

Attributes Critical to Product Acceptance of Chocolate Peanut Cream by Bulgarian Consumers

Dida Iserliyska^{1*}, Anna V.A. Resurreccion², Pavlina Paraskova¹, Manjeet S. Chinnan², Milena Ruinova¹, and Todorka Petrova¹

ABSTRACT

Central location tests (CLT) were conducted for five consecutive days to determine consumer acceptance of chocolate peanut cream. Scales for intensity, just-about-right (JAR) and hedonic ratings were used to measure each attribute evaluated. Consumers (n = 152) were asked to rate the intensities of spreadability, chocolate, peanut and overall flavors, and texture using a 9-point scale. JAR scales were used to evaluate the same attributes as well as aroma; while overall acceptance was assessed using a 9-point hedonic scale. Means and frequencies of each sensory attribute were obtained. Chi-square analysis was used to analyze JAR ratings.

Key Words: consumer affective test, central location test, chocolate spread, peanut spread, chocolate cream, just-about-right scales (JAR), intensity scales, hedonic scales.

The just-about-right (JAR) scales measures deviation from desirability of a specific attribute, and these scales are often used by product developers to determine the optimum levels of attributes in a product. One limitation to the use of JAR scales occurs when they are used in isolation without guidance from responses to additional intensity-related questions. The combination of hedonic and intensity information that characterizes the JAR scale obscures actual intensity ratings for product attributes. One solution to this problem is to use intensity scales in addition to the JAR scale to aid in its interpretation. Thus, the absolute level of attribute intensity and its relation to desirability of the product attribute becomes evident to the product developer, insofar as respondents are able to accurately scale intensity (Lawless and Heymann 1997).

¹Regional Center for Scientific and Applied Service (RCSAS), 154 Vassil Aprilov Blvd, Plovdiv-4000, Bulgaria, Tel: +359 32 900 233, Fax: +359 32 952 286; Email: dida_isser@yahoo.com

²Department of Food Science and Technology, 1109 Experiment Street, Griffin, GA 30223-1797.

*Corresponding author.

The Central Location Test (CLT) requires a large number of respondents per product. A sample size of 100 or more consumers is recommended in the literature (Stone and Sidel 1993; Resurreccion 1998) especially when segmentation is anticipated. The increase in the number of consumers compared to the laboratory test is necessary to counterbalance the expected increase in variability due to the wide differences in acceptance ratings for the same sample, inexperience of the consumer participants, and the novelty of the situation (Resurreccion 1998).

A 1997 nation-wide survey conducted in Bulgaria revealed a high demand for peanuts and peanut products (Moon and Florkowski 1999). Results from a consumer CLT in 1999 indicated that 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). Additionally, hazelnut based spreads, which have been aggressively promoted by Western companies, gained in popularity within the last decade; therefore, a peanut based alternative to this product would be of interest. Moreover introduction of a new spreadable peanut product would encourage growth and diversification in the consumption of peanut since consumers are given new and better choices.

The objective of this study was to determine the acceptance of a chocolate peanut cream formulation and product by Bulgarian consumers. This research was conducted to provide directional information for product developers on product reformulation or optimization of the spreadable peanut product.

Materials and Methods

Sample Preparation

Chocolate Peanut Cream Preparation. The process protocol for chocolate peanut cream (CPC) was as described by C. A. Chu and A. Resurreccion (2004). Chocolate peanut cream was produced from the Bulgarian "Kalina" peanut cultivar. Raw medium 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 material or damaged nuts; then passed through the blancher a third time. Blanched cool peanuts were then passed through a colloid mill (model Type T2, Koruma - Germany) twice to grind the peanuts to a paste. Chocolate syrup (25%), sugar (30%) and stabilizer (Grindsted® PS 105K, Danisco Cultor, USA, Inc) were added to the peanut paste (45%) and passed through a colloid mill. The product was rapidly cooled to 40°C (instant cooling by placing in ice bath), filled into clean jars and stored.

Chocolate Syrup Preparation. The week before the testing, cocoa powder (Nestle™), nonfat dry milk (Clever™), corn oil (Clever™) and powdered sugar (Clever™) were purchased from the local supermarket food chain “Billa”. Imitation vanilla flavor and lecithin both were provided by P.I.C.Co, Plovdiv, Bulgaria. The chocolate syrup consisted of cocoa powder (12%), nonfat dry milk (12%), corn oil (38%), powdered sugar (36%), lecithin (1%), and imitation vanilla flavor (1%). The dry ingredients (sugar, nonfat dry milk and cocoa) were blended together in a mixer (Laboratory mixer, Hran-Mash Ltd., Stara Zagora, Bulgaria) on low speed for 2 min. With the mixer maintaining the same speed, vanilla, corn oil, and lecithin were added in that order and mixed for 5 min. The speed was then increased to medium speed for an additional 5 min to obtain a smooth liquid.

