS TOTAIS NO MELÃO

RESUMO - O teor de sólidos solúveis totais (TSST) apresenta alta correlação positiva com o teor de açúcares e, portanto, geralmente é aceito como importante característica de qualidade dos frutos. No melão, geralmente, a avaliação é feita triturando-se uma fatia da polpa do fruto em processador doméstico, coando-se o material triturado e determinando-se o TSST no suco resultante. Essa avaliação é trabalhosa e demorada. Idealizou-se, então, um processo alternativo de obtenção do suco: a polpa da fatia do fruto seria cortada transversalmente uma ou mais vezes e pressionada manual e longitudinalmente, para obtenção do suco. O objetivo do trabalho foi comparar processos de obtenção do suco, para avaliação do TSST do melão. Foram avaliados 50, 15 e 15 frutos dos tipos Galia, Amarelo e Cantaloupe, respectivamente. Cada fruto foi considerado um bloco e foi dividido longitudinalmente em seis frações aproximadamente iguais, que corresponderam às parcelas experimentais. O suco foi obtido com os seguintes tratamentos: fração sem corte, frações com um, três, cinco ou sete cortes transversais e fração tratada com o processo convencional. Concluiu-se que o procedimento de pressionar as fatias de melão, para obtenção do suco para avaliação do TSST, pode superestimar esse teor. Provavelmente, isso seria devido provavelmente ao fato da porção mais interna no mesocarpo apresentar maior TSST que as porções mais próximas ao epicarpo.

Palavras-chave: *Cucumis melo* L., melão Amarelo, melão Gália, melão Cantaloupe, Brix.

INTRODUCTION

The melons produced in the Northeast Brazil are imported by countries where the consumer is quite demanding. In addition, a general tendency is observed according to which the domestic consumers are also becoming more demanding. The total soluble solids content (TSSC), expressed as a percentage of fresh matter mass, shows high positive correlation with sugars content, and is therefore generally accepted as an important quality trait of fruits. This correlation, however, is not absolute, since a high TSSC value does not adequately define good melon quality (YAMAGUCHI *et al.*, 1977).

Due to the importance of the TSSC value as a qualitative attribute of melon, in general the studies involving this crop try to evaluate this trait. Usually, the evaluation is done by grinding a slice of fruit pulp in a household food processor, straining the ground material and then determining the TSSC in the resulting juice (GRANGEIRO *et al.*, 1999; SILVA *et al.*, 2002; SILVA *et al.*, 2003). This evaluation is labor-intensive and takes a long time to complete; in addition, after each evaluation, the grinder, filter, and so on, need to be washed before new samples can be evaluated. As a consequence, an alternative process has been thought up for obtaining the juice. In this case, the pulp in the fruit slice would be transversally cut one or more times in such a way that the cuts would not separate the fractions (the cuts reaching the endocarp, but not the pericarp). Next, the slice would be pressed longitudinally to obtain the juice.

The objective of this work was to compare six processes for obtaining juice to evaluate TSSC in Galia- (Solar King cultivar), Yellow- (Gold Pride cultivar) and Cantaloupe-type (Torreon cultivar) melons.

Fifty, 15, and 15 fruits of the Galia, Yellow, and Cantaloupe type were evaluated, respectively, obtained from lots destined for export by Mossoró-RN enterprises. The fruits were weighed and measured, for a better characterization. Each fruit was considered as a block, and was split longitudinally into six fractions of approximately equal sizes, which corresponded to the experimental plots. Therefore, the experiment was conducted in randomized complete block design with 50, 15, or 15 replications, respectively. The juice was obtained by means of the following treatments: fraction without cuts, fractions with one, three, five, or seven transversal cuts, and the fraction

treated by the conventional process (pulp removal, grinding, and so on). In the fractions containing cuts, the cut was performed so as to split the fruit slices into approximately equal parts. The juice obtained from each section was utilized to perform three readings in a digital refractometer.

For a better analysis of the results obtained in the experiments, another one was conducted. In this experiment, a fraction of approximately 4 cm × 10 cm of pulp was removed from each of the four “sides” of each one of 8 fruits. The pulp in this fraction was split, with cuts made parallel to the epicarp, into three fractions, of approximately equal thicknesses: mesocarp-I = mesocarp fraction closest to the interior of the fruit; mesocarp-E = mesocarp fraction closest to the epicarp; and mesocarp-M = fraction between the two other fractions. The four fractions of each fruit were submitted to the conventional process for TSSC evaluation, and three readings were taken. In this experiment as well, each fruit was considered as a block and each fraction of the mesocarp was a plot. In the analysis of variance of each experiment, the means of the three readings taken for each plot were utilized.

Variations in length, diameter, weight, and TSSC were observed in the analyzed fruits (Table 1). Comparisons must be avoided between melon types with regard to the measured traits, since the fruits were produced in different areas, evaluated based on different sample sizes, etc.

