

INFLUENCE OF DIFFERENT PRODUCT ATTRIBUTES ON ROMANIAN CONSUMER PURCHASE DECISIONS FOR ORGANIC DRIED BERRIES

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Abstract

Data collected in recent years has shown an enormous growth in overall consumer health consciousness. Nowadays the food industry is facing a new profile of consumers, and these consumers are demanding healthier options. Packaging claims are considered to have an influence on consumer purchase decisions for food products.

In our research we included 289 participants that answered to our questionnaire that have two parts. The first part of the questionnaire focuses on attributes like: price (7 Romanian leu - RON, 12 RON; 1 EUR = 4.59 RON, exchange rate on 30.08.2017), origin (Romania, European Union), drying method (microwave, sun-dried, air-dried), and nutritional claim (with or without nutritional claim) for a specific organic dried berries mix, to allow us to supply specific values for these factors to the research participants. The second part of the questionnaire focuses on evaluating a series of statements regarding consumers' attitudes towards: organic food, naturalness, healthy food, and novel processing technologies. Data were processed by conjoint analysis.

Conjoint analysis of responses from this 289 participants (representative sample for the Romanian urban population), with a margin of error of $\pm 6\%$ at a 95% confidence level) reveals that specific attributes affect consumer purchase decisions of organic dried berries mix ($P \leq 0.05$). We found that consumers' willingness to pay for microwave-dried berries is independent from values associated with price, origin and nutritional claim.

This study offers demographic information on Romanian consumer's attitude towards new technologies for organic berry-based products. Also, it is established that conjoint studies technique is a useful instrument in designing new products.

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Key words: *Organic berries, Conjoint analysis, Consumer purchase decision, Drying method, Origin, Price, Nutritional claim.*

1. Introduction

Fruits and vegetables are important components of a healthy diet and may reduce the risk of certain non-communicable diseases [1].

Berry fruit have been widely recognized as an excellent source of bioactive phenolic compounds including: flavonoids, phenolic acids, and tannins that both individually and synergistically may help protect against: cardiovascular disease, cancer, inflammation, obesity, diabetes, and other chronic diseases [2]. In addition to flavonols commonly found in berries, anthocyanins are dominant in dark-skinned berries, such as blackcurrant (*Ribes nigrum*) and bilberry (*Vaccinium myrtillus*) [3].

Referring to the factors that influence the purchase decisions, the healthiness of berries or berries-based products can be an important factor affecting their acceptance and use. Moreover, the individually varying sensitivities for different tastes may have an important impact on the perception of berries or berries-based products [4 - 7]. Di Palma [8], points out that among the

factors that influence the growth of consumption of berries there is on the one hand, the growing interest in food preparations by a large part of consumers, and on the other, the health properties owned by such fruit.

Consumers are nowadays much more interested in information about the production methods and components of the food products that they eat, than they had been 50 years ago [9]. For the majority of consumers, how they perceive food naturalness is very important in the decision-making process as they link naturalness to healthy eating (Figure 1). According to Roman *et al.*, [10], the items used by consumers to measure the importance of naturalness can be classified into three categories: 1) The way the food has been grown (food origin): 2) How the food has been produced (what technology and ingredients have been used); and 3) Final product properties.

Novel processing technologies such as microwave drying have great market potential to be alternative or supplement for conventional processing technologies. Generally, microwave is applied for phytochemicals extraction, heating and drying. Microwave-assisted extraction shortens the extraction duration and protects thermally susceptible compounds in an environmental friendly and economic way [11]. However, such technologies face low consumer acceptance being perceived "less natural", as revealed by the present study as well.

The aim of the present study is the determination of consumer purchase decisions for organic dried berries in Romania and the influence of different packaging claims for this particular food product, with respect to origin, drying technology and nutritional properties. In this regard, a survey in the form of an online questionnaire lasting 12 minutes has been designed and launched in Romania, in August 2017, via SurveyGizmo platform.

2. Materials and Methods

Conjoint analysis was chosen for exploring the effects of and interactions between the various packaging claims on consumer acceptance. By presenting a set of 'complete' products (Figure 2) described by a group of attributes, conjoint analysis uncovers the essential trade-offs consumers consciously or unconsciously make when judging and purchasing products. Conjoint analysis is generally considered to be suitable for assessing consumer acceptance of and preferences for novel food products [14].

