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CROP BREEDING AND APPLIED BIOTECHNOLOGY

CULTIVAR RELEASE

'UC14': a new papaya cultivar with intermediate fruit size

Crop Breeding and Applied Biotechnology
19: 226-229, 2019
Brazilian Society of Plant Breeding.
Printed in Brazil
http://dx.doi.org/10.1590/1984-70332019v19n2c31

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Abstract: *The papaya cultivar UC14, recommended for the Southeast and Northeast regions of Brazil, was developed by UENF/CALIMAN breeding program. 'UC14' produces smaller fruit than those of Formosa hybrid, with a mean weight of 0.8 kg and a mean fruit yield of 199.45 t ha^{-1}.*

Keywords: *Carica papaya L., plant breeding, hybrid.*

INTRODUCTION

Brazil is one of the world's leading producers of papaya (*Carica papaya* L.). In 2017, the national production was 1.5 million tons, corresponding to 11.6% of the world papaya production (FAOSTAT 2019, http://faostat3.fao.org/browse/Q/QC/E). The entire Brazilian papaya production is based on the cultivation of 'Golden' with smaller fruits and the hybrid cultivars 'Tauning 01' and 'Calimosa', which have bigger fruits and higher yield (Pereira et al. 2018). The fruit size of the Formosa hybrids is more than twice as large as that of the Solo cultivars. In other words, no cultivar with intermediate fruit size is available on the market.

One alternative to continuous increase of papaya production is the cultivar development with high-yielding, and adapted to the different environmental conditions (Marin et al. 2006a, b). The papaya breeding program of the UENF in partnership with Caliman Agricola S.A. has been evaluating the yield of new papaya genotypes (Pereira et al. 2018; Pereira et al. 2019). Based on these yield trials, four new papaya hybrids suited for domestic production were registered by the Universidade Estadual do Norte Fluminense Darcy Ribeiro - UENF in the Ministry of Agriculture, Livestock, and Supply – MAPA, among these, the cultivar UC14 (Luz et al. 2015).

The aims of this paper were to describe the main traits of the papaya cultivar UC14, with a new option of the hybrid cultivars with intermediate fruit.

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Received: 09 October 2017
Accepted: 17 December 2018

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PEDIGREE AND BREEDING METHODOLOGY

Cultivar UC14 was developed by the papaya breeding program of the Universidade Estadual do Norte Fluminense Darcy Ribeiro – UENF in partnership with the company Caliman Agrícola S.A.. The company is located in Linhares, ES (lat 05º 28' S, long 35º 33' W, alt 33 m asl), where the annual mean temperature is 23.4 °C and rainfall on average 1193 mm year-1. This cultivar was obtained from a biparental cross between the genotypes UC-36/7 and UC-19 of the germplasm bank and selected by the pedigree method (Pereira et al. 2015).

Cultivar UC14 and the controls ('Golden' and 'Tainung') were evaluated in two yield trials, in Linhares, ES, and Pureza (lat 05º 28' S, long 35º 33' W, alt 40 m asl), RN, over a period of two growing seasons (2012-2013). The cultivar was evaluated in a randomized complete block design, with four repetitions and plots with 10 plants, at a spacing of 3.6 m between the plants in the line and 1.5 m between lines. Fertilization and cultural practices applied in the experiment were the same used to the commercial crop plantations by the Caliman Agrícola S.A.. The data of each yield trial were obtained at the field and laboratory evaluations, at the 270, 360, 450 and 540 days after planting. The measured traits were: fruit weight - FW (kg); fruit diameter - FD (mm); fruit length - FL (mm); total soluble solids - TSS (°Brix); number of deformed fruits - NDF; fruitless leaf axils - FLLA; number of marketable fruits - NMF; fruit yield - Yield (t ha-1). The fruit yield was the same calculated by Pereira et al. (2019).

After the collected data, the normality test of Kolmogorov-Smirnov was performed to verify the data consistency (Cruz et al. 2012). After that, the homogeneity test (F max) was used to compare the residual variances (Ramalho et al. 2012). Software SAS (SAS Institute, Cary, NC, USA) was used to perform the analysis of variance and trait mean comparisons according to Tukey's test.

