Original Article

SEGREGATION OF APRICOT ACCESSIONS ON THE BASIS OF FRUIT QUALITY ATTRIBUTES

SEGREGAÇÃO DE GENÓTIPOS DE DAMASCO NA BASE DAS CARACTERÍSTICAS QUANTITATIVAS DO FRUTO

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ABSTRACT: The objective of this study was to characterize the European apricot germplasm that was collected in Cacak and Smederevo region, Central Serbia. Fifteen physical, chemical and sensorial traits were investigated in this germplasm consisting 14 accessions during a two year period. High variations were recorded in fruit weight, soluble solids content, ripening index, index of sweetness and total mineral mater, whereas variations in stone weight, titratable acidity and total sugars were smaller. Most of the accessions had large fruits with weight ≥60 g; two accessions had a fruit weight ≥80 g. Generally, fruits had a good aroma, firm flesh, orange and yellow flesh and skin color, respectively, and sweet kernel taste. High correlations were found between some evaluated properties. The accessions were grouped into four clusters according to their potential. Using a principal component analysis, accessions were segregated into groups with similar physical, chemical and sensorial properties. These relationships may help in selection of a set of accessions with better fruit quality performances, which, in our study, were found in T-1, T-2, T-10, T-13 and T-14.

KEYWORDS: Acidity. Multivariate analysis. *Prunus armeniaca* L.. Soluble solids. Sugars. Variability.

INTRODUCTION

Apricot (*Prunus armeniaca* L.) are the most important horticultural crops which grown worldwide. Apricot plays an important role in human nutrition, and can be used as a fresh, dried or processed fruit such as frozen apricot, jam, jelly, marmalade, pulp, juice, nectar, extrusion products etc (DROGOUDI et al., 2008). Additionally, fruit apricot is rich in phytochemicals, i.e. primary and secondary metabolites such as sugars, organic acids, phenolic compounds, carotenoids, fiber, vitamins and mineral matter (SCHMITZER et al., 2011). For this reasons, apricots had high dietary and human health capacity.

European and Mediterranean countries represent more than 75% of the world production of apricots (FAOSTAT, 2011). In Serbia, major producing area is Cacak region (Western Serbia). The most important cultivars in this region are ‘Hungarian Best’ and their numerous clones, followed by ‘Kecskemét Rosè’, ‘Harcot’, ‘Roksana’, ‘Krpna Rana’ and new Serbian cultivars such as ‘Aleksandar’, ‘Biljana’, ‘Vera’, ‘Novosadska Rodna’ etc. (MILOŠEVIĆ et al., 2010). These are well adapted to specific climatic conditions and characterized by high variation. The harvest season of apricot fruit in this region starts at mid June until late July.

Cacak region is known for its favorable ecological potential for growing apricot and also some other fruit species. This region is characterized by the great wealth of biodiversity as a source of apricot germplasm, and hence the abundance of different genotypes, accessions, clones, varieties, forms, and types. However, there are a much higher number of individual or grouped apricot trees grown in fields, farms or neglected areas. They are marked by great differences in terms of biological and pomological traits. Some trees have respectable biological and pomological traits and are commonly grown in plantations around Cacak under different local names (MILOŠEVIĆ et al., 2010). In addition, their origin is unknown, but some of these apricot germplasms were replaced by new Serbian apricot cultivars after 1995s such as ‘Aleksandar’, ‘Biljana’, ‘Vera’, when apricot growers realized the high quality and higher commercial value of cultivated cultivars (MILOŠEVIĆ et al., 2012).

Information on the genetic variability of apricots germplasm belong to European ecogeografical group is limited (PAUNOVIC, 1988; BADENES et al., 1998; MRATINIĆ et al., 2011a). The determination of fruit quality attributes of some promising accessions from this apricot group germplasms is important for future breeding programs

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and consumer acceptance. Namely, the goal of the breeding program is to select promising genotypes from these accessions for high fruit quality.

In this context, the aim of the present study was to evaluate and compare the fruit quality attributes of 14 apricot accessions and one traditional cultivar (‘Hungarian Best’). In addition, a multivariate analysis was undertaken in order to study the correlations between the variables and to establish the relationships between genotypes regarding the fruit quality attributes.

