Consumer research is difficult and all available information should be taken in consideration, as individual differences between consumers, consumers’ knowledge, thinking and behaviour in the environment, and all aspects of the marketer’s promotion which influence the consumer purchase decisions [Garber et al. 2003, Grunert et al. 2010, Becker et al. 2011]. Not everyone likes or appreciates, or is familiar with every food category and its composition or processing method [Wurdemann et al. 2011], therefore, it is important in consumer studies to incorporate subjects which are representative of those who like and are regular consumers of certain food on the target market. Unfortunately, there are not enough published...
investigations concerning food choice, knowledge on food quality and preference of college students, as young consumers from Bosnia and Herzegovina.

Consumers’ food preference

Many factors shape consumers’ food preference, as personal roles and experiences, social, cultural and physical environments to which a person has been exposed [Wansink et al. 2003, Davies and Smith 2004, Tengvall and Ellegard 2007, Hamadeh and Marquis 2008, Batrinou and Kanellou 2009, Dickson-Spillmann et al. 2011]. Life course generates a set of influences (ideals, personal factors, resources, social framework and food context) and shapes people’s personal systems. Personal system includes conscious value negotiations, as sensory perceptions, monetary considerations, convenience, health and nutrition, quality, and managing relationships [Davies and Smith 2004, Hamadeh and Marquis 2008]. Davies and Wright [1994] revealed that consumers perceived unhealthiness of additives, do not read labels, and half of all respondents were unable to give a single example of a food additive.

MONOSODIUM GLUTAMATE USE, SAFETY AND FOOD PALATABILITY

Consumers express concerns about chemicals in their diet [Dickson-Spillmann et al. 2011]. Additives are chemical substances that should be used in accordance with good manufacturing practice, at a level not higher than is necessary to achieve the intended purpose and provided that they do not mislead the consumer. Taste plays a major role in determining food palatability, which promotes selection, intake, absorption and digestion of foods. Umami is a characteristic taste imparted by glutamate, which is naturally present in many foods and play important roles in the taste, palatability and acceptability of foods increasing the flavour characteristics, mouth fullness, impact, mildness and thickness or enjoyment of the food around the world [Garattini 2000, Halpern and Ninomiya 2000]. Monosodium glutamate (MSG) is flavour enhancer, additive which enhances the existing taste and/or odour of a foodstuff [European... 1995]. The total dietary intakes of glutamates, arising from their use at levels necessary to achieve the desired technological effect do not represent a hazard to health. The results of the conducted research suggested that large doses of MSG given without food may elicit some symptoms, but they were not observed when MSG was given with food [FSANZ 2000, Garattini 2000, Geha et al. 2000, Walker and Lupien 2000]. Purity criteria for the monosodium glutamate (E621) are established [Commission... 2001] and maximum level of use monosodium glutamate is 10 g·kg⁻¹, which refer to foodstuffs in general ready for consumption and prepared following manufacturers’ instructions (with some exceptions), and in condiments and seasonings is used in quantum satis [European... 1995].

Additives have important role in food production. They are added to food to achieve, modify and maintain its technological and sensory quality, or to enhance convenience for the consumers. Educated young people are the creators of the future of society, and their knowledge about food quality and nutrition can affect the entire interests of society, and on the offer, selection and consumption of food, health and working ability of residents and on the social and economic situation in Bosnia and Herzegovina as developing country.

The present research was aimed at survey of highly educated young consumers’ knowledge about food quality and food additives and its impact on food choice within the observed population, grouped based on: (1) education and (2) gender.

METHODOLOGY OF THE SURVEY

Participants

The study included 109 students (54.13% or 59 were female and 45.87% or 50 were male) ages 22-33 (mean age = 25), in the final years of undergraduate study at the University of Banja Luka, Bosnia and Herzegovina (BA), grouped, based on education and on gender. A-group had 47% of surveyed or 51 (68% female and 32% male) students of the third and fourth year of undergraduate study on Faculty of Food Technology and Nutrition, including all available students, young consumers with fundamental knowledge on food quality and food additives. Formed B-group was similar size, with 58 students of other faculties (42% female and 58% male) or 53% of the surveyed, of whom, none of them had nutrition or food science
course. They were observed as representatives of average young consumers. It was not possible to influence the number of females and males, so that status was only registered.

