

MORPHOLOGICAL AND CHEMICAL ANALYSIS OF *ZIZYPHUS JUJUBA* MILL. FRUITS FROM TIMIȘOARA BOTANICAL PARK

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Abstract

Zizyphus jujuba Mill. belongs to the Rhamnales order, Rhamnaceae family, Rhamnus genus. The genus includes about 40 species native to tropical and subtropical regions of both hemispheres, as well as the Mediterranean region. Species *Zizyphus jujuba* Mill. it is native to SW Asia, has ornamental features and is found spontaneously on the Danube coast. The first cultivated varieties were introduced at the Faculty of Horticulture in Bucharest in Shanxi Province, China in a joint research project in 1997. In our study, the fruits were harvested from two genotypes in the Botanical Park of Timisoara. For the harvested fruits were analyzed: fruit weight (g), seed weight (g), fruit length (mm), fruit width (mm) and chemical analyses were performed: soluble dry matter (%), C vitamin (mg 100 g⁻¹), total potassium content (mg 100 g⁻¹) and protein (%). In the analyzed fruits, the soluble dry matter varied between 28.3-29.81%, C vitamin between 247.97-288.17 mg 100g⁻¹, proteins between 4.84-5.63% and potassium between 79.53 -79.63 mg 100 g⁻¹.

Keywords: Chinese date palm, chemical analysis, morphological characters, *Zizyphus jujuba* Mill.

1. INTRODUCTION

Zizyphus jujuba Mill. - Chinese date, belongs to the order Rhamnales, family Rhamnaceae, genus Rhamnus (Săvulescu et al., 1958).

The genus includes about 40 species native to the tropical and subtropical regions of both hemispheres, as well as the Mediterranean region. The species *Zizyphus jujuba* Mill., reaches a height of 8 m, most often considered a shrub than a tree, is native to SW Asia, has ornamental features and is found spontaneously on the Danube coast, between Hîrșova and Dealul Celea Mare as well between Măcin and Cerna (Dumitriu-Tătăranu et al., 1960).

The Roman emperor Octavian Augustus brought the Chinese date from Syria to Italy and then spread to other Mediterranean countries including Dobrogea, in the region between the Danube and the Black Sea (Ciocârlan, 2000).

The locals called the fruits of this species "Dobrogea olive". In the Dobrogea area, two genotypes of jujube were identified, one in Jurilovca and another in Ostrov. Within the 'Jurilovca' population, two jujube biotypes were identified: 'Jurilovca 1' and 'Jurilovca 2'. Romanian jujube genotypes produce small fruits, but have adapted to local climate and soil conditions over the centuries. 'Jurilovca' biotypes could be interesting for future use as rootstocks (Stanica, 2009).

In China, jujubes are popularly called "Chinese date" or "red date" and are eaten fresh, dried, smoked, candied, pickled, baked in pies, or boiled in rice (Small, 2012).

Ziziphus jujuba Mill., the Chinese date, comes from the middle and lower part of the Yellow River, the "mother river" of the Chinese people. This species is widespread in at least 48 countries on all continents except Antarctica and is becoming increasingly important, especially in arid and semi-arid marginal lands. Based on a systematic analysis of the unique characteristics of jujube, we suggest that it deserves to be recognized as a superfruit (Mengjun Liu, et al. 2020). In 1996, the collaboration between the Faculty of Horticulture in Bucharest and the Agricultural Academy in Shanxi Province, China began in a joint research project starting from the *Ziziphus jujuba* Mill species. (Stănică, 2019 a).

Jujube fruits are rich in bioactive compounds and can be introduced into the healthy diet of humans (Cosmulescu, 2018 a).

2. MATERIALS AND METHODS

The study was conducted by analyzing the fruits of two ornamental shrubs of *Ziziphus jujuba* Mill. identified in the Botanical Park from Timisoara, introduced according to the archive from the discipline of Botany on February 19, 1987 following the donation of the Dumitrescu family. The fruits were harvested at the end of October 2019. Two ornamental shrubs were selected from the total population, depending on the degree of fruiting and the size of the fruits (figure 1).



Figure 1. *Ziziphus jujuba* Mill. fruits experimental variants

For the harvested fruits were analyzed: fruit weight (g), seed weight (g), fruit length (mm), fruit width (mm) and chemical analyses were performed: soluble dry matter (%), C vitamin ($\text{mg } 100 \text{ g}^{-1}$), total potassium content ($\text{mg } 100 \text{ g}^{-1}$) and protein (%).

