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Cross-country comparison of pomegranate juice acceptance in Estonia, Spain, Thailand, and United States



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ABSTRACT

The objective of this study was to compare acceptance of different flavor combinations across countries, determine consumer clusters across countries and identify drivers of liking for a healthy product (pomegranate juice). Five pomegranate juices varying in flavor character were evaluated by consumers in Estonia, Spain, Thailand, and the United States. In this study the consumers evaluated overall acceptability and flavor, sweet, sour, fruity, and pomegranate flavor liking. Also, Just About Right (JAR) questions were answered for those same attributes. The results suggested that although some samples varied in their liking across countries, larger differences in acceptance were found between consumer clusters across countries. These data suggest that individual consumer variation is greater than country specific variation. In addition, factors such as taste sensitivity or prior exposure rather than flavor are important in acceptability of pomegranate juices.

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1. Introduction

In recent years there has been an increase in the awareness of health benefits of products such as pomegranate fruits and supplements. Because of market demand various products made from those healthful ingredients have become available. Pomegranate juice is one of various products that provides a simple and convenient way to consume biologically active nutrients (Viuda-Martos, Fernández-López, & Pérez-Álvarez, 2010). However, within a healthful product category such as pomegranate juice, there is a wide selection of flavor profiles available (Koppel & Chambers, 2010).

Some studies have concentrated on international food flavor characterization. For example, green teas, the consumption of which is considered healthy and is growing in popularity, were studied for acceptance in three countries (Lee et al., 2010). Green tea was considered a traditional product in two (Thailand and Korea) and non-traditional, but healthy in one country (USA). While different flavors were preferred in different countries, *bitterness* was disliked everywhere. Another example is a study conducted

by Oupadissakoon, Chambers, and Chambers (2009), in which the sensory properties of ultra-high-temperature milks from different countries were compared. These authors reported that production technology of that product may have more impact on the product characteristics than local raw material quality. Neely, Lee, and Lee (2010) studied a soy-based extruded snack food with U.S. and Indian consumers and found that individual preferences were more important than cultural factors.

Consumer satisfaction has been studied with various blended juices, for example in the study by Vázquez-Araújo, Chambers, Adhikari, and Carbonell-Barrachina (2010) consumer liking of pomegranate juice mixed with other juices was researched and the authors found that juice mixtures containing 90% pomegranate and 10% blackberry or raspberry juice were highly liked by US consumers. The liking of mixed fresh and healthy juices was studied by Endrizzi, Pirretti, Calo, and Gasperia (2009). In their study pomegranate, pineapple, apple, orange, and blood orange juices were mixed with strawberry, raspberry, blackberry, red currant, and blueberry juices; Italian consumers disliked mixtures with pomegranate juice and liked pineapple and blood orange mixes best. The results of those two studies suggest that country or cultural differences as well as reactions to some flavors can play a part in pomegranate juice acceptance.

Possible beneficial effects to health probably drive the consumption of pomegranate juices. However, repurchase is more

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likely if the flavor of the product was liked (Moskowitz, Gofman, & Beckley, 2006). In addition, cultural differences may cause variations in liking patterns (Rozin, Fischler, Imada, Sarubin, & Wrzesniewski, 1999). Our hypothesis was that segments exist that are independent of country borders and may be similar or different based on familiarity with the product category. The objective of this study was to determine how consumers from different cultures (Estonia, Spain, Thailand, and the US) accept taste and flavor combinations of a healthy juice, whether clusters of consumers exist across countries, and what drives flavor liking among consumers.

2. Materials and methods

2.1. Samples

Five samples, representing the five flavor clusters reported by Koppel and Chambers (2010), were acquired from Estonia, Spain, US, and Thailand (Table 1). Four samples (B, C, D, and E) had been used in the study by Koppel and Chambers (2010). One sample (B) was delayed in customs when shipping to Thailand and an available local sample with a similar flavor profile that represented the same cluster was substituted and referred to as B1. Two samples (A, B1) were used to represent clusters from the earlier study based on cluster descriptors given by Koppel and Chambers (2010), but were not part of that study. Sample E was a pomegranate juice concentrate, diluted with purified water, with a ratio of 1 (concentrated juice): 3 (water). All samples were purchased from grocery stores or ordered in bulk, except for sample C, which was provided by Granadas de Elche (Alicante, Spain). All samples were within the use by date and were stored at room temperature, as indicated on the packaging, until testing and sent to each of the participating countries by mail.