**Procedure**

The study was realized on the University of Banja Luka (BA), offering the students printed form with list of prepared questions or statements, to which they answered YES or NO. They spent approximately 10 minutes on answers. The questionnaire consisted of questions divided into the groups. The first part of the questionnaire (a) contained 6 questions with personal data (name of faculty, years of study, age, gender, health and economic status). The other questions referred to the importance of individual factors for consumers’ food choice, and were as follows: (b) 8 questions related to the fundamental knowledge on food quality and food additives; (c) 8 questions related to the nutrition and desire to consume food that contains additives; and the last contained (d) 5 questions related to knowledge on monosodium glutamate (MSG) and desire to consume food containing additive MSG.

**Data analysis**

The Statistical Analysis and testing hypotheses was used to conduct all the analyses of this study with the level of significance $p < 0.05$. The comparison data between the responses from A-group and B-group, also between male and female subjects were performed by Chi-square analysis ($\chi^2_{0.05} = 3.841$; $p < 0.05$) to determine students’ current eating preferences and knowledge [StatistiXL Toolpak SPSS 1.8 for Microsoft Excel Analysis].

**RESULTS AND DISCUSSION**

**Economic status influence on food consumption**

One of the most important parameters influencing food consumption pattern are income level and lack of nutrition knowledge. Unusan [2006] found that the problem is not just in the unavailability of foods, but its uneven distribution among socio-economic, gender and age groups. O’Key and Hugh-Jones [2010] explained food choice related to the culture, and mothers impact on their children’s dietary needs and preferences.

In the first part of the questionnaire in our study, students answered questions with personal data, as name of their faculty, years of study, personal age, gender, health and economic status. Based on the data, breakdown by economic status was neglected during the test, because of unequal relations between subjects: a greater number of respondents (86.24%) answered that they had satisfactory, and a small number of respondents (13.76%) that they had a low standard of living.

**Impact of health on nutrition**

There is still a large number of investigators who reported the results obtained using questionnaires about attitudes and values and relating their results to actual food choice [Köster 2003]. Ready meal consumption could be dependent on sensory- and health-related aspects [Costa et al. 2003, 2004, 2007]. Family have important impact on development of attitudes and behaviours that promote health and prevent disease, childhood food preferences [Kowalczuk 2007] and university students’ food preferences development [Unusan 2006].

In our survey, due to the large differences in the number of respondents, the impact of health on nutrition could not be examined, as health status had no impact on the nutrition for 92.66% respondents of the total population surveyed and for 7.34% respondents of the total population, health had impact on nutrition. Analysing the results, it was concluded that there was no statistically significant difference ($\chi^2 = 0.856$, $p < 0.05$) between the responses from A-group and B-group related to the need for a special diet.

**Consumers’ fundamental knowledge on food quality and food additives**

The new position of the consumer in formation of product quality and the market justifies the necessity to pay special attention to learning consumers’ needs, expectations, preferences, behaviours and factors affecting it. Knowledge of these factors and relations between them creates an opportunity of a greater influence of the choice, acceptance and consumption of certain food products [Eertmans et al. 2006, Costa et al. 2007, Rybowska and Babicz-Zielińska 2007]. Authorized institutions must ensure quality control and safety products that are offered on the market.
Acknowledgement from our research that the most of students from A-group and from B-group, answered that there is not enough food products quality control on the BA market (questions no. 1 in Table 1), could be seen as alarming.

