



Consumers' sensory perception and acceptability of hibiscus drinks: a cross-cultural study in Europe

Monteiro, M.J.P. ^a, Costa, A.I.A. ^{a,e}, Fliedel, G. ^b, Bechoff, A. ^c, Maraval, I. ^b, Pintado, A.I.E. ^a, Cisse, M. ^b, Pallet, D. ^b, K.Tomlins ^c, Pintado, M.M.

^a CBQF Laboratório Associado, ESB UCP - Porto, Portugal.
^b CIRAD - Montpellier, France.
^c NRI, University of Greenwich - Chatham, United Kingdom

^d ESP, Université Cheik Anta Diop - Dakar, Senegal.
^e CUBE - Católica Lisbon School of Business and Economics - Lisboa, Portugal.

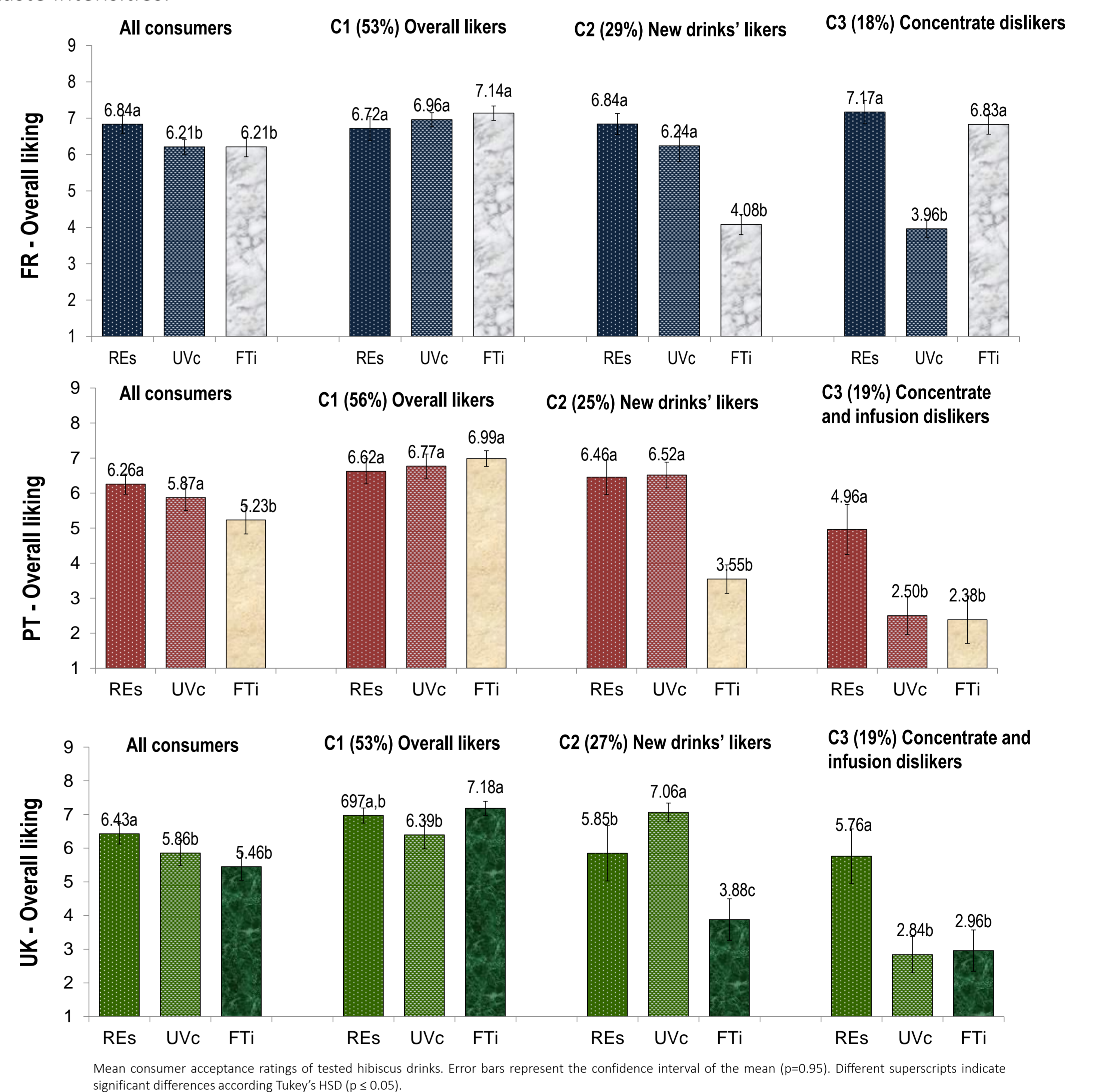


Summary

- *Hibiscus var. sabdariffa* drinks are rich in nutrients and their consumption is widespread in Africa and Asia, but they still are quite unknown among European consumers.
- The sensory quality and acceptability of a hibiscus infusion, prepared freshly from dried calyces according to Senegalese tradition, and two new hibiscus drinks developed by the African Food Tradition Revisited by Research (AFTER) project – an ultra-vacuum concentrate (Uvc) and an improved syrup (REs) – were evaluated by comparable consumer samples in France (n=133), Portugal (n=133) and United Kingdom (n=124), between March and July 2014.
- Similar sensory characterizations and preference profiles were obtained across countries, although French participants were generally the most appreciative of hibiscus drinks.
- The most frequently selected CATA descriptors were *fruity* and *red fruits*, strongly suggesting that participants misidentified the drink as a red fruits beverage. Oppositely, *tisane* and *new* were among the less frequently chosen terms, suggesting consumers in general did not recognize the drink as an extract of an unknown plant.

Results and discussion

- In each target country, consumer acceptance was positive for all samples, but differed significantly ($p \leq 0.05$) between them. Similar preference profiles were observed across countries. French participants were the ones that appreciated the tested drinks the most.
- New hibiscus drinks were liked slightly to moderately by participants in Clusters C1 (*overall likers*) and C2 (*new drinks' likers*), which represented about 80% of participants in each country. Clusters were highly related to participants' evaluations of sensory attributes, namely the sweet and acid taste intensities.



Materials and Methods

- Participants were non-probabilistically recruited in France (Montpellier, n=133, Portugal (Porto, n=133) and United Kingdom (Rochester, n=124), according to their willingness and availability to participate in the study. 98% were European or European residents. All participants consumed fruit beverages and 95% consumed fruit beverages or cold tisanes at least monthly.
- The questionnaire was written in French, Portuguese and English. To gather evaluative relevant information and maximize the equivalence between questionnaires, exploratory local focus groups were performed. XLSTAT (Addinsoft) software was used to analyze data.
