

Consumer Acceptance of Bulgarian Peanut Butters Employing Central Location Testing (CLT)

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ABSTRACT

Peanut butter and peanut butter based products, although flavorful and nutritious, are rarely found in Eastern European diets. To exploit marketing opportunities for peanut products in the region, consumer acceptance of smooth (PBS) and crunchy (PBCN) peanut butters was determined through central location tests (CLT) at an International Food Fair in Plovdiv, Bulgaria.

Consumers (147) were asked to rate their feelings about the intensities of spreadability, overall flavor, and texture using a nine-point intensity scale. Just-about-right (JAR) scales were used to evaluate the same attributes and aroma. Overall acceptance was assessed using a nine-point hedonic scale. Descriptive statistics, the paired t-test and chi-square test were used to analyze the data. The cross tabulation indicated that all of the products tested were rated acceptable for consumers of all ages and income ranges. This information provides a basis for introducing peanut butter to the Bulgarian and Eastern European consumers, to be used by food processing enterprises interested in expanding the market for peanuts.

Key Words: Consumer affective test, central location test, peanut, peanut butter, peanut spread.

A nationwide food consumption survey conducted in Bulgaria in 1997 determined consumer acceptability and preferences for 102 foods, which focused on processed peanuts and peanut products. Of the 2500 national food consumption survey questionnaires distributed in 28 regions of Bulgaria to determine the role of peanut in the diet and potential market opportunities for peanut-based products. More than 86% of the survey participants like peanuts and 83% would like to eat peanuts more often. Therefore a 1997 nation-wide survey in Bulgaria revealed a high demand for roasted peanuts and peanut products (Moon *et al*, 1999). An exhibition at the International Food Fair in

1999 introduced to Bulgaria and other European countries a wide range of commercial peanut products produced in the USA. Consumer surveys to determine acceptability and preferences of Bulgarians for various cultivars of roasted peanuts and peanut butters were conducted. The nationwide consumer survey and the consumer taste panel studies have provided information on consumer preferences for types of peanut products. Results from consumer affective central location sensory test in 1999 involving 601 respondents has revealed that very crunchy peanut butter rated higher than regular or low-salt, low-sugar peanut butters for overall acceptance. The potential for a successful introduction of a peanut butter in Bulgaria would be enhanced by development of a crunchy peanut butter that contains sugar and salt (Paraskova *et al*, 2000).

In Bulgaria, the popularity of peanuts as a snack is evident by their display at farmer's markets, in grocery shops, and on street stands where vendors offer raw, roasted and flavored peanuts, and peanut products. However, peanut butter is gaining in popularity slowly and in order to effectively perform in an increasingly competitive market, food manufacturers, distributors, and retailers need information about preferences of Bulgarian consumers towards Bulgarian peanut butter. Hence, in the absence of large and reliable data set, the study required implementation of a consumer survey.

Central location tests (CLT) are the most common consumer sensory acceptance tests used by those conducting market research. CLT tests are used primarily for product screening and defining the consumer segment that will accept or prefer the product. The major advantages of using CLT are that the method allows for a large number of participants to be recruited thus providing a large number of responses that have considerable impact and validity because actual consumers are used (Resurreccion, 1998).

Considering that peanut butter and peanut butter based products, although flavorful and nutritious, are not commonly found in Bulgarian diet, the objective of this study was to determine marketing opportunities for peanut products in the region and consumer acceptance of smooth (PBS) and crunchy (PBCN) peanut butters through central location tests (CLT) at an International Food Fair in 2005, Plovdiv, Bulgaria.

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Materials and Methods

Experimental Design.

Panelists in the consumer sensory test evaluated two peanut butter samples (PBS and PBCN) in five consecutive days. The order of presentation was balanced across the panel. Every panelist was presented the same samples, but in a different order. A randomized, balanced block design (Excel, Microsoft office^{exp}, Random Numbers Generator) was used to serve all samples.

Sample preparation.

