Emirates Journal of Food and Agriculture. 2021. 33(6): 528-531
doi: 10.9755/ejfa.2021.v33.i6.2715
http://www.ejfa.me/

SHORT COMMUNICATION

Assessment of the characteristics of the fresh quince (*Cydonia oblonga* Miller) from different geographical origin and year of harvesting

Esther Vidal Cascales, José María Ros García*

Department of Food Science and Technology and Human Nutrition, University of Murcia, Campus de Espinardo, 30100 Murcia, Spain

ABSTRACT

Quince fruits from different geographical origin and year of harvesting (2019 and 2020) were characterized from physicochemical and nutritional viewpoint. Quince fruits were collected at maturity (September) in Murcia (Spain). The pH, soluble solids, titratable acidity, colour, moisture, water activity, total phenolic compounds, antioxidant activity, vitamin C and flavonoids were measured for all samples. There were significant differences among quince fruits characteristics. The comparison of quinces from the different origins and the comparison of quinces from the same origin and harvested two different years indicate differences in both physicochemical and nutritional characteristics, being greater the variation in the nutritional characteristics. This is to be considered by the quince industry, since the reality is that quinces from different geographical origin are the raw material of the quince industry every season.

Keywords: Quince; Characteristics; Origin; Year; *Cydonia oblonga*

INTRODUCTION

Quince (*Cydonia oblonga* Miller) is a fruit not useful to be consumed fresh, due to its hard texture and a rough mouth feel (Silva et al., 2002). Quince and sugar are the main ingredients of the quince jam, a sweet dessert made by cooking of quince pulp and sugar, with a thick consistency (Vidal Cascales and Ros García, 2020). The quince jam is prepared at domestic and industrial level. Other products recently developed are the freeze-dried quince slices (Yildiz and Izli, 2019), the fresh-cut quince fruit (Yildiz et al., 2020) and the convective-dried quince (Izli and Yildiz, 2021). Quince season starts in September and finish in November. The factories of quince, which elaborate the quince jam along the year, have only these three months to process the fresh quince into quince pulp, which will be the ingredient of all the quince products from this industry (Vidal Cascales and Ros García, 2020).

The content in phytochemical compounds of quince is subject of research, since it has been described an interesting amount in phenolic compounds, flavonoids and ascorbic acid (Baroni et al., 2018; Bystrická et al., 2017; Maghsoudlou et al., 2019; Mir et al., 2016; Stojanović et al., 2017). These bioactive compounds naturally present in fresh quince are also in the quince jam, which is considered a healthy food (Sut et al., 2019). Bystrická et al. (2017) reported that the content in phytochemical compounds, beside the variety, may be affected by many factors, also climatic conditions, the agrochemical composition of the soil and the maturity index (Blanda et al., 2020). Rasheed et al. (2018) reported on the composition of quince fruit pulp collected from different locations and concluded that there is a great variation in chemical composition among the fruits from different localities. These changes are attributed to differences in the environmental conditions and the soils.

Due to the reality that quinces from different geographical origin are the raw material of the quince industry every season, the objective of this research is a preliminary assessment about the natural variation of the physicochemical and the nutritional characteristics of quinces from different geographical origin and year of harvesting.

***Corresponding author:**
José María Ros García, Department of Food Science and Technology and Human Nutrition, University of Murcia, Campus de Espinardo, 30100 Murcia, Spain. **E-mail:** jmros@um.es

Received: 02 April 2021; **Accepted:** 04 June 2021

MATERIALS AND METHODS

Geographical origin and years of harvesting of the fresh quince

Fresh quince samples (Figs. 1 and 2) were harvested at similar maturity in September of the years 2019 and 2020 in the following Spanish places: Orihuela (38°5' N, 0°56' W), Lorca (37°40' N, 1°42' W), Murcia and Huerta de Murcia (H. Murcia), the orchard area around the city of Murcia (37°59' N, 1°7' W). For each set of analyses six different quince samples of around 10 kgs were taken from the same origin place and year. These samples were analysed in triplicate.

