Manchester Metropolitan University

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ICFSQN, April 11 – 13th, 2012, Manchester, UK

Venue

Manchester Food Research Centre, Hollings Faculty, Manchester Metropolitan University, M14 6HR, UK

NOVEL TECHNOLOGIES AND FOOD PRODUCTS
Session Chairs: Prof. K. Muthukumarappan & Dr. P.J. Cullen

14:30 – 14:50	Advanced Oxidation Processes for fruit and vegetables **P.J. Cullen**	**NTFP1**
14:50 – 15:10	Extrusion Processing: Opportunities and Challenges **K. Muthukumarappan**	**NTFP2**
15:10 – 15:30	Pomegranate liquor preparation and analysis **L.R. Galego, L. M. Estevinho and J.P. Da Silva**	**NTFP3**
15:30 – 16:00	**TEA/COFFEE AND POSTER SESSIONS**	
16:00 – 16:15	Effect of Soluble Solids Concentration and Temperature on the rheological Properties of Oat Milk **A. Deswal, N.S. Deora and H.N. Mishra**	**NTFP4**
16:15 – 16:30	Production and development of nutraceutical from Ganoderma lucidum NRCM OE 52 by submerged fermentation process **M.F. Ahmad, B. P. Panda and Z.A.A. Azad**	**NTFP6**
16:30 – 16:45	Diversity in starch functionality in field pea germplasm **N. Singh, S. Singh, N. Kaur, N. Isono, T. Noda and J.C. Rana**	**NTFP7**
16:45 – 17:00	Apple pomace as a potential ingredient for the development of new functional foods **S.F. Reis, D.K. Rai and N. Abu-Ghannam**	**NTFP10**

Date: 12/04/2012

FOOD SAFETY AND RISK ASSESSMENT
Session Chairs: Dr. Enda Cummins & Dr. P.S. Negi

10:30 – 10:50	Food safety assessment – risks, regulation and recent developments **E. Cummins**	**FSRA1**
10:50 – 11:10	Natural Antimicrobial Agents: Scope for plant extracts in food preservation **P.S. Negi**	**FSRA2**
11:10 – 11:30	Simultaneous detection of bacterial pathogens Salmonella, Vibrio 1editer and E. coli associated with seafood by Multiplex PCR assay **G. Jeyasekaran, K.T. Raj, R.J. Shakila, A.J. Thangarani and D. Sukumar**	**FSRA3**
11:30 – 11:45	Migration and exposure assessment of engineered silver nanoparticles from a PVC nanocomposite food packaging **M. Cushen and E. Cummins**	**FSRA4**

Pomegranate Liquor Preparation and Analysis

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ABSTRACT

The pomegranate (*Punica granatum* L.) liquor has been produced for several centuries in the south of Portugal, mainly in the mountain areas. The "Assaria" variety is the preferred cultivar due to its organoleptic properties and high arils to peel ratio. Wild pomegranates are also widely distributed but, despite the health benefits that have been associated to the fruits, they continue to be unappreciated for consumption. Liquor preparation is a very good alternative for wild pomegranate fruits. We prepared pomegranate liquors by following a maceration procedure using the arils or juice of Assaria and wild pomegranate fruits. Strawberry tree (*Arbutus unedo* L.) fruit spirits were used to prepare the liquors. At the end of the maceration time 5 day as minimum sugar syrup was added. The maturation period was three months or longer. The obtained liquors showed a very attractive pink colour. The colour and the total polyphenol, as well as the anthocyanin and ellagitannin profiles, were measured at the end of the maceration and maturation times. Wild pomegranates gave rise liquors with more intense pink colour and higher polyphenol contents than the prepared using Assaria fruits. The anthocyanin and ellagitannin profiles also indicated higher contents of polyphenols for liquors prepared using wild pomegranate fruits. When juice is used instead of complete arils during the maceration period punicalin is not present and the consequently total polyphenols is low. The main anthocyanins identified in the liquors were delphinidin-3,5-diglucoside, cyaniding-3,5-diglucoside, delphinidin–3-glucoside, cyaniding–3-glucoside, pelargonidin–3–glucoside; the main ellagitannins were punicalagin and punicalin.