Peanut butters were produced from the Bulgarian 'Kalina' peanut cultivar. Raw peanut kernels were heated in a roaster (MPK-20I, "Interbis" Ltd. – Bulgaria) at 163 C in 4.5 kg batches for 3–5 min to obtain a medium roast (visual assessment). Peanuts were air-cooled at room temperature, passed through a dry peanut blancher (model EX, Ashton Food Machinery Co. Inc. – USA) twice, hand sorted to inspect and discard foreign or damaged nuts, and passed through the blancher a third time. Blanched cool peanuts were then passed through colloid mill ("Koruma", model Type T2) twice to grind the peanuts. Salt, sugar, and stabilizer were added to peanut paste followed by mill treatment to refine the smooth peanut butter (PBS) followed by blending the added chopped nuts, as per product design for crunchy peanut butter (PBCN). The product was then rapidly cooled to 40 C and filled into clean jars to be stored.

Sensory Evaluation.

Recruitment and screening of panelists. A total of 147 consumers participated in the two sample peanut butter tests. Untrained consumers were intercepted, screened to qualify for their participation in the test, and asked to participate in the test being conducted at a booth. Prospective panelists who had known allergies to peanuts, RCSAS employees, or retirees as well as non-Bulgarian citizens were excluded from the tests. In addition, participating consumers must have consumed peanuts, peanut products, or peanut flavored food at least once a month and be at least 18 years old. During recruitment, an effort was made to include an equal number of participants representing gender and age groups.

Demographic Information. Before evaluating the samples, consumers were asked to complete a demographic questionnaire that requested information concerning their age, gender, ethnic group, marital status, educational background, employment, income of the household, and their consumption habits of peanut products (including peanut spread) such as waffles, traditional desserts (such as

baklava), or any other confectionary goods either sprinkled with pieces of peanuts or filled with peanut paste, peanut butter or peanut flavored food.

Consumer Acceptance Test.

Consumer test. Consumers were asked to evaluate two samples of PBS (smooth peanut butter) and PBCN (crunchy peanut butter). Nine-point intensity scales were used to rate spreadability, overall flavor and texture; nine-point just-about-right (JAR) scales were used to assess spreadability, aroma, overall flavor and texture; and a nine-point hedonic scale for overall acceptance. The two samples of peanut butter (PBS and PBCN) in 50 ml plastic cups were coded with a three-digit random number. All questions were administered, asked, and responses recorded on individual ballots by a trained interviewer. Samples were presented to each consumer by interviewers seated in partitioned booths in a balanced sequential monadic order. Each panelist was asked to evaluate the sample and indicate their answer to each specific question by pointing to a category on large nine-point intensity, JAR, or hedonic scales. After the first sample was tested, consumers were urged to drink some water and eat a cracker to cleanse their palates before proceeding with the second sample. Evaluations were carried out in three separate booths.

Questionnaire. Intensity scale categories were: for spreadability (1 = extremely unspreadable, 5 = neither spreadable nor unspreadable, 9 = extremely spreadable), for overall flavor (1 = extremely weak, 5 = neither weak nor strong, 9 = extremely strong) and for texture (1 = extremely smooth, 5 = neither crunchy nor smooth, 9 = extremely crunchy). JAR scale categories were: for spreadability (1 = very much less spreadable, 2 = much less spreadable, 3 = slightly less spreadable, 4 = very slightly less spreadable, 5 = just-about-right, 6 = very slightly more spreadable, 7 = slightly more spreadable, 8 = much more spreadable, 9 = very much more spreadable), for aroma and overall flavor (1 = very much weaker, 2 = much weaker, 3 = slightly weaker, 4 = very slightly weaker, 5 = just-about-right, 6 = very slightly stronger, 7 = slightly stronger, 8 = much stronger, 9 = very much stronger) and for texture (1 = very much smoother, 2 = much smoother, 3 = slightly smoother, 4 = very slightly smoother, 5 = just-about-right, 6 = very slightly crunchier, 7 = slightly crunchier, 8 = much crunchier, 9 = very much crunchier). The nine-point Hedonic scale categories for overall acceptance were: 1 = dislike extremely, 5 = neither like nor dislike, and 9 = like extremely.

Statistical Analysis.

Data were statistically analyzed using SYSTAT (SYSTAT 7.0.1., 1997) and STATISTICA software

(STATISTICA 7, 2005) using paired t-test to determine significant differences in the scoring of each sensory attribute, frequency tables to obtain the number of consumers who found the product to be acceptable and percentage of just-about right attributes. JAR versus intensity ratings were analyzed using chi-square test.

