



UC Riverside Urban Pomegranate Grove Project

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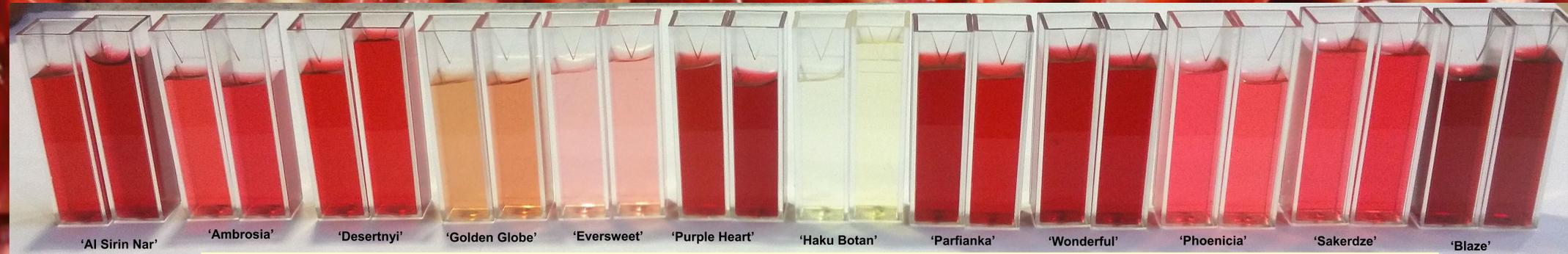


Fig. 3. Twelve pomegranate juice samples used in this research. For each cultivar, the sample on the left is juice extracted from arils (sarcotesta) and the sample on right is juice extracted from whole fruit samples, which included arils, exocarp (peel) and mesocarp (septa).

Punica granatum



Fig. 1. Nine year old 'Wonderful' pomegranate tree with fruit

UC Riverside Urban Pomegranate Grove Project aims at providing pomegranate trees to the campus community as an alternative to food pantries and providing engagement opportunities in the form of pomegranate fruit tastings. Propagation material and fruit for the tasting panels were sourced from one of Merhaut Lab's pomegranate cultivar field trials, located at the Department of Agricultural Operations at University of California, Riverside.



Introduction

Cultivars selected for this study included 'Eversweet', 'Green Globe', 'Haku Botan', 'Phoenicia', 'Wonderful', and 'cv. 857', an heirloom cultivar (Table 1). All cultivars except 'cv. 857' were sourced from germplasm conserved at the USDA NCGR. All fresh market quality pomegranate fruit were harvested by hand at maturity in late October and early November at cultivar field trials in Riverside, CA and Somis, CA. Fruit were removed from the trees by clipping fruit and then transferred to a cold room for 3-4 weeks at 6°C and 98% relative humidity for storage prior to the consumer evaluation. Before consumption, fruit were moved to room temperature the previous evening. Prior to sensory evaluation, the fruit were washed with tap water, dried with towels, the arils were extracted by hand after cutting the rind and placed in a sealed plastic container and kept in a refrigerator at 6 °C until the consumer evaluation.

Materials and Methods

Plant material

Cultivars selected for this study included 'Eversweet', 'Green Globe', 'Haku Botan', 'Phoenicia', 'Wonderful', and 'cv. 857', an heirloom cultivar (Table 1). All cultivars except 'cv. 857' were sourced from germplasm conserved at the USDA NCGR. All fresh market quality pomegranate fruit were harvested by hand at maturity in late October and early November at cultivar field trials in Riverside, CA and Somis, CA. Fruit were removed from the trees by clipping fruit and then transferred to a cold room for 3-4 weeks at 6°C and 98% relative humidity for storage prior to the consumer evaluation. Before consumption, fruit were moved to room temperature the previous evening. Prior to sensory evaluation, the fruit were washed with tap water, dried with towels, the arils were extracted by hand after cutting the rind and placed in a sealed plastic container and kept in a refrigerator at 6 °C until the consumer evaluation.

Consumer evaluation

Prior to the sensory panel evaluation, 5-6 arils were transferred to sampling cups (4-cm diam.) with one cultivar per sample. The order and assigned number of each sample were completely randomized and blind to the panelists (McDonald and others 2013). Consumer panels were carried out in the Department of Botany and Plant Sciences at the University of California, Riverside. All consumers were recruited from the University of California, Riverside area (Riverside, California, U.S.A.). The panelists consisted of adult consumers from the general public, and were not experts in food science. Most consumers were prior consumers of pomegranate, however, some had not knowingly tasted pomegranates previously. Before the sensory evaluation, consumers were asked to answer demographic questions which included age and name. The consumer sensory evaluations were conducted in two sessions (n = 40 and n = 47). Each panelist received six randomized sampling cups of arils (Table 1, 2; Figure 1). Panelists were instructed to consume the arils of the samples in the specific order given to them. Scoring included assessments of aril color, sweetness, tartness, seed hardness, bitterness and overall desirability of each sample. A 9-point hedonic scale was used for each preference variable where 9 = like extremely, 5 = neither like or dislike and 1 = dislike extremely. Filtered water was provided as palate cleansers between each aril sample.

