Potravinarstvo Slovak Journal of Food Sciences

Slovak Journal of
Food Sciences

EGGS AND THEIR CONSUMPTION AFFECTED BY THE DIFFERENT FACTORS OF PURCHASE

Dagmar Kozelová, Dana Országhová, Eva Matejková, Martina Fikselová, Elena Horská, Dominika Ďurdíková, Renata Matysik-Pejas

ABSTRACT

Consumers' buying behavior and preferences are affected by many factors such as the product quality, price, labeling and country of origin. The objective of this paper was to examine the opinions of the Slovak consumers about the purchase and consumption of eggs and identify their preferences at egg purchase. The input data were obtained using a questionnaire survey. The method of descriptive statistics and selected methods of measuring dependence or associations were used. The existence of statistically significant relationships was verified by the Pearson chi-square test or by the Fisher's exact test. The statistical proof of relationships was evaluated based on the significance of the test characteristic (*p*-value). The existence of dependence between the most important factor affecting purchasing of eggs - a price of eggs, and the age of the respondent - was confirmed. Further, the relationship between the preferred place of buying eggs and the classification criterion was also proved, i.e. whether a respondent is a breeder of the egg type of hens or not. The relationship between the preferred place of buying eggs and the gender of a respondent was confirmed as well. There was determined the dependence on the gender of a respondent in the question related to eggs consumption.

Keywords: egg consumption; consumer behavior; preferences; purchasing place; Fisher's exact test

INTRODUCTION

Eggs are one of nature's the most nutritious foods, with low content of saturated fat and high content of protein. It remains a popular ingredient in cooking worldwide (**Fang et al., 2012**). Egg white proteins (EWPs) are well established as a valuable source of dietary nitrogen, but recently, these proteins have reclaimed scientist's interests due to a number of new discovered biological functions (**Ruan et al., 2010**). Additionally, EWPs possess very important functional properties, which make them very important ingredients for food products (**Jing et al., 2011).** Eggs are also good dietary sources of choline, vitamin A, vitamin D, iron, conjugated linoleic acid (CLA) and lutein (**Fang et al., 2012**).

The Food and Agriculture Organization of the United Nations estimates that about 795 million people of the 7.3 billion people in the world, or one in nine, were suffering from chronic undernourishment in 2014 – 2016. Millions of children were malnourished in the same time (**World Hunger, 2015**).

The idea of providing cheap, accessible and valuable source of protein and energy is also dominant in "bottom of the pyramid market approach" (**Prahalad 2014; Horská et al., 2014; Paluchová and Prokeinová, 2014**). Even more, many research studies were accomplished

regarding enrichment of eggs with different micronutrients as omega-3 fatty acids, selenium and vitamin E through nutritional manipulations without deteriorating egg internal and organoleptic qualities (**Hayat et al., 2014**). **Angelovičová et al. (2013)** observed the effect of dietary probiotics *Bacillus subtilis (PB6)* on egg weigh, egg mass weigh, egg fat content and cholesterol content in egg yolk in laying hens. **Arpášová et al. (2012)** evaluated the influence of probiotic preparation based on lactobacillus, oregano essential oil, sumac (*Rhus coriaria*), propolis and pollen on egg quality parameters of laying hens.

In accordance with the law, from January 1st, 2012 Slovak producers of eggs do not keep laying hens in barren battery cages and sell only eggs from enriched breeding. Laying hens had to be moved from barren cages into bio breeding, or in barn systems with free range and barn systems cages with perch – enriched cages. Implementation of these EU directives ensured the welfare in breeding of laying hens. Welfare provides physical and mental health of the animal, comfort in accordance with the environment in which it lives, as well as reducing the incidence of stressful situations to a minimum. Due to changes in technology of keeping hens there was a significant increase in the cost of egg production, which is

reflected in the price of table eggs and the purchasing patterns of Slovak consumers.

Scientific hypothesis

The purpose of this study was to monitor consumer's preferences at buying eggs. We verified the validity of the following hypotheses:

Hypothesis H1: We assume the existence of dependence between the place of buying eggs and a respondent's age (or gender, or layer breeding).

Hypothesis H2: We assume the existence of dependence between the impact factor egg purchase and respondent's age (or gender, or layer breeding).