3. RESULTS AND DISCUSSIONS

Table 1 presents the results of the morphological characters of the fruits from the two shrubs in the Botanical Park of Timișoara.

These can be compared with the results obtained by the team from the Faculty of Horticulture within USAMV Bucharest on the weight of fruits from local populations of Romanian jujube (Stanica, 2019 b), namely the weight of the fruits varied from 0.96 g (sour jujube Chinese) up to 1.35 g (Jurilovca population 2).

The weight of the fruits of the Ostrov biotype was 6.29 g.

Table 1. Morphological characters of *Ziziphus jujuba* Mill. fruits

Experimental variant	Fruit length (mm)	Fruit width (mm)	Fruit weight (g)	Seed weight (g)
V1	19.24	18.13	5.47	0.31
V2	22.68	21.82	6.13	0.43
Average	20.96	19.97	5.80	0.37

Data on the soluble dry matter content of the *Ziziphus jujuba* Mill. Are given in Table 2.

Table 2. Unilateral influence of soluble dry matter content

Experimental variant	Soluble dry matter content %		Difference ±D	Signification of difference
	Obtained values	%		
V1	28.31	97.4	-0.75	00
V2	29.81	102.6	0.75	**
Average	29.06	100.0	0.00	Control

LSD (p 5%) 16.38
LSD (p 1%) 37.82
LSD (p 0.1%) 120.94

Following the presented data, it is noticed that the V2 experimental variant registers a higher top content (29.81%) of soluble dry matter, with a difference of 0.75% being significantly different from the average of the experience considered as a control. The values obtained are comparable with those obtained by Cosmulescu et al. (2018 b).

Table 3 presents the data on the C vitamin content of the experimental variants.

Table 3. Unilateral influence of C vitamin content

Experimental variant	C vitamin (mg/100g)		Difference ±D	Signification of difference
	Obtained values	%		
V1	247.97	92.5	-20.10	0
V2	288.17	107.5	20.10	*
Average	268.07	100.0	0.00	Control

LSD (p 5%) 0.19
LSD (p 1%) 0.45
LSD (p 0.1%) 1.42

Regarding the amount of C vitamin content of experimental variants, it can be seen that the fruits of shrub 2 have a higher content of C vitamin, with a difference of 20.1% from the average, considered as control, being significantly positive and the content of C vitamin for the shrub 1 fruits being significantly negative compared to the same control. The values obtained are in line with those reported by Gao et al., (2013) and Cosmulescu et al. (2018 a).

Table 4 presents the data on the protein content of the experimental variants.

Table 4. Unilateral influence of protein content

Experimental variant	Protein (%)		Difference ±D	Signification of difference
	Obtained values	%		
V1	4.84	87.8	-0.39	-
V2	5.63	112.2	0.40	-
Average	5.24	100.0	0.00	Control

LSD (p 5%) 0.58
LSD (p 1%) 1.34
LSD (p 0.1%) 4.27

Following the data on the unilateral influence of the protein content of the fruits of the two studied shrubs, the values obtained were 4.84% for the fruits of shrub 1 and 5.63% for the fruits of shrub 2, but these are not statistically assured. These results are close to those obtained by Li et al. (2007). Table 5 presents the data on the potassium content of the experimental variants.

Table 5. Unilateral influence of potassium content

Experimental variant	Potassium mg/100g		Difference ±D	Signification of difference
	Obtained values	%		
V1	79.63	108.7	0.05	*
V2	79.53	91.3	-0.05	0
Average	79.58	100.0	0.00	Control

LSD (p 5%)

0.58

LSD (p 1%)

1.34

LSD (p 0.1%)

4.27

The values obtained regarding the potassium content register the best value (79.63 mg / 100g) for shrub 1 with a difference of 0.05% being significantly positive, compared to the average considered as a control. Regardless of the fruits analyzed, the values obtained are in line with those reported by Pareek, (2013).

4. CONCLUSIONS

Following the results of the study of morphological characters and chemical analyzes of jujube fruits from the Botanical Park shrubs, it can be concluded that they come from local populations found in Dobrogea.

Due to the high content of C vitamin, the content of potassium, protein, dry matter, in the Botanical Park jujube fruits, these can be recommended for visitors' consumption.

5. REFERENCES

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