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PRELIMINARY RESULTS REGARDING THE BEHAVIOR OF SOME FIG GENOTYPES IN BUCHAREST AREA CONDITIONS

Emilia MOISESCU[1], Florin STĂNICĂ[1, 2]

[1]University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Mărăști Blvd, District 1, 011464, Bucharest, Romania
[2]Research Center for Studies of Food Quallity and Agricultural Products, University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Mărăști Blvd, District 1, 011464, Bucharest, Romania

Corresponding author email: emilia_moisescu@yahoo.com

Abstract

Fig (Ficus carica L.) is a Mediterranean fruit specie that have been introduced from centuries in our country by Greeks, Romans, Ottomans and probably, Armenians colonists. Even it is a thermophile plant, fig trees are spread all around the country, several genotypes being found. Recently, a certain interest on fig cultivation raised, and there is a request of valuable cultivars and respectively, planting material. At the Faculty of Horticulture in București, an important collection of fig genotypes found in Romania and introduced from Italy and Iraq, was started in 2015 and since then their evaluation is in process. The present paper presents the selection process of 25 fig genotypes, with interesting pomological characteristics, fruits measurements being performed in accordance with IPGRI descriptors. Fruit biochemical analyses on soluble solids, glucose and fructose were realized. The results showed that some of local and foreign genotypes produced no fruits or had very small fruits. All the analyzed parameters were influenced by the genotype. The plants that produced good results concerning fruit quality, size, taste and cracking resistance, will be further studied in order to observe their productivity and resistance to biotic and abiotic stresses.

Key words*: earliness, Ficus carica, fruits, soluble solids, vigour.*

INTRODUCTION

Fig is a member of Moraceae family and includes over 1000 genotypes, of which, over 600 were studied by the American horticulturist Condit (1947).

It is considered that the fig was cultivated by humans before cereals (Kislev, 2006) being an important plant in the Mediterranean area, next to vines and olive trees.

We find it mentioned in various mythological legends and songs (Sinha, 2003), it appears in the Bible and the Quran (Tomescu, 2014) and the translation of the name Dyonisos, the Greek god of wine, means "the friend of figs" (Minonne et al., 2011).

The origin of the fig is not known, but the Swedish botanist De Candolle states that, it is Caria, Syria and the Mediterranean Basin.

He supports his hypothesis by the fact that in these areas we frequently find wild specimens, a criterion that is not sufficient to ensure the certainty of the plant's origin (Minonne et al., 2011).

In Romania, it is not known who brought the fig. The south of the country was occupied or transited by Greeks, Romans, Ottomans, Armenians, peoples on whose territory fig trees grew. Greek settlers in the Dobrogea area had in the 1st century BC. Exchange of goods and food with Greece, offering cereals, honey, fish and receiving fruits and vegetables in exchange along other products (Kaufman, 2006). Under the influence of the Ottomans, in the nineteenth century, Romanians included figs in the daily diet (Giurescu, 1966) and in Bucharest there was a fig tree in almost all people's yards (Stănică, 2017).

The fig tree grows as a bush with 4-7 stems, or as a tree (Mediterranean Basin) (Vidaud, 1997). It is heat sensitive, the trunk freezes at temperatures bellow -21°C and the annual branches at -15ºC.

To ripen the fruit needs temperatures of 20 - 21ºC, does not tolerate water excess in the soil (Chira, 2009) and due to its root system, the fig is the species in the plant world that makes the best use of water (Vidaud, 1997). In areas

favourable to fig fruiting, such as the Mediterranean Basin, 40-80-100 kg/plant are obtained (Accorsi e Beldi, 2011), while in our country 10-12-15 kg/plant (Hoza, 2001). It is a robust Mediterranean tree and if it is well cultivated it requires little or no phytosanitary treatments (Jullien and Jullien, 2011).

Fig is a unisexual dioecious plant (Evreinoff, 1947). The fruit is a sicone, a false fruit composed of many achenes (Hoza, 2001; Hoza, 2003).

Fresh fruits contain between 13 - 25% carbohydrates, significant amounts of Ca, Zn, Fe, K, vitamin B1, vitamin. B2, B6, C, Pp, fiber (Hoza, 2000; Gherman, 2013).

Fruits and leaves have nutraceutical properties, being recommended in alleviating diseases such as: anaemia, physical asthenia, intestinal inflammation, senescence (Gherman, 2013), diabetes (Wojdilo et al., 2016), cancer (Wang et al., 2008; Menichini et al., 2012).

The vast majority of cultivated species have undergone breeding programs, which has not happened in the case of figs, which is why this plant now has great genetic variability. This is a great advantage for research in terms of germplasm collection.