Physicochemical characteristics of the fresh quinces

The pH (pHmeter), soluble solids (refractometer), titratable acidity (titration), colour (Minolta reflectance colorimeter), moisture (oven dehydration) and water activity (Novasina) were measured as reported by Vidal Cascales and Ros García (2020).

Nutritional characteristics of the fresh quinces

The total phenolic compounds content (TPC, Folin-Ciocalteu reaction), the antioxidant activity (FRAP), the radical scavenging capacity (DPPH), the vitamin C content (Vit. C, 2,6-dichlorophenolindophenol reaction) and the total flavonoids content (TF, aluminium chloride reaction) were measured as reported by Vidal Cascales and Ros García (2020).

Fig 1. Quince (*Cydonia oblonga* Miller) fruits

Fig 2. Inner of the quince fruit

Statistical analysis

The results as average values of 18 (6 x 3) analyses are shown in the tables. The standard deviations are not shown since for all analyses the coefficients of variation are less than 5%. The analysis of the variance was used to compare the results obtained among the fresh quinces of different origin places and years of harvesting. All extractions and measures were made in triplicate. The statistical model was a random design and the different origin places and years of harvesting were considered as treatments. The effect of the treatments was determined using an ANOVA analysis. Scheffé's homogeneity means test ($p < 0.05$) was used. The statistical computer program used was Statistix 8 for Windows.

RESULTS AND DISCUSSION

The results indicate that there are significant differences in the physicochemical characteristics (Table 1: pH, soluble solids, acidity, colour and water content) and in the nutritional characteristics (Table 2: phenolic compounds, antioxidant activity, vitamin C and flavonoids) of the quinces from the different places of cultivation, and also significant differences in the same characteristics due to the year of harvesting. All the analysed parameters varied, except the water activity. Comparing the variation between the physicochemical characteristics (Table 1) and the nutritional characteristics (Table 2), it is greater in the nutritional characteristics.

Table 1: Physicochemical characteristics of the fresh quince harvested in 2019 and 2020 in four different Spanish places (n=6/place and year)

	Orihuela		Lorca		Murcia		H. Murcia	
	2019	2020	2019	2020	2019	2020	2019	2020
pH	3.6^{c}	3.7^{b}	3.4^{e}	3.7^{b}	3.4^{e}	3.5^{d}	3.4^{e}	3.8^{a}
Soluble solids (ºBrix)	13.6^{d}	14.3^{d}	15.7^{c}	16.2^{c}	13.4^{d}	15.5^{c}	17.0^{b}	19.5^{a}
Acidity (g ACA/100 g)	0.6^{d}	0.7^{c}	0.8^{b}	0.5^{e}	0.9^{a}	0.8^{b}	0.8^{b}	0.8^{b}
Colour L*	78.0^{c}	81.8^{a}	80.0^{b}	76.0^{d}	78.4^{c}	78.6^{c}	77.0^{d}	82.2^{a}
a*	4.2^{c}	-1.5^{e}	4.8^{b}	-0.3^{d}	-1.3^{e}	-1.5^{e}	5.5^{a}	-1.9^{e}
b*	27.2^{d}	22.5^{e}	30.0^{a}	21.4^{f}	28.3^{c}	28.9^{b}	26.9^{d}	24.4^{e}
Moisture (%)	82.5^{b}	83.7^{a}	80.4^{e}	79.9^{e}	84.4^{a}	81.4^{d}	81.3^{d}	81.7^{c}
Water activity	0.98	0.98	0.98	0.98	0.99	0.98	0.98	0.98

Average values of 18 (6 x 3) analyses. The standard deviations are not shown since for all analyses the coefficients of variation are less than 5%. Means in line for the two years with different letters (a, b, c, d, e, f) are significantly different ($p < 0.05$). ACA: Anhydrous Citric Acid

