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Characteristics and nutritional compositions of two jujube varieties cultivated in Korea

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국내산 대추품종의 품질특성 및 영양성분 비교

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Abstract

The appearance and physicochemical characteristics of a native jujube (called Yak jujube) and Bokjo jujube were compared in this study. Our results revealed that the native jujube had smaller size, lower hardness, and higher contents of sugar, crude protein, crude fat, crude ash, dietary fiber, and calcium contents, when compared to that of Bokjo jujube. Therefore, native jujube is softer and sweeter, with higher general nutrient content, despite being smaller than that of Bokjo jujube.

Key words : jujube, variety, nutrient composition

Introduction

Jujube (*Zizyphus Jujuba* Mill) is the fruit of deciduous broadleaf tree in the Rhamnaceae family (1). With its excellent taste and aroma, jujube has been widely used as food material since the ancient times. It is a familiar fruit commonly used in wedding preparations or ancestral rites in Korea. Jujube has been widely used as digestive medicine and tonic in Oriental medicine.

Jujube is cultivated in Northern China and Korea, particularly in the Gyeongsan and Cheongsong regions of Gyeongsangbuk-do. Among different varieties, Bokjo jujube is the most cultivated one. Jujube contains carbohydrates, vitamins, and saponins (2). Their antioxidant effect, anti-allergy effect, and anti-inflammatory effect have been reported (3-8). In addition, physicochemical properties depending on the degree of maturity, drying, and processing have been investigated (9). However, comparative studies between jujube species have been seldomly conducted. Therefore, the objective of this study was to compare the characteristics of fresh and dried fruits of native jujube (also known as Yak jujube) and Bokjo jujube to provide basic data for the two species.

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Materials and Methods

Samples

Fresh and dried native jujube fruits were cultivated in the Cheongsong region of Gyeongsangbuk-do. Fresh and dried Bokjo jujube fruits were cultivated in the Gyeongsan region of Gyeongsangbuk-do. They were collected in October 2014.

Appearance characteristics and sugar content

Randomly selected jujubes were subjected to measurements of appearance (weight, diameter, length), chromaticity (lightness, redness, yellowness), and sugar contents. The chromaticity was measured using a chromameter (CR-300,

Minolta, Osaka, Japan). Sugar content was determined using a refractometer (PAL-1, Atago, Tokyo, Japan).

Hardness measurement

The hardness of fruits was measured using a rheometer (Compac-100 II, Sun Scientific Co., Tokyo, Japan). It was set up to measure 1/2 depth of the fruit flesh. The resistance of the tissue was observed when the probe was inserted at a rate of 40 mm/min. Hardness was measured and expressed as kg_f.

Analyses of general components, minerals, and vitamins

Moisture content was measured by atmospheric pressure heating and drying. Crude fat content was measured using the chloroform-methanol extraction method. Crude protein content was determined using the Kjeldahl method. Crude ash and dietary fiber contents were measured using the Ash test method and Total dietary fiber method of the Korean Food Standards Codex of 2013 (10). Vitamin C content was analyzed using the Vitamins test method of the Korean Food Standards Codex of 2013 (10). Mineral (Ca, Fe, P) contents were analyzed using inductively coupled plasma atomic emission spectroscopy (ICP-AES) methods (11).

Results and Discussion

Appearance characteristics and hardness

Native and Bokjo jujube fruits were randomly selected and their weight, diameter, and length were measured. Bokjo jujube had higher numbers in all measurements (Table 1). Its weight was twice of that of native jujube. In terms of chromaticity, Bokjo fresh jujube showed higher L*a*b* values compared to native fresh jujube. However, the difference was not significant. Fresh Bokjo jujube had more red and yellow colors but less black color (Table 2). The hardness of fresh fruit of native jujube was 2.06 kg_f, which was lower than that (2.57 kg_f) of Bokjo jujube (Table 1).

Table 1. Appearance and hardness of jujube fruits

	Native		Bokjo	
	Fresh	Dried	Fresh	Dried
Weight (g)	5.5±0.5[1)]	2.6±0.3	11.0±0.7	7.0±0.6
Diameter (cm)	2.0±0.1	1.9±0.0	2.4±0.1	2.1±0.1
Length (cm)	2.6±0.3	2.5±0.1	3.1±0.1	2.9±0.3
Hardness (kg_f)	2.06±0.06	-	2.57±0.07	-
pH	4.7±0.3	-	4.6±0.0	-

[1)]All data were represented as mean±SD of 10 samples.

Table 2. Chromaticity of jujube fruits

	Native		Bokjo	
	Fresh	Dried	Fresh	Dried
Lightness (L*)	25.7±3.9[1)]	97.7±4.1	28.8±4.3	103.7±4.3
Redness (a*)	10.7±2.9	33.0±2.3	12.8±2.6	34.2±5.7
Yellowness (b*)	11.9±2.2	26.1±3.7	12.9±3.7	21.7±5.3

[1)]All data were represented as mean±SD of 10 samples.

