Flavonoids Content of Different Apricot (*Prunus armeniaca* L.) Cultivars

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Abstract: Several epidemiological studies have revealed that natural antioxidants are important in health maintenance and the prevention of chronic and degenerative diseases. Special attention has been given to flavonoids since many studies have revealed a great cultivar of beneficial effects in diseases such as cardiovascular and cerebrovascular diseases, some forms of cancer and Parkinson's and Alzheimer's diseases. Several cultivars and accessions of apricots (*Prunus armeniaca* L.) belonging to the germoplasm collection of local apricot (Agronomic Experimental Centre of Tavira, CEAT, Algarve, Portugal) were studied for flavonoids' content and quality indices. Three main flavonoids could be detected in the samples: quercetin-3-rutinoside, quercetin-3-galactoside and quercetin-3-glucoside. Quercetin-3-rutinoside was absent in 5 samples of apricot: Priana cultivar, and the accessions 13, 5, 9 and 12, nevertheless when present it constituted the most important in the remaining samples.

Keywords: Apricot, Cultivars, Algarve, Flavonoids, HPLC.

1 Introduction

There is increasing interest in the use of dietary antioxidants for improving human health and for the prevention of cardio- and neurodegenerative diseases. Consumption of fruit and vegetables has been associated with lower incidence of these diseases as well with lower mortality rates of cancer due to the presence of antioxidant nutrients, in addition to vitamin C or E and carotenoids. Antioxidant nutrients includes phenols and particularly flavonoids [1,2]. Many studies have revealed a great cultivar of beneficial effects in diseases such as cardiovascular and cerebrovascular diseases, some forms of cancer and Parkinson's and Alzheimer's diseases [3]. Flavonoids are polyphenolic compounds present in appreciable quantities in fruit, vegetables, plant extracts, red wine, plant-derived beverages like tea and cocoa [4]. These compounds are predominantly conjugated with sugars or other polyols via *O*-glycosidic bonds or ester bonds. The composition and distribution of these conjugated components are responsible for the differences observed in the culinary, physiological and medicinal properties, mainly those that present health benefits [5].

The main goal of the present work was to evaluate the quality indices as well as to quantify the total phenolic content and the different flavonoids present in known cultivars and accessions.

2 Material and Methods

2.1 Plant material

The cultivars "Lindo", "Beliana" and "Priana" and the accessions A2, A3, A5, A6, A9, A13 and A21 belong to a germoplasm collection of local apricot (*P. armeniaca* L.) in the Agronomic Experimental Centre of Tavira (CEAT), Algarve.

2.2 Quality Indices

Soluble solids content (SSC) was measured with a digital Atago refractometer and firmness with a Chatillon TCD200 penetrometer fitted with a conical plunger of 6.5 mm diameter and 2.4 mm height. Maximum penetration depth was 12.6 mm. Titrable acidity was expressed as percent malic acid.

2.3 Flavonoids

Samples' preparation: After cutting the fruits, they were homogenized and extracted with a solution of acetone 70 % (v/v). The mixtures were vigorously stirred for 1 h at room temperature. The acetone was evaporated in a Rotavapor at 30 ºC and 280 mbar and then the pellet was ressuspended in water. The watered sample pH was adjusted until to reach 1.5 and then was extracted three times with ethyl acetate. The solvent was evaporated and the pellet ressuspended in water.

Separation and quantification of Flavonoids: Flavonoids' separation was performed by HPLC analysis with a detector UV-Vis Beckman 166 (USA), using a LiChrochart 100 RP-18 column (25 cm x 0,4 mm diam), 5 μm particle size, Purosphere. The mobile phase was acetic acid 20% (A) and acetic acid 0.5 % in water/acetonitrile solution (50:50 v/v) (B). The gradient program started with 10 % B in A to reach 55 % B at 50 min, 55% B at 10 min, 100% B at 10 min and 100%B to 10 % B in 5 min.

2.4 Total phenolic concentration

Two grams of frozen fruit were homogenized and extracted with 5 ml of methanol stirring for 1 h at room temperature. The samples were centrifuged (4500g at 15ºC for 10 min) and the supernatants recovered. Phenolic concentration was determined using the Folin-Ciocalteu method by using Gallic acid as standard. The results were expressed as milligrams of Gallic acid equivalent (GAE).

3 Results and discussion

Figure 1 represents the phenolic content in diverse cultivars and accessions of apricots. The amounts of total phenols differed remarkably among the apricot samples. Accession 13 possessed the highest concentration of total phenols (72 µg/mL), immediately followed by the cultivar Beliana (63 µg/mL), in contrast to the accession 2 that exhibited the lowest content (43 µg/mL). Nevertheless there is not a direct correlation between total phenols and flavonoid content.

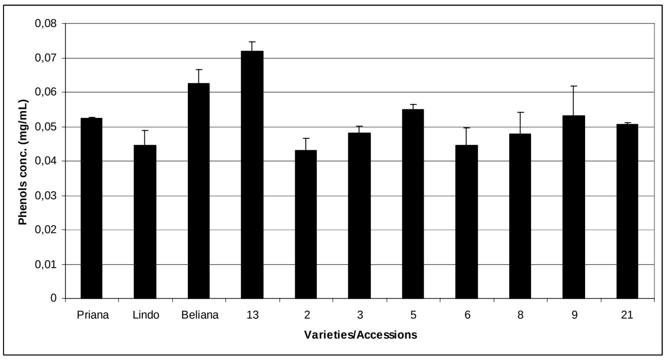

Figure 1. Phenolic content of some cultivars and accessions of apricots from Algarve

Fig. 2 that depicts the amounts of quercetin-3-rutinoside, quercetin-3-galactoside and quercetin-3-glucoside, revealed that the accession 13 was significantly poorer in these components than practically all the remaining samples. The cultivar Priana was the unique exception, in which the amounts of quercetin-3-galactoside and quercetin-3-glucoside were the lowest found in all samples assayed (Fig. 2). Such results suggest that the phenolic richness of accession 13 may only be attributed to phenols other then quercetin-conjugates analysed in this work. It is also noteworthy to refer that quercetin-3-rutinoside was absent in 5 samples of apricot: Priana cultivar, and the accessions 13, 5, 9 and 12. Nevertheless when present it constituted the most important in apricot extracts (Fig.2). Another interesting result was registered for the accession 9, in which quercetin-3-glucoside was significantly higher than quercetin-3-galactoside (Fig. 2).

