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Comparison of some biochemical traits of ten sweet orange(*Citrus sinensis*) cultivars grown in Hormozgan province

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ABSTRACT

The goal of this investigation was to evaluate some biochemical traits(pH, total soluble solids and ascorbic acid) in fruits of ten orange(*Citrus sinensis*) cultivars.Studied cultivars were Salustiana, Pine apple, Number 4, Valencia, Hamlin, Early Navel, Madam Vinous, Marss, Brohen and Thompson. The results showed that there were significant differences among studied cultivars. The highest and the lowest pH were found in Early Navel (4.17) and Brohen (3.01), respectively. The highest and the lowest total soluble solids (TSS) were obtained in the cultivars Number 4(11.16%) and Brohen (7.8%), respectively. The cultivars Number 4, Pine apple and Salustiana had no significant differences for TSS ($P < 0.05$).The lowest pH and TSS belonged to the cultivar Brohen. The highest and the lowest ascorbic acid content were obtained in the cultivars Number 4($107.33_{mg.100ml^{-1}}$) and Marss ($56.33_{mg.100\ ml^{-1}}$), respectively. The results showed that the cultivar Number 4 can be valuable among other cultivars since it had the highest TSS and ascorbic acid.

Key words: pH, total soluble solids, ascorbic acid, *Citrus sinensis*, Hormozgan, Iran.

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INTRODUCTION

Citrus fruits have a high contents of phenolic compounds, ascorbic acid, dietary fibres, and trace elements (Marlett, 1992; Marlett and Vollendorf, 1994). Ascorbic acid (vitamin C) is an important antioxidant, therefore citrus fruit are protective against many of diseases produced by reactive oxygen such as superoxide (Ness and Powles, 1997). It has reported that antioxidant compounds can directly react with free radicals (Di Majo et al., 2005).In Iran, citrus planting area is more than 250000 ha with 3.7 millions ton annual production and sweet oranges occupies approximately 50% of planting area citrus (Fifaei et al., 2007).In this research we evaluated some biochemical traits of ten sweet orange (*C. sinensis*)cultivars to determine the cultivars with high food quality. These cultivars can be used by user and agriculture researchers.

MATERIALS AND METHODS

In this study fruits of 10 orange (*C.sinensis*) cultivars provided by Hajiabad agricultural research station, Hormozgan, Iran. The cultivars were Salustiana, Pine apple, Number 4, Valencia, Hamlin, Early Navel, Madam Vinous, Marss, Brohen and Thompson. All fruits harvested in ripening stage and the parameters pH, total soluble solids (TSS) and ascorbic acid (vitamin C) were determined. Determination of pH and TSS were carried by pH meter and refrectrometer (Model AR10, Germany), respectively. Ascorbic acid also determined

Table 1. Comparison of pH, TSS and ascorbic acid among ten orange cultivars (*Citrus sinensis*).

Cultivar	pH	TSS (%)	Ascorbic acid ($_{mg\ .100\ ml^{-1}}$)
Brohen	3.01±0.030 f	7.80±0.519 e	82.66±1.154 c
Salustiana	3.21±0.119 e	10.50±0.00 ab	69.66±0.577 de
Valencia	3.30±0.037 e	8.53±0.057 de	68±5.56 ef
Number 4	3.46±0.028 d	11.16±0.763 a	107.3±6.02 a
Marss	3.50±0.095 d	9.83±0.288 bc	56.33±5.03 g
Hamlin	3.53±0.032 d	9.33±0.288 cd	90.33±3.21 b
Pine apple	3.83±0.036 c	10.93±0.115 a	85.33±3.78 bc
Thompson	4.02±0.091 b	9.00±0.00 d	86.66±4.93 bc
Madam vinous	4.02±0.063 b	9.33±0.763 cd	75.66±2.51 d
Early Navel	4.17±0.117 a	9.00±0.50 d	62.33±2.08 fg

Significant differences within the same column are indicated by different letters (P = 0.05, Duncan test)(n=3.)

by $CuSO_4$ titration (Barakat et al, 1973) and stated as mg. 100 ml^{-1} extract. Data analysis carried out by SPSS software and means compared by Duncan test.

RESULTS

The results showed that there were significant differences in the parameters pH, TSS and ascorbic acid among studied cultivars as shown in Table 1. Variation range of pH was between 2.99 and 4.26(mean 3.6±0.378). The highest and the lowest pH content were found in Early Navel(pH=4.17) and Brohen (pH=3.01),respectively and both cultivars had significant difference with other cultivars. Variation range of TSS was also between 7.5 and 12% (mean 9.54±1.09).The highest and the lowest TSS were obtained in the cultivars Number 4(11.16 %) and Brohen(7.8 %),respectively. The cultivars Number 4, Pine apple and Salustiana had no significant difference for TSS($P<0.05$).The cultivar Brohen showed the lowest pH and TSS among cultivars.Variation range of ascorbic acid was between 51 and 113mg . 100 ml^{-1} extract(mean 78.43±14.92).The highest and the lowest amounts of ascorbic acid were obtained in the cultivars Number 4(107.33) and Marss (56.33)respectively. The cultivar Number 4 showed the greatest contents of TSS and ascorbic acid.

DISCUSSION

According to results there was a negative correlation between ascorbic acid content and pH(-.068), but it was not significant. TSS and ascorbic acid also had no significant correlation. The results showed that there were high diversity in measured parameters among studied cultivars. Many researches have reported variable results from measured parameters and have stated these parameters are related to cultivar type and different origin (Johnson et al., 1995;LoScalzo et al., 2004; Miller and Rice-Evans, 1997; Rapisarda et al.,1999; Roberts and Gordon, 2003). Ascorbic acid contents also are affected by duration and temperature during post-harvest periods (Klimezak and Malecka, 2006).Emese and Nagymate (2008) reported that the stability of ascorbic acid decreases with increase in temperature and pH. Gorinstein et al.(2001) reported contents of ascorbic acid in fruits of lemon (47.9 mg. 100 ml^{-1}) and sweet orange(47.7 mg. 100 ml^{-1}) were higher than grapefruit (35.1mg. 100 ml^{-1}). Vinci et al. (1995) reported that contents of ascorbic acid of sweet orange, grapefruit and lemon determined by HPLC method were 49.8, 64.7 and 51.3 %, respectively that were less than our data(mean 78.43±14.92).Ebrahimzadeh et al.(2005) reported mean of ascorbic acid concentration in citrus fruits were 85.4 mg. 100 ml^{-1}extract that was higher than our results.

Conclusion

The results showed that the cultivar Number 4 can be valuable among other cultivars since it had the highest TSS and ascorbic acid. The findings of this study may provide suitable information about nutritional value of studied cultivars for food experts and other researchers.

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