General components and mineral contents

The moisture, crude protein, crude fat, crude ash, and dietary fiber contents of each jujube sample were determined. In our results, the content of moisture was most high followed by dietary fiber, crude protein, crude ash and crude fat, which was similar to results of Kim et al (12). Compared to Bokjo jujube, the native jujube had higher contents for all components except moisture (Table 3). Greater differences were noted in crude protein, crude ash, and dietary fiber (Table 3). The sugar content in fresh native jujube was 29.2 °Brix, which was slightly higher than that (25.6 °Brix) in fresh Bokjo jujube (Table 3). For mineral contents, calcium (Ca) content was higher in the native jujube. Phosphorus (P) was higher in Bokjo and native jujube for fresh and dried samples respectively. However, there was no significant difference in iron (Fe) contents (Table 4).

Table 3. Contents of general nutrition components in jujube fruits

Components (g/100 g)	Native		Bokjo	
	Fresh	Dried	Fresh	Dried
Moisture	71.46±0.54[1)]	23.77±0.22	72.90±0.66	33.04±0.17
Crude protein	1.71±0.09	5.32±0.21	1.37±0.07	4.61±0.15
Crude fat	0.33±0.04	0.65±0.09	0.31±0.02	0.52±0.08
Crude ash	1.11±0.02	2.17±0.07	0.71±0.03	1.68±0.05
Dietary fiber	4.16±0.17	10.77±0.23	2.92±0.11	7.54±0.14
Sugar (°Brix)	29.2±1.2	-	25.6±0.6	-

[1)]All data were represented as mean±SD of 3 samples.

Vitamin C contents

The vitamin C contents of jujube samples are summarized in Table 5. In fresh jujube fruits, the vitamin C content in Bokjo jujube was 37.67 mg/100 g, which was higher than that (29.06 mg/100 g) of native jujube. In dried jujube fruits, the vitamin C content in Bokjo jujube was 14.50 mg/100 g, which was lower than that (16.76 mg/100 g) of native jujube. However, the difference was not significant.

Table 4. Contents of minerals in jujube fruits

Components (mg/100 g)	Native		Bokjo	
	Fresh	Dried	Fresh	Dried
Ca	14.69±0.43[1)]	58.8±2.03	11.58±0.44	30.6±0.95
P	29.83±0.20	105.6±1.37	32.14±0.33	88.7±1.29
Fe	0.3±0.0	0.8±0.0	0.3±0.0	1.4±0.1

[1)]All data were represented as mean±SD of 3 samples.

Table 5. Contents of vitamin C in jujube fruits

Components (mg/100 g)	Native		Bokjo	
	Fresh	Dried	Fresh	Dried
Vitamin C	29.06±3.50[1)]	16.76±1.44	37.67±4.18	14.50±2.21

[1)]All data were represented as mean±SD of 3 samples.

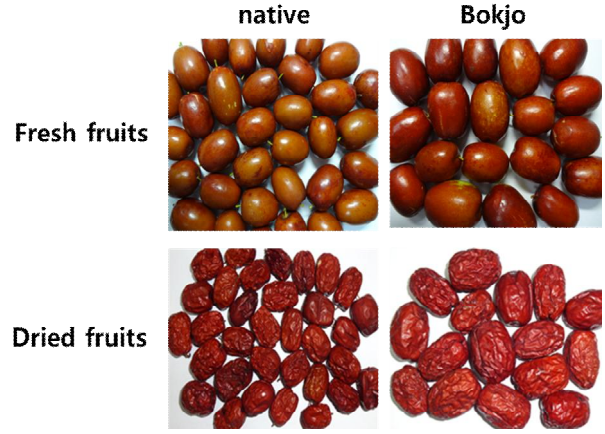

Fig. 1. Photographs of native and Bokjo jujube.

요 약

대추의 품종에 따른 특성파악 및 활용을 위한 기초자료를 확보하기 위하여 현재 국내에서 가장 많이 재배되고 있는 품종인 복조대추와 국내산 재래종대추(약대추)의 외형특성과 이화학적 특성을 비교한 결과 재래종대추는 복조대추에 비하여 크기가 작고 경도가 낮았으며 당도, 조단백질, 조지방, 조회분, 식이섬유, 칼슘함량이 높았다. 한편, 복조생대추는 인과 비타민 C의 함량이 높게 나타났다. 따라서 재래종대추는 복조대추에 비하여 크기는 작으나 부드럽고 당도가 높으며 주요 일반영양성분 함량이 높은 것으로 판단된다.

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