In Romania, the fig is found especially in people's yards, a situation in which genotypes have different synonyms or are unknown. This fact determined the need to identify the plants, propagate and study them in fruit tree collections. The first study of this kind was conducted at the Faculty of Horticulture in Bucharest, and the results were published in the paper Preliminary Characterization of some Fig Biotypes in Romania (Ahmad et al., 2017).

Pomological characterizations or identification of fig genotypes were also performed in Morocco (Khadari et al., 2008), Tunisia (Aljiane et Ferchichi, 2008), Italy (Resta et al., 2008), Albania (Koka, 2008), California (Stover and Aradhya, 2008), Lebanon (Chalak et al., 2008), Canary Islands (Gil et al., 2008).

MATERIALS AND METHODS

The natural framework of the areas where the reseach was carried out is the Experimental field of the Faculty of Horticulture, Bucharest. It is located in the Northen part of the capital, geographical coordinates 44°28'10" latitude N and 26°04'00" longitude E, at 78 m altitude. Bucharest borders with: Câmpia Titu – Gheorghița at N, Câmpia Bărăganul Mostiștei at E and SE, Ialomița River at NE, Argeș Valley at V and SV. The climate is temperate-continental, with cold winters and hot and dry summers.

The annual average temperature is 10.5ºC, the annual average of precipitations sums up to 550-600 mm.

The vegetal material is represented by the fig trees, on their own roots, come through cuttings from the figs grown in the country (Romania) and abroad (Italy and Irak). The cuttings were rooted in the vegetation house of the Faculty of Horticulture Bucharest.

The following genotypes were identified and selected for study: Stork, 1 Mai, Piața Obor, Dr. Constantinescu from Bucharest; Smochin negru and Ploiesti nr.1 from Ploiești; Brazi from Brazi, PH; Fântânele from FântânelePH; Negoiești 01 from Negoiești, PH; Viscool from Mărăcineni, AG; Galben mare from Braniștea, GR; Oli Timișoara from Timisoara, TM; Săvârșin from Săvârșin, AR; Rot negru from Svinița, CS; Melo nero, Bifera bianco, Awitato, Bianco Etna, Natawa, Bianco Sicilia, Passulana nera, Cilento nero, Fiorone Etna, Fig primizia from Italy; Irak 1 from Kerkut, Irak.

These fig genotypes were analysed and described in accordance with IPGRI descriptors. We made determinations and measurements, such as: harvest period, tree vigour, fruit size (weight, length, diameter), neck, stalk, ostiole, skin and flesh (colour, aspect, texture, etc.). Biochemical analyses, such as: soluble solids, glucose and fructose, completed the morphological and pomological description and were performed in the Researcher Centre for Study of Food Quality and Agricultural Products, USAMV Bucharest. The period analysed in this study was 2020.

RESULTS AND DISSCUSIONS

For the studied genotypes, the second harvest was analysed, and the results of the measurements showed a high phenotypic variability and different harvesting periods.

The most early ripening genotypes were: Galben mare, Brazi and Viscool, all of them had the first harvest in the second decade of August (Tabel 1).

Table 1. Harvest schedule

Genotype	Harvest schedule
Galben mare	Decade II August – Decade III October
Stork	Decade III August – Decade III October
Brazi	Decade II August – Decade III October
Viscool	Decade II August – Decade III October
Rot negru	Decade III August – Decade III October
Fântânele PH	Decade III August – Decade III October
Passulana nera	Decade III August – Decade III October
Dr. Constantinescu	Decade III August– Decade III October
Cilento nero	Decade I September – Decade III October
Awitato	Decade I September – Decade III October
1 Mai	Decade I September – Decade III October
Smochin negru	Decade I September– Decade III October
Savârșin	Decade I September– Decade III October
Fig Primizia	Decade I September– Decade III October
Negoiești 01	Decade I September– Decade III October
Piața Obor	Decade I September– Decade III October
Ploiești 1	Decade I September – Decade III October
Oli Timișoara	Decade I September– Decade III October
Bianco Etna	Decade III September– Decade III October

The fruit ostiole opening was between 4.97 mm, Cilento nero; 4.94 mm, 1 Mai; 4.94 mm Oli Timișoara; 3.87, Dr. Constantinescu; 3.57 mm, Viscool (Figure 1).

The weight of the fruits is between: Săvârșin - 54.11 g, Ploiesti nr.1 - 51.36 g, and Smochin negru - 18.83 g, Negoiești 01-17.16 g (Figure 2).