Results and Discussion

Demographic Characteristics of Consumer Panelists.

Of the panelists tested (147 consumers) (Table 1), 95.9% were Slavonic, 1.4% were Turkish, and 2.7% were from other ethnic background. The panel was comprised of 52.1% males and 47.9% females. Each age category from 25–70 years was represented by 19 to over 20% of the panel, indicating the even spread of participants across all age categories. The majority of participants were in the 35–44 age group. Most (65.1%) of the participants were married. The panel was highly educated, with 76% having some university education or graduated, or had a professional degree. Among the participants 66.4% were employed full time, 41.3% of the consumers had a monthly household income of over 501 lv (1 US \$ = 1.57 lv at the time of the test) whereas 5.8% had an income of less than 150 lv.

Consumer responses about peanut, peanut butter and peanut flavored food. In response to the questions (data not presented) concerning the frequency of consumption of any type of products with peanuts or peanut spread such as waffles, traditional desserts (such as baklava), or any other confectionary goods either sprinkled with pieces of peanuts or filled with peanut paste, 29.4% of the participants consumed these products once a week, 25.3% four times a week and 13.7% on daily basis. About 58.2% of the consumers indicated that they consume peanut butter rarely or never, 11.6% once a week and 10.9% less than once a month. Most consumers (24.6%) use peanuts, peanut products, or peanut flavored food once a week, 23.3% consume these products four times a week, 15.7% on daily basis and 11.6% once a month.

Consumer acceptance of Bulgarian peanut butters.

Means of intensity and just-about-right ratings for sensory attributes of peanut butter samples evaluated by 147 Bulgarian consumers were determined (Table 2).

Spreadability. Intensity ratings for PBS were equivalent to “moderately spreadable” for intensity of spreadability ($x = 7.3$). Intensity of spreadability for PBCN was found to differ by paired t-test ($p = 0.05$) (Table 2). The preferred degree of spread-

Table 1. Demographic characteristics of consumer panelists (n = 147) participating in sensory evaluation of peanut butter.

Variable	Percentage
Age (years)	
Under 25	6.8
25–34	21.9
35–44	28.1
45–54	19.2
55–70	23.9
Gender	
Male	52.1
Female	47.9
Ethnic background	
Slavonic	95.9
Turkish	1.4
Other	2.7
Marital status	
Never married	24.6
Married	65.1
Separated	1.4
Divorced	6.2
Widowed	2.7
Education	
Less than 7 years of school	0.0
Some high school	1.4
Complete high school or equivalent	26.9
Some university education	15.2
Graduate or professional school or higher	56.5
Employment status	
Employed full-time	66.4
Employed part-time	9.6
Homemaker	3.4
Student	5.5
Retired	11.6
Unemployed	2.7
Disabled	0.7
Level of household income (leva) ^a	
< 150	5.8
151–250	8.0
251–350	17.4
351–450	9.4
451–500	18.1
500 and higher	41.3

^a1 US \$ = 1.57 leva at the time of the consumer panel.

ability rated in “slightly spreadable” to “moderately spreadable” (intensities of 6.1 to 7.3) (Figure 1 and Figure 2) as perceived as JAR in both of the formulations.

Flavor. Intensity ratings for PBS and PBCN were equivalent to “neither weak nor strong” for intensity of overall flavor (intensities of 5.6 to 5.7) (Table 2) and rated in both samples as JAR (Figure 3 and Figure 4).

Texture. Intensity ratings for PBS were equivalent to “moderately smooth” for intensity of texture ($x = 3.3$). Intensity of texture for PBCN was found to differ by paired t-test ($p = 0.05$) (Table 2). The intensity of

Table 2. Means of intensity^a and just-about-right^b (JAR) ratings of sensory attribute of peanut butter samples evaluated by Bulgarian panelists.

Samples	Intensity of spreadability	JAR of spreadability	Intensity of overall flavor	JAR of overall flavor	Intensity of texture	JAR of texture	JAR of aroma
PBS	7.3 ± 1.5A	5.5 ± 1.4A	5.6 ± 1.5A	5.2 ± 1.4A	3.3 ± 1.7A	3.8 ± 1.8A	5.1 ± 1.3A
PBCN	6.1 ± 1.9B	4.9 ± 1.6B	5.7 ± 1.3A	5.4 ± 1.3A	4.7 ± 1.8B	4.8 ± 1.8B	5.3 ± 1.3A

Means in the same column not followed by the same letter are significantly different at $p = 0.05$ as determined by t-paired test.