Choice-based conjoint analysis was employed, as it has the unique advantage of mimicking the actual marketplace choices. The respondents were asked to make a choice between three products, all organic dried berries mixes. A choice experiment was conducted with

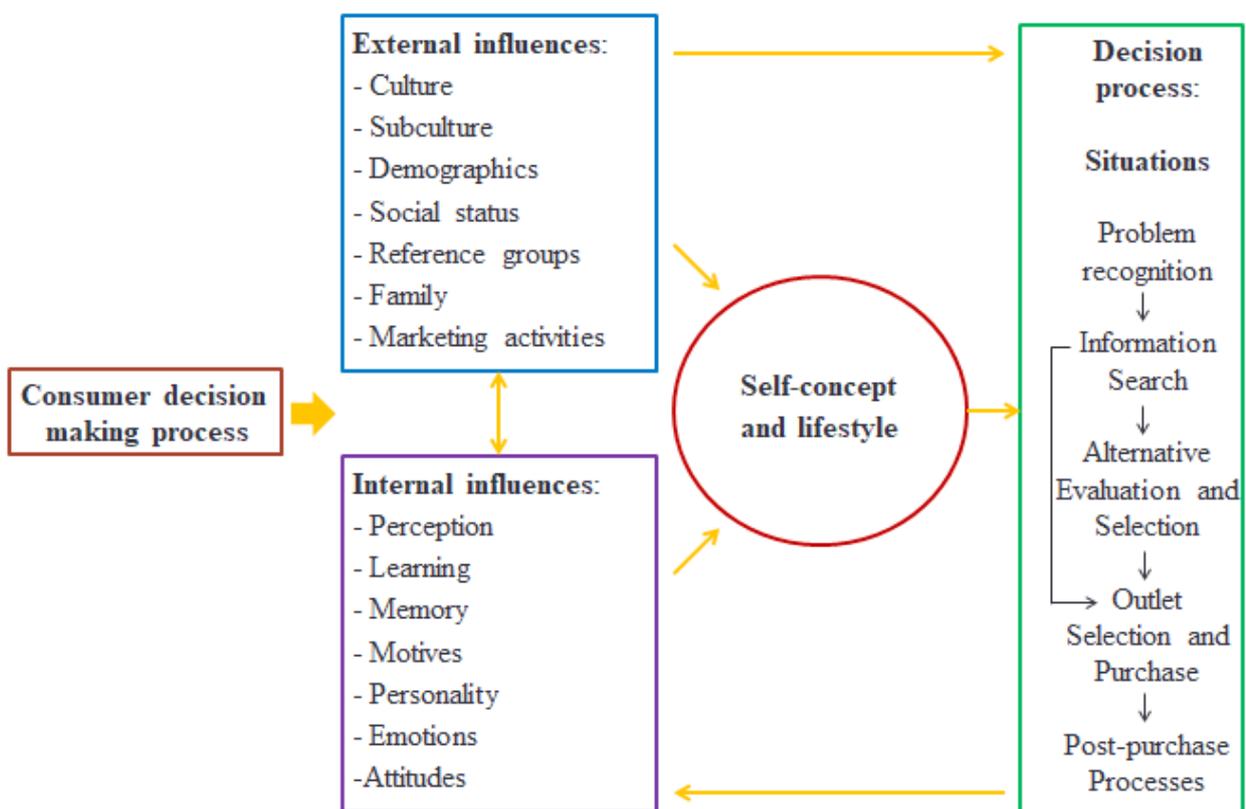


Figure 1. Consumer decision-making process and its main determinants (Adapted from Symmank *et al.*, [12] and Popa and Popa [13])



Figure 2. Product attributes used in the conjoint analysis design in the form of conceptual cards

4 conjoint attributes: price (2 levels), origin (2 levels – EU and RO), content of minerals and fibers (2 levels - normal content and higher content of minerals and fibers), and processing technology (3 levels - air drying, sun drying and microwave drying).

The results were automatically reported through the online platform SurveyGizmo, based on R statistics. With the assistance of a market research agency, participants were recruited from a national online research panel using a quota sampling procedure, where the quota control variables were age and gender.

The first part of the questionnaire comprised of the choice experiment. The second part focused on evaluating a series of statements regarding consumers' attitudes towards: organic food, naturalness, healthy food, and novel processing technologies.

