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DIFFERENCES IN SOME QUALITY TRAITS BETWEEN RED AND YELLOW CHERRY TOMATO VARIETIES GROWN IN REPUBLIC OF MACEDONIA

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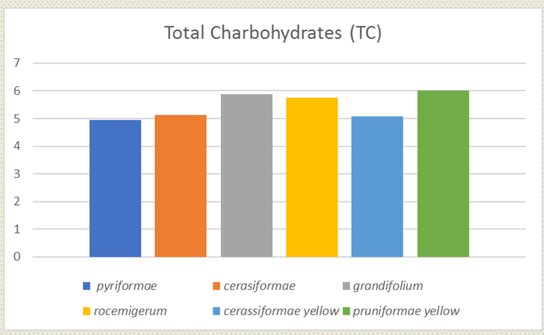
Introduction

Being a popular fruit, tomatoes find numerous uses in both fresh and processed forms. Many differences in general composition have been highlighted between traditional varieties (big tomatoes) and the new small-sized varieties (cherry and plum tomatoes), the latter characterised by higher dry matter and soluble solid fraction, essentially due to the higher levels of sugars and organic acids (Muratore, Licciardello, & Maccarone, 2005). The flavor of tomato fruit mainly comes from soluble sugars, organic acids, amino acids, and volatile compounds. Compared with the wild or heirloom tomato varieties, modern tomato varieties have decreased many flavor compounds (fructose, glucose, citric acid, and at least 13 volatiles) throughout the process of domestication and improvement (Tomato Genome Consortium, 2012; Lin et al., 2014) because breeders serve growers, not consumers. In our research was use four red (*cerrasiformae*, *grandifolium*, *rocemigerum*, *pyriformae*) and two yellow colored (*cerasiformae, pruniformae*) cherry tomato varieties were investigated in this study regarding some physical and chemical properties like pH, total carbohydrates (TC), total acidity (TA), ascorbic acid (AA), ash (AS), water (H_2O), and dry matter (DM) content. A non-parametric Mann–Whitney *U* test for independent samples was performed to identify statistically significant differences between red and yellow cherry tomato regarding investigated traits. Yellow investigated varieties showed higher values for TC, AS, DM and AA content while red cherry tomato varieties showed higher content for TA and H_2O. Statistically significant differences were observed regarding TC, AA, AS, DM and H_2O content between the yellow and red varieties.

Figure 1. Investigated yellow varieties of cherry tomato: (a) *Lycopersicon esculentum* var. *pruniforme* (b) *Lycopersicon esculentum* var. *cerasiforme*

Materials and Methods

The open-field experiments were carried out in the region of Skopje, the most important vegetable production region in North Macedonia. Four red cherry tomato varieties obtained from the National germplasm bank were used in this experiment such as *Lycopersicon esculentum* var *cerasiformae*, *Lycopersicon esculentum* var. *pyriformae*, *Lycopersicon esculentum* var. *grandifolium*, and *Lycopersicon esculentum* var. *racemigerum*. Moisture and dry matter content of cherry tomato fruit were determined according to Gharezi *et al.* (2012). For that purpose, 10 g of tiny-chopped tomato were placed into a petri-dish and measured. The petri-dish was placed in an oven at 105ºC until the constant mass was reached. For determination of titratable acidity, 10 ml of filtered tomato juice was added to 50 ml of distilled water and titrated with 0.1M NaOH using phenolphthalein (Horwitz 1975). The content of ash was determined according to Owusu *et al.* (2012). For that purpose, 2.0 g of chopped tomato were placed into a porcelain dish and ashed in a muffle furnace at 600 ºC for 3 hr. Ascorbic acid was determined by a redox titration using iodine. For that purpose, 100 g of tomato fruit and 50 ml of distilled water are blended in a food processor. The obtained juice is filtered through the cheesecloth to remove the pulp. The pulp is washed three times with 10 ml of distilled water. The extracted solution was filled up to 100 ml and then 20 ml of this solution were transferred into an Erlenmeyer of 250 ml after which were added 150 ml of distilled water and 1 ml of a starch indicator. The sample was titrated with 0.005 mol/l of iodine solution until a dark blue-black color endpoint is reached that occurs due to a starch-iodine complex formation (IPGRI 1996). The content of total carbohydrates was determined colorimetrically by the phenol - sulfuric acid method. For that purpose, a clear aqueous solution of tomato juice is treated with phenol and sulfuric acid. The sulfuric acid converted the non-reducing sugars to reducing sugars after which the solution turns in yellow-orange as a result of the interaction between the carbohydrates and the phenol. The absorbance is measured at 420 nm (Kenneth 1990). Acidity (pH) was measured potentiometrically according to Voća *et al.* (2011)