The amount of soluble solids was between 20.83°Bx in Awitato; 19.53°Bx in Passulana nera and 14.6°Bx Fântânele PH; 13.9°Bx Negoiești 01genotypes; glucose 22.96%, fructose 22.61% in Awitato; glucose 21.5%, fructose 21.63% in Passulana nera and glucose 15.98%, fructose 15.72% in Fig Primizia; glucose 15.28%, fructose 15.29% in Negoiești 01 (Figure 3).

The comparison of the growth vigour was performed (Figure 4).

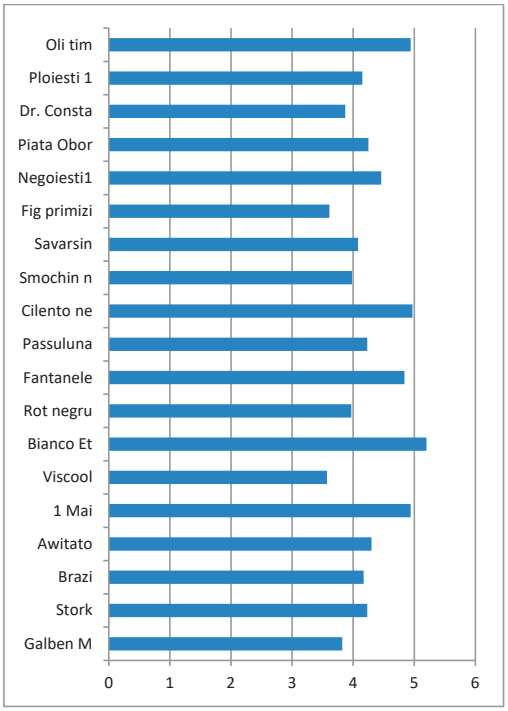

Figure 1. Fruit ostiole opening

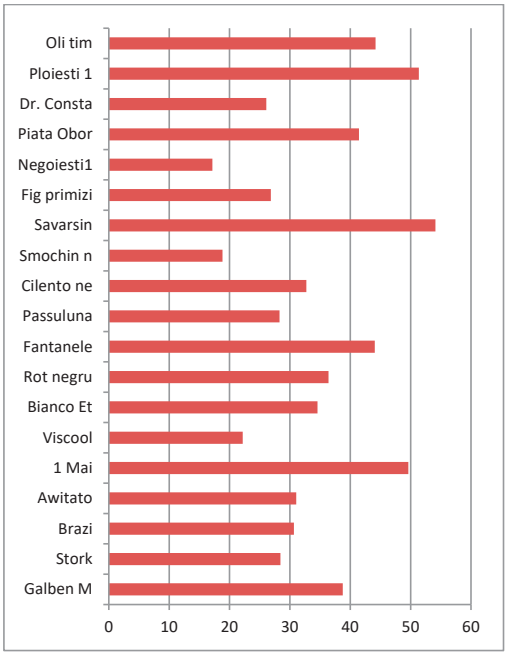

Figure 2. Average fruit weight (g)

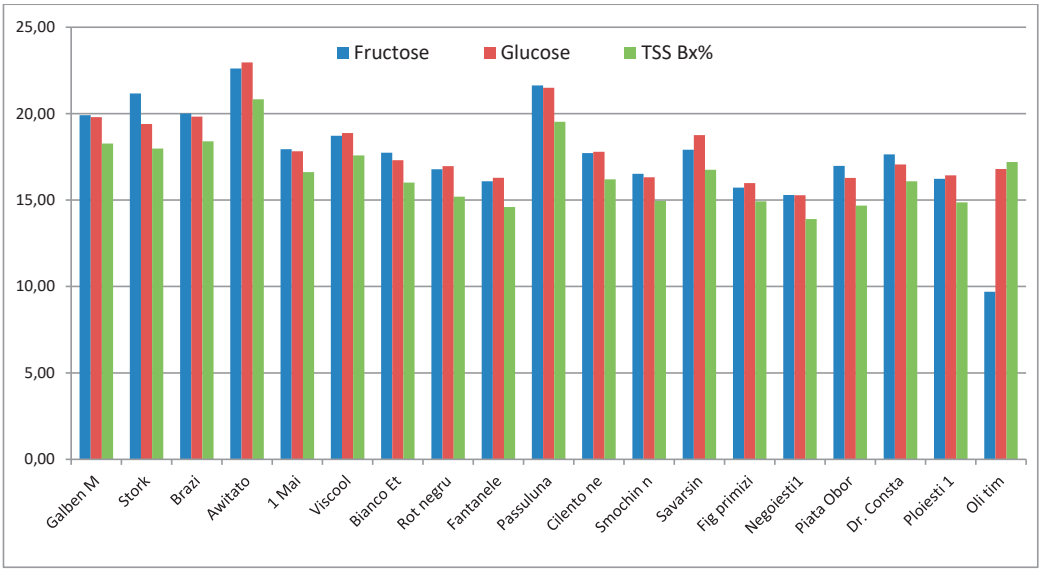

Figure 3. Fruit biochemical determinations (%)