MATERIALS AND METHODS

Plant material and weather conditions

In 2006 and 2007, all accessions were collected from the autochthonous populations of apricot in the regions of Cacak (43°53’ N; 20°21’ E) and Smederevo (44°40’ N; 20°56’ E). The research included identification, observation and recording of fruit quality attributes and *in situ* sampling from 1,210 apricot trees grown in the fields (not in the orchards). Out of the total numbers of accessions, singling out 14 accessions for further studies and they were compared to ‘Hungarian Best’ (HB as a control), the most popular cultivar in Serbia. A single-plant selection method was used. Trees of all accessions were very old, approximately beyond 70-80s years. Control cultivar on Myrobalan seedling rootstock was grown in the commercial orchard under standard cultural practices, with 6 m × 4 m spaces and in 24th and 25th year after planting.

Weather conditions of Cacak and Smederevo are characterized by the average annual temperature of 11.3°C and total annual rainfall of 690.2 mm.

Experimental procedure and analysis of fruit quality attributes

The investigation focused on the three segments. The first included recording of the fruit physical properties - fruit weight (FW), stone weight (SW) and flesh/stone ratio (FSR), all in g and %, respectively. A total of 30 fruits were sampled for each accession. FW and SW were measured on a technical digital balance (ET 1111, Iskra, Horjul, Slovenia). On the basis measured data, FSR was calculated.

The second segment comprised main chemical properties. For these analyses, four replicates of ten fruits each were used for each accession. Soluble solids content (SSC) and titratable acidity (TA) were determined in juice extracted using a food processor in four replicates of ten apricots. SSC was determined using a hand refractometer Milwaukee MR 200 (ATC, Rocky Mount, USA) and expressed as °Brix, and TA was analyzed in juices by titration to pH 8.1 with N/10 NaOH and expressed as malic acid content (%). On the basis of the measured data, soluble solids/titratable acidity ratio (SS/TA ratio or ripening index - RI) was calculated. Total sugar (TS) was estimated by the Luff-Schrool volumetric method (LEES, 1975), and data expressed as % of fresh weight. Total mineral mater was determined according to method described by Chaira et al. (2009). Data are given in % of fresh weight.

The third segment recording of the fruit sensorial properties. The IBPGR methodology (GUERRIERO; WATKINS, 1984) was used to provide sensorial description of the accessions. Trained panel of five experts classified the peaches visually, according to the perception of the fruit aroma (FA), fruit firmness (FF), flesh color (FC), skin color (SC), kernel taste (KT) and fruit usage (FU). The above properties were categorized according to IPBGR Descriptors for apricot: FA: 5 = intermediate aroma, 6 = intermediate to rich aroma, 7 = rich aroma; FF: 3 = soft, 5 = medium, 7 = firm; FC: 6 = light orange, 7 = orange, 8 = deep orange; SC: 4 = yellow, 5 = light orange, 6 = orange, 7 = dark orange; KT: 1 = sweet, 2 = weak bitterness; FU: 1 = fresh consumption, 3 = drying.

Statistical analysis

All data are means of two years. The measured data were subjected to an analysis of variance (ANOVA) using the SAS statistical package (SAS Institute Inc., North Carolina, USA) and means of measured data of each accessions were compared with control using Dunett’s test at $d' \leq 0.05$. The relationships between the fruit physical, chemical and sensorial attributes were evaluated by Pearson’s product moment correlation at $P \leq 0.05$. Clustering of genotypes into similarity groups was done using the method of UPGA (Unweighted Pair Group Average). The Statistica 6.0 (StatSoft, Inc., Tulsa, Oklahoma, USA) was employed to make a graphic representation of the cluster analysis. As a tool of germplasm description and determine the relationships among accessions to study correlations among variables in apricot, we have used principal component analysis (PCA). The PCA was performed using the

PRINCOMP procedure of the SAS statistical package (SAS Institute Inc., North Carolina, USA).