With regard to TSSC, there were significant differences between fruits (blocks) for each melon type. These differences are probably the result of environmental or environment-related factors, as the plants of each cultivar have the same genotype, since they are simple hybrids. As to the methods for obtaining the juice to determine TSSC, the conventional method yielded, for the three types of fruits, a smaller content than with the other methods, which were not different among themselves (Table 2). In the Galia, Yellow, and Cantaloupe types, the differences between the means obtained with the conventional method and the means obtained with the other five methods were, approximately, 50%, 52%, and 35%, respectively. Since there were no differences between the “no cut” and the “with cut” methods, the cuts become unnecessary, in case the method of only pressing the pulp slice to obtain the juice is to be adopted.

The ventral and dorsal portions of the melon did not differ among themselves and are superior to the lateral portion, with regard to TSSC

Table 1 - Fruit weight, length, and diameter statistics, and total soluble solids content in the fruit pulp of three types of melon plants.

Trait	Statistics	Melon type		
		Galia	Yellow	Cantaloupe
Weight (g)	Amplitude	903 – 1288	1575 – 2311	1125 – 1591
	Mean	1024	1921	1389
	Standard error	87	17	31
Length (cm)	Amplitude	12.2 – 14.3	16.1 – 19.1	13.7 – 16.0
	Mean	13.0	17.5	14.8
	Standard error	0.44	0.22	0.17
Diameter (cm)	Amplitude	11.6 – 13.3	14.5 – 16.9	13.1 – 14.6
	Mean	12.3	15.8	13.9
	Standard error	0.37	0.21	0.10
Solids content (°B)	Amplitude	8.5 – 17.8	11.0 – 16.0	8.2 – 12.0
	Mean	12.8	13.9	9.9
	Standard error	1.70	0.36	0.26

(SILVA *et al.*, 2003). Also, the TSSC in the basal portion is inferior to those in the medial and apical portions (SILVA *et al.*, 2002). It is possible, however, that the differences in TSSC

decreasing as the portions nearer to the pericarp are included in the consideration (Table 3). In support of this observation, it has been verified that, in melon, the exomesocarp has a greater

Table 2 - Total soluble solids contents (°B) of pulp juice from three types of melon, obtained by different extraction methods.

Pulp juice extraction methods	Melon type ¹		
	Galia	Yellow	Cantaloupe
No pulp cuts + manual pressure	13.5 a	14.6 a	10.2 a
1 pulp cut + manual pressure	13.5 a	14.7 a	10.3 a
3 pulp cuts + manual pressure	13.6 a	14.6 a	10.5 a
5 pulp cuts + manual pressure	13.5 a	14.8 a	10.3 a
7 pulp cuts + manual pressure	13.5 a	14.8 a	10.4 a
Conventional (grinding + filtration)	9.0 b	9.7 b	7.7 b

¹ Values followed by a common letter, in the same column, are not different among themselves at 5% probability by Tukey test.

observed in the present work between the two types of methods, are related to the fact that, in the conventional method, the juice of all the pulp (mesocarp) is represented, while in the other methods probably the surface part of the pulp is represented in greater proportion. In other words,

content of sugars, followed by the endocarp, placenta and seeds (CHROST & SCHMITZ, 1997). The soluble sugars represent over 97% of the total soluble solids, with sucrose representing over 50% of all sugars (BIANCO & PRATT, 1977). The variations in TSSC between different

Table 3 - Total soluble solids contents in fractions of the mesocarp of Cantaloupe melon.

Mesocarp fraction ¹	Mesocarp-I	Mesocarp-M	Mesocarp-E
Total soluble solids contents (°B) ²	8.5 a	7.8 b	5.8 c

¹ Mesocarp-I = mesocarp fraction closest to the interior of the fruit; mesocarp-E = mesocarp fraction closest to the epicarp; and mesocarp-M = middle fraction.

² Values followed by a common letter are not different among themselves at 5% probability by Tukey test.

the juice portion obtained with non-conventional methods is not representative. In the surface portion of the pulp, the TSSC is higher,

parts of the melon could be related to differences in the concentrations of growth regulators in different parts of the fruit (Dunlap *et al.*, 1996).

Such regulators have an important participation in the process of translocation of carbohydrates into the fruit (SALISBURY & ROSS, 1991).

It can be concluded, therefore, that the procedure by which the melon slices of types Gália, Yellow and Cantaloupe, either cut transversally or not, and pressed manually for obtaining the juice to evaluate TSSC, can overestimate the concentration, in relation to the conventional method of grinding the pulp and straining the juice. This would probably be due to the fact that the most internal section of the mesocarp has greater TSSC than the portions closer to the epicarp.

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