Sensory Evaluation

Recruitment and Screening of Panelists. The CLT for consumer acceptance was conducted over five consecutive days in commercial booths during an industrial fair in Plovdiv, Bulgaria, in 2005. A total of 152 panelists were recruited and screened for specific criteria as follows.

Untrained consumers were randomly selected, screened, and only the qualified consumers were asked to participate in the test being conducted at a fair booth. The screening process ensured that each consumer panelist was qualified to participate in the test by eliminating individuals with known allergies to peanuts, chocolate, sugar or milk. Regional Center for Scientific and Applied Services (RCSAS) employees or retirees, as well as non-Bulgarian citizens were also excluded from the tests. In addition, participating consumers must have consumed chocolate, peanuts, peanuts and chocolate together, commercial chocolate-peanut cream, 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 group.

Demographic Information. Before evaluating the samples, consumers participating in the chocolate peanut cream test 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 patterns for chocolate, Nutella™ type of products and peanuts, peanut products or peanut flavored food eaten along with chocolate.

Consumer Acceptance Test

Consumer Test. Consumers were asked to evaluate one sample (15 g) of CPC in a 50 ml plastic cup with lid. Nine-point scales, were used to rate intensities of the spreadability, chocolate, peanut and overall flavors; and texture. Nine-point JAR scales were used to assess spreadability, aroma, chocolate, peanut and overall flavors as well as texture; while a nine-point hedonic scale was used for overall acceptance. All questions were administered by a trained interviewer who asked questions, one at a time, and recorded panelist responses on individual ballots. The sample evaluated was presented to each consumer by interviewers seated in partitioned booths. Each panelist was asked to evaluate the sample then indicate their answer to each specific question by pointing to a category on large nine-point intensity, JAR or hedonic scales. After the sample was tested, the consumer was dismissed. Evaluations were carried out in three adjacent partitioned booths.

Questionnaire. Intensity scale categories were as follows: spreadability (1 = extremely unspreadable, 5 = neither spreadable nor unspreadable, 9 = extremely spreadable), chocolate, peanut and overall flavor (1 = extremely weak, 5 = neither weak nor strong, 9 = extremely strong), and texture (1 = extremely smooth, 5 = neither crunchy nor smooth, 9 = extremely crunchy). The Just-about-right (JAR) scale categories were as follows: 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). Aroma, chocolate, peanut and overall flavors were rated as follows (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 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). Hedonic scale categories for overall acceptance were 1 = dislike extremely, 5 = neither like nor dislike, and 9 = like extremely for each attribute evaluated.

Statistical Analysis

The data was statistically analyzed using SYSTAT (SYSTAT 7.0.1., 1997) and STATISTICA software (STATISTICA 7, 2005) to determine mean for each scale, sensory attribute, percentage of JAR attributes, as well as frequency tables which were used to obtain the number of consumers who found the product to be acceptable. JAR ratings were analyzed using the chi-square test.

Results and Discussion

Demographic Characteristics of Consumer Panelists

The age range of consumers participating in the test ranged from under 25 to 70 years. Their age classifications are listed in Table 1. There were approximately equal numbers of participants in all categories except for those in the median category of 35–44 years old, and which had fewer respondents. The attempt to include an equal number of male (47.7%) and female (52.3) consumers was successful. The median monthly income category was 351 to 450 leva (1 US\$=1.57 Leva). Participants having a monthly income over 501 leva or higher constitute the largest group (34%). Household monthly incomes were 151 to 350 leva for 37% and participants reporting monthly income of 150 leva or less made up a very small percentage of the panel. Most of the consumers tested (69.5 %) were employed full- or part-time. Among the remaining participants, there were a few students and pensioners (26.5%). A very small number were unemployed. The number of participants who had some university education or higher degree was over 70%. Less than 4% did not complete high school or the equivalent education.