Practical Application:

Consumer preference panels are important to determine scientifically which cultivars (also known as varieties) are desired by the public. These panels allowed for the determination of which pomegranate cultivars are liked or disliked by consumers and why. If growers and fruit breeders know the most desirable cultivars for consumers, they are more likely to adopt and plant them, thus potentially increasing the diversity in the marketplace, as has been demonstrated with apples, peaches, plums, pears, mangoes, strawberries, raspberries, blueberries, and citrus.

Results

Table 1. Day 1 Sensory panel results of six pomegranate cultivars sourced from the USDA-ARS National Clonal Germplasm Repository. Traits evaluated by panelists included aril color, sweetness, tartness, seed hardness, bitterness, and overall. All traits were evaluated on a hedonic scale from 1 (dislike extremely) – 9 (like extremely). Fruit were harvested at cultivar trials in Riverside and Somis, CA.

Cultivar	Aril		Seed			Overall
	color	Sweetness	Tartness	hardness	Bitterness	
Eversweet	6.15b ^{1,2}	5.26b	4.92bc	5.83a	6.17a	5.92b
Green Globe	5.80b	6.70a	5.72abc	4.60b	6.14a	6.24ab
Haku Botan	3.80c	3.87c	4.58c	4.28b	4.39b	4.03c
Phoenicia	8.03a	6.31ab	6.70a	5.88a	6.11a	6.97a
(Coastal)						
cv. 857	8.15a	6.78a	6.03ab	5.88a	6.14a	7.03a
Wonderful	8.15a	5.75ab	5.83abc	5.45ab	5.24ab	6.39ab
P-value	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

¹ Values expressed in means.

² Values followed by different letters within a column are significantly different (P < 0.05)

Table 2. Day 2 Sensory panel results of six pomegranate cultivars sourced from the USDA-ARS National Clonal Germplasm Repository. Traits evaluated by panelists included aril color, sweetness, tartness, seed hardness, bitterness, and overall. All traits were evaluated on a hedonic scale from 1 (dislike extremely) – 9 (like extremely). Fruit were harvested at cultivar trials in Riverside and Somis, CA.

Cultivar	Seed				Overall	
	Aril color	Sweetness	Tartness	hardness	Bitterness	desirability
Green Globe	4.55b ^{1,2}	6.45a	5.04ab	4.66cd	5.43ab	5.40b
Loffani	5.26b	4.43b	4.00b	3.72d	4.61b	3.78c
Phoenicia	7.06a	6.89a	6.32a	6.34ab	6.61a	7.04a
cv. 857 (Coast)	7.51a	6.60a	6.04a	6.45ab	6.02a	6.55a
Wonderful	7.43a	7.19a	5.72a	6.62a	6.02a	7.21a
Wonderful (Coast)	7.89a	4.16b	5.53a	5.55bc	5.55ab	5.36b
P-value	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001

¹ Values expressed in means.

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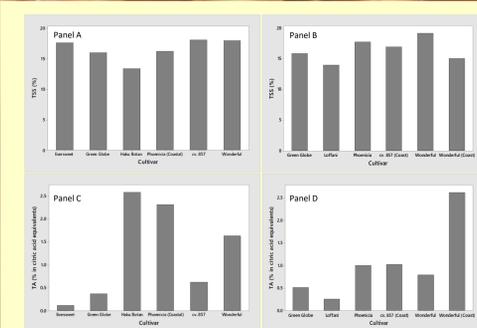


Figure 1. Sugar content of arils, reported in total soluble solids (%), titratable acidity (%), and sugar to acid ratio for the pomegranates used in the sensory panels for Day 1 (Panel A, C, E) and Day 2 (Panel B, D, F). Six pomegranate cultivars were sourced from the USDA-ARS National Clonal Germplasm Repository. All fruits were picked at maturity from field trials in Riverside, CA and Somis, CA, USA and data represent a composite sample of juice obtained from a random sample of 100 arils for each cultivar.