Keywords: Pomegranate, macerates, liquor, anthocyanins, ellagitannins

INTRODUCTION

Pomegranate (*Punica granatum* L.) is a shrub original from India and has been cultivated in tropical and subtropical countries (Melgarejo, 2011; Mousavinejad, 2009; Kulkarni, 2005). As in most countries of the Mediterranean area, pomegranates grow in Portugal, mainly in the southern regions. In Algarve pomegranates grow as a wild shrub, usually in the border of other orchards. Some of these wild shrubs were budded with selected cultivars being the Assaria variety one of the most popular (Miguel, et al., 2004). The wild fruits usually show smaller arils, higher seed to juice ratios and higher contents of husk, being therefore much less appreciated or simply non-used.The health benefits of pomegranate fruits have been associated with their phenolic compounds (Bialonska, et al., 2010; Dell'Agli et al., 2010; Lee, et al., 2010; Tezcan et al., 2010; Viuda-Martos, et al., 2010; Oliveira, et al., 2010; Mousavinejad et al., 2009; Basu & Penugonda, 2008; Patel et al., 2008; Shukla, et al., 2008;

Pérez-Vicente et al., 2002). Aromatic pomegranate liquor would show therefore some properties of functional drink. This liquor has an attractive pink colour and is traditionally produced in Monchique. The city of Algarve is also the heart of strawberry tree fruits (*Arbutus unedo* L.) distillate production. The preparation of the pomegranate liquor follows a maceration procedure and uses the strawberry tree fruit distillate as the alcohol source. This gives to the final liquor the aroma of this distillate. The preparation of liquors can also be made using fig fruit distillates, which are much cheaper. However, in this case a partially deodorized distillate is desirable (Galego, et al., 2011). This work describes the preparation of pomegranate liquors using wild and Assaria pomegranate fruits with fruit distillates. Total polyphenols, the phenolic profiles, pH, acidity, total soluble solids and colour were monitored in juice fruits, macerates and liquors.

MATERIALS

Samples of wild and budded pomegranates were randomly collect in different orchard growing both kinds of pomegranates, in November 2010. *Arbutus unedo* L. distillate was provided by a local producer. The properties of the distillate were in accordance with the European Legislation (European Union EC, Regulation 110/2008) and with the specific Portuguese law (Decreto-Lei 238/2000 de 26 de Setembro). Partial deodorization of the fig distillate was performed in laboratory by following a previous procedure (Galego et al., 2011).

Liquor preparation

Pomegranate liquor preparation. Pomegranate arils were hand separated, and used immediately. The pomegranate arils were macerated in concentrated strawberry tree fruits distillate (70 ± 2 % v/v) or in a partially deodorised and concentrated fig distillate (68 ± 2 % v/v). The amount of used arils was 1000 g L^{-1}. Three replicates were made for each set of experimental conditions. After maceration the resulting liquid was filtered and sugar syrup (a sucrose aqueous solution (~ 1 kg L^{-1})) was added. Liquors with 240 ± 5 g/L of sugar and final alcohol proof of 18 ± 2 % v/v were obtained. The maceration period was 6 months and and the maturation time also 6 months.

METHODS

Physical measurements: Seven fruits of each pomegranate type were individually analysed for physical characteristics. Fruits were weighted using Ohaus Pioneer (Nänikon, Switzerland) balance of accuracy 0.01 g, twenty arils of each cultivar were also weighted with Ohaus Pioneer (Nänikon, Switzerland) balance with 0.0001 g accuracy. The *total soluble solids* were measured by refractive index as ºBrix with an ABBE Atago refractometer (Tokyo, Japan) expressed at 20 ºC and calibrated with distilled water. The colour of the pomegranate juices, macerates and liquors was determined using a Dr Lange Colorimeter D65/10 (Neurtex, Spain). The colour was determined according CIE (Comission International del'Eclairage) using the coordinates L* for lightness, a* for red-greenness, and b* for blue-yellowness. All analyses were repeated 7 times in 5 ml samples placed in the instrument specific cuvette.

Total acidity, pH and total polyphenols: The total acidity was measured by titration using a potentiometric method. Measurement of pH was done with a pH meter (Crison, Spain) after calibration with the standards 4 and 7. The total polyphenol contents were measured by the

Folin-Ciocalteau method (Regulation EEC 2676/90), using gallic acid as standard. The absorbance intensity was measured at 765 nm using a Cintra 101 UV-Vis spectrophotometer (Dandenong, Australia).