3. Results and Discussion

3.1 Demographics

The sample of the 289 participants is representative for the Romanian urban population in terms of age and gender distribution, with a margin of error of $\pm 6\%$ at a 95% confidence level. More specifically, there are 51.6% women and 48.4% men. The age distribution is, as follows: 15.2% between 18 - 24 years of age, 26.8%

between 25 - 34, 22.6% between 35 - 44, and 35.4% between 45 - 64 years of age.

The sample distribution in terms of education, occupation and income is presented in Table 1. Moreover, the average number of persons in a household is 2.4, with 31.7% of participants having children under 18 years of age in the household.

Table 1. Sample distribution in terms of education, occupation and monthly household disposable income

Demographics	Distribution among the participants (n = 289)
Education	66% university graduates 33% high school graduates 1% gymnasium graduates
Occupation	41% employed in private sector 17% employed in public sector 15% retired 11% student 8% freelancer/ consultant 5% others 3% unemployed
Monthly household disposable income*	28% above 4501 RON (above ~945 EUR) 31% between 3001 - 4500 RON (~650-944 EUR) 27% between 1501 - 3000 RON (~327-649 EUR) 8% less than 1500 RON (less than ~326 EUR) 6% refused to answer

*1 EUR = 4.59 RON, exchange rate on 30.08.2017.

3.2 Conjoint analysis

Choice-based conjoint analysis of responses reveals that specific attributes affect consumer purchase decisions of organic dried berries mix. We found that consumers' willingness to pay for microwave-dried berries is low, independent from values associated with price, origin and nutritional claim.

The results presented in Table 2 show the importance of individual attribute levels based on their part-worth utilities. A utility is a measure of relative desirability or worth. The higher the utility, the more desirable the attribute level. Levels that have high utilities have a large positive impact on influencing respondents to choose products. In this case, consumers prefer air-dried organic berries that come from Romania, at lower price, and with higher nutritional content.

The most important attribute (Table 2) is processing technology, contributing almost 46% to the preference rating for organic dried berries. The second most important attribute is represented by: the nutritional claim (27%), followed by origin (16%) and, lastly, by price (11%).

3.3 Usage and attitudes

In terms of buying habits, the results from the survey reveal that four out of ten Romanian consumers (38%) purchase organic food products at least once a month, and 29% at least once a week. In the same time, a third of consumers (33%) buy organic food only several times a year or rarely. The buying frequency on type of berries-based products is depicted in Figure 3. The results show higher buying frequencies for fresh and dried berries versus frozen berries, and also for berries-based dairy products, mixes of nuts and dried berries, and breakfast cereals with dried berries.

The main places to buy berries-based products, irrespective of the processing (dried, fresh or frozen) are supermarkets/ hypermarkets (66.7% for frozen berries, 45.9% for dried berries, and 27.1% for fresh berries) and traditional open markets (42.4% for fresh berries, 20.3% for dried berries, and 10.7% for frozen berries).

Table 3 presents the results of consumers' evaluation of a series of statements regarding attitudes towards organic food, naturalness, healthy food, and novel processing technologies.

Table 2. Estimates of Part-Worth utilities for main effects of dried organic berries mix

Relative importance of product attributes	Utilities		Part-Worth Estimate	Standard Error
16% origin attributes	Origin	RO	0.187	0.251
		UE	-0.187	0.251
46% technology attributes	Technology	Air drying	1.550	0.335
		Sun drying	-0.763	0.393
		Microwave drying	-0.787	0.393
11% price attributes	Price	7 RON (~1.6 EUR)	-0.950	0.503
		12 RON (~2.7 EUR)	-1.900	1.005
27% nutritional attributes	Nutritional claim	higher content of minerals and fibers	-3.125	0.503
		normal content of minerals and fibers	-6.250	1.005
-	(Constant)	-	14.225	1.098