Hypothesis H3: We assume the existence of dependence between the frequency of egg consumption and respondent's age (or gender, or layer breeding).

MATERIAL AND METHODOLOGY

The primary data originated from the questionnaire survey, performed during the year 2016 in the Slovak districts of Turčianske Teplice, Martin and Nitra. The sample of 200 respondents answered to seven questions, out of them three were classification ones (age and gender). The questions were aimed at finding consumers` opinions and their preferences at purchase and consumption of eggs.

1. Which factor is the most important at egg purchase?
2. Which is the most preferred place for your egg purchase?
3. How often do you eat eggs?
4. Do you keep laying hens?

In the selected sample of 200 respondents there was approximately equal representation of both genders (54.5% women and 45.5% men). By the age structure the most represented group was from 20 to 30 years (24%), the second one was from 31 to 40 years (22.5%), followed by the category from 41 to 50 years (21%) and from 51 to 60 years (19.5%). The smallest one was the age group from 61 and more (13 %). In our survey we were also interested in the percentage of consumers who keep hens. We determined that 24.5% of respondents breed hens at home.

Statisic analysis

The first method, used for testing the hypotheses, was the statistical method – Chi-Square Goodness of Fit Test test of independence. The chi-squared statistic of this test is given by the following formula: $\chi^2 = \Sigma\ [\ (O_i - E_i)^2\ /\ E_i\ ]$, where O_i is the observed frequency count for the *i*th level of the categorical variable, and E_i is the expected frequency count for the *i*th level of the categorical variable.

The basic prerequisite for the use of this test is that expected value of the number of sample observations in each level of the variable is at least 5. If this condition is not met, then the incorrect conclusions can be obtained. In this case it is possible to use the Fisher's exact test, which is the part of output SAS Enterprise Guide after identification. Fisher's exact test is also known as Freeman-Halton test, which is described in detail in the

source: http://support.sas.com/documentation/cdl/en/procstat/63963/HTML/default/. In the paper the conclusions of hypotheses were achieved based on p-value, which is the part of outputs in the tables. It is stated: if p-value < a, then H0 hypothesis is refused.

Within the measurement of associations we also dealt with the degree of association between the studied characteristics. It is possible to measure the intensity (or power) of dependences by several means of statistics. In our paper we consider the measures which are the part of the output of SAS Enterprise Guide. The measures are following: Phi Coefficient, Contingency Coefficient, and Cramer's V Coefficient. As we utilized the table r x s, the given coefficients acquire the values from the interval from 0 to 1, where the high value indicates the high degree of association. The particular measures are also described in detail in the source: http://support.sas.com/documentation/cdl/en/procstat/63963/HTML/default/viewer.htm#procstat_freq_a0000000561.htm.

Analyzes, calculations and graphical outputs were carried out in statistical software SAS Enterprise Guide 5.1 and in MS Excel 2013.

RESULTS AND DISCUSSION

The annual egg consumption per inhabitant should be 11.2 kg. The egg consumption in Slovakia was 200 pieces (12.2 kg) in 2015, that means higher recommended dose by 1.0 kg. Until now the highest egg consumption (13.3 kg) was recorded in 2012. As **Jamborová (2016)** states the egg consumption can be influenced by the supply on the domestic market, purchasing power of inhabitants and price.

We asked about the place where the respondents do shopping of eggs. 43 respondents (21.5%) claimed that they buy eggs directly from the hens` farms, 62 respondents (31%) buy them from poultry plants, 76 respondents (38%) in the food stores and 19 (9.5%) buy eggs elsewhere (Figure1). We can conclude that the consumers buy eggs most frequently from food stores (38%) or poultry plants (31%).

We can compare our results with **Fiľa and Tóthová (2013)**; they state about the direct sale advantage in promoting the local economy, increasing employment in the region, reduction of transport costs as well as consolidation relations in the region. In relation farmer - consumer, there is a direct relationship between the seller and the buyer. Other benefits for producer are demand, development regarding consumers' needs, supporting social network. Food quality, transparent prices, contact with soil and animals belong to benefits for consumer **(Chreneková et al., 2015)**.

