

The Comparative Study of Three Types of Ai-wan Pomelo Nutrients and Economic Benefit Analysis

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Abstract. This test is made of suining Ai-wan pomelo, for Ai-wan pomelo pulp in the different color soluble solids, soluble sugar, titratable acid, sugar acid ratio, anthocyanins and total phenol, flavone and comparison of VC and other nutrients and three kinds of economic benefit analysis of Ai-wan pomelo. According to the result of determination of pick out some performers to cultivation promotion, for the local pomelo class resources industrialization development provide a theoretical basis in practice and research, to further promote the rational development and utilization of local varieties, through three Ai-wan pomelo intrinsic quality of the determination results and pomelo class market economic benefits, and combined with relevant evaluation standard of citrus fruit, red flesh is better than yellow flesh and white flesh, red flesh can be Ai-wan pomelo as the main promotion of local varieties.

Keywords: Ai-wan pomelo; economic benefit; intrinsic quality; evaluation standard.

1. Introduction

Pomelo is a subtropical evergreen fruit tree of citrus subfamily citrus of rutaceae, native to China and southeast Asia. Ai-wan pomelo is a new bud strain selected from the late white pomelo strain in Taiwan [1], with strong adaptability and disease resistance, high and stable yield, and storage resistance. It belongs to the special late ripening variety.

Z J Shen [2] et al. studied the antioxidant factors of peach fruits of three flesh color types, and the results showed that there was an inevitable relationship between the nutritional quality of the fruit and the flesh color. L N Chen [3] et. al. also analyzed the fruit quality of red flesh pitaya and white flesh pitaya. At present, the research on Ai-wan pomelo mainly focuses on cultivation, while the research on other fields is very limited. The comparative study on the content of anthocyanin, total phenol, VC and other nutrients in the flesh of the three colors of Ai-wan pomelo has not been reported.

Based on the results of the determination of the fruit quality of three kinds of Ai-wan pomelo, combining with the yield and market benefits of Ai-wan pomelo, this experiment optimized the varieties suitable for local cultivation and promotion, provided the research basis and practical basis for the industrialization development of local pomelo resources, and further promoted the rational development and utilization of local varieties.

2. Materials and Methods

2.1 Basic Survey of the Test Site

The test site is pengxi county, suining city, sichuan province, which belongs to the subtropical warm and humid monsoon climate zone. The soil in this area is mostly purple soil or brown soil, with shallow soil layer and organic matter content of >1.5%.

2.2 Experimental Materials and Design

The solid acid pomelo was selected as the rootstock, the tree age was 6 years, the row spacing was 3m × 2m, and the field management was relatively consistent. The red flesh Ai-wan pomelo, white flesh Ai-wan pomelo and yellow flesh Ai-wan pomelo were selected as the experimental materials.

The red Ai-wan pomelo, White Ai-wan pomelo and yellow Ai-wan pomelo were divided into three groups. A total of 150 plants were selected from each group. Each group was sampled in a checkerboard pattern. When the fruit was ripe, 9 pomelos with different flesh color types were selected to determine the main nutritional indexes.

2.3 Index Determination

Vitamin C was determined by 2, 6-dichlorophenol indophenol titration [4]. Reducing sugar and transforming sugar were determined by film liquid oxygenation reduction titration [5]. Titratable acid was determined by NaOH neutralization titration [6]. Soluble solids were measured with wyt-4 handheld refractometer [7]. Anthocyanin content was determined by spectrophotometry [8]. Total phenol was determined by folinol method [9]. Total flavonoids refer to Y Zhang [10] method.

2.4 Data Analysis

Microsoft Excel 2016 was used to organize data; SPSS 20 was used to analyze the significance of variance difference. $\text{mg} \cdot \text{ml}^{-1}$

3. Results and Analysis

3.1 The Results of Nutritional Index Determination of Three Kinds of Flesh Color Ai-wan Pomelo

Table 1. Nutritional indexes of three kinds of flesh color Ai-wan pomelo

Color type	Total soluble solid/%	Soluble sugar content/%	Titratable acid/%	Sugar-acid ratio	V _C /mg·100ml ⁻¹
Red	10.62a	8.96a	0.77a	11.64a	47.13a
White	10.08b	8.40b	0.81a	10.38b	45.93b
Yellow	10.12b	8.12b	0.80a	10.15b	46.11b

Note: data with different lowercase letters after the same column indicate significant difference ($P < 0.05$).

As can be seen from table 1, the content of soluble solids in red flesh Ai-wan pomelo was 10.62%, significantly higher than that of white flesh Ai-wan pomelo and yellow flesh Ai-wan pomelo, and there was no significant difference in the content of soluble solids between white flesh Ai-wan pomelo and yellow flesh Ai-wan pomelo. The content of soluble sugar and titratable acid is the key factor to determine the flavor of fruit. The soluble sugar content of red flesh Ai-wan pomelo was the highest, reaching 8.96%, which was significantly higher than that of other treatments. There was no significant difference in the content of titratable acid between the three kinds of Ai-wan pomelo. The content of titratable acid in red flesh Ai-wan pomelo, White flesh Ai-wan pomelo and yellow flesh Ai-wan pomelo was 0.77%, 0.81% and 0.80% respectively, among which the content of titratable acid in red flesh Ai-wan pomelo was the lowest. The sugar-acid ratio of red flesh Ai-wan pomelo was 11.64, significantly higher than that of white flesh Ai-wan pomelo and yellow flesh Ai-wan pomelo. The sugar acid ratio of the fruit determines its sweetness. The higher sugar acid ratio is, the more prominent the sweetness will be. Therefore, the flavor of red flesh Ai-wan pomelo is better than that of white flesh Ai-wan pomelo and yellow flesh Ai-wan pomelo. The content of vitamin C in red flesh Ai-wan pomelo was significantly higher than that in white flesh Ai-wan pomelo and yellow flesh Ai-wan pomelo. However, there was no significant difference in the content of vitamin C between White flesh Ai-wan pomelo and yellow flesh Ai-wan pomelo.