^aA 9-point intensity scale with descriptors: spreadability 1=extremely unspreadable, 2=very unspreadable, 3=moderately unspreadable, 4=slightly unspreadable, 5=neither spreadable nor unspreadable, 6=slightly spreadable, 7=moderately spreadable, 8=very spreadable, 9=extremely spreadable; overall flavor 1=extremely weak, 2=very weak, 3=moderately weak, 4=slightly weak, 5=neither weak nor strong, 6=slightly strong, 7=moderately strong, 8=very strong, 9=extremely strong; texture 1=extremely smooth, 2=very smooth, 3=moderately smooth, 4=slightly smooth, 5=neither crunchy nor smooth, 6=slightly crunchy, 7=moderately crunchy, 8=very crunchy, 9=extremely crunchy.

^bA 9-point JAR scale with descriptors: spreadability 1=very much less unspreadable, 2=much less spreadable, 3=slightly less spreadable, 4=very slightly less spreadable, 5=just-about-right, 6=very slightly more spreadable, 7=slightly more spreadable, 8=much more spreadable, 9=very much spreadable; overall flavor and aroma 1=very much weaker, 2=much weaker, 3=slightly weaker, 4=very slightly weaker, 5=just-about-right, 6=very slightly stronger, 7=slightly stronger, 8=much stronger, 9=very much stronger; texture 1=very much smoother, 2=much smoother, 3=slightly smoother, 4=very slightly smoother, 5=just-about-right, 6=very slightly crunchier, 7=slightly crunchier, 8=much crunchier, 9=very much crunchier.

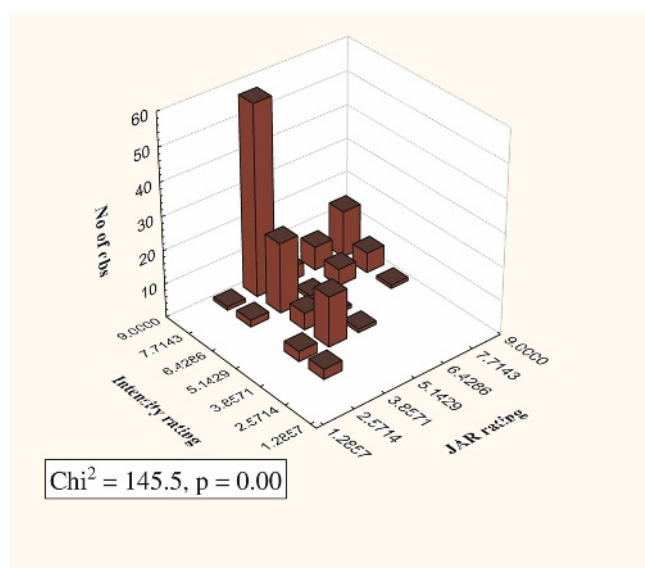
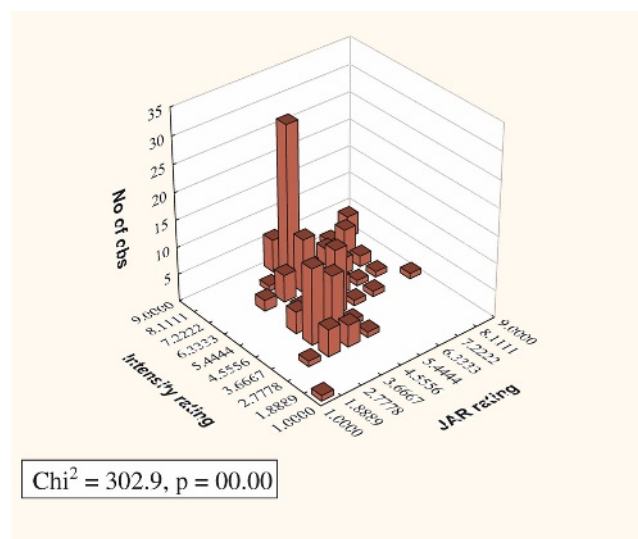
texture appeared to be lower, “moderately smooth” to “neither crunchy nor smooth” (intensities of 3.3 to 4.7) than the preference of the consumers for both of the samples as it was conformed by the given JAR ratings (Figure 5 and Figure 6).