Such results seem to reveal the importance of plant genotype for the production of flavonoids. In this way, the benefits of biological effects on human health of this kind of components are also affected, as already reported by some authors [2].

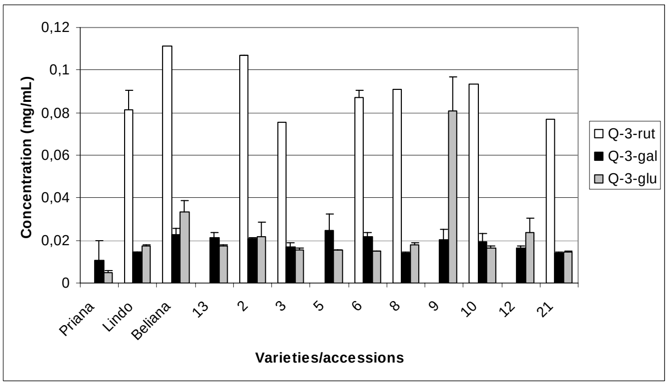

Figure 2. Concentration of quercetin-3-rutinoside (Q-3-rut), quercetin-3-galactoside (Q-3gal) and quercetin-3-glucoside (Q-3-glu) in some cultivars and accessions of apricots from Algarve.

Firmness of ripe apricots changed from 0.6 to 1.2 kgf. Fruits of accession A6 were the firmest. The known cultivars Priana and Lindo had the lowest firmess values together with accessions A2, A5, A9 and A21. Firmness values known as the eating ripe firmness values (around 1kgf) were the ones of Beliana, A3, A8 and A13 (Figure 3).

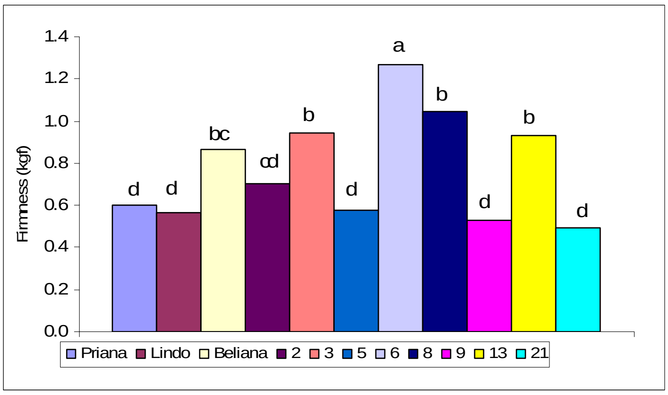

Figure 3-Firmness of ripe apricots of some cultivars and accessions of apricots from Algarve.

Soluble solids content (TSS) were from 11 to 15%, being the cultivar Beliana the sweetest. Good values of ºBrix were also the ones of A3, A5, A9 and A13 (Figure 4).

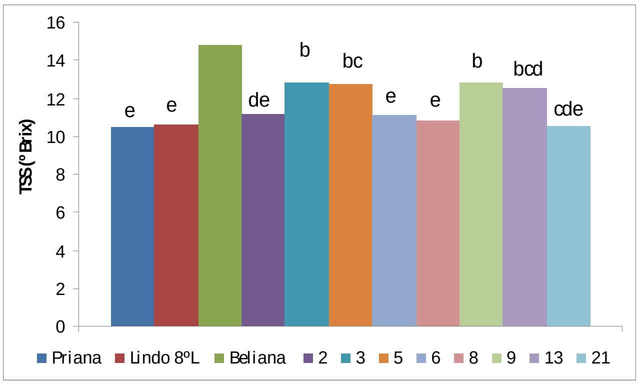

Figure 4-Soluble solids content of some cultivars and accessions of apricots from Algarve.

Since the taste is a combination of TSS and acidity, it seams that Beliana was the best in taste since it had not too much, not too few titrable acidity. Priana and Lindo had the highest values of titrable acidity and the accession A21 the lowest (Figure 5).

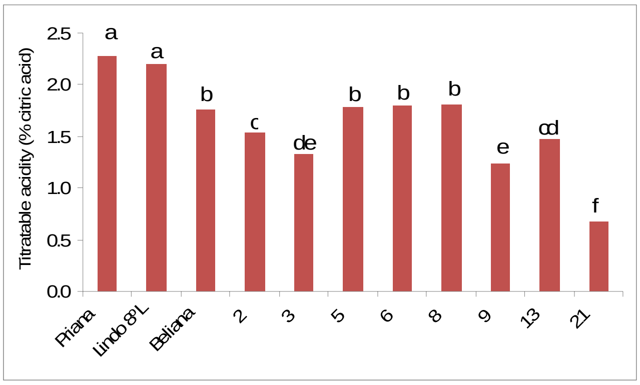

Figure 5. Titrable acidity of some cultivars and accessions of apricots from Algarve.

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