- Sample acceptability was assessed by overall liking ratings provided on a 9-point hedonic scale. Hierarchical cluster analysis (Ward's method) was used to segment consumers accordingly. Sensory attribute – *red colour*, *sweet* and *acid taste* – intensities, relatively to participants' ideal level, were measured by attribute ratings provided on a 3-point JAR scale.
- Sensory profiles were obtained with CATA questions. These entailed 24 sensory or hedonic-oriented descriptors were drawn from previous focus groups held in Senegal and in Europe. Besides the three hibiscus drinks, participants were asked to use CATA question to describe their ideal beverage. The samples discriminant terms ($p \leq 0.05$) were analysed and subsequently submitted to Multiple Factorial Analysis (MFA) and Correspondence Analysis (CA).



Conclusions

- Overall liking assessments were complemented by attribute intensity evaluations and sensory profiling to provide important insights about hibiscus drinks' perception and acceptability by consumers in three European countries. In spite of their varying sensory characteristics, the new drinks developed by AFTER were all moderately liked by Portuguese, United Kingdom and French consumer samples.
- Important drivers for further sensory optimization of the new hibiscus drinks were uncovered through the employment of JAR, CATA and Ideal Profiling techniques.
- Besides exploring further opportunities for enhancing the sensory profiles of the new drinks in line with European taste, future studies should also investigate the levels of marketing activities (pricing, distribution and promotional information – including nutritional and healthiness attributes) which will best support their successful introduction in European markets.

- A penalty analysis was employed to relate overall liking and attribute intensity ratings. Results showed that a strong sweetness led to a significant decrease in overall liking of REs, whereas strong color and acidity where the major penalizing attributes for Uvc and FTi.
- CATA-derived sensory profiles were similar in the three countries, concerning both the actual drinks tested and an ideal similar drink. Significant differences in descriptor frequencies between samples were found for 9 descriptors in PT, 11 for UK and 12 in FR ($p < 0.05$). The terms *balanced flavor*, *artificial*, *healthy*, *natural*, *refreshing*, *invigorating*, *new*, *antioxidant* and *different/unknown* were non-discriminating.
- Cross-country CA results showed that REs was perceived to have a highly distinct sensory profile when compared with FTi and Uvc. While REs was associated to mild descriptors (sweet, watery, syrupy and light red), Uvc and FTi were related to more aggressive ones (strong taste, acidic, bitter, astringent, dark red). The sensory profile of the ideal drink was best described as simple, with a tisane/fruity character, low astringency and bitterness, and balanced in sweetness and acidity.