RESULTS AND DISCUSSION

Evaluation of fruit physical attributes

There were large variations between FW and SW in all accessions evaluated (Table 1). The eleven accessions had higher FW than control, while one had lower value. Only one accession had similar FW with control. According to IPBGR descriptor (GUERRIERO; WATKINS, 1984), the large fruits (61-70 g) were found from seven accessions (T-11, T-3, T-4, T-6, T-9, T-10, T-2), and very large (71-85 g) from three accessions (T-14, T-13, T-1). Only two accessions (T-5, T-7) and HB had smaller FW than 50 g. This shows that apricot germplasm in the present study are mainly composed of high FW accessions, as previously reported by Paunovic (1988) and Badenes et al. (1998). Therefore, the genotypes may be expected to produce larger fruits under better cultural practices. In addition, more number of authors also reported high variability among genotypes regarding this trait (RUIZ; EGEA, 2008; MRATINIĆ et al., 2011a). As also shown in Table 1, SW from all accession, except T-1, was similar with control and generally categorized as large. Moreover, largest stone with large and sweet kernel had economical value and can be used for direct consumption (ASMA; OZTURK, 2005).

All accessions had significantly better FSR values than control cultivar (Table 1). The high FSR is a desired fruit property in table-consumed apricots, as previously recorded (MEHLENBACHER et al., 1991).

Table 1. Physical and chemical attributes of apricot accessions

Accession	FW (g)	SW (g)	FSR (%)	SSC (°Brix)	TA (%)	RI	TS (%)	IS	MM (%)
T-1	81.50 *	5.01 *	93.85 *	17.81 ns	1.06 ns	16.80 ns	13.37 *	12.61 *	0.41 *
T-2	69.98 *	4.04 ns	94.23 *	17.48 ns	0.77 *	22.70 *	12.88 *	16.73 *	0.36 ns
T-3	60.87 *	3.69 ns	93.94 *	17.93 ns	0.89 ns	20.15 *	12.51 ns	14.06 *	0.37 ns
T-4	61.23 *	3.37 ns	94.50 *	17.98 *	0.88 ns	20.43 *	12.49 ns	14.19 *	0.35 ns
T-5	41.34 *	2.98 ns	92.79 *	18.88 *	0.93 ns	20.30 *	13.40 *	14.41 *	0.43 *
T-6	67.36 *	4.08 ns	93.94 *	17.85 ns	1.00 ns	17.85 *	12.55 ns	12.55 *	0.39 *
T-7	51.55 ns	3.16 ns	93.87 *	18.01 *	0.83 *	21.70 *	11.71 ns	14.11 *	0.40 *
T-8	65.84 *	3.71 ns	94.36 *	16.23 ns	0.93 *	17.45 ns	12.72 ns	13.68 *	0.29 ns
T-9	68.77 *	3.54 ns	94.85 *	15.72 ns	1.05 ns	14.97 *	11.53 ns	10.98 *	0.39 *
T-10	69.43 *	3.86 ns	94.44 *	18.03 *	1.04 ns	17.34 ns	12.98 ns	12.48 *	0.41 *
T-11	60.65 *	3.22 ns	94.69 *	18.11 *	1.01 ns	17.93 *	12.49 ns	12.37 *	0.35 ns
T-12	59.94 *	3.34 ns	94.43 *	17.95 *	1.00 ns	17.95 *	12.21 ns	12.21 *	0.38 ns
T-13	80.27 *	3.98 ns	95.04 *	16.01 ns	1.08 ns	14.82 *	14.99 *	13.88 *	0.42 *
T-14	72.68 *	4.04 ns	94.44 *	17.76 ns	0.99 ns	17.94 *	12.43 ns	12.56 *	0.40 *
HB	49.07	3.37	93.13	16.77	1.03	16.28	12.07	11.72	0.32

Some data from Table 1 are previously published by Milošević et al. (2010); For abbreviations see section "Experimental procedure and analysis of fruit quality attributes"; The asterisk in columns indicates a significant difference between accessions and control at $d' < 0.05$ by Dunett's test; ns - non significant differences.