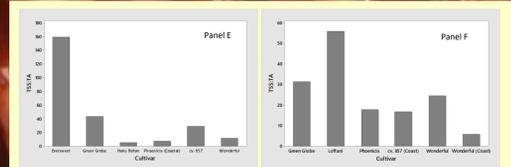


Table 3. Description of cultivars used in sensory panel

Cultivar	Country of Origin	Acidity	Flavor	Peel color	Aril color	Seed hardness
Eversweet	CA, USA	Very Low	Sweet	Pink and yellow	Pink	Soft
Green Globe	CA, USA	Low	Sweet	Greenish yellow	Pink	Hard
Haku Botan	Japan	Very High	Sour	White/yellow	White	Medium Hard
Loffani	CA, USA	Low	Sweet	Pink	Pink	Hard
Phoenicia	CA, USA	High	Tart	Red, Green, pink	Pink, red	Hard
Wonderful	FL, USA	Medium-high	Sweet-tart	Red	Red	Medium hard
cv. 857	CA, USA	Medium	Sweet-tart	Red	Red, purple	Medium hard

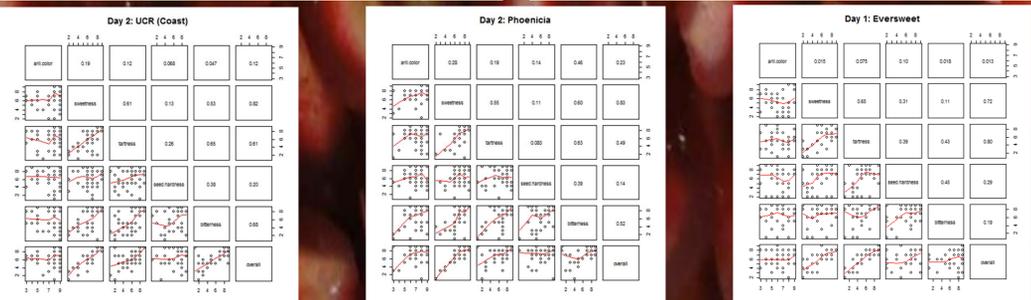


Figure 3. Internal correlations showing explanatory relationships between all variables for Day 2 (Panels A, B, C). Pomegranate germplasm was sourced from the USDA-ARS National Clonal Germplasm Repository. All fruits were picked at maturity from field trials in Riverside, CA and Somis, CA, USA, which have inland and coastal Mediterranean climates, respectively. Data represent a composite sample of juice obtained from a random sample of 100 arils for each cultivar.

Results and Conclusions

1. Pomegranates cultivars have very diverse acid contents and sugar to acid ratios, but not for sugar content (Fig. 1).
2. There were significant differences between favorability for many cultivars versus 'Wonderful'. 'Phoenicia', 'Wonderful' and 'cv. 857' had relatively high favorability
3. 'Haku Botan' was the most disliked pomegranate cultivar (Fig. 6).

The results indicate the diversity of the USDA germplasm repository among the cultivars analyzed, with many fitting the sensory profile and desirability of 'Wonderful'. Cultivars of interest should be considered for investigation via cultivar trials to determine commercial suitability and to evaluate traits important to growers.



COLUMN ONE

The pomegranate is family tree for budding botanist

BY GEOFFREY MOHAN

The first pomegranate that John Chater grasped bled crimson drops onto his tan suede shoes. The leathery hull brimmed with dark, translucent seeds bigger than his baby teeth, and when he nibbled them they burst with a sweetness his toddler tongue had never experienced. After that, no other fruit proffered by his Lebanese grandfather would do. Not his sweet loquats. Not his tart Persian mulberries, carefully tended in a quarter-acre backyard in Camarillo. "Every time I'd go to my grandfather's house to visit, I would ask for them," said Chater, 34, "Because I didn't understand seasonality

back then." Chater understands seasonality now in ways that go beyond botany. A doctoral candidate at UC Riverside's Department of Botany and Plant Sciences, Chater is cultivating and studying the same pomegranates his grandfather once grew. Sassin John Chater, it turns out, is responsible for at least a dozen novel types of pomegranate that are loved by the discerning few but remain rare to this day, abandoned in favor of a single variety that goes onto most produce shelves in the U.S., and into juices such as Pom Wonderful. John Chater, the grandson, is out to change that. Chater is up against history and billionaires Stewart and Lynda Resnick, whose nut and citrus empire sprawls [See Pomegranates, A10]

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A family interest that bears fruit



DIFFERENT TYPES of pomegranate seeds are ranked by a tasting panel at UC Riverside on sweetness, tartness, seed color and the overall experience.