PERFORMANCE

Cultivar UC14 was evaluated in four growing seasons, in which it produced a mean fruit yield of 199.45 t ha^{-1}, which is 95% and 14.2% higher than that of the cultivars Golden and Tainung used as commercial controls, with mean fruit yields of 102.05 t ha^{-1} and 174.7 t ha^{-1}, respectively (Table 1). Importantly, the far higher fruit yield of 'UC14' than that of variety 'Golden' can be partly explained by the fact that the former is a hybrid and the latter a pure line. Aside from being more productive, the fruit quality traits of cultivar UC14 were better than those of the controls 'Golden' and 'Tainung'. For example, the total soluble solids content (TSS) of cultivar UC14 (10.3 °Brix in the yield trial in Pureza, RN and 10.6 °Brix in Linhares, ES) was higher than that of the controls (Table 1).

In the set of evaluated hybrids, papaya cultivar UC14 is one of the best adapted and most stable. This pattern indicates that the cultivar can be recommended for distinct Brazilian regions, from the semi-arid to the traditional

Table 1. Performance of papaya cultivars 'UC14', 'Golden' and 'Tainung' in four growing seasons

Cultivar	**Pureza** (RN)				**Linhares** (ES)				**Mean**
	TSS	**NMF**	**FW**	**Yield**	**TSS**	**NMF**	**FW**	**Yield**	**Yield**
'UC14'	10.3a	157.63a	0.802d	230.80bc	10.6a	119.87a	0.749e	168.10cde	199.45
'Golden'	10.2a	139.50ab	0.385e	103.05e	9.6b	132.98a	0.392f	101.05f	102.05
'Tainung'	9.5b	63.57e	1.390b	152.74d	9.0b	63.11c	1.595b	196.60abc	174.67

Means with equal letters in the same column did not differ significantly ($p < 0.05$) according to Tukey's test. TSS: total soluble solids content (°Brix); NMF: number of marketable fruits; FW: fruit weight (kg); Yield (t ha^{-1}).

Table 2. Average sensory acceptance and purchase intention with regard to papaya cultivars 'UC14', 'Golden' and, 'Tainung' of consumers in 2014, Campos dos Goytacazes, RJ, Brazil

Cultivar	**Acceptance**						**Purchase intention**		
	Aroma	**Flavor**	**Texture**	**OI**	**EA**	**IA**	**PI1**	**PI2**	**PI3**
'UC14'	6.90ab	6.86abc	7.00a	6.96ab	6.86ab	7.80a	4.06a	3.98a	4.56a
'Golden'	6.50abc	6.58abc	6.86ab	6.64bc	4.46d	5.64d	3.64ab	2.32ab	3.04ab
'Tainung'	5.24e	4.62e	4.78d	4.88d	5.80c	4.48e	2.34d	3.12d	2.22d

Means with equal letters in the same column did not differ significantly ($p < 0.05$) according to Tukey's test. OI: overall impression; EA: external appearance; IA: internal appearance; PI1: purchase intention assessed during tasting; PI2: purchase intention associated with external appearance; PI3: purchase intention associated with internal appearance.

papaya-producing area in the Southeast, where the cultivar was evaluated (Luz et al. 2018a).

For cultivar UC14, on average 70% of the flavor scores were within the acceptance area (score > 5), although some scores for some traits were in the rejection area (Figure 1a). This result indicates the positive assessment of the evaluators for most traits. An opposite behavior was observed for the control cultivars 'Golden' and 'Tainung', where the score distribution was diffuse, with most scores in the rejection area (score < 5), evidencing the non-acceptance of the sensory attributes of these genotypes (Figure 1b, 1c).