3.2 Determination Results of Functional Substance Indexes of Three Flesh Color Types of Ai-wan Pomelo

Table 2. Determination of three kinds of flesh color Ai-wan pomelo functional material nutrition indices results

Color type	Anthocyanin (mg·100g ⁻¹)	Total phenols (mg·100g ⁻¹)	Total flavonoids (μg·g ⁻¹)
Red	42.41a	46.51a	174.57ab
White	3.96b	41.99b	172.96b
Yellow	4.66b	46.10a	176.10a

Note: data with different lowercase letters after the same column indicate significant difference ($P < 0.05$).

Anthocyanin is mainly responsible for the different colors of fruits, such as red, yellow and purple [11]. As can be seen from table 2, the content of anthocyanin in red flesh Ai-wan pomelo was significantly higher than that in White flesh Ai-wan pomelo and yellow flesh Ai-wan pomelo, among which the content of anthocyanin in red flesh Ai-wan pomelo was the highest, reaching 42.41mg·100g⁻¹, which was 10.7 times and 9.1 times higher than that in White flesh Ai-wan pomelo and yellow flesh Ai-wan pomelo, respectively. The development and utilization of functional fruits rich in ketone and phenolic substances has become a focus of contemporary food and health care industry. As can be seen from table 2, the total flavonoids content of yellow flesh Ai-wan pomelo was significantly higher than that of red flesh Ai-wan pomelo and White flesh Ai-wan pomelo. There were significant differences in total phenol content among the three kinds of fleshy Ai-wan pomelo, among which the highest content of total phenol in red flesh Ai-wan pomelo was 46.51mg·100g⁻¹, and the content of total phenol in red flesh Ai-wan pomelo and yellow flesh Ai-wan pomelo was significantly higher than that in White flesh Ai-wan pomelo.

In conclusion, the content of anthocyanin and total phenol in red flesh Ai-wan pomelo is better than that in white flesh Ai-wan pomelo and yellow flesh Ai-wan pomelo. Because the anthocyanin and total phenol in food have important health effects on human body, it can be expected that red flesh Ai-wan pomelo has higher health value and economic benefits.

3.3 Economic Benefit Analysis of Three Fleshy Types of Ai-wan Pomelo

Table 3. Economic benefit analysis of the three types of pomelo

Color type	weight of single fruit /kg	yield per plant	per mu yield
Red flesh	1.52-2.13	25-33	3000-3960
White flesh	1.48-2.09	23-30	2760-3600
Yellow flesh	1.53-2.12	26-32	3120-3840

Because the sales mode of Ai-wan pomelos is different from that of general pomelos, the pomelos sold in the market are mostly measured by weight, while Ai-wan pomelos are sold individually regardless of size and weight. The sales prices of the three types of Ai-wan pomelos are basically the same, so the main influence on the economic benefits of Ai-wan pomelos is their output. As can be seen from table 3, there is no significant difference in single fruit weight among the three kinds of

Ai-wan pomelo. The yield per plant and per unit area were the highest in red flesh Ai-wan pomelo, while White flesh Ai-wan pomelo and yellow flesh Ai-wan pomelo were slightly lower than red flesh Ai-wan pomelo. According to the market prices of the three kinds of Ai-wan pomelo and the combined selling methods, it can be seen that the economic benefits of the red flesh Ai-wan pomelo are higher than that of the White flesh Ai-wan pomelo and the yellow flesh Ai-wan pomelo.

4. Discussion and Summary

The vitamin C content of pomelo fruits is an important evaluation index of fruit quality. The vitamin C content of the three kinds of Ai-wan pomelo fruits is more than $45\text{mg}\cdot 100\text{g}^{-1}$, which is at a medium level in pomelo fruits. Fruit flavors and economy index is an important factor is the fruit sugar content, generally in the pomelo fruits called fruit soluble sugar content $> 9\%$ of the varieties of high sugar content, it is called a higher between $8\% - 9\%$, and the $< 8\%$ of the varieties are known as low sugar content, and measured by three Ai-wan pomelo flesh of soluble sugar were $> 8\%$, total soluble solids were $> 10\%$, suggests that Ai-wan pomelo flesh in pomelo type of fruit sugar content at a higher level.

To sum up, the indexes of anthocyanin, total phenol, V_c , soluble solids, soluble sugar and sugar-acid ratio of the red flesh Ai-wan pomelo fruit were significantly higher than those of the white flesh Ai-wan pomelo and the yellow flesh Ai-wan pomelo, while the differences of anthocyanin, total phenol, V_c , soluble solids, sugar-acid ratio and soluble sugar were not significant. There was no significant difference in titrable acid content among the three groups. The content of total flavonoids in yellow flesh Ai-wan pomelo was significantly higher than that in White flesh Ai-wan pomelo and red flesh Ai-wan pomelo, and there was no significant difference between red flesh Ai-wan pomelo and White flesh Ai-wan pomelo.

According to the determination results of the internal quality of three kinds of Ai-wan pomelo and combining with the yield and market benefit of Ai-wan pomelo, the results show that red flesh Ai-wan pomelo is better than yellow flesh Ai-wan pomelo and White flesh Ai-wan pomelo.

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