Table 2: Nutritional characteristics of the fresh quince harvested in 2019 and 2020 in four different Spanish places (n=6/place and year)

	Orihuela		Lorca		Murcia		H. Murcia	
	2019	2020	2019	2020	2019	2020	2019	2020
TPC (mg GA/100 g)	143^{e}	229^{a}	120^{g}	158^{d}	134^{f}	208^{b}	184^{c}	161^{d}
FRAP (µmol Fe^{+2}/100 g)	1126^{d}	1196^{c}	745^{f}	1258^{b}	734^{f}	1652^{a}	877^{e}	1211^{c}
DPPH (IC_{50})	4.3^{d}	3.4^{e}	4.1^{d}	4.7^{c}	9.7^{a}	5.9^{b}	4.3^{d}	3.6^{e}
Vit. C (mg AA/100 g)	22.1^{b}	12.7^{e}	9.9^{f}	24.8^{a}	18.4^{c}	18.3^{c}	18.5^{c}	17.7^{d}
TF (mg QE/ 100 g)	6.2^{f}	19.5^{c}	11.0^{e}	32.0^{b}	5.2^{g}	19.0^{c}	14.5^{d}	36.4^{a}

Average values of 18 (6 x 3) analyses. The standard deviations are not shown since for all analyses the coefficients of variation are less than 5%. Means in line for the two years with different letters (a, b, c, d, e, f, g) are significantly different ($p < 0.05$). TPC: Total phenolic compounds. Antioxidant activity: FRAP and DPPH. Vit. C: Vitamin C. TF: Total flavonoids

The values found for the characteristics of the sampled quinces are in agreement with previous results reported by Vidal Cascales and Ros García (2020) and references herein.

The variations found are of the same order of magnitude to those previously reported in quince clones (Rodríguez-Guisado et al., 2009), and quince cultivars (Rop et al., 2011; Leonel et al., 2016). Considering the assessment of these preliminary results and the necessities of raw materials of the quince industry, future research will deal on the relationship between cultivars, origin, time of harvesting, maturity index, climatic conditions and soil characteristics.

CONCLUSIONS

There were significant differences among quince fruits characteristics. The comparison of quinces from the different origins and the comparison of quinces from the same origin and harvested the years 2019 and 2020 indicate differences in both physicochemical and nutritional characteristics, being greater the variation in the nutritional characteristics. The future research will deal on the relationship between cultivars, origin, time of harvesting, maturity index, climatic conditions and soil characteristics.

ACKNOWLEDGEMENT

The authors received no financial support for the research, authorship, and/or publication of this article; only the use of the laboratory facilities at Food Technology, University of Murcia (Spain), what they appreciate.

Authors' Contributions

This manuscript contains some results of Esther Vidal Cascales's master thesis. This master thesis was carried out by Esther at the University of Murcia (Spain), under the direction of Dr. José María Ros García, who design the research. Esther carried out the work at laboratory and industrial level taking samples, making the physicochemical and nutritional analyses and also the statistical analysis of the data. Finally, the manuscript has been prepared by Esther and José María.

REFERENCES

Baroni, M. V., J. Gastaminza, N. S. Podio, M. S. Lingua, D. A. Wunderlin, J. L. Rovasio, R. Dotti, J. C. Rosso, S. Ghione and P. D. Ribotta. 2018. Changes in the antioxidant properties of quince fruit (*Cydonia oblonga* Miller) during jam production at industrial scale. J. Food Qual. 2018: 1460758.

Blanda, G., M. J. Rodríguez-Roque, P. Comandini, M. A. Flores-Córdoba, N. A. Salas-Salazar, O. Cruz-Álvarez and M. C. Soto-Caballero. 2020. Phenolic profile and physicochemical characterization of quince (*Cydonia oblonga* Mill) fruits at different maturity index. Notul. Bot. Hortic. Agrobot. 48: 2306-2315.