Consumer Consumption Responses

Participants consumption of chocolate and peanuts is shown in Table 2. Consumer participants selected, consumed chocolate at least once a week (70.5%) and almost 59.8% ate peanuts at least once a week, but almost 80% of the participants consumed NutellaTM, a chocolate nut spread available in the Bulgarian marketplace. Almost 60% of the participants consumed this nut spread at least once a month, and almost 30%

Table 1. Demographic characteristics of consumer panelists (n = 152) participating in sensory evaluation of chocolate peanut cream

| Variable | Percentage |
|---|------------|
| Age (years) | |
| Under 25 | 17.0 |
| 25–34 | 21.6 |
| 35–44 | 12.4 |
| 45–54 | 20.9 |
| 55–70 | 28.1 |
| Gender | |
| Male | 47.7 |
| Female | 52.3 |
| Ethnic background | |
| Slavonic | 96.1 |
| Turkish | 1.9 |
| Other | 1.9 |
| Marital status | |
| Never married | 30.1 |
| Married | 63.4 |
| Separated | 1.9 |
| Divorced | 3.3 |
| Widowed | 1.3 |
| Education | |
| Less than 7 years of school | 0.0 |
| Some high school | 3.9 |
| Complete high school or equivalent | 25.5 |
| Some university education | 20.3 |
| Graduate or professional school or higher | 50.3 |
| Employment status | |
| Employed full-time | 58.3 |
| Employed part-time | 11.2 |
| Homemaker | 3.3 |
| Student | 14.6 |
| Retired | 11.9 |
| Unemployed | 0.7 |
| Disabled | 0.0 |
| Level of household income (leva) ^a per month | |
| < 150 | 6.3 |
| 151–250 | 18.2 |
| 251–350 | 18.9 |
| 351–450 | 9.8 |
| 451–500 | 12.6 |
| 500 and higher | 34.3 |

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

consumed it one to seven times per week. The high frequency of consumption of chocolate, peanuts and a nut spread indicate that a chocolate peanut spreadable product would have a high potential for use, by Bulgarian consumers.

Consumer Acceptance of Bulgarian Chocolate Peanut Cream

Spreadability. Most consumers rated spreadability of the chocolate peanut cream high in

Table 2. Consumer responses regarding chocolate, chocolate cream, peanuts, peanut products and peanut flavored food consumed along with chocolate

| Questions | Choices | Percentage |
|---|------------------------|------------|
| How often do you eat chocolate? | Daily | 21.6 |
| | 4 times/week | 26.1 |
| | Once a week | 22.9 |
| | Thrice a month | 7.2 |
| | Twice a month | 9.1 |
| | Once a month | 5.9 |
| | Less than once a month | 3.9 |
| | Rarely or never | 3.3 |
| How often do you consume NUTELLA™ type of products? | Daily | 3.9 |
| | 4 times/week | 10.4 |
| | Once a week | 15.7 |
| | Thrice a month | 5.9 |
| | Twice a month | 9.8 |
| | Once a month | 13.1 |
| | Less than once a month | 19.6 |
| | Rarely or never | 21.6 |
| How often do you consume peanuts, peanut products or peanut flavored food with chocolate? | Daily | 13.1 |
| | 4 times/week | 17.8 |
| | Once a week | 28.9 |
| | Thrice a month | 9.9 |
| | Twice a month | 5.9 |
| | Once a month | 6.6 |
| | Less than once a month | 8.5 |
| | Rarely or never | 9.2 |

intensity (7.7) and also rated the product optimal for spreadability (Fig. 1). Some consumers who rated spreadability high gave it JAR rating of being more spreadable than optimal.

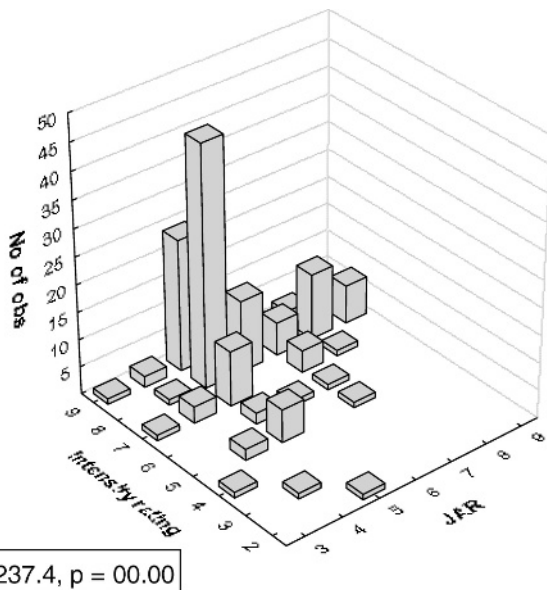


Fig. 1. Just- About- Right (JAR) ratings versus Intensity ratings of spreadability