A better appearance and pleasant taste of some food products is achieved using food additives. In our study, the most respondents from A-group showed high level of knowledge when asked why additives are added to food, and confirmed statements about additives function in preservation of food quality, use of MSG as a flavour enhancer, food regulations and a list of additives whose use is permitted (Table 1). On the other side, respondents from B-group showed less knowledge (Table 1) and some of them did not know or didn’t answer on the questions related to the food

Table 1. Questions and statements with responses of A-group and B-group, expressed in percents

<table>
<thead>
<tr>
<th>Questions and statements related to the fundamental knowledge on food quality and food additives</th>
<th>Responses of A-group %</th>
<th>Responses of B-group %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Is there enough control of quality of food products on the market of BA?</td>
<td>4 yes 96 no didn’t respond</td>
<td>12 yes 78 no didn’t respond</td>
</tr>
<tr>
<td>2. Do you know why the additives are added to food?</td>
<td>98 yes 2 no didn’t respond</td>
<td>60 yes 38 no didn’t respond</td>
</tr>
<tr>
<td>3. Additives allow the preservation of food quality.</td>
<td>94 yes 6 no didn’t respond</td>
<td>59 yes 33 no didn’t respond</td>
</tr>
<tr>
<td>4. In food regulations there are a list of additives whose use is permitted.</td>
<td>98 yes 2 no didn’t respond</td>
<td>69 yes 17 no didn’t respond</td>
</tr>
<tr>
<td>5. A better appearance and pleasant taste of some food products is achieved using food additives.</td>
<td>98 yes 2 no didn’t respond</td>
<td>88 yes 9 no didn’t respond</td>
</tr>
<tr>
<td>6. Consuming “fast food” increases the risk of obesity and health problems.</td>
<td>98 yes 2 no didn’t respond</td>
<td>91 yes 9 no didn’t respond</td>
</tr>
<tr>
<td>7. Monosodium glutamate (MSG) E 621 is an additive with flavour enhancer property.</td>
<td>80 yes 16 no 4 didn’t respond</td>
<td>29 yes 24 no 4 didn’t respond</td>
</tr>
<tr>
<td>8. Have you noticed the product on the market that contains monosodium glutamate (MSG) or E 621?</td>
<td>41 yes 55 no 4 didn’t respond</td>
<td>16 yes 50 no 4 didn’t respond</td>
</tr>
<tr>
<td>9. I eat just because I have to, to maintain normal functioning of my body.</td>
<td>20 yes 80 no didn’t respond</td>
<td>47 yes 52 no didn’t respond</td>
</tr>
<tr>
<td>10. I enjoy in food consumption.</td>
<td>92 yes 8 no didn’t respond</td>
<td>71 yes 29 no didn’t respond</td>
</tr>
<tr>
<td>11. I try to eat properly.</td>
<td>88 yes 6 no 6 didn’t respond</td>
<td>59 yes 41 no didn’t respond</td>
</tr>
<tr>
<td>12. I avoid food products that contain artificial sweeteners.</td>
<td>53 yes 47 no didn’t respond</td>
<td>43 yes 57 no didn’t respond</td>
</tr>
<tr>
<td>13. I avoid food products that contain additives.</td>
<td>16 yes 84 no didn’t respond</td>
<td>31 yes 67 no didn’t respond</td>
</tr>
<tr>
<td>14. I like to eat soup from bag and soup in a cube, easy preparing instant products.</td>
<td>41 yes 59 no didn’t respond</td>
<td>60 yes 40 no didn’t respond</td>
</tr>
<tr>
<td>15. I like salty, ready to eat meals, which are prepared by heating in a microwave oven.</td>
<td>10 yes 90 no didn’t respond</td>
<td>34 yes 64 no didn’t respond</td>
</tr>
<tr>
<td>16. I like to eat salty meals and soups in which are the “mixtures of seasonings with vegetables” added during preparation.</td>
<td>45 yes 55 no didn’t respond</td>
<td>57 yes 40 no didn’t respond</td>
</tr>
</tbody>
</table>

people in post-industrial societies are faced with many food products and diverse eating situations that can make food-choice decisions complex [Connors et al. 2001]. Preferences for specific product characteristics vary with different types of consumption situations, food product use and product knowledge [Kowalczik 2004, Costa et al. 2007]. Food purchasing intentions are influenced with education and information on the importance of healthy eating and living [Kowalczik 2007, Lobb et al. 2007, Al-Khamees 2009]. Lack of knowledge and products inadequate labelling explains the discrepancy between concern over additives and purchase behaviour [Davies and Wright 1994].