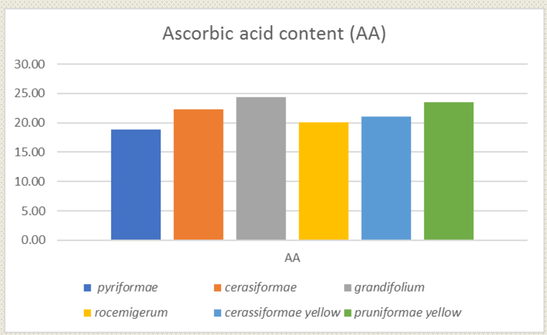
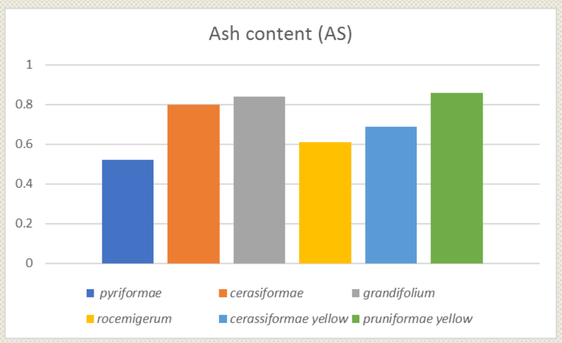
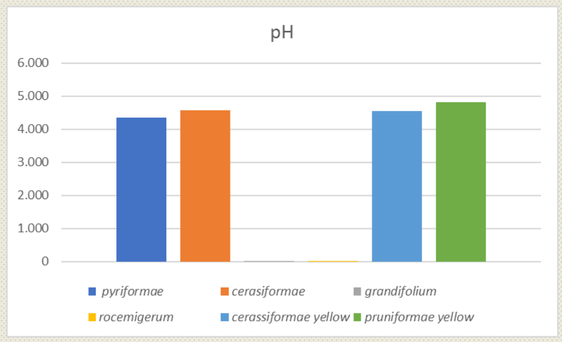


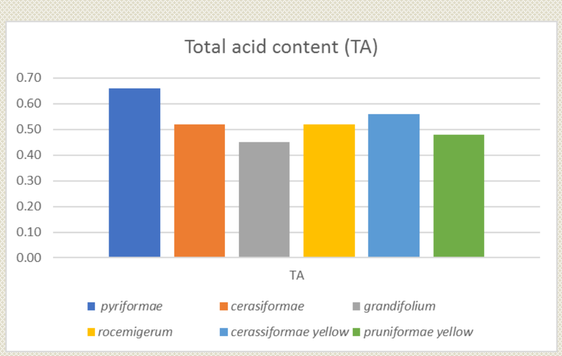
Figure 2. Investigated red varieties of cherry tomato: (a) *Lycopersicon esculentum* var. *pyriforme,* (b) *Lycopersicon esculentum* var. *rocemigerum* (c) *Lycopersicon esculentum* var. *grandifolium,* (d) *Lycopersicon esculentum* var. *cerasiformae*

Results and discussion

Yellow investigated varieties showed higher values for TC, AS, DM and AA content while red cherry tomato varieties showed higher content for TA and H_2O (Fig.3). Statistically significant differences were observed regarding the DM, M, AA, AS, and TA content between the majority of the varieties using LSD test. The varieties of *cerasiformae* and *pruniformae*, and the varieties of *pyriformae* and *grandifolium* were most similar regarding the DM and H_2O content. The AS content was statistically different between the varieties of *grandifolium*, *rocemigerum* and *pyriformae* while red and yellow varieties of *cerasiformae* and the two investigated yellow varieties, *cerasiformae* and *pruniformae* where similar regarding this traits. The variety of *cerasiformae* and *grandifolium* didn't differ in TA content. TC is a trait where the majority of investigated varieties didn't differ from each other. Differences were observed only between varieties of *pruniformae* and *rocemigerum*, and between *pyriformae* and the investigated yellow varieties, *cerasiformae* and *pruniformae*. A non-parametric Mann–Whitney U test for independent samples was performed to identify if there are statistically significant differences between investigated red and yellow cherry tomato varieties. The obtained result for the range of the test statistic U was compared to the critical values of the Mann-Whitney U two tailed table (Kanji 2006). The result showed differences in the content of TC, AA, AS, DM and H_2O. Considreing the average values for investigated traits it can be concluded that the yellow varieties have greater content of TC, AA, AS and DM but the water content was greater in red varieties indicating their shorter shelf life.







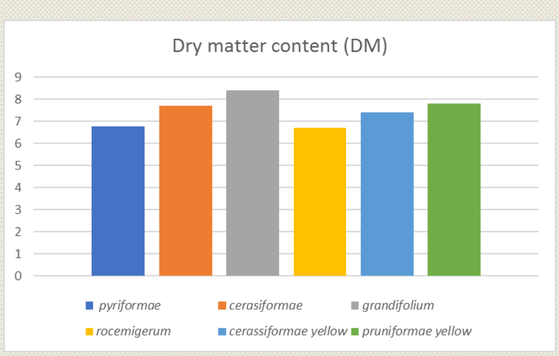


Table 1. The Mann- Whitney U test for two independent groups (the critical value for the groups of 4 and 2 samples is estimated at 3). Significant values are bolded.

	Group	N	Sum of Ranks	U
TC	Yellow	2	8	**3**
	Red	4	13	5
AA	Yellow	2	8	**3**
	Red	4	13	5
TA	Yellow	2	7	4
	Red	4	14	4
pH	Yellow	2	7	4
	Red	4	14	4
AS	Yellow	2	9	**2**
	Red	4	12	6
DM	Yellow	2	8	**3**
	Red	4	13	5

Conclusion

Statisticaly significant differences were investigated between four red and two yellow cherry tomato varieties. From the descriptive statistical analyzis it can be seen that yellow investigated varieties have higher content of TC, AS, DM and AA while red cherry tomato varieties have higher content of TA and H_2O. The least differences were observed in TC content. Regarding this trait the red variety of *pyriformae* significantly differ from the two investigated yellow varieties (*cerasiformae and pruniformae). Difference was also observed and between the red variety of rocemigerum and the yellow var. pruniformae. T*he Mann–Whitney U test identify significant differences between the group of red and the group of yellow investigated varieties regarding the TC and AA content as well as regarding AS, DM and M content. The yellow varieties showed greater content of TC, AA, AS and DM while red varieties showed greater water content. *T*he Mann–Whitney U test showed to be effective in determining differences between red and yellow cherry tomato varieties even when a very small number of data is analyzed. The test was more sensitive than the simple students t-test.

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