Bystrická, J., J. Musilová, H. Lichtnerová, M. Lenková, J. Kovarovič and M. Chalas. 2017. The content of total polyphenols, ascorbic acid and antioxidant activity in selected varieties of quince (*Cydonia oblonga* Mill.). Slovak J. Food Sci. 11: 77-81.

Izli, G. and G. Yildiz. 2021. Evaluation of high intensity ultrasound pre-treatment effects on the physical properties and bioactive compounds of convective dried quince samples. Int. J. Fruit Sci. 21: 645-656.

Leonel, M., S. Leonel, M. A. Tecchio, M. M. Mischan, M. Fernandes Moura and D. Xavier. 2016. Characteristics of quince fruits cultivars' (*Cydonia oblonga* Mill.) grown in Brazil. Aust. J. Crop Sci. 10: 711-716.

Maghsoudlou, Y., M. A. Ghajari and S. Tavasoli. 2019. Effects of heat treatment on the phenolic compounds and antioxidant capacity of quince fruit and its tisane's sensory properties. J. Food Sci. Technol. 56: 2365-2372.

Mir, S. A., S. M. Wani, T. A. Wani, M. Ahmad, A. Gani, F. A. Masoodi and A. Nazir. 2016. Comparative evaluation of the proximate composition and antioxidant properties of processed products of quince (*Cydonia oblonga* Miller). Int. Food Res. J. 23: 816-821.

Rasheed, M., I. Hussain, S. Rafiq, I. Hayat, A. Qayyum, S. Ishaq and M. S. Awan. 2018. Chemical composition and antioxidant activity of quince fruit pulp collected from different locations. Int. J. Food Properties. 21: 2320-2327.

Rodríguez-Guisado, I., F. Hernández, P. Melgarejo, P. Legua, R. Martínez and J. J. Martínez. 2009. Chemical, morphological and organoleptical characterisation of five Spanish quince tree clones (*Cydonia oblonda* Miller). Sci. Hortic. 122: 491-496.

Rop, O., J. Balik, V. Řeznicek, T. Jurikova, P. Skardova, P. Salas, J. Sochor, J. Mlcek and D. Kramařova. 2011. Chemical characteristics of fruits of some selected quince (*Cydonia oblonga* Mill.) cultivars. Czech J. Food Sci. 29: 65-73.

Silva, B. M., P. B. Andrade, F. Ferreres, A. L. Domingues, R. M. Seabra and M. A. Ferreira. 2002. Phenolic profile of quince fruit (*Cydonia oblonga* Miller) (pulp and peel). J. Agric. Food Chem. 50: 4615-4618.

Stojanović, B. T., S. S. Mitić, G. S. Stojanović, M. N. Mitić, D. A. Kostić, D. Đ. Paunović, B. B. Arsic and A. N. Pavlović. 2017. Phenolic profiles and metal ions analyses of pulp and peel of fruits and seeds of quince (*Cydonia oblonga* Mill.). Food Chem.

232: 466-475.

Sut, S., S. Dall'Acqua, G. Poloniato, F. Maggi and M. Malagoli. 2019. Preliminary evaluation of quince (*Cydonia oblonga* Mill.) fruit as extraction source of antioxidant phytoconstituents for nutraceutical and functional food applications. J. Sci. Food Agric. 99: 1046-1054.

Yildiz, G. and G. Izli. 2019. The effect of ultrasound pretreatment on quality attributes of freeze-dried quince slices: Physical properties and bioactive compounds. J. Food Proc. Eng. 42: e13223.

Yildiz, G., G. Izli and R. M. Aadil. 2020. Comparison of chemical, physical, and ultrasound treatments on the shelf life of fresh-cut quince fruit (*Cydonia oblonga* Mill.). J. Food Proc. Preserv. 44: e14366.

Vidal Cascales, E. and J. M. Ros García. 2020. Characteristics of the raw fruit, industrial pulp, and commercial jam elaborated with Spanish quince (*Cydonia oblonga* Miller). Emir. J. Food Agric. 32: 623-633.