Evaluation of fruit chemical attributes

According to the evaluated chemical attributes, SSC was better in six accessions (T-4, T-5, T-7, T-10, T-11, T-12) than in control (Table 1). Also, all accessions and HB showed values higher than 12°Brix. Namely, apricots with >12°Brix were characterized by an excellent gustative quality (GURRIERI et al., 2001). An important variability has been reported previously by other authors (RUIZ; EGEA, 2008; DROGOUDI et al., 2008). Generally, SSC is a very important quality attribute, influencing notably the fruit taste. Regarding fruit acidity, the T-2, T-7 and T-8 showed lowest TA than control, whereas other accessions had similar values with HB (Table 1). The fruit maturity stage at the harvest date is the key factor affecting fruit acidity and also the SS content (CRISOSTO et al., 2004). Our range of TA values is in agreement with the previous work on apricot (MEHLENBACHER et al., 1991). SSC/TA ratio or RI was significantly higher in nine accessions than in control, and lower in two (T-9, T-13), whereas rest three accessions (T-1, T-8, T-10) had similar values with HB (Table 1). The relationship between SS and TA has an important role in consumer's acceptance of some stone fruits such as apricot, peach, nectarine, and plum cultivars. With the cultivars with TA >0.90% and SS <12.0%, the consumers' acceptance was controlled by the interaction between TA and SS rather than SS alone (CRISOSTO et al. 2004).

The data in Table 1 showed that only four accessions (T-1, T-2, T-5, T-13) had significantly higher TS when compared with control, whereas other accessions had similar content. Our range of values was higher than those obtained by Mratinić et al. (2011a) for apricot germplasm from Macedonia. The differences between our results and those of Mratinić et al. (2011a) could be due to the different ecological conditions and apricot accessions studied. All accessions, except T-9, had significantly better IS values than control (Table 1). Therefore, apricot quality consists of a balance of sugar and acidity as well as a strong apricot aroma (SCHMITZER et al., 2011). Namely, high sugar content and low acid are considered as sweet and consumers prefer fruit that have a sweet taste more than aromatic flavor (CRISOSTO et al., 2004).

Data presented in Table 1 indicated that T-1, T-5, T-6, T-7, T-9, T-10, T-13 and T-14 apricots were richness in MM when compared with control. Other accession had similar content. Akin et al. (2008) reported that total mineral mater in apricot fruits varied between 0.50% and 0.80%, and depended on the origin of genotypes and geographical regions.

Evaluation of fruit sensorial attributes

The FA was good and similar with control in nine accessions, whereas predominant FF was firm (Table 2). It may be concluded that most of accessions showed good characteristics regarding above properties. Similar observations were found by Ruiz and Egea (2008). Most of the accessions examined similar FC to those of HB, i.e. orange, whereas seven accessions had yellow, five accessions and HB had orange, whereas others had light orange (T-10) and deep orange (T-12) FC, respectively. Similar findings were obtained in a previous work (MRATINIĆ et al., 2011a).

Table 2. Sensorial attributes of apricot accessions on the basis IBPGR methodology

Accession	Fruit aroma	Fruit firmness	Flesh color	Skin color	Kernel taste	Fruit usage
T-1	7	3	7	4	1	1
T-2	6	7	6	6	1	1
T-3	6	7	7	6	1	1
T-4	6	7	7	4	1	1
T-5	5	5	7	4	1	3
T-6	6	7	6	6	1	1
T-7	5	7	8	6	1	3
T-8	6	7	8	6	1	1
T-9	6	7	7	4	1	1
T-10	6	7	7	5	2	3
T-11	6	7	7	4	1	3
T-12	5	5	8	7	1	1
T-13	6	3	7	4	2	1
T-14	7	3	5	4	1	1
HB	6	7	7	6	1	1

Some data from Table 1 are previously published by Milošević et al. (2010); HB: Hungarian Best (control cultivar); Fruit aroma: 5 = intermediate, 6 = good, 7 = rich; Fruit firmness: 3 = soft, 5 = medium, 7 = firm; Flesh color: 5 = yellow, 6 = light orange, 7 = orange, 8 = deep orange; Skin color: 4 = yellow, 5 = light orange, 6 = orange, 7 = dark orange; Kernel taste: 1 = sweet; 2 = weak bitterness; Fruit usage: 1 = dessert (fresh); 3 = drying (GUERRIERO; WATKINS, 1984).