Research objective was focused also on the fact if the age of consumers (or gender, or breeding resp. non-breeding) has the impact on the shopping place, i. e. we verified the validity of our first hypothesis (H1). The obtained results of the statistical testing are given in the Table 1.
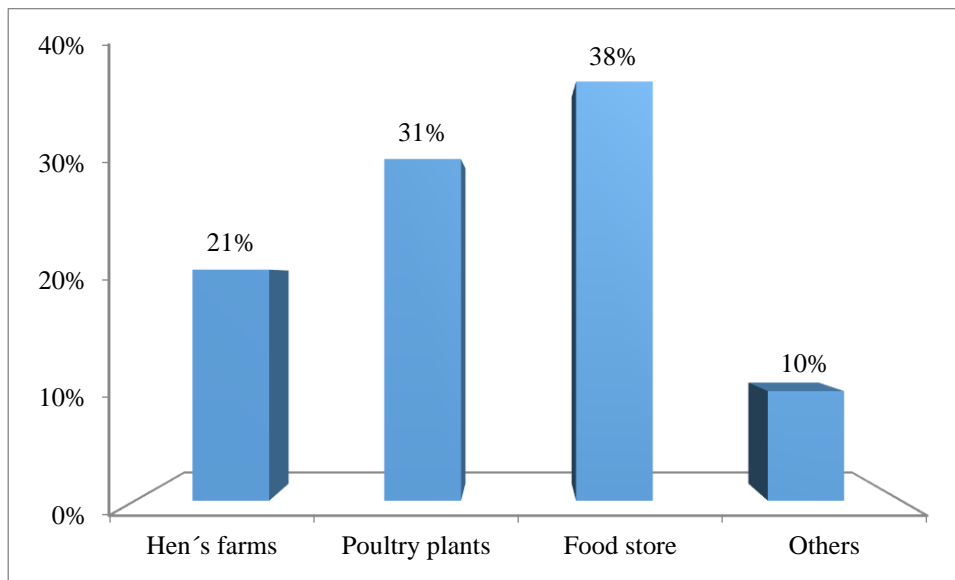
Figure 1 The most preferred place for the egg purchase. Source: own processing in MS Excel.

Table 1 The results of the statistical testing to the question: The most preferred place for the egg purchase.

Statistic	Ownership of laying hens		Gender		Age	
	Value	*p*-value	Value	*p*-value	Value	*p*-value
Chi-Square	43.2421	**0.0000**	17.1911	**0.0006**	10.8538	0.5415
Fisher's Exact Test		1.08E-08		6.62E-04		
Phi Coefficient	0.4650		0.2932		0.2330	
Contingency Coefficient	0.4216		0.2813		0.2269	
Cramer's V	0.4650		0.2932		0.1345	

Note: Source: Own calculation in the system SAS Enterprise 5.1.

The results in the Table 1 indicate that statistically significant dependence was proved between preferred place and the customer gender (p-value 0.0006); moreover, significant dependence exists between preferred place and layer breeding (*p*-value 0.0000). When evaluating the degrees of the tightness of dependence (Phi Coefficient, Contingency Coefficient, Cramer´s V) more important factor on the place of buying eggs is the fact if the respondents keep or do not keep layers (we can say it is medium strong dependence). A moderate dependence (around value 0.3) occurred in the gender of respondents.

Figure 2 shows that women prefer buying eggs from the food stores and poultry plants, while men prefer buying eggs directly from the layer breeders.

Regarding the preferred purchase place with respect to the own keeping of hens (Figure 3), if consumer does not have the possibility to have own production, they prefer to buy eggs from the poultry plants and food stores. Part of respondents buys sometimes eggs from farmers; the majority of respondents still prefer food stores. As **Fil'a et al. (2013)** state this may be caused by the lack of advertising marketing activities from the side of producers. As it is generally known, main reason why people prefer large shopping centers is the fact they can find everything they need under one roof. They do not have time to travel to several different shops neither to visit some local farms.

The next question related to the different factors influencing the respondents at egg purchase. Figure 4

demonstrates that the respondents considered to be the most important factor the price (34% respondents). The following significant factor was own experience (24%), or the origin (22%).

At food purchase, price seems to be the most important factor. However, we can see that also some sustainable attributes show a certain growing dominance, especially the methods of rearing of laying hens. Sustainable consumption patterns should be the part of the solution to the sustainability problem, including animal welfare as the food value for consumers **(De Bakker and Dagevos, 2012)**. Also in research of **Annunziata and Scarpato (2014)** was found that among the factors affecting consumers' attitude towards food products with sustainable attributes belong animal welfare, together with environmental impact.