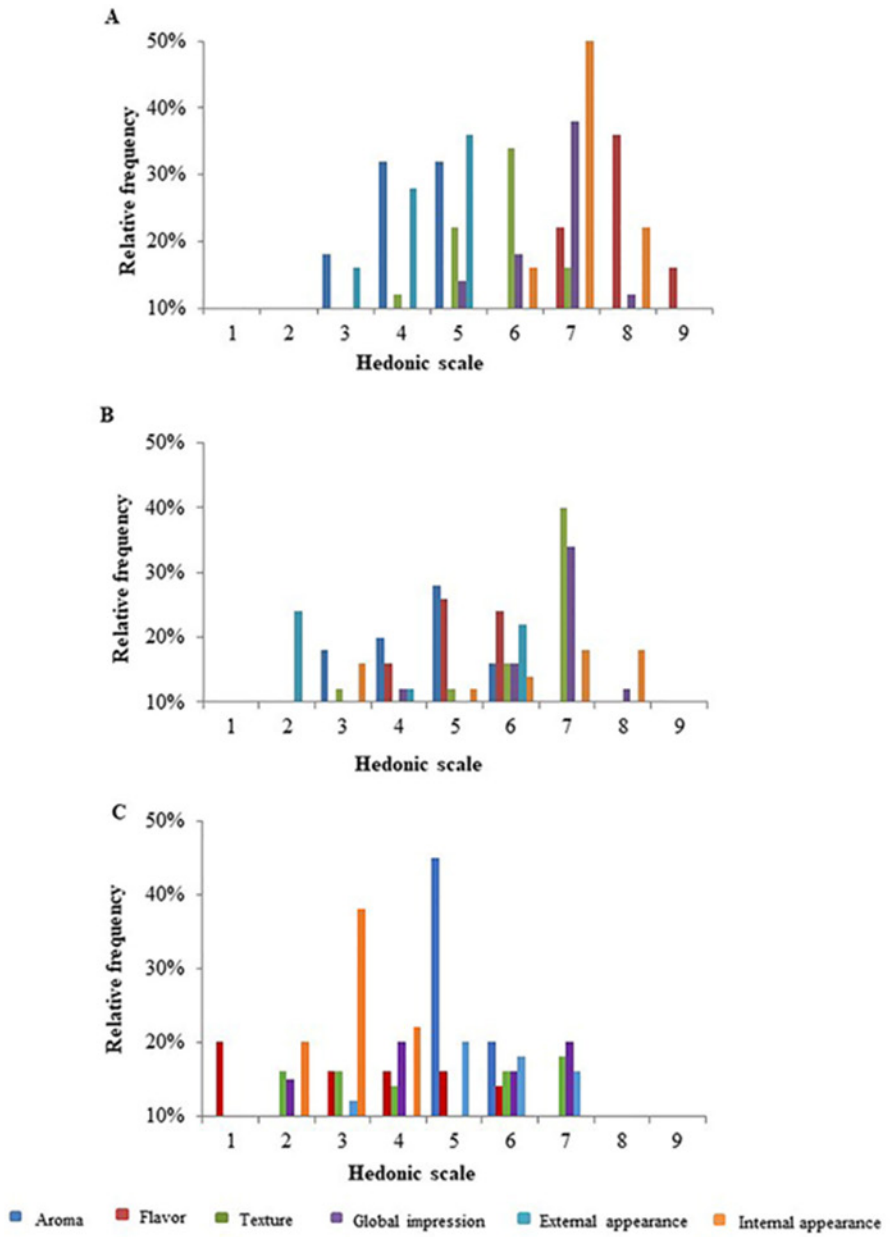

Figure 1. A. 'UC14'; B. 'Golden; C. 'Tainung'. Frequency distribution of consumer response (n = 50), in %, for acceptance of sensory traits of the cultivars 'UC14', 'Golden' and 'Tainung', on a 9-point hedonic scale (1: extreme disapproval; 2: strong disapproval; 3: moderate disapproval; 4: slight disapproval; 5: neither approval nor disapproval; 6: slight approval; 7: moderate approval; 8: approval; 9: extreme appreciation).

In the evaluation of the purchase intention, the scores for the overall impression were best for cultivar UC14, indicating its acceptance from the organoleptic point of view. The frequency distribution for external and internal fruit appearance showed that the acceptance pattern of cultivar UC14 was the same for the organoleptic as for the sensory variables, with a high frequency of maximum scores, indicating cultivar UC14 as superior to the commercial controls 'Golden' and 'Tainung' (Table 2) (Luz et al. 2018b).