The only T-10 and T-13 accessions showed weak bitterness KT, whereas rest accessions and control cultivar had sweet KT, as previously obtained (PAUNOVIC, 1988). While the sweet kernels are being used for direct consumption, the bitter ones find application in pharmaceutical and cosmetic industry (ASMA; OZTURK, 2005). Most of the accessions studied and control can be used for fresh consumption, whereas fruits of T-5, T-7, T-10 and T-11 are suitable for drying and processing due to its high SSC and TS. Similar findings were observed in the earlier studies (AKIN et al., 2008; DROGOUDI et al., 2008).

Correlation among variables

Significant correlations were found between the set of 15 fruit quality attributes of the accessions evaluated (Table 3). FW significantly correlated with SW, FSE or FA, whereas SW correlated with FA. These could be justified as fruits with larger in size would also have larger stones, higher FSR and also better fruit aroma. This relationship has been reported also by other authors (ASMA; OZTURK, 2005). Correlation between FW and each fruit chemical properties (SSC, TA, RI, TS, IS or MM) was not observed, which is in agreement with previous work in apricot (BADENES et al., 1998; RUIZ; EGEA, 2008; MRATINIĆ et al., 2011b). The SSC strongly correlated with RI or FA, while no relationship between SSC and TA, as previously reported by Badenes et al. (1998), Ruiz and Egea (2008) and Mratinić et al. (2011b). Contrary, Asma and Ozturk (2005) observed a very strong negative correlation between SSC and TA in a set of Turkish apricot cultivars belong to Irano-Caucasian ecogeographical group. The differences between our results and that of Asma and Ozturk (2005) can be explained by different ecogeographical group apricots and the different size of the group of cultivar evaluated. The TA negatively correlated with RI or IS, indicating a decrease in RI and sweetness parallel to increase in acidity. A positive relationship between RI and IS was also observed. It was reported that fruit with higher RI have a higher sweetness. The TS negatively correlated with FF, but positively correlated with KT, suggesting that fruits with high sugar content had low firmness. Relatively similar findings were found in a previous work on apricot (BADENES et al., 1998). The MM was negatively correlated with FF, indicated that softness fruits are richness in MM. Also, we found a negative relationship between FA and FC. Asma and Ozturk (2005) observed significant relationship between FC and SC. These observations indicated that skin and flesh color in general does not seem to be a good indicator of some sensorial properties in stone fruits, especially firmness (LEWALLEN; MARINI, 2003; MILOSEVIC; MILOSEVIC, 2010).

Cluster analysis

The dendrogram (Figure 1) was generated from the average linkage cluster analysis based on UPGA distance. High similarity level was found between accessions T-3 and T-4, between T-6 and T-10 and between T-1 and T-13 (Figure1) On the other hand, high dissimilarity level was observed among accessions T-1, T-2 and T-12 and between T-5 and T-13. The dissimilarity level, i.e. genetic distance (*d*) ranged from 0.0004 to 0.0205, indicating a high similarity degree and a low genetic distance between the accessions. Similar data were reported by Mratinić et al. (2011a) who suggested that traditional fruit quality attributes and geographical origin classification could not completely reflect the pedigree relationship among the studied apricot accessions.

Principal component analysis

As a tool of germplasm description and determine the relationships among accessions to study correlations among variables in apricot (ASMA; OZTURK, 2005; RUIZ; EGEA, 2008; DROGOUDI et al., 2008; MRATINIĆ et al., 2011a), we have used PCA.

The PCA showed that more than 80% of the variability observed was explained by the first 5 components (Table 4). PC1, PC2 and PC3 accounted for 33.82%, 16.97% and 15.31%, respectively, of the total variability. Correlation between the original variables and the first three principal components is shown in Table 5: PC1 explains FW, SW, FSR, TA, FA, KT, RI, FF and SC: PC2 represents SSC, TS, IS and MM: PC3 explains FC and FU. The highest positive values for PC1 represents two accessions (T-1 and T-13) with the highest FW, higher SW and FSR and the best FA. Negative values for PC1 indicates accessions with higher RI and firm fruits (T-3, T-4 and T-7) as shown in Figure 2. Two accessions (T-5 and T-14) with the highest positive values for PC2 were characterized by higher SSC and MM (Figure 2). Accessions T-8, T-9 and T-12 and HB had lower content of TS and lower IS which was represented by negative values for PC2 (Figure 2). PC3 indicate accessions which may be used for drying (T-10 and T-11) and accessions with light orange FC. Finally, PC analysis can be very useful tool to segregate accessions with better fruit quality attributes, which in our study, could be indicated in accessions T-1, T-2, T-10, T-13 and T-14.