Total anthocyanin index and anthocyanin profiles: The total anthocyanin index was carried out by the sulphur decolourization method as in previous works (Galego et al., 2011).The main anthocyanins were identified by LC-MS. The LC-MS system is an Agilent Technologies 1200 Series LC coupled to a Bruker Daltonics HCT ultra (ion trap detector). The ionization was made by electro-spray in the positive polarity. A Purospher STAR (Merck, Germany) LiChroCART 125-2 (12.5 cm length, 2 mm internal diameter, RP-18, 5 µm) column stabilized at 25 ºC was used for HPLC. The used ionizing agent was formic acid. The other polyphenols were analysed using a similar procedure but in negative mode.

Antioxidant activity: The antioxidant properties of the liquors were evaluated using the 2,2-diphenyl-1-picrylhdrazyl radical (DPPH· assay) and the β-carotene bleaching method (BCB assay) (Ferreira et al., 2009).

Statistical analysis: The results of each parameter were evaluated using one-way analysis of variance (ANOVA) with P≤0.05. All the statistical analysis was performed by IBM SPSS statistics (version 19).

RESULTS AND DISCUSSION

Physical measurements. The mass of the arils, the husk percentage, the ºBrix, the Red-greenness, the acidity and total the phenol contents were compered for the two cultivars. The juice percentage and pH were also evaluated. The obtained results are presented in Table 1.

Table 1. Properties of the studied pomegranate types

Type/ Parameter	Acidity (g/L) (in citric acid)	Total Phenols (g/L)	Arils Mass (g)	Husk (%)	º Brix	Red-greenness a*
"Assaria"	3.06 ± 0.07	1.11 ± 0.06	0.597 ± 0.154	29.0 ± 4.9	16.0 ± 0.9	4.3 ± 0.2
Wild	3.45 ± 0.06	1.25± 0.04	0.338 ± 0.071	47.6 ± 2.5	17.1 ± 0.2	5.6 ± 0.2

The total polyphenols as well as the anthocyanin contents reach a maximum concentration after seven and five days, respectively. This has been observed for the preparation of myrtle berry liquors (Galego et al., 2011). The total polyphenol contents as well as the antioxidant activity are higher for liquors prepared using the wild fruits (see Table 2)

Table 2. Properties of the prepared liquors.

Varieties/ Physical analysis	Acidity (g/L) (in citric acid)	Total Phenols (g/L)	Red-greenness a*	Antioxidant DPPH.(EC_{50})	Activity (mg/mL) BCN (EC_{50})
"Assaria"	0.93 ± 0.03	0.17± 0.04	1.0 ± 0.1	0.54 ± 0.03	4.27 ± 0.18

Wild	1.05 ± 0.06	0.29± 0.03	1.4 ± 0.1	0.57 ± 0.04	5.04 ± 0.23

The major anthocyanins identified in pomegranate juices, macerates and liquors of both pomegranate types were delphynidin-3,5-diglucoside, delphynidin-3-glucoside, cyaniding-3,5diglucoside and cyaniding-3-glucoside and the minor peaks were pelargonidin-3-5-diglucoside and pelargonidin-3-glucoside (Figure 1) (Zhang et al., 2009; Aligourchi et al., 2008; Gil et al., 2000; Miguel et al., 2004). Other identified polyphenols were punicalin and punicalagin.

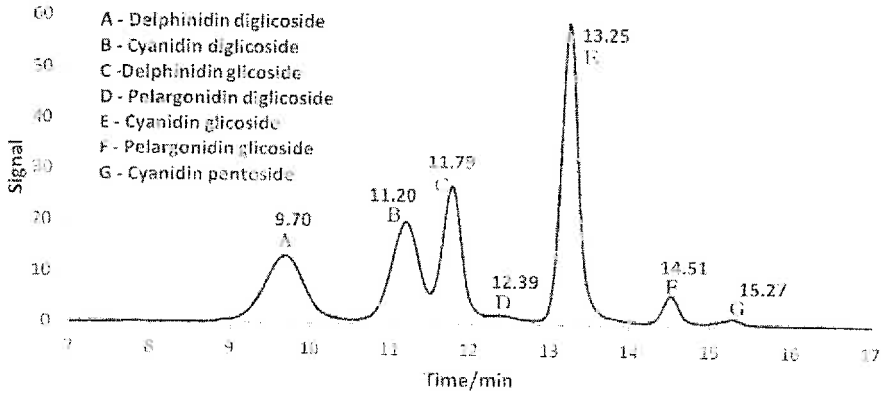

Figure 1. Anthocyanin profile of a pomegranate juice prepared with wild fruits.

CONCLUSIONS

Wild pomegranates showed to have good properties for liquor preparation. The antioxidant activity and the polyphenol contents are slightly higher for wild fruits.

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