Table 2. Comparison of YES responses between A-group and B-group at the level of the total observed population and responses between the group of female and male subjects

<table>
<thead>
<tr>
<th>Questions and statements related to the fundamental knowledge on food quality and food additives</th>
<th>YES responses of total population</th>
<th>YES responses of A-group</th>
<th>YES responses of B-group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumers’ fundamental knowledge on food quality and food additives (questions no. 2-8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\chi^2 = 40.05^*$</td>
<td>546</td>
<td>57</td>
<td>43</td>
</tr>
<tr>
<td>Nutrition and desire to consume food that contains additives (questions no. 9-16)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\chi^2 = 1.704$</td>
<td>422</td>
<td>45</td>
<td>55</td>
</tr>
<tr>
<td>Knowledge on MSG (questions no. 7-8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\chi^2 = 14.510^*$</td>
<td>85</td>
<td>73</td>
<td>27</td>
</tr>
<tr>
<td>Desire to consume food containing additive MSG (questions no. 14-16)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\chi^2 = 12.499^*$</td>
<td>137</td>
<td>36</td>
<td>64</td>
</tr>
</tbody>
</table>

* $p < 0.05$; $\chi^2_{0.05} = 3.841$. 

www.food.actapol.net/
Comparison responses of A-group and B-group showed that there was no statistically significant differences ($\chi^2 = 1.704$, $p < 0.05$) in habits between the groups related to the nutrition and desire to consume concentrates of soups as soup from bag and soup in a cube, or other food products that contains additives (questions no. 9-16). These findings confirmed calculation on relationship between groups A and B expressed in percentage (Table 2), and for comparison of female and male subjects’ answers (Table 3). Comparing the level of total tested population, attitude and habits of female and male young people in terms of nutrition, whether they enjoy the food consumption, whether they are trying to feed properly, to avoid the additives in food and the like (questions no. 9-16 in Table 1), it was concluded that among them there was no statistically significant difference ($\chi^2 = 2.356$, $p < 0.05$) and that they have similar habits regarding nutrition (Table 3).

Young adults between ages 18 and 34 changes their eating habits and lifestyle comparing to the period under parents controlling food intake. Use of different kinds of concentrates of food in nutrition depends on such social and economical factors as age, education, income and place of living [Kowalczuk 2004]. The relationship between food-related personality traits, specific food choice motives and food intake were investigated [Noble et al. 2003, Eertmans et al. 2005, Kobayashi 2009]. Aspects of food quality and nutrition appear to have a fundamental impact on happiness [Blades 2009]. Good appearance and taste of food lead to consumption of meals. A poor taste, a relatively high price and health considerations are a major obstacle in food choice. Costa et al. [2007] connect food choice with the desire of young people to have more time for other daily activities.

In our study, subjects appeared to be worried about the effects of food consumption on diet and health. Most of respondents from group A and less from group B answered that they try to eat properly (Table 1), but some of them confirmed the statement that they eat just because they have to and to maintain normal functioning of the body. It is encouraging to realise that a large number of students from group A (Table 1) said that they enjoy food consumption and in that way confirmed their commitment to work in the field of food production.

### Table 3. Comparison of YES responses between female and male subjects at the level of the total observed population and classified within A-group and B-group

<table>
<thead>
<tr>
<th>Questions and statements related to the fundamental knowledge on food quality and food additives</th>
<th>YES responses of total population</th>
<th>YES responses of female</th>
<th>YES responses of male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumers’ fundamental knowledge on food quality and food additives (questions no. 2-8)</td>
<td>sum</td>
<td>female</td>
<td>male</td>
</tr>
<tr>
<td></td>
<td></td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Nutrition and desire to consume food that contains additives (questions no. 9-16)</td>
<td>546</td>
<td>58</td>
<td>42</td>
</tr>
<tr>
<td>Knowledge on MSG (questions no. 7-8)</td>
<td>422</td>
<td>52</td>
<td>48</td>
</tr>
<tr>
<td>Desire to consume food containing additive MSG (questions no. 14-16)</td>
<td>80</td>
<td>59</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* $p < 0.05$; $\chi^2_{0.05} = 3.841$. 