Table 3. Correlation matrix among variables evaluated

Variable	FW	SW	FSR	SSC	TA	RI	TS	IS	MM	FA	FF	FC	SC	KT	FU
FW	1														
SW	**0.844**	1													
FSR	**0.678**	0.194	1												
SSC	-0.412	-0.170	-0.463	1											
TA	0.367	0.281	0.222	-0.333	1										
RI	-0.424	-0.268	-0.340	**0.631**	**-0.938**	1									
TS	0.418	0.384	0.108	-0.071	0.262	-0.212	1								
IS	-0.069	-0.005	-0.135	0.250	**-0.808**	**0.773**	0.348	1							
MM	0.175	0.196	-0.034	0.325	0.246	-0.041	0.367	-0.016	1						
FA	**0.717**	**0.773**	0.272	-0.237	0.338	-0.360	0.171	-0.199	-0.069	1					
FF	-0.452	-0.479	-0.077	0.002	-0.435	0.337	**-0.591**	0.071	**-0.546**	-0.366	1				
FC	-0.337	-0.405	-0.033	-0.116	-0.024	-0.040	-0.104	-0.074	-0.236	**-0.613**	0.265	1			
SC	-0.272	-0.141	-0.214	0.029	-0.368	0.296	-0.357	0.140	-0.401	-0.430	0.431	0.331	1		
KT	0.400	0.182	0.384	-0.218	0.419	-0.392	**0.639**	-0.016	0.389	0.046	-0.227	0.034	-0.209	1	
FU	-0.472	-0.477	-0.226	**0.526**	-0.093	0.273	-0.033	0.047	0.315	-0.456	0.212	0.247	-0.180	0.207	1

For abbreviations see section “Experimental procedure and analysis of fruit quality attributes”; In bold, significant values (except diagonal) at the level of significance *P* = 0.05.

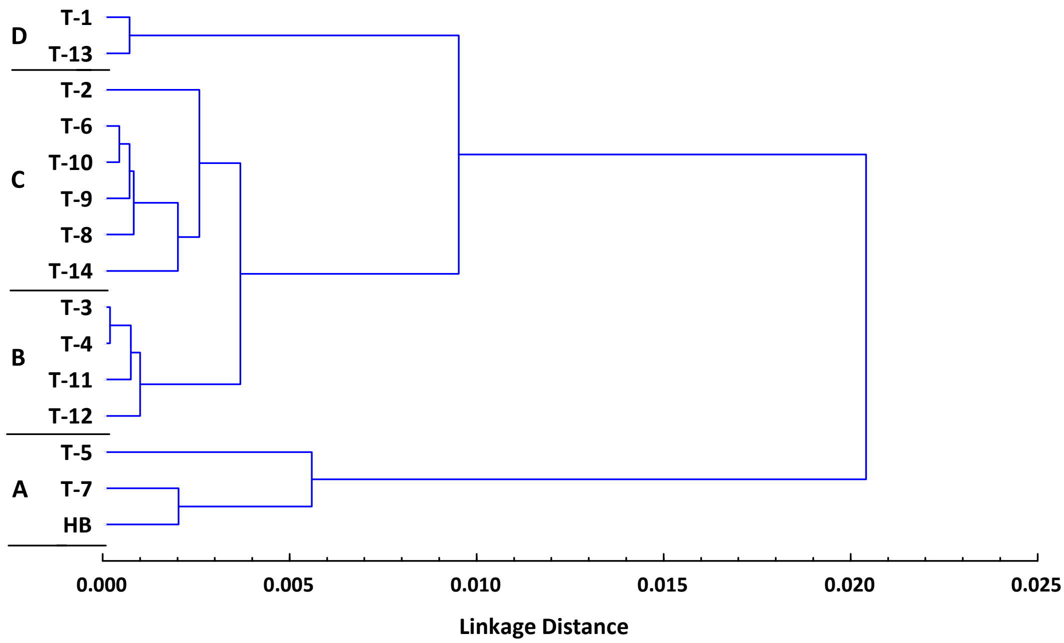

Figure 1. Dendrogram of 14 apricot accessions and control cultivar obtained by UPGA cluster analysis based on 15 fruit quality attributes. Capital letters represent the different groups of accessions. HB: Hungarian Best - control cultivar.

