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ASSESSMENT OF CHEMICAL COMPOSITION AND SENSORY QUALITY OF TOMATO FRUIT DEPENDING ON CULTIVAR AND GROWING CONDITIONS

INTRODUCTION

Nowadays, the increasing consumption of fresh vegetables containing bioactive compounds and consumers' acceptance of the product are very important. Sensory properties are very important in the assessment of vegetable quality and consumers' preferences. Good quality of tomato fruits and their acceptance by consumers describes a high correlation coefficient between the results of sensory assessment and the results of chemical analysis. Fruit composition and their desirability are affected by many factors such as growth media, fertilizers, and salinity sources. The aim of this work was to compare the chemical composition quality traits of cherry tomato and middle fruit size tomato cultivars with sensory attributes and their correlation in relation to growing medium and harvest time.

MATERIAL AND METHODS

The experiments were carried out in a greenhouse with the controlled microclimate in the years 2008 and 2009 at Warsaw University of Life Sciences. Two tomato cultivars: typical cherry tomato one Dasher F1 with red skin and Organza F1 with yellow skin and two middle fruit size tomato ones Admiro F1 and DRW 7594 F1 (Monsanto Polska Sp. z o.o. earlier De Ruiters Seeds) were used in the study. Tomatoes were cultivated on organic media such as coconut fiber slabs (manufacturer: Ceres Intern.), wood fiber slabs (Steico S.A.) and rockwool slabs (Grodan BV, Master type). The experiment was established in random design, in three replicates, with 8 plants in each. Fruits for quality evaluation were harvested at the full colour maturity stage at two different dates: at the beginning of July and at the end of September. At each harvest time, 40 fruits were collected from each combination. One part was examined for the chemical quality attributes of tomato fruit another part of fruits was subjected to sensory analysis done by the scaling method.

Statistical analysis was performed using three-way analysis of variance. Results for individual years were regarded as repetitive values in a statistical test. Detailed comparison of means was performed by the Tukey's test at the significance level of $\alpha=0.05$. For the needs of chemical analysis and sensory assessment the correlation coefficient was calculated (linear dependence between two traits) using the Statgraphics Plus program.

RESULTS

The results of the experiment show that harvest time and tomato cultivar as well as growth medium significantly influenced fruit quality. Tomatoes harvested in July had a higher content of TS and TA than fruits harvested in September (tab. 1). Fruits harvested in July obtained higher note of all the investigated discriminants in sensory evaluation than fruits harvested in September (tab. 2). They were characterized by stronger smell and the taste typical for tomato, they were sweeter and evidently more juicy. Their skin was firmer. The overall assessment was higher than in September. Fruits obtained from cultivation on coconut fiber were characterized by the highest TS:TA ratio as compared to fruits cultivated on rockwool. A significant difference was observed in the case of typical tomato smell which obtained the highest note in the case of fruits cultivated on coconut fiber. Fruits of Dasher F1 cultivar were characterized by the highest content of TS, TA, TSS and TS/TA as compared to other investigated cultivars. Some determinants of the sensory assessment were significantly correlated with the content of sugars and organic acids as well as compounds dissolved in the cell sap of tomato fruits. A significant correlation between those chemical components and the firmness of the skin and sweet taste of fruits was observed (tab. 3). Particular quality traits of tomato were mostly differentiated by the type of cultivar but also by the date of fruit harvest and, although to a lesser degree, by the medium traits.

CONCLUSIONS

1. Tomatoes harvested in July had a higher sugar content and received a higher sensory evaluation note than those harvested in September.
2. The sugars to acids ratio was the highest in fruits cultivated on coconut fiber. These fruits also received a higher note of particular determinants, especially in the case of the tomato smell.
3. The highest quality in relation to the content of the investigated chemical components and sensory evaluation had fruits of Dasher F1 and Admiro F1 cultivars.
4. A significant correlation was proved for such determinants of sensory evaluation as skin firmness, tomato taste and sweet taste.
5. The sugar content in fruits was positively correlated with the overall evaluation of tomato fruits.
6. Skin firmness and sweet taste were significantly correlated with the content of organic acids and soluble solids.

Table 1. Chemical related traits of tomato fruits as affected by harvest time, growing media and cultivar (mean values for 2008-2009)

Factor	Total Sugars	TA	TSS	TS/TA
	(g100g ⁻¹ fw)		(%)	
Date of Harvest				
July	2,54 a*	0,36 a	4,23 a	6,91 a
September	2,28 a	0,34 a	4,22 a	7,12 a
Growing Medium				
Coconut fiber	2,58 a	0,34 a	4,48 a	7,75 a
Wood fiber	2,42 a	0,34 a	3,99 a	7,15 ab
Rockwool	2,23 a	0,38 a	4,29 a	6,13 b
Cultivar				
Dasher F ₁	3,66 a	0,46 a	6,47 a	8,14 a
Organza F ₁	2,66 b	0,34 b	3,92 b	7,04 ab
Admiro F ₁	1,95 b	0,29 b	3,48 b	6,85 ab
DRW 7594 F ₁	1,76 b	0,31 b	3,04 b	5,99 b

* Mean values for factors which do not differ according to Tukey's HSD test at P=0.05 are marked with the same letters. Interaction insignificant



Table 2. Effect of harvest time, growing media and cultivar on sensory attributes of tomatoes (mean values for 2008-2009)

Factor	Smell Tomato	Tough of Skin	Flesh Texture	Juiciness of Flesh	Taste			Overall Quality
					Typical Tomato	Sour	Sweet	
Date of Harvest								
July	5,98 a *	4,31 a	5,34 a	6,43 a	6,33 a	4,10 a	3,20 a	7,39 a
September	5,60 b	3,88 b	5,07 a	6,14 b	5,81 b	3,98 a	2,85 b	6,64 b
Growing Medium								
Coconut fiber	5,93 a	4,06 a	5,04 a	6,30 a	6,16 a	4,13 a	3,02 a	7,09 a
Wood fiber	5,69 b	4,12 a	5,14 a	6,31 a	6,02 a	4,05 a	2,97 a	6,98 a
Rockwool	5,75 ab	4,11 a	5,43 a	6,24 a	6,03 a	3,93 a	3,08 a	6,97 a
Cultivar								
Dasher F ₁	6,26 a	6,11 a	5,74 a	6,19 b	6,83 a	4,51 a	4,47 a	7,52 a
Organza F ₁	5,04 c	3,93 b	3,96 b	6,58 a	5,30 d	3,41 c	2,56 bc	6,68 b
Admiro F ₁	6,04 ab	3,41 bc	5,48 a	6,57 a	6,28 b	4,02 b	2,67 b	7,15 a
DRW 7594 F ₁	5,81 b	2,94 c	5,64 a	5,80 c	5,87 c	4,20 b	2,38 c	6,69 b

* Mean values for factors which do not differ according to Tukey's HSD test at P=0.05 are marked with the same letters. Interaction insignificant

Table 3. Significant correlations between the content of total sugars, titratable acidity and soluble solid content of tomatoes (respectively) and sensory attributes of the scaling method (mean values for 2008-2009)

Sensory attributes	Correlation coefficient		
	Total Sugars	TA	TSS / SRSK
Tough of Skin	0,65**	0,75**	0,81**
Tough of Skin	0,65**	0,75**	0,81**
Typical Tomato Taste	0,54**		
Sweet Taste	0,71**	0,71**	0,73**
Overall Quality	0,57**		

** significant at P=0,01