Aroma. Aroma was JAR in both of the treatment formulations (Table 2).

Overall acceptance. Mean consumer ratings for overall acceptance of peanut butters are shown in Table 3. Overall acceptance of smooth and crunchy peanut butter samples were rated highly ($x = 7.2$ or like moderately) but were not significantly different. The results of the hedonic rating for each peanut butter are also shown in Table 3. The

percentage of consumers that rated the overall acceptance of smooth peanut butter (PBS) as like slightly or better ($x \geq 6$) was 89.7%, whereas crunchy peanut butter (PBCN) was rated ≥ 6 by 87% of the consumer panelists.

JAR scales for PBS showed that all attributes were just about right over 50% except JAR rating for texture (36%). In the case of PBCN only aroma and overall flavor were just-about right over 50% (Table 4). Significant differences in the JAR ratings for aroma (Median test, chi-square=15.03, $p=0.05$) and overall flavor (Median test, chi-square=16.95, $p=0.047$) were detected by age group for PBCN samples (Table 5).

**Fig. 1. JAR versus Intensity ratings of spreadability for PBS.****Fig. 2. JAR versus Intensity ratings of spreadability for PBCN.**

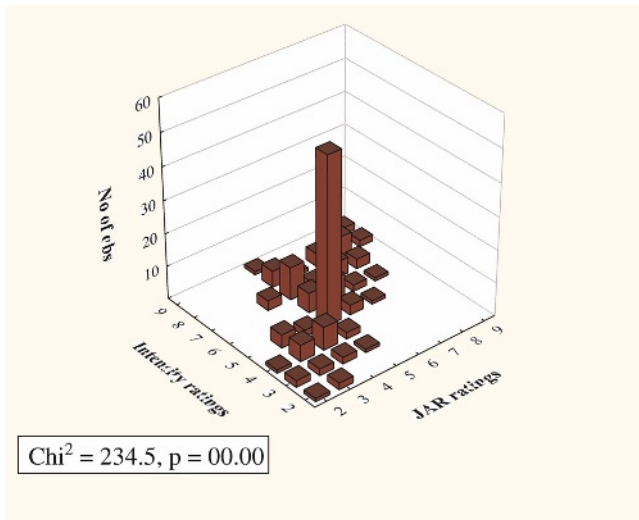


Fig. 3. JAR versus Intensity ratings of overall flavor for PBS.

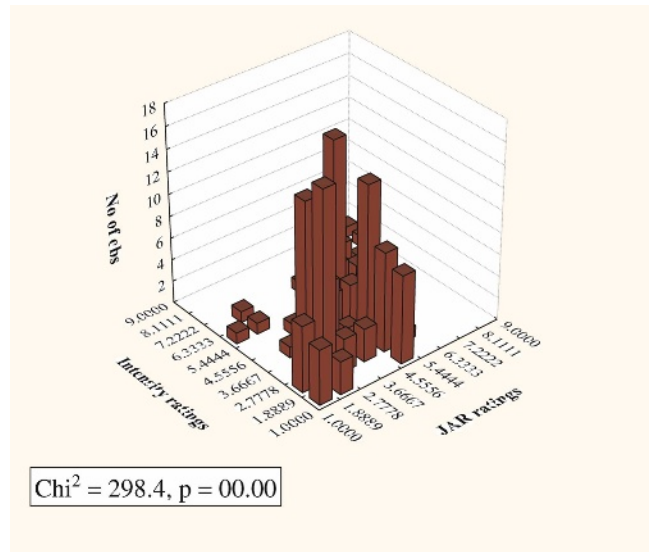


Fig. 5. JAR versus Intensity ratings of texture for PBS.