Table 4. Eigenvalues and proportion of total variability among plum breeding genotypes and control cultivars as explained by the first eight principal components (PC)

PC	Eigenvalues	Percent of variance	Cumulative (%)
1	5.073	33.821	33.821
2	2.546	16.971	50.792
3	2.297	15.311	66.103
4	1.599	10.663	76.766
5	1.023	6.821	83.587

Table 5. Component loadings for quality variables and component scores for 14 apricot accessions and control cultivar

Variable	Component loadings			Accessions	Component scores		
	PC_1, λ = 33.8	PC_2, λ = 17.0	PC_3, λ = 15.3		PC_1	PC_2	PC_3
FW (g)	0.859	0.051	-0.334	T-1	3.599	1.181	-0.751
SW (g)	0.723	0.192	-0.459	T-2	-1.452	1.641	-3.513
FSR	0.517	-0.234	-0.069	T-3	-1.375	0.121	-1.251
SSC (°Brix)	-0.476	0.621	0.089	T-4	-1.114	0.192	-1.039
TA (%)	0.727	-0.282	0.537	T-5	-2.892	2.966	2.250
RI	-0.747	0.490	-0.405	T-6	0.353	-0.220	-0.789
TS (%)	0.516	0.555	0.135	T-7	-3.883	0.574	0.844
IS	-0.369	0.603	-0.468	T-8	-0.435	-2.386	-1.147
MM (%)	0.288	0.666	0.423	T-9	1.641	-2.805	0.778
FA	0.730	0.003	-0.472	T-10	1.082	0.786	2.064
FF	-0.641	-0.437	-0.097	T-11	-0.540	-0.425	1.247
FC	-0.367	-0.364	0.436	T-12	-1.180	-1.300	0.954
SC	-0.501	-0.343	-0.255	T-13	4.580	1.104	1.392
KT	0.493	0.232	0.447	T-14	2.587	1.099	-1.351
FU	-0.417	0.369	0.637	HB	-0.970	-2.528	0.312