2.2. Descriptive sensory analysis

For this study, the flavor profile of each sample (A, B, B1, C, D, and E) was tested on the same lot used for consumer testing. Each of the six profile panelists had more than 120 h of training in descriptive sensory testing and at least 1000 h experience in descriptive sensory analysis, including fruits and juices. The procedure and lexicon used in descriptive profiling was the same as that used by Koppel and Chambers (2010). Attribute intensities were evaluated on a scale, where 0 = none and 15 = very high. Panelists evaluated the samples individually, but the final flavor profile was agreed upon as a result of a discussion led by the panel leader, following the consensus flavor profile approach. Similar procedures have been used by Bett-Garber, Lea, Champagne, and Mcclung (2012), Suwonsichon, Chambers, Kongpensook, and Oupadissakoon (2012), and Adhikari et al. (2011). All of the samples (A, B, B1, C, D, and E) were tested both at room temperature (20–22 °C) and chilled (5–7 °C). This was done to confirm (a) presence of

key flavor attributes that resulted in different flavor clusters as shown by Koppel and Chambers (2010), and (b) presence of key flavor attributes at both temperatures as the juice may be consumed chilled by the consumers and was served as such (5–7 °C) during the consumer study.

2.3. Consumer study

Consumer acceptance was studied in Estonia, the US, Spain, and Thailand. These countries were selected based on availability for collaborators and locations on different continents (Europe vs. North America vs. Asia) that enabled study of traditional and familiar vs. not traditional flavors and cultures where consumers are health-oriented. In addition pomegranates are locally grown in Spain and USA, in minor quantities in Thailand, but not in Estonia. The studies took place December 2010 in US and Estonia, January 2011 in Spain, and February 2011 in Thailand. Approximately 100 consumers (US $n = 101$, Thailand $n = 110$, Estonia $n = 102$, Spain $n = 100$), with a ratio of 60 (women): 40 (men), respectively, were recruited in each country for a central location test.

All participating consumers in all participating countries were recruited via e-mails and fliers. Consumers had to complete a screener stating their gender, age, and diet restrictions or allergies. Consumers were asked about juice consumption frequency and willingness to taste pomegranate juice from a selection of juices. Consumers who stated they were 18–64 years old, drank any kind of juice at least two times per week, had no diet restrictions or allergies, and were willing to taste pomegranate juice were recruited for testing.

The ballots, screeners, and demographic questionnaires were translated from English to Estonian, Spanish, and Thai and then back to English to confirm that no major misinterpretations took place during the translation process.

The day before testing, the samples were stored and cooled in a refrigerator (3–5 °C). The samples were poured into disposable uncovered opaque plastic cups (appr. 150 ml in size) approximately 1–1.5 h before testing and were stirred using a plastic disposable spoon just before serving. Approximately 50 ml of sample was served. The samples were served (~5–7 °C) in a randomized order. Consumers were asked to clean their palates with purified water and unsalted crackers after tasting a sample. The consumers completed a ballot and answered questions on a 9-point liking scale where 1 = *dislike extremely* and 9 = *like extremely*. The questions included: *overall*, *flavor*, *sweet taste*, *sour taste*, *fruity flavor*, *pomegranate flavor*, and *aftertaste* liking. The consumers were also asked about *flavor*, *sweetness*, *sourness*, *fruitiness*, *pomegranate flavor*, and *aftertaste* intensities on a 9-point Just-About-Right (JAR) scale where 1 represented “too weak”, 5 “Just about right”, and 9 “too strong”. According to Tuorila (2007, chap. 2) this combination of hedonic and diagnostic questions can provide important information to the reasons that result in differences among consumer perceptions.

Table 1
Samples tested and their origin.

Sample	Cluster ^a	Countries tested in	Country of origin	Country acquired from
A**	4	Estonia, US, Spain, Thailand	Azerbaijan	Estonia
B	2	Estonia, US, Spain	N/A	US
B1**	2	Thailand	N/A	Thailand
C	1	Estonia, US, Spain, Thailand	Spain	Spain
D	3	Estonia, US, Spain, Thailand	N/A	US
E	5	Estonia, US, Spain, Thailand	N/A	US

^a According to descriptions by Koppel and Chambers (2010).

** Sample not studied by Koppel and Chambers (2010).

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