**Nutrition and desire to consume food that contains additives**

Comparison responses of A-group and B-group showed that there was no statistically significant differences ($\chi^2 = 1.704$, $p < 0.05$) in habits between the groups related to the nutrition and desire to consume concentrates of soups as soup from bag and soup in a cube, or other food products that contains additives (questions no. 9-16 in Table 1). These findings confirmed calculation on relationship between groups A and B expressed in percentage (Table 2), and for comparison of female and male subjects’ answers (Table 3). Comparing the level of total tested population, attitude and habits of female and male young people in terms of nutrition, whether they enjoy the food consumption, whether they are trying to feed properly, to avoid the additives in food and the like (questions no. 9-16 in Table 1), it was concluded that among them there was no statistically significant difference ($\chi^2 = 2.356$, $p < 0.05$) and that they have similar habits regarding nutrition (Table 3).

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and quality control. The outcome of our study suggests that delicious meals that are semi-prepared or easily prepared could constitute a preferred type of meal of young population, results similar to findings of other surveys [Costa et al. 2003, Wansink et al. 2003].

**Knowledge on MSG and desire to consume food containing additive MSG**

Over the last decade consumers have become increasingly concerned by health risks posed by food consumption. To determine whether awareness of consumers about food additives, the questionnaire included questions related to the knowledge on MSG and desire to consume food containing additive MSG. Comparison of the differences between responses from group A and group B, in terms of knowledge on additive MSG (questions no. 7, 8 in Table 1) it was concluded that the attitudes of these groups differ significantly ($\chi^2 = 14.510$, $p < 0.05$). Those findings confirmed number of YES answers (Table 2), and can be concluded that students from the Faculty of Food Technology and Nutrition (A-group), as result of their education have shown more knowledge about the additive MSG, than other students (B-group). Comparing the level of the total tested population, knowledge of female and male subjects on additive MSG, it was found that there was no a statistically significant difference ($\chi^2 = 1.310$, $p < 0.05$) between subjects (Table 3).

In our study, responses of groups A and B regarding the desire to consume concentrates of soups, food containing additive MSG or food prepared in microwave oven, were compared (questions no. 14, 15, 16 in Table 1), and it was concluded that the attitudes of these groups differ significantly ($\chi^2 = 12.499$, $p < 0.05$). Calculating relationship of YES answers between the A and B groups responses (Table 2) showed that students from group A, expecting to have more knowledge about the additives, have shown more awareness in choices of food containing additives and MSG as flavour enhancer, than students from group B. Comparing the level of the total tested population, attitude of female and male subjects in desire to consume food containing flavour enhancer MSG (Table 3), it was found that there was no statistically significant difference between the subjects ($\chi^2 = 3.613$, $p < 0.05$).

The findings of our study are similar to those of Costa et al. [2007] and indicate that the meals composition and quality are associated with the health-related aspects for some consumers. Therefore, negative evaluation of the wholesomeness, nutritional and sensory quality of some meals containing food additives could become a reason to avoid them.

**CONCLUSIONS**

This study was aimed at survey of undergraduate student’s knowledge on food quality, food additives and nutrition impact on food preference. Our findings show that students with fundamental knowledge on the food quality and food additives had more awareness in choices of food they prefer to consume than other students, representatives of average young consumer. Consumers with less knowledge on the food quality, food additives and nutrition are likely to have difficulty in understanding of the additives role and safety use in food processing. Actions on young consumers’ education are recommended as contribution to protecting the health, safety, economic and legal interests of consumers and society.

**REFERENCES**


O’Key V., Hugh-Jones S., 2010. I don’t need anybody to tell me what I should be doing’. A discursive analysis of maternal accounts of (mis)trust of healthy eating information. Appetite 54, 524-532.