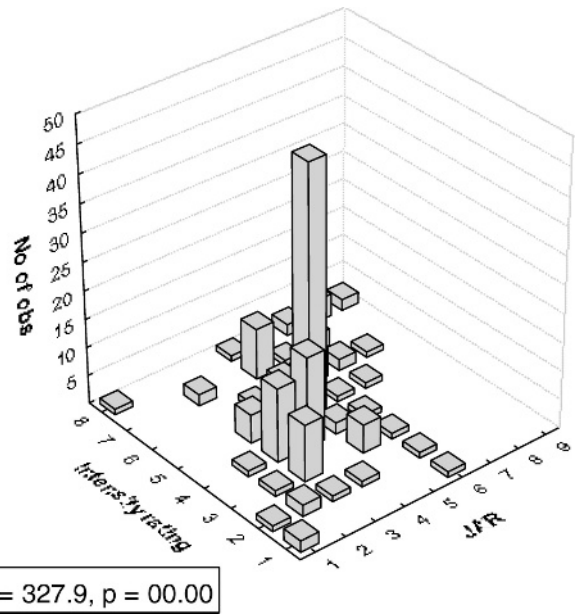


Fig. 2. Just- About- Right (JAR) ratings versus Intensity ratings of chocolate flavor

Chocolate Flavor. A slightly “slightly weak” (4.8) intensity rating for chocolate flavor was given to the sample. This intensity corresponded to a less than optimal spreadability rating. To increase acceptance of the peanut cream, more chocolate flavor should be perceived (Figure 2).

Peanut Flavor. Intensity ratings for peanut flavor were equivalent to “neither weak nor strong” (5.8). This corresponded to an optimal peanut flavor (Figure 3).

Overall Flavor. Intensity ratings were equivalent to “neither weak nor strong” for overall flavor (5.4) and corresponded with optimal ratings (Figure 4).

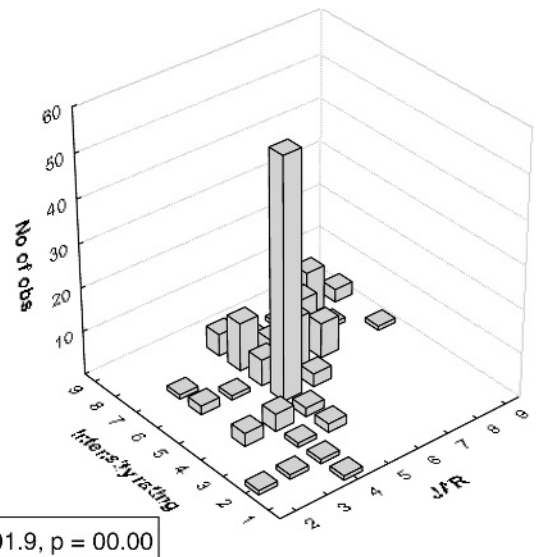


Fig. 3. Just- About- Right (JAR) ratings versus Intensity ratings of peanut flavor

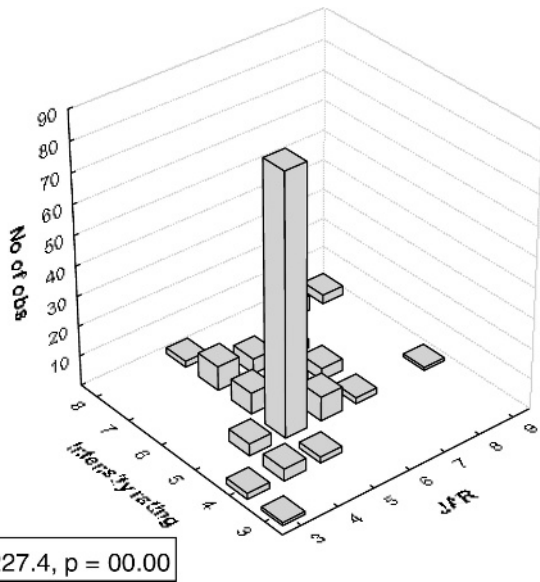


Fig. 4. Just- About- Right (JAR) ratings versus Intensity ratings of overall flavor

Texture. Texture was rated 4.3 or “slightly smooth,” however, a slightly crunchier texture was considered optimal by more consumers than a smoother product. Consumers who rated the product as smoother also rated the product less than optimal in texture (Figure 5).

Aroma. Aroma of the peanut cream was rated optimal by consumers (data not presented).