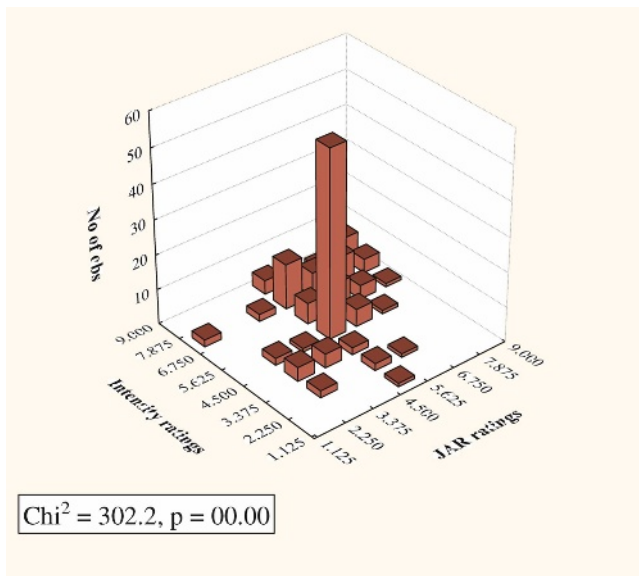


Fig. 4. JAR versus Intensity ratings of overall flavor for PBCN.

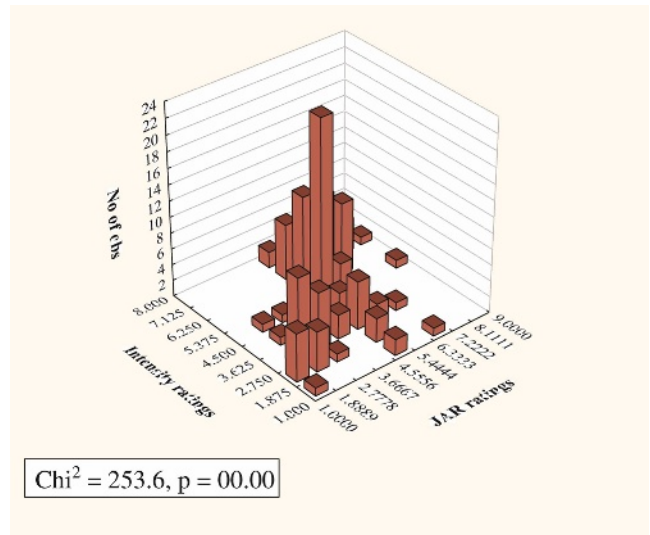


Fig. 6. JAR versus Intensity ratings of texture for PBCN.

The cross tabulation indicated that all of products tested were rated acceptable by consumers of all ages and income ranges (Figures 7 and 8).

Conclusions

A central location test involving 147 respondents has revealed that smooth and crunchy peanut butters were rated equally highly (“like moderate-

Table 3. Number and percentage (in parenthesis) of panelists giving consumer ratings for overall acceptance of peanut butter formulations (n = 147).

Samples	Hedonic rating ^a									Overall ^b acceptance
	1	2	3	4	5	6	7	8	9	
PBS	1 (0.7)	0	1 (0.7)	4 (2.7)	9 (6.1)	13 (8.8)	47 (32.0)	54 (36.7)	18 (12.2)	7.2 ± 1.3A
PBCN	2 (1.4)	0	1 (0.7)	5 (3.4)	11 (7.5)	7 (4.8)	50 (34.0)	53 (36.0)	18 (12.2)	7.2 ± 1.4A

^aA 9-point hedonic scale with 1 = dislike extremely, 2 = dislike very much, 3 = dislike moderately, 4 = dislike slightly, 5 = neither like nor dislike, 6 = like slightly, 7 = like moderately, 8 = like very much, and 9 = like extremely was used.

^bMeans in the same column followed by the same letter are not significantly different at p = 0.05 as determined by t-paired test.

Table 4. Number and percentage (in parenthesis) of panelists giving just-about-right (JAR) consumer rating ($\alpha=5$) for selected attributes of peanut butter formulations ($n = 147$).

Samples	JAR of spreadability	JAR of overall flavor	JAR of texture	JAR of aroma
PBS	90 (61.2) ^a	77 (52.4) ^c	53 (36.0) ^e	86 (58.5) ^g
PBCN	63 (42.5) ^b	83 (56.4) ^d	58 (39.5) ^f	90 (60.8) ^h

^aPearson chi-square=270.7; $p=0.00$; ^bPearson chi-square=293.6; $p=0.00$; ^cPearson chi-square=219.7; $p=0.00$; ^dPearson chi-square=154.3; $p=0.00$; ^ePearson chi-square=193.6; $p=0.00$; ^fPearson chi-square=321.5; $p=0.00$; ^gPearson chi-square=274.8; $p=0.00$; ^hPearson chi-square=147.3; $p=0.00$.

