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# Acceptance characteristics of pomegranate juice for four countries: Spain, United States, Estonia, and Thailand

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**Abstract.** Five 100% pomegranate juices, representing various flavor profiles, were evaluated by at least 100 consumers in each country, Thailand, Estonia, Spain, and the USA, to determine which products were liked most by consumers in each country. Flavor of the juices was evaluated by a trained descriptive panel. The results suggest that Estonian, United States, and Thai consumers liked pomegranate juice samples that were sweet, sour, and had other fruity flavor notes, whereas, Spanish consumers liked the sample with fruity, musty/earthy, and vegetative flavors. One sample that was high in sweet aromatics, but also was described by consumers as having “artificial taste” or tasting like a “fruit flavored drink” was liked by some consumers in all countries. The sample that was high in astringency and had fermented and metallic flavors was not liked in any country. Clustering of the consumers showed some split opinions for several samples.

**Keywords.** Pomegranate – Sensory – Acceptability – Juice – Flavour.

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## I – Introduction

Studies on pomegranate juice have shown that flavors vary, but can be grouped into five major flavor categories (Koppel and Chambers, 2010). Overall, the flavor of pomgranate juice is sweet, sour, musty/earthy, fruity, and astringent, but individual groups are higher in certain flavors. One group was higher in dark fruity flavors and sourness, another higher in fruity, grape-like flavors with low sourness, a third group high in musty/earthy flavor and chalkyness with low sourness, a fourth one was high in astringency and fermented notes with high sourness, and the last group exhibiting higher sweetness and candy-like flavors. Vázquez-Araújo *et al.*, (2011) studied commercial and fresh pomegranate juice flavor and aroma and found that volatile composition was higher in fresh juice suggesting that volatiles, and potentially flavor, was being lost during processing. Calin-Sanchez *et al.*, (2011) found that the presence of certain monoterpenes was related to high acceptance of pomegranate juice by Spanish consumers.

This study was conducted to compare sensory characteristics of juice to consumer acceptance of five different pomegranate juices, in four different countries: Thailand, Estonia, Spain, and the United States of America (US)

## II – Materials and methods

### 1. Samples

Samples, which represented the five flavor clusters (called, A,B,C,D,and E in this paper) reported by Koppel and Chambers (2010), were acquired from Estonia, Spain, the USA, and Thailand. Samples were shipped from their purchase location to other countries. Sample B was originally purchased in the US, but later a similar substitute sample was purchased in Thailand for testing in that market because of shipping issues.

### 2. Descriptive sensory analysis

Flavor of the sample was measured by six highly trained panelists using a 0-15 intensity scale. The same procedure was used in descriptive profiling as described by Koppel and Chambers (2010).

### 3. Consumer study

Consumer acceptance was measured using a hedonic scale in Estonia, US, Spain, and Thailand. Approximately 100 consumers in each country rated each sample. The consumers had an age range of 18-65 with a ratio of 60:40 women and men. Samples were served chilled at 5-7°C in a randomized order.

### 4. Analysis

Significant differences ( $p=0.05$ ) were found between countries for samples and also between juices for a country. The consumers were clustered using K-means clustering according to flavor liking scores. Consumer cluster flavor likings were mapped with descriptive sensory analysis data added as supplemental variables using Principal Component Analysis (PCA).

## III – Results

As expected, Sample A was higher in sour, astringent and dark-fruity attributes; sample B had cranberry, grape, fruity and berry aromatics; sample C had some musty/earthy and beet notes and there was a chalky mouthfeel present; sample D was sour, astringent, bitter, but also carried fermented and metallic notes, and sample E was high in sweet overall, with cherry and candy-like notes present in addition to the sweet taste.

According to clustering results only one juice (D) caused negative liking scores for all consumer clusters (Fig. 1). Although mean scores showed some disliking in Estonia and US for sample A, it was actually liked by a cluster of consumers in those countries; the same applied for sample B in Spain and sample C in Thailand. Although the mean score of sample C showed liking in Estonia and Spain, and sample E in Estonia, Thailand, and US, there was also a cluster of consumers in those countries who disliked these juices. One of the Thai consumer clusters liked samples C and B with musty and berry flavors and the other cluster liked samples B and E with cranberry, fruity, and candy-like flavors high in sweet aromatics. The two Spanish clusters both liked sample E; however, only one of the clusters liked two additional juices (B and C), while the other cluster found all other juices unpleasant. The flavor liking of Estonian and US consumer clusters were very similar with the exception of one juice. Sample C was liked by one cluster in Estonia, although it was not liked by either of the clusters in the US. Clustering results combined with descriptive data showed toothetch, fermented, sour, bitter, astringent, or metallic flavors were not liked in any country (Fig. 1).

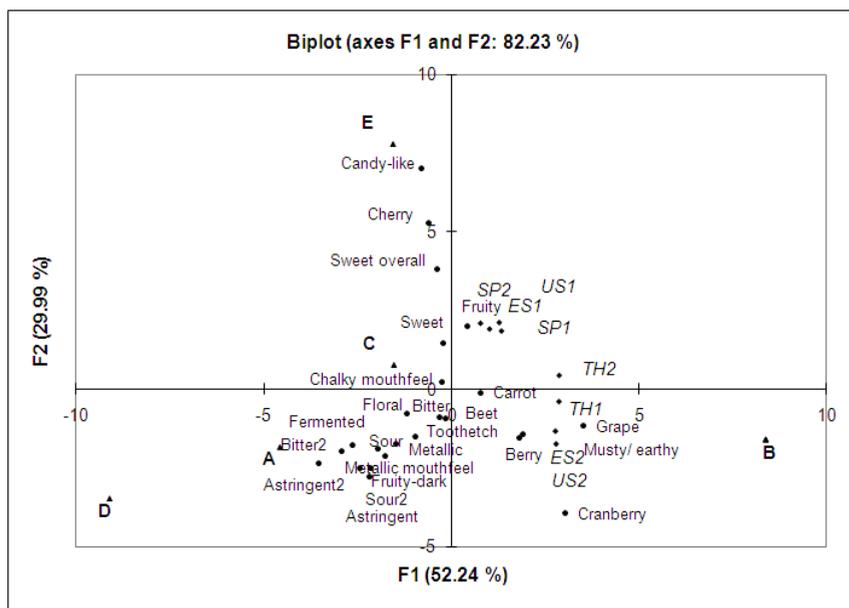


Fig. 1. Consumer clusters flavor liking PCA, descriptive data used as supplementary data. US1, US2 – US clusters 1 and 2; TH1, TH2 – Thailand clusters 1 and 2, ES1, ES2 – Estonian clusters 1 and 2; SP1, SP2 – Spanish clusters 1 and 2.

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