Overall Acceptance. Mean consumer ratings for overall acceptance of chocolate peanut cream are shown in Table 3. Overall acceptance of the treatment formulation was rated high ($\bar{x} = 7.3$ or like moderately). The frequencies of hedonic ratings for overall acceptance are also shown in

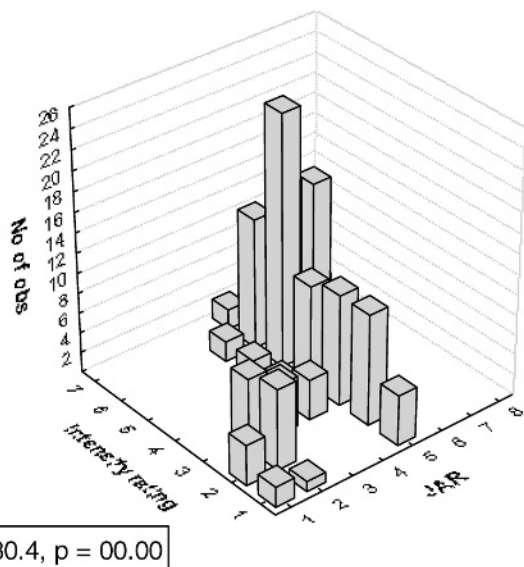


Fig. 5. Just- About- Right (JAR) ratings versus Intensity ratings of texture

Table 3. Number and percentage (in parenthesis) of panelists giving consumer ratings for overall acceptance of chocolate peanut cream (CPC) formulation (n = 152).

| Sample | Hedonic rating* | | | | | | | | | Overall** acceptance |
|--------|-----------------|---------|---------|---------|---------|---------|-----------|-----------|----------|----------------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| CPC | 0 (0) | 1 (0.6) | 2 (1.3) | 6 (3.9) | 1 (0.6) | 4 (2.6) | 56 (36.8) | 71 (46.7) | 11 (7.2) | 7.3±1.2 |

*A 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.

**No one of the ratings was found to differ by one sample t-test: *p = 0.05

Table 3. Over 50% of consumers rated the peanut cream either like very much or like extremely. The percentage of consumers that rated the overall acceptance of chocolate peanut cream as like moderately or better ($x \geq 7$) was 90.0%.

Overall, JAR ratings showed that all attributes were rated just about right by over 50 % of consumers, except for chocolate flavor (42%) indicating the need for increased perception of chocolate flavor intensity.

Conclusions

A central location test involving 152 respondents has indicated that Bulgarian consumers rated overall acceptance of chocolate peanut spread product as “like moderately”. The results demonstrated that Bulgarian consumers preferred a high degree of spreadability and a medium intensity of peanut and overall flavors. A higher intensity of chocolate flavor and texture than rated in the sample was preferred by consumers. Intensity of chocolate flavor and texture of CPC formulation needs to be increased to be perceived as optimal. Aroma was rated as optimal.

Acknowledgement

This research was supported by the Peanut Collaborative Research Support Program of US Agency for International Development, USAID grant No DAN-4048-G-0041-00.

Literature Cited

- Chu, C.A. and A. Resurreccion. 2004. Optimization of a Chocolate Peanut Spread using response surface methodology (RSM). *J. Sensory Studies*. 19:237-260.
- Lawless, H.T. and H. Heymann. 1997. *Sensory Evaluation of Food: Principles and Practices*. Chapman & Hall, New York.
- Moon, W., W.J. Florkowski, L.R. Beuchat, A.V.A. Resurreccion, M.S. Chinnan, P. Paraskova, and J. Jordanov. 1999. Effects of product attributes and consumer characteristics on attitude and behavior: The case of peanuts in a transition economy. *Agribus*. 15:411-425.
- Paraskova, P., J. Jordanov, A.V.A. Resurreccion, W. Moon, W.J. Florkowski, M.S. Chinnan, and L.R. Beuchat. 2001. Consumer acceptance of American peanut products by Bulgarian consumers. *Peanut Sci*. 28:44-48.
- Resurreccion, A.V.A. 1998. *Consumer Sensory Testing for Product Development*. Aspen Publications, Inc., Gaithersburg, MD.
- SPSS Inc. 1997. SYSTAT® 7.0 Statistics. Prentice – Hall, Inc., Chicago, IL.
- StatSoft Inc. 2005. STATISTICA®: The Small Book. Tulsa, OK.
- Stone, H. and J. Sidel. 1991. *Sensory Evaluation Practices*. Academic Press, New York, NY.