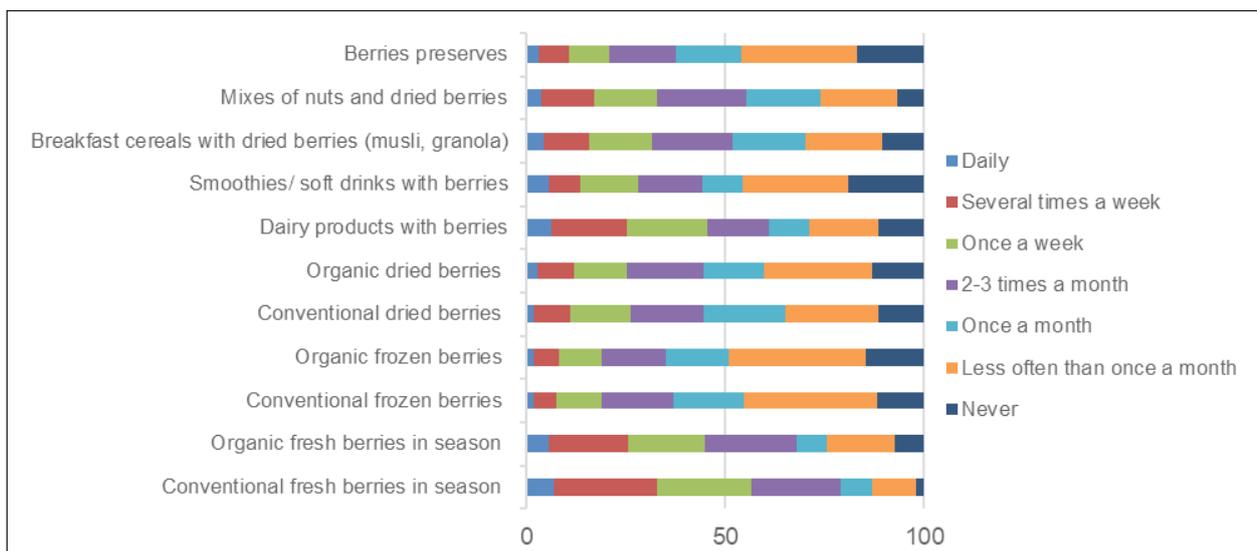


Figure 3. Buying frequency for different types of berries-based products

Table 3. Top-2-box (7 points Likert scale, where 7 means total agreement and 1 - total disagreement) scores regarding consumers' attitudes towards:

a. HEALTHY FOOD	
It is important for me that my daily diet contains many vitamins and minerals	60.6%
I'm very careful about how healthy the foods I eat are	47.7%
It is important for me that the products I eat to have a low fat content	47.4%
I pay attention to the amount of salt in my diet	46.3%
b. ORGANIC FOOD AND NATURALNESS	
I support the use of organic or natural food	74.5%
I would like to consume only organically grown vegetables	73.9%
I'm trying to eat foods without additives	58.5%
I do not mind paying more for organic food products	48.4%
I always buy organic food if I have the opportunity	46.7%
c. NOVEL FOOD PROCESSING TECHNOLOGIES	
Benefits of new processing technologies are often presented in a much better light than they actually are	55.4%
The society should not depend so much on technology to solve its food problems	52.7%
New foods on the market are not healthier than traditional products	50.2%
New technological processes for obtaining food products decrease their natural qualities	47.8%
The new technologies for obtaining food could have long-term negative effects on the environment	47.4%
There are plenty of tasty products on the market right now, we do not need to use new technologies	39.1%

As revealed in Table 3, six in ten consumers declare to pay attention to nutrient content, while fat and salt content are also important aspects to consider. Moreover, seven in ten consumers aspire to consume only organic vegetables, seen as natural and healthy. On the contrary, novel processing technologies are viewed with skepticism and often linked to negative effects than to benefits. This explains the lower appeal of microwave drying attribute in the conjoint experiment.

4. Conclusions

- This study offers an overview on Romanian consumers' attitudes towards new technologies for organic berry-based products. Moreover, it examines which of the food naturalness attributes (i.e. origin, technology, and nutritional benefit) are more relevant for consumers, which would be extremely important for the industry in order to develop their products, as revealed by Roman *et al.*, [10].

- Air-drying seems to be the most preferred packaging claim, followed by the Romanian origin.

- Technology preferences interact with nutritional content. A possible explanation to this is that consumers would expect the perceived natural or traditional processing technologies (i.e. air drying and sun drying) to be linked to nutritional benefits.

- Conjoint studies technique proved a useful instrument in designing new food products and the food packaging claims. The findings pose an opportunity for the food industry. Production processes, ingredients, packaging, and marketing need to be combined in a way that consumers perceive the products as natural foods that have similarities with traditional ones [10].

- In terms of consumers' attitudes, the study reveals that the "healthy eating" trend is also present in Romania. Consumers show higher interest in nutritional content, additive-free and organic claims.