The existence of dependence in the question about the importance of different factors for respondents was also verified by the statistical procedures (Table 2).

The results in Table 2 indicate that there is the dependence between the considered factors which have impact on the egg purchase and the respondents` age. Based on the degrees of tightness we can claim the moderate even medium strong dependence.
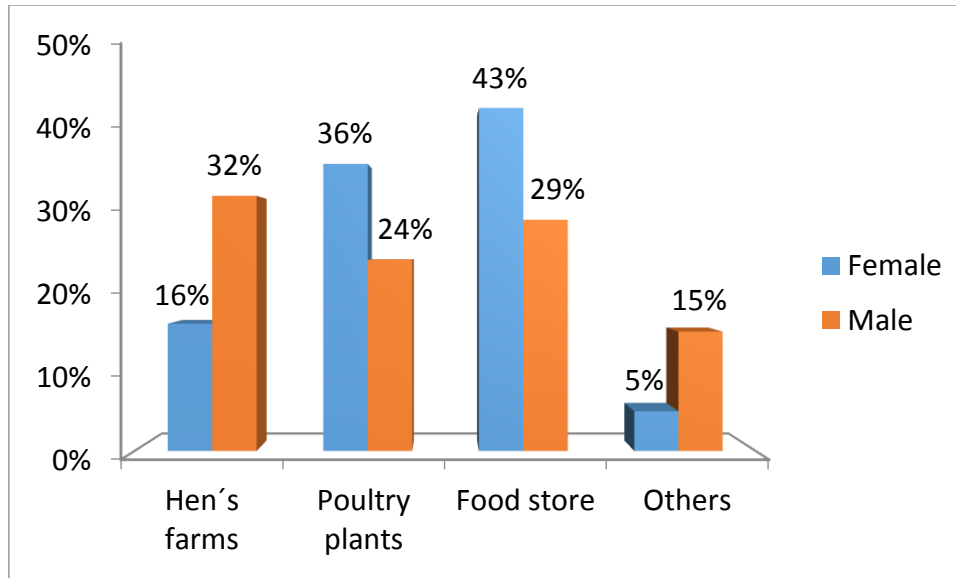
Figure 2 Preferred purchase place with respect to the gender. Source: own processing in MS Excel.
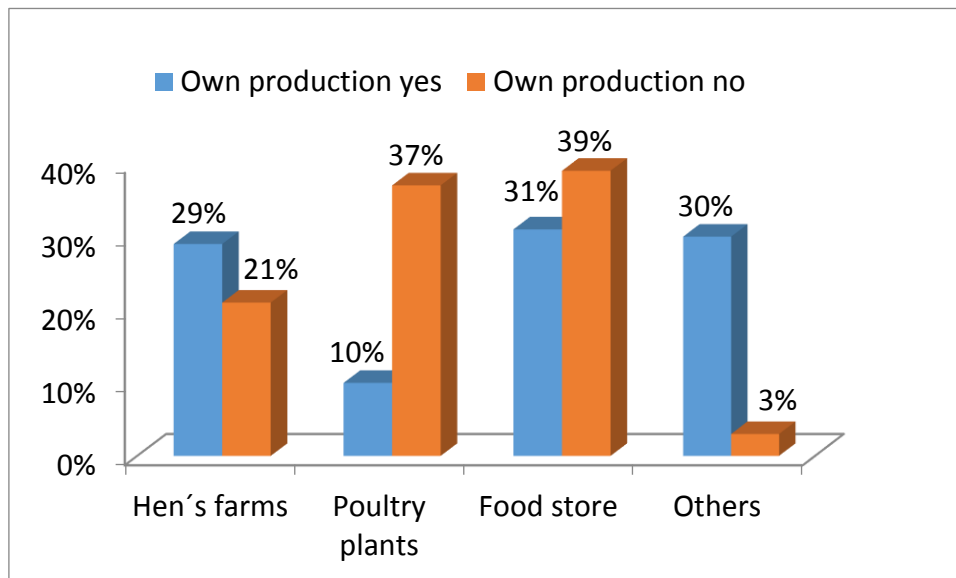