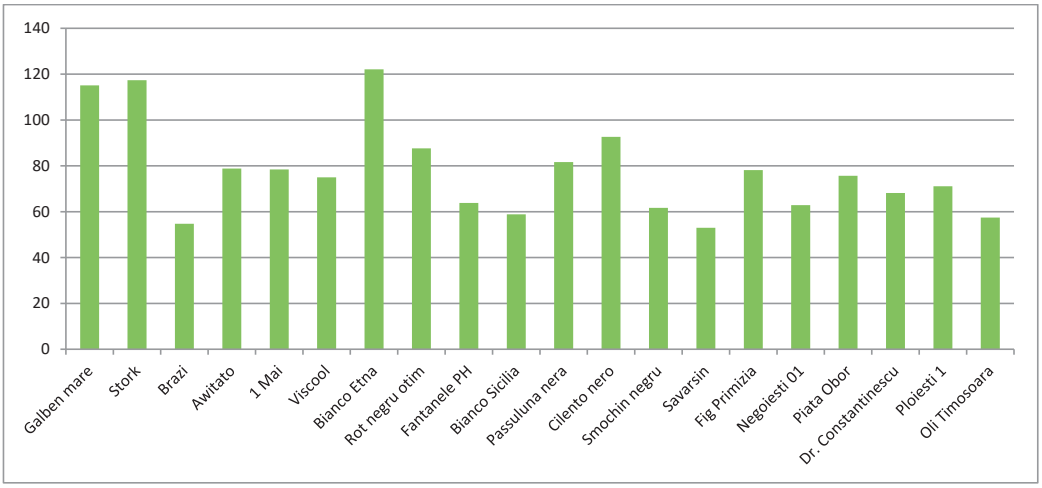

Figure 4. Fig average shoot length (cm)

Pomological fruit description is made in accordance with IPGRI descriptors (International Plant Genetic Resources Institute) and it is presented below (Table 1a and 1b).

Table 1a. Fig fruit pomological characteristics

Genotype	1. Fruit width	2. Fruit length	3. Fruit shape; index (width/ length)	4. Fruit shape according to the location of the maximum width	5. Fruit shape near the stalk	6. Fruit symmetry according to the vertical axis	7. Uniformity of fruit size	10. Fruit neck length (mm)	12. Shape of the fruit stalk	17. Ostiole colour	18. Resistance to ostiole-end cracks	21. Ease of peeling
Galben mare	42.07	52.03	oblong	pyriform	acut	yes	yes	12.26	long slender	pink	susceptible	no
Stork	38.47	52.73	oblong	short pyriform	acut	no	yes	18.94	short slender	pink	intermed.	no
Brazi	37.73	43.59	oblong	short pyriform	acut/ round	yes	yes	8.85	long slender	white	intermed.	no
Awitato	35.54	43.68	oblong	pyriform	acut	slightly asymmetric	yes	4.84	long slender	white	intermed.	yes
1 Mai	42.64	50.47	oblong	pyriform	flat	slightly asymmetric	yes	no	long slender	pink	intermed.	no
Viscool	33.67	39.47	oblong	short pyriform	acut	yes	yes	7.28	long slender	brown	intermed.	no
Bianco Etna	37.83	45.1	oblong	short pyriform	acut	yes	yes	no	long slender	white	susceptible	no
Rot negru	42.95	42.76	oblate	short pyriform	acut	yes	yes	7.79	long slender	red	resistant	no
Fântânele Ph	42.85	45.16	oblong	pyriform	round	yes	yes	no	long slender	pink	intermed.	no
Passulana nera	35.05	36.53	globose	short pyriform	round	yes	yes	no	long slender	pink	intermed.	no
Cilento nero	38.3	38.8	globose	short pyriform	round	yes	yes	no	long slender	brown	intermed.	no
Smochin negru	31.22	31.36	globose	short pyriform	round	yes	yes	5.14	short slender	pink	intermed.	no
Săvârșin	43.23	44.43	globose	pyriform	flat	slighly asymmetric	yes	no	long slender	pink	intermed.	no
Fig Primizia	35.35	40.97	oblong	pyriform	acut	yes	yes	no	long slender	white	resistant	no
Negoiești 1	34.87	28.67	oblate	short pyriform	acut	yes	yes	no	short slender	white-pink	resistant	no
Piața Obor	41.26	42.21	globose	pyriform	round	slightly asymmetric	yes	no	short thick	red	susceptible	no
Dr. Constantinescu	35.43	42.07	oblong	short pyriform	acut	yes	yes	7.43	long slender	white	intermed.	no
Ploiesti 1	44.12	53.26	oblong	pyriform	round long	yes	yes	no	short thick	pink	intermed.	no
Oli Timișoara	40.79	55.55	oblong	pyriform	flat	yes	yes	no	long medium	red	resistant	no