- Novel food processing technologies appear controversial, with half of the consumers seeing more of their potential negative effects, while the other half being rather undecided. One challenge for consumer acceptance of these technologies may be the lack of naturalness. Companies working on innovative food technologies should design these in a way that consumers should perceive the new food products as natural. One would desire to verify that other ways of describing novel technologies might spawn higher levels of consumer acceptance, as careful choice of the wording can affect consumers' preferences considerably [15]. For example, one might imagine that the use of a claim describing only the benefits of using microwave processing could prompt stronger values than directly stating: "microwave drying".

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5. References

- [1] WHO. *Increasing fruit and vegetable consumption to reduce the risk of noncommunicable diseases*. URL: http://www.who.int/elena/titles/fruit_vegetables_ncds/en/. Accessed 30 August 2017.
- [2] Wu R., Frei B., Kennedy J. A., Zhao Y. (2010). *Effects of refrigerated storage and processing technologies on the bioactive compounds and antioxidant capacities of 'Marion' and 'Evergreen' blackberries*. *LWT - Food Science and Technology*, 43, pp. 1253-1264.
- [3] Tian Y., Liimatainen J., Alanne A. L., Lindstedt A., Liu P., Sinkkonen J., Kallio H., Yang B. (2017). *Phenolic compounds extracted by acidic aqueous ethanol from berries and leaves of different berry plants*. *Food Chemistry*, 220, pp. 266-281.
- [4] Suomela J. P., Vaarno J., Sandell M., Lehtonen H. M., Tahvonen R., Viikari J., Kallio H. (2012). *Children's hedonic response to berry products: Effect of chemical composition of berries and hTAS2R38 genotype on liking*. *Food Chemistry*, 135, (3), pp. 1210-1219.
- [5] Hartvig D., Hausner H., Wendin K., Bredie W. I. P. (2014). *Quinine sensitivity influences the acceptance of sea-buckthorn and grapefruit juices in 9-to11-year-old children*. *Appetite*, 74, pp. 70-78.
- [6] Sandell M., Hoppu U., Lunden S., Salminen M., Puolimatka T., Laaksonen O., Laitinen K., Hopia A. (2015). *Consumption of lingonberries by TAS2R38 genotype and sensory quality of texture-designed lingonberry samples*. *Food Quality and Preference*, 45, pp. 166-170.
- [7] Laaksonen O., Knaapila A., Niva T., Deegan K. C., Sandell M. (2016). *Sensory properties and consumer characteristics contributing to liking of berries*. *Food Quality and Preference*, 53, pp. 117-126.
- [8] Di Palma R. (2011). *Small fruits, great resources: Raspberries, currants, blueberries* (in Italian). *Parma Economica*, 3, pp. 48.
- [9] Asioli D., Aschemann-Witzel J., Caputo V., Vecchio R., Annunziata A., Næs T., Varela P. (2017). *Making sense of the "clean label" trends: A review of consumer food choice behavior and discussion of industry implications*. *Food Research International*, 99, (1), pp. 58-71.
- [10] Roman S., Sanchez-Siles L. M., Siegrist M. (2017). *The importance of food naturalness for consumers: Results of a systematic review*. *Trends in Food Science & Technology*, 67, pp. 44-57.
- [11] Li F., Chen G., Zhang B., Fu X. (2017). *Current applications and new opportunities for the thermal and non-thermal processing technologies to generate berry product or extracts with high nutraceutical contents*. *Food Research International*, 100, (2), pp. 19-30.
- [12] Symmank C., Mai R., Hoffmann S., Stok F. M., Renner B., Lien N., Rohm H. (2017). *Predictors of food decision making: A systematic interdisciplinary mapping (SIM) review*. *Appetite*, 110, pp. 25-35.
- [13] Popa M., Popa A. (2012). *Consumer Behavior: Determinants and Trends in Novel Food Choice*. In: McElhatton A., do Amaral Sobral J. P. (Eds.), *ISEKI Food (Vol. 7), Novel Technologies in Food Science: Their Impact on Products, Consumer Trends and the Environment*, pp. 137-158.
- [14] Shan L. C., De Brún A., Henchion M., Li C., Murrin C., Wall P. G., Monahan F. J. (2017). *Consumer evaluations of processed meat products reformulated to be healthier - A conjoint analysis study*. *Meat Science* 131, pp. 82-89.
- [15] Miklavec K., Pravst I., Raats M. M., Pohar J. (2016). *Front of package symbols as a tool to promote healthier food choices in Slovenia: Accompanying explanatory claim can considerably influence the consumer's preferences*. *Food Research International*, 90, pp. 235-243.