Table 5. Significant differences in the scoring of JAR ratings detected by age group.

PBS		PBCN	
JAR rating ^a	Age estimate ^b , λ^2	JAR rating ^a	Age estimate ^b , λ^2
JARS	3.93 ^{ns}	JARS	7.38 ^{ns}
JARA	13.94 ^{ns}	JARA	15.03*
JAROF	14.68 ^{ns}	JAROF	16.95*
JART	9.19 ^{ns}	JART	9.85 ^{ns}

^aJARS - JAR rating for spread ability; JARA - JAR rating for aroma; JAROF - JAR rating for overall flavor; JART - JAR rating for texture.

^b* = significant at $p = 0.05$, ^{ns} = non significant, λ^2 - chi-square.

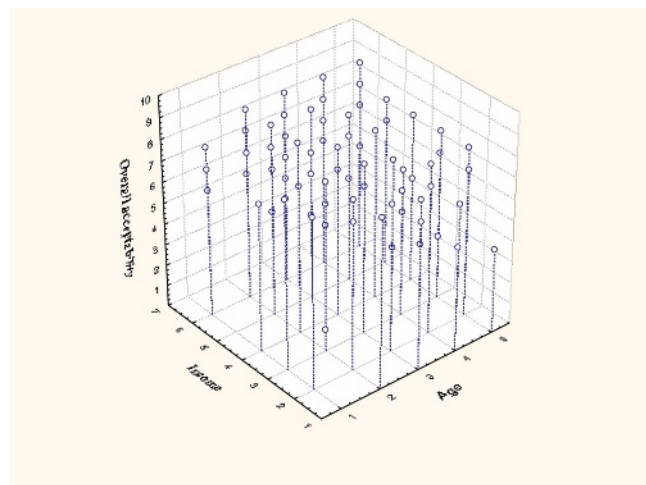


Fig. 7. Acceptability (9-point hedonic scale) of PBS by age group category ($n = 147$) on a scale “1” to “5” with 1= under 25 years old, 2 = 25–34 yrs of age, 3 = 35–44 yrs old, 4 = 45–54 yrs old and 5 = 55–70 yrs of age and income range on a scale increasing form “1” to “7”.

ly”) for overall acceptance. The results demonstrated that Bulgarian consumers preferred a high

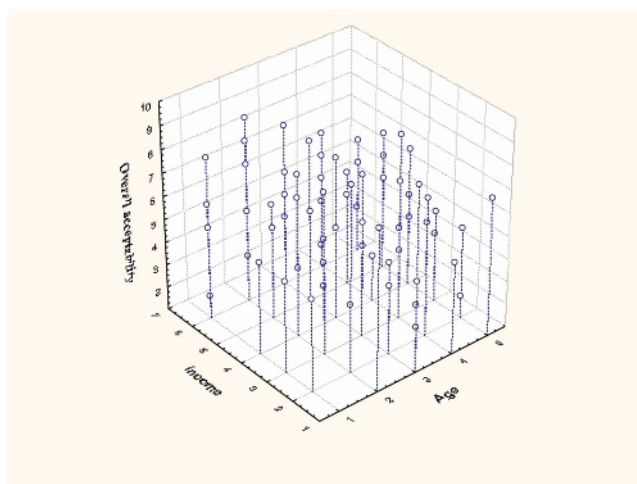


Fig. 8. Acceptability (9-point hedonic scale) of PBCN by age group category ($n = 147$) on a scale “1” to “5” with 1= under 25 years old, 2 = 25–34 yrs of age, 3 = 35–44 yrs old, 4 = 45–54 yrs old and 5 = 55–70 yrs of age and income range on a scale increasing form “1” to “7”.

degree of spreadability and a medium intensity of overall flavor. Consumers preferred a higher intensity of texture than rated in both samples. Intensity of texture of PBS needs to increase to be perceived as JAR Aroma was JAR for both of the samples.

The cross tabulation indicated that the products tested were rated acceptable for consumers of all ages and income ranges.

Acknowledgement

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