Table 1b. Fig fruit pomological characteristics

Genotype	22. Fruit ribs	23. Fruit skin cracks	24. Resistance to cracks	27. Fruit skin ground colour	28. Shape and colour of the overcolour	29. Fruit lenticels quantity	30. Fruit lenticels colour	31. Fruit lenticels size	33. Pulp internal colour	34. Pulp texture	35. Pulp flavour
Galben mare	Intermed..	minute	susceptible	green-yellow	yellow	no			pink-amber	coarse	medium sweet
Stork	slightly	minute	intermed.	light-green	brown-green	no			red	coarse	medium sweet
Brazi	slightly	no	susceptible	light - green	yelloe	no			pink	medium	medium sweet
Awitato	intermed.	no	resistant	yellow	yellow	no			amber	medium	very swee
1 Mai	no	minute	intermed.	yellow-green	brown-green	scarce	white	medium	pink	medium	sweet
Viscool	intermed.	longitudin	intermed.	brown - green	brown	scarce	white	medium	red	coarse	medium sweet
Bianco Etna	no	no	susceptible	light-green	yellow	no			amber	fine	very swee
Rot negru	intermed.	minute	intermed.	light-green	brown-green	scarce	white	small	red	coarse	medium sweet
Fântânele Ph	no	longitudn	intermed.	light-green	brown-green	scarce	white	medium	pink	fine	sweet
Passulana nera	intermed.	no	resistant	green light	purple-green	intermed.	white	medium	red	medium	very swee
Cilento nero	yes	no	resistant	green light	purple-green	scarce	white	small	pink	medium	very swee
Smochin negru	yes	minute	intermed.	yellow-green	brown-green	scarce	white	small	red	coarse	medium sweet

Săvârșin	yes	minute	resistant	light green	brown-green	sarce	white	small	amber	fine-med	medium sweet
Fig Primizia	yes	minute	intermed.	yellow	yellow	no			amber	fine	very swee
Negoiești 1	no	no	resistant	yellow-green	brown-green	intermed.	white	medium	pink	coarse	medium sweet
Piața Obor	no	minute	intermed.	light-green	light-green	no			amber-pink	fine-med	medium sweet
Dr. Constantinescu	intermed.	minute	intermed.	light-green	yellow-green	no			amber	medium	sweet
Ploiesti 1	no	intermed.	intermed.	yellow-green	brown-green	scarce	white	medium	amber	fine	sweet
Oli Timișoara	no	minute	intermed.	light green	brown-green	no			pink	fine-med	medium sweet

CONCLUSIONS

The earliest genotypes were the Romanian genotypes, such as: Brazi, Galben mare and Viscool, all of them had the first crop in the second decade of August.

In order of the vigor growth, the smallest were: Săvârșin, Brazi, Oli Timișoara (Romanian genotypes) and the biggest: Bianco Etna (Italian genotype), Stork and Galben mare (Romanian genotypes).

The biggest fruits were registered at the following genotypes: Săvârșin – 54.11 g, Ploiesti nr.1 - 51.36 g, 1 Mai – 49.63 g, Oli Timișoara – 44.18 g, Fântânele 44.6 g, Piața Obor – 41.45 g.

The ostiole opening is an important criterion for the fruit quality. Viscool and Fig Primizia genotypes have the smallest ostiole opening.

The highest amount of sugar (soluble solids, glucose, fructose) was found in Awitato and Passulana Nera genotypes.

At the end of this year's studies, 5 genotypes with foreign origin were eliminated from the culture.

Melo nero, Fiorone Etna – Italian genotypes and Irak 1 – Irakian genotype, did not develop fruits.

Bifera bianca – Italian genotype, has produced a significant quantity of fruits, but in early September, when the fruits were in the size of an olive, they all fell down.

Natawa – italian genotype, has produced a significant quantity of fruits which once reached at the consumption maturity are very small in olives size.

We will keep on monitoring the Romanian originated fig trees which have had a good evolution.

The plants of Italian origin, such as Awitato, Bianco Etna, Passulana nera, Cilento nero which have had a good evolution, with a very tasty fruits and good cracking resistance will be monitored in the coming years.

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