Figure 3 Preferred purchase place with respect to the own keeping hens. Source: own processing in MS Excel.
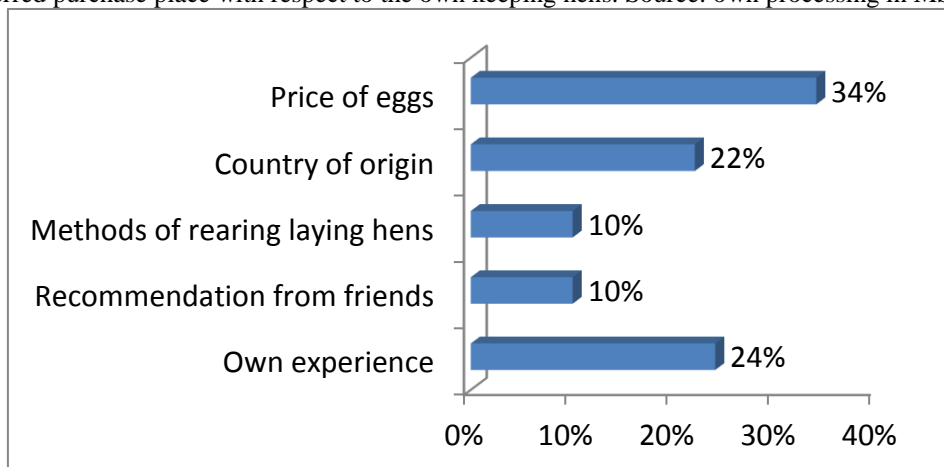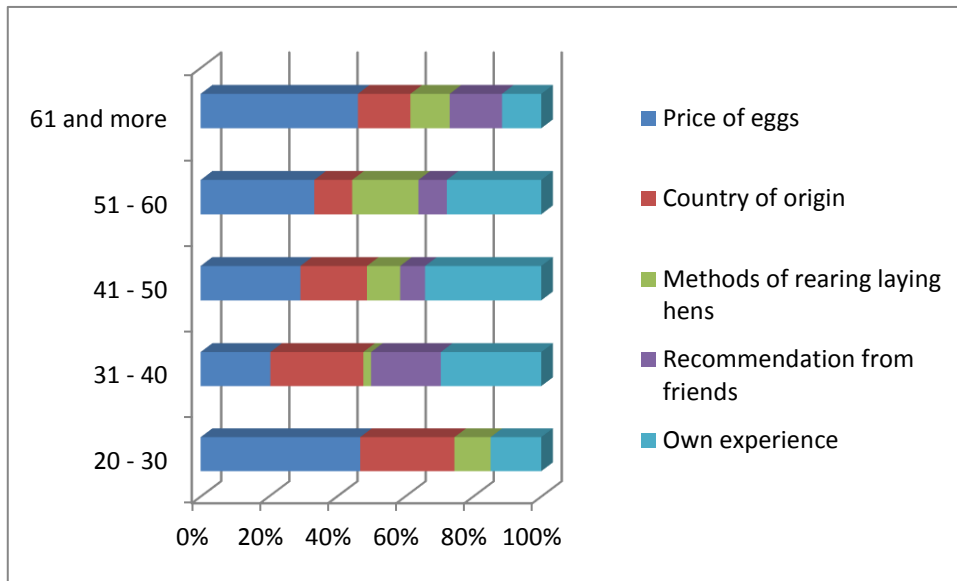