OTHER CHARACTERISTICS

Cultivar UC14 has pear-shaped fruits with color variations. When immature, the fruits are dark green while that the mature fruits are light yellow. The fruits have a short (1.5 - 2.0 cm) petioles and in the laboratory evaluations, the fruits presented a slightly red pulp, mean pulp thickness of 2.36 cm and small internal cavity.

SEED PRODUTION AND DISTRIBUTION

Papaya cultivar UC14 was registered by the Ministry of Agriculture, Livestock and Supply - MAPA in 2014, under number 32360. The Company Caliman Agrícola S.A. is responsible for the production and marketing of hybrid seeds.

REFERENCES

Cargnelutti Filho A, Toebe M, Silveira TR, Casarotto G, Haesbaert FM and Lopes SJ (2010) Tamanho de amostra e relações lineares de caracteres morfológicos e produtivos de crambe. **Ciência Rural 40**: 2262-2267.

Cruz CD, Regazzi AJ and Carneiro PCS (2012) Diversidade genética. In Cruz CD, Regazzi AJ and Carneiro PCS (eds) **Modelos biométricos aplicados ao melhoramento de plantas**. 4th edn, Editora UFV, Viçosa, p. 392-429.

FAOSTAT - **Food and Agriculture Organization Corporate Statistical Database** (2017) Available at: <http://faostat3.fao.org/browse/Q/QC/E>. Accessed on Jan 16, 2017.

Luz LN, Pereira MG, Barros FB, Barros GB and Fereguetti GA (2015) Novos híbridos de mamoeiro avaliados nas condições de cultivo tradicional e no semiárido brasileiro. **Revista Brasileira de Fruticultura 37**: 159-171.

Luz LN, Santa-Catarina R, Barros GBA, Barros FR, Vettorazzi JCF and Pereira MG (2018a) Adaptability and stability of papaya hybrids affected by production seasonality. **Crop Breeding and Applied Biotechnology 18**: 357-364.

Luz LN, Vettorazzi JCF, Santa-Catarina R, Barros FR, Barros GBA, Pereira MG and Cardoso DL (2018b) Sensory acceptance and qualitative analysis of fruits in papaya hybrids. **Anais da Academia Brasileira de Ciências 90:** 1-11.

MAPA - Ministério da Agricultura, Pecuária e Abastecimento (2014) **Cultivar web Gerenciamento de Informações.** Available at <http://extranet.agricultura.gov.br/php/snpc/cult>. Accessed on Jan 16, 2019.

Marin SLD, Pereira MG, Amaral Junior AT, Marteletto LAP and Ide CD (2006a) Heterosis in papaya hybrids from partial diallel of 'Solo' and 'Formosa' parents. **Crop Breeding and Applied Biotechnology 6**: 24-29.

Marin SLD, Pereria MG, Amaral Junior AT, Marteletto LAP and Ide CD (2006b) Partial diallel to evaluate the combining ability for economically important traits of papaya. **Scientia Agricola Piracicaba 63**: 540-546.

Pereira MG, Ferreguetti GA, Ramos HCC, Santa-Catarina R, Vettorazzi JCF, Poltronieri TPS, Aredes FAZ, Boechat MSB, Azevedo AON, Moreira NF, Bohry D, Pereira TNS, Silveira SF and Vivas M (2018) Melhoramento genético do mamoeiro: programa UENF/CALIMAN. In Martins DS (ed) **VII Simpósio do papaya brasileiro: produção e sustentabilidade hídrica.** Incaper, Vitória, p. 1-59.

Pereira MG, Luz LN, Santa-Catarina R, Ramos HCC, Pereira TNS, Barros GBA, Ferreguetti GA, Vivas M, Cortes DFM, Vettorazzi JCF, Azevedo AON, Silveira SF, Oliveira JG and Viana AP (2019) UC10: a new early Formosa papaya cultivar. **Crop Breeding and Applied Biotechnology 19**: 131-134.

Ramalho MAP, Ferreira DF and Oliveira AC (2012) **Experimentação em genética e melhoramento de plantas.** 3rd edn, UFLA, Lavras, 303p.

Serrano LAL and Cattaneo LF (2010) O cultivo do mamoeiro no Brasil. **Revista Brasileira de Fruticultura 32**: 657-959.