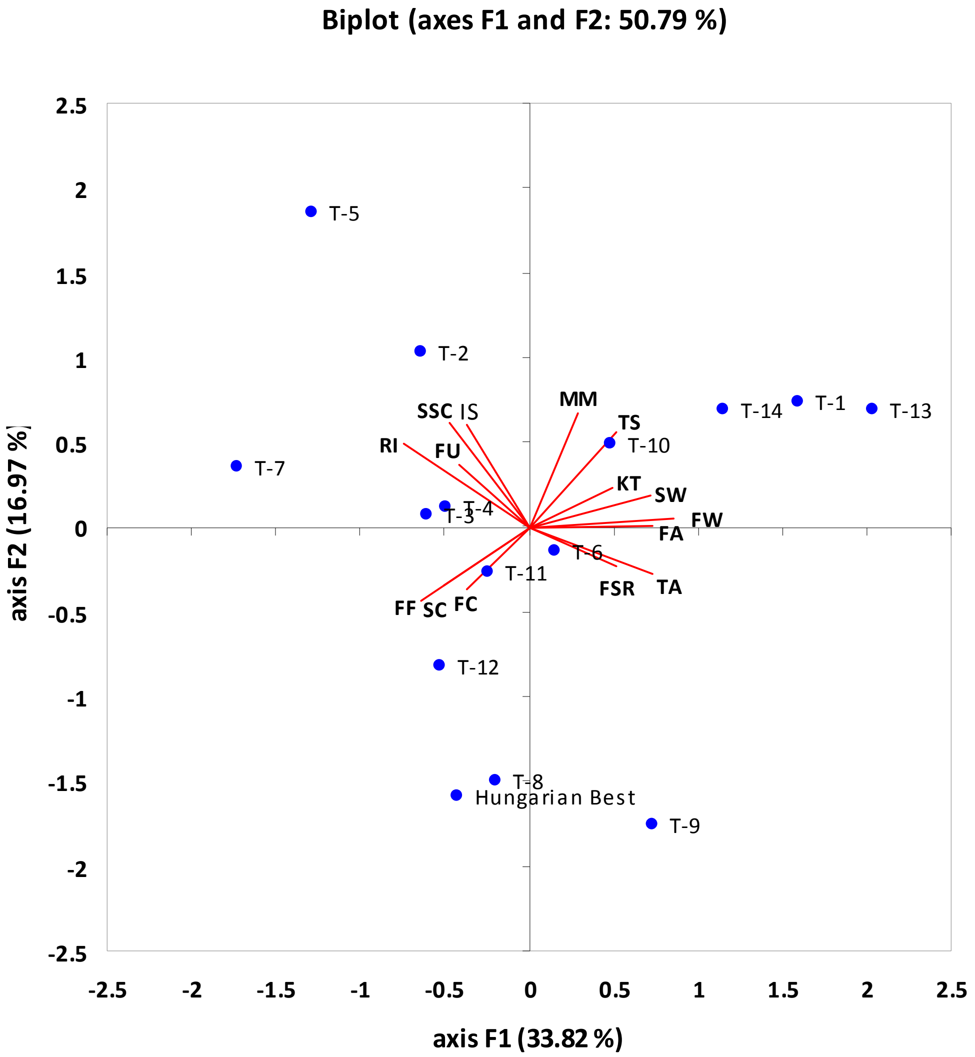

Figure 2. Biplot based on PC analysis for fruit quality attributes in 14 promising apricot accessions and control cultivar. For abbreviations see section "Experimental procedure and analysis of fruit quality attributes"

CONCLUSIONS

The apricot accessions collected in the Cacak and Smederevo region (central Serbia) showed wide variation in terms of the evaluated fruit quality attributes.

In absence of cultural practices, most of accessions had large fruit size and high mesocarp percentage, accumulated high content of soluble solids and total sugars, and relatively low amounts of titratable acidity. Also, most of accessions had firm flesh, attractive skin and flesh color, sweet kernel and suitable for fresh consumption, drying and processing due to its good ripening index and index of sweetness.

A strong relationship between some quality attributes was recorded. Cluster analysis indicating a high similarity degree and a low genetic distance between the accessions. PC analysis may help in selection of a set of genotypes with better fruit quality features, which, in our study, were observed in T-1, T-2, T-10, T-13 and T-14 accessions. Finally, these accessions can be recommended for planting and further breeding programs.

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RESUMO: O objetivo deste estudo foi examinar o germoplasma do grupo Europeu de damasco coletados na Região de Cacak e Smederevo, Serbia Central. Quinze das propriedades físicas, químicas e sensoriais foram investigadas durante dois anos neste germoplasma que consistia de 14 genótipos, Foi confirmada uma grande variação no peso do fruto, do teor das substâncias solúveis, do índice de maturação, do índice de doçura e do conteúdo mineral, enquanto a variação do caroço, dos ácidos totais e do conteúdo total dos açucares foram menos destacados. O maior número de genótipos tiveram o peso do fruto de 60 g enquanto dois genótipos tiveram o peso do fruto acima de 80 g. Geralmente, os frutos tiveram um bom sabor, carne firme de cor alaranjada, com o epiderme de cor amarela e sabor doce do núcleo. Fortes correlações foram confirmadas entre algumas características dos frutos. Os genótipos na base de seus potenciais foram agrupados em quatro clusters. Usando as análises das componentes mais importantes, foram selecionados os genótipos com as características físicas, químicas e sensoriais semelhantes dos frutos. Essas relações podem ser úteis na seleção de um conjunto de genótipos com as qualidades de melhor desempenho que são determinados em nosso trabalho com T-1, T-2, T-10, T-13 e T-14.

PALAVRAS-CHAVE: Acidez. Análise multivariada. *Prunus armeniaca* L. Matérias sólidas solúveis. Açucares. A variabilidade.

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