Figure 4 Preferred factor at egg purchase. Source: own processing in MS Excel.
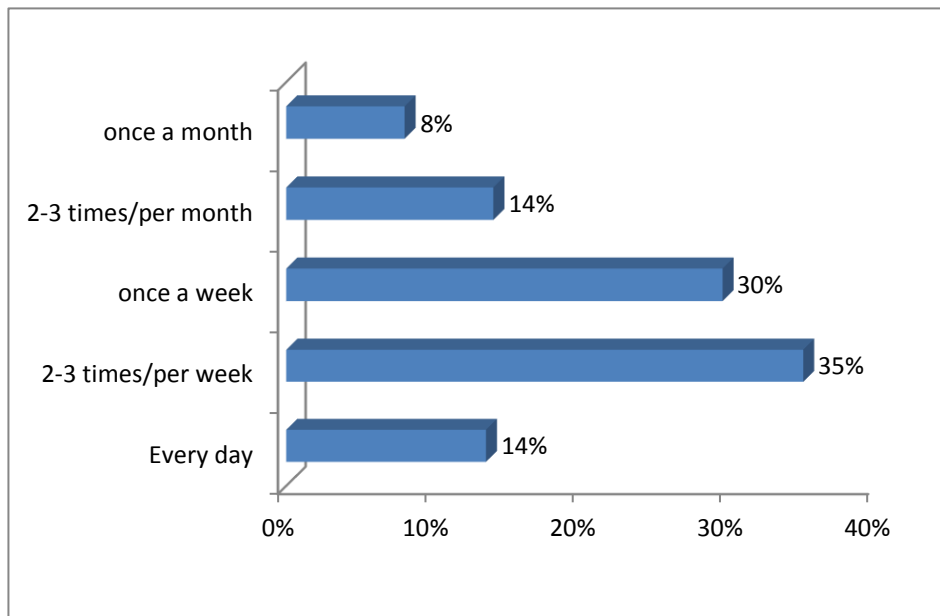
Table 2 The results of the statistical testing to the question: *Preferred factor at egg purchase.*

Statistic	Ownership of laying hens		Gender		Age	
	Value	*p*-value	Value	*p*-value	Value	*p*-value
Chi-Square	9.0708	0.0594	7.5728	0.1085	32.7537	**0.0080**
Fisher's Exact Test		5.62E-02		1.11E-01		
Phi Coefficient	0.2157		0.1971		0.4098	
Contingency Coefficient	0.2108		0.1933		0.3792	
Cramer's V	0.2157		0.1971		0.2049	

Note: Source: Own calculation in system SAS Enterprise 5.1.

Figure 5 Preferred factors at egg purchase with respect to the age. Source: own processing in MS Excel.

Figure 6 Frequency of egg consumption. Source: own processing in MS Excel.

Table 3 The results of the statistical testing to the question: *The frequency of egg consumption.*

Statistic	Ownership of laying hens		Gender		Age	
	Value	*p*-value	Value	*p*-value	Value	*p*-value
Chi-Square	3.1603	0.5314	11.5898	**0.0207**	16.7043	0.4050
Fisher's Exact Test		5.50E-01		1.89E-02		
Phi Coefficient	0.1257		0.2407		0.2890	
Contingency Coefficient	0.1247		0.2340		0.2776	
Cramer's V	0.1257		0.2407		0.1445	

Note: Source: Own calculation in SAS Enterprise 5.1 system.

Figure 7 The consumption frequency with respect to the gender. Source: own processing in MS Excel
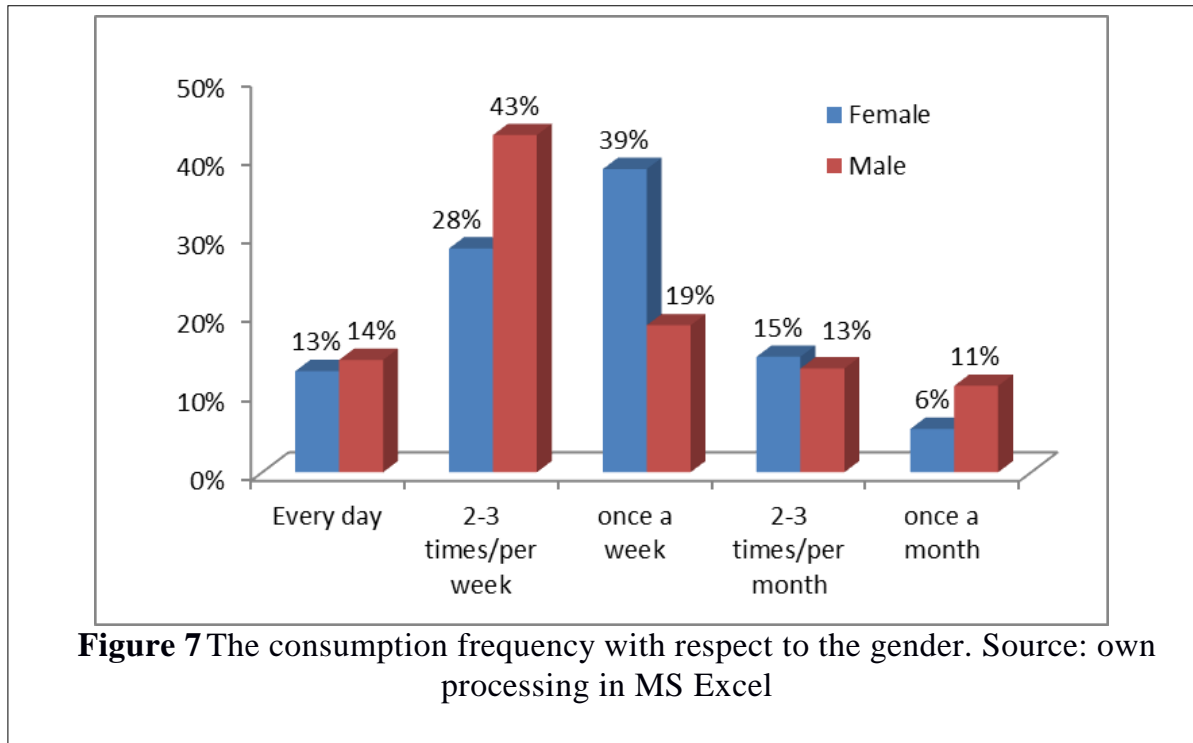
Figure 5 shows that the egg price is the most important for the young people (20 – 30 years old), older people and the retired (61 and more). The essential factor for the people in the productive age (31 – 50) is their own experience. Therefore the hypothesis H2 was affirmed only in the relation to age. From the viewpoint of gender, or breeding/non-breeding of layers we did not refuse the null hypothesis, i.e. men and women are influenced by the considered factors of egg purchase equally. The fact, whether they breed or not breed the layers, similarly it does not have impact on the consumers from the aspect of the determined factors, which can influence at egg purchase.

The last presented question is the issue related to the frequency of egg consumption. The respondents were offered to select among five options: from the daily egg consumption to the consumption once a month. The Figure 6 indicates that the consumers eat eggs mostly 2 – 3 times a week (35%), or once a week (30%). Further, 8% of respondents consume eggs once a month minimally; on the contrary, 14 % respondents consume eggs every day.

Apart from the positive impact of the nutritional value of eggs it is possible to remind that hens´eggs contain allergens which can cause the immediate reaction (type I, IgE - mediate) at the sensitive patients. The symptoms of egg allergy can vary from mild to serious ones (e.g. anaphylaxis) (**Sakai et al., 2015**). Egg white (albumin) is more allergenic than yolk (**Halaj and Golian, 2011**).
In many expert studies the impact of egg consumption on human health was analyzed. **Missmer et al. (2002)** report that eggs contain particularly high level of cholesterol (425 mg per 100 g) and the recommended daily dose is 300 mg, for children and persons at risk of 100 mg. The increased level of LDL (low density lipoproteins) cholesterol tends to develop vascular deposition and atherosclerosis. Cholesterol is a precursor of steroid hormones and can affect the risk of breast cancer through the formation of estrogen (**Rong et al., 2013**). According **Shin et al. (2013)** consumption of up to one egg per day can have a significant effect on coronary heart disease or brain stroke. However, some researchers believe that eggs are helpful for reducing breast cancer risk, as eggs are sources of certain amino acids, lutein zeaxanthin, omega-3

and omega-6 fatty acids which may be used to prevent cancer (**Bao et al., 2012**). Egg yolks are also a significant source of choline, the consumption of which has been found to be associated with a lower risk of breast cancer (**Zhang et al., 2013**).

The results of verification of H3 hypothesis validity are given in the Table 3. The obtained values of statistical testing indicate that there exists dependence on 5% level of significance between the frequency of egg consumption and a respondent`s gender. Based on the degrees of tightness of dependence we can state that there is the weak dependence (0.2340, or 0.2407 by the applied coefficient). The statistically significant dependences were not confirmed between the frequency of eggs consumption and the other classification criteria (age, breeding/non-breeding of layers).

Figure 7 indicates the relationship between the frequency of egg consumption and gender. Based on the Figure 7 we can claim that women consume eggs once a week most frequently, while men eat eggs 2 – 3 times per week.

The survey showed that 30% of respondents do not take into account the way how the layers are kept.

CONCLUSION

Eggs belong to a food that Slovak consumers often buy and like to consume. Results indicate that preferences of consumers are affected by many factors while some of them are considered to be significant.

The frequency of eating eggs demonstrates that 90% of respondents consume eggs. The price of eggs is the most important factor at egg purchase (34% respondents) followed by the own experience of consumers. The research was focused on the most preferred place for the egg purchase as well. Results confirmed the statistically significant dependence between preferred place of purchase and a customer's gender. We can conclude that the consumers buy eggs as the most frequently from large shops and only 21% directly from farms.

Regarding the consumption, women consume eggs once a week the most frequently, while men eat eggs 2 - 3 times per week. 8% of respondents consume eggs once a month minimally; on the contrary, 14% respondents consume eggs every day.

The survey showed that 30% of respondents do not take into account the way how the layers are kept. Country of origin as preferred factor at purchasing of eggs stated only 22% of our respondents.

REFERENCES

Angelovičová, M., Alfaig, E., Král, M., Tkáčová, J. 2013. The effect of the probiotics Bacillus subtilis (PB6) on the selected indicators of the table eggs quality, fat and cholesterol. *Potravinarstvo*, vol. 7, no. 1, p. 80-84. https://doi.org/10.5219/271

Annunziata, A., Scarpato, D. 2014. Factors affecting consumer attitudes towards food products with sustainable attributes. *Agricultural Economics – Czech*, vol. 60, no. 8, p. 353-363.

Arpášová, H., Kačániová,M., Haščík, P., Šidlová, V. 2012. Effect of selected feed additives on internal quality parameters of table eggs. *Potravinarstvo*, vol. 6, no. 4, p. 52-61. https://doi.org/10.5219/235

Bao, P. P., Shu, X. O., Zheng, Y., Cai, H., Ruan, Z. X., Gu, K., Su, Y., Gao, Y.-T., Zheng, W., Lu, W. 2012. Fruit, vegetable, and animal food intake and breast cancer risk by hormone receptor status. *Nutr. Cancer Int. J.*, vol. 64, no. 6, p. 806-819. https://doi.org/10.1080/01635581.2012.707277 PMid:22860889

De Bakker, E., Dagevos, H. 2012. Reducing meat consumption in today's consumer society: questioning the citizen-consumer gap. *Journal of Agricultural and Environmental Ethics,* vol. 25, p. 877-894. https://doi.org/10.1007/s10806-011-9345-z

Fang, D., Tan, F., Wang, Ch., Zhu, X., Xie, L. 2012. Egg intake and bladder cancer risk: A meta-analysis. *ExpTherMed.*, vol. 4, p. 906-912. https://doi.org/10.3892/etm.2012.671 PMid:23226747

Fiľa, M., Tóthová, V. 2013. Possibility of using the CSA as an alternative farmers' business model in Slovak Republic. *Journal on Law, Economy & Management.*, vol. 3, no. 1, p. 19-26.

Fiľa, M., Tóthová, V., Slíšková, S. 2013. Slovak consumers' preferences in relation to CSA in comparison with some international results. *Journal of Management and Marketing*, vol. 1, no. 1, p. 35-41.

Halaj, M., Golian, J. 2011. Vajce - biologické, technické a potravinárske využitie (Egg - biological, technical and food use). Nitra, Slovakia : Garmond, 222 p. ISBN 978-80-89148-70-7.

Hayat, Z., Nasir, M., Rasul, H. 2014. Egg quality and organoleptic evaluation of nutrient enriched designer eggs. *Pakistan Journal of Agricultural Sciences*, vol. 51, no. 4, p. 1085-1089.

Horská, E., Ondieki-Mwaura, F., Krasnodębski, A. 2014. The Role of Cross-Border Heterogeneity, Location Specificity and Distance Related Variables: Lessons Learnt from V4 Marketers: In: International business from the Central European Perspective, edit. by Blaženka Kneževic and Krzysztof Wach, Zagreb 2014, p. 129-144. ISBN 978-953-6025-89-03.

Chreneková, M., Dirgasová, K., Fáziková, M. 2015 Selected development factors of peripheral districts of the Žilina region. In *XVIII. mezinárodní kolokvium o regionálních vědách*. 1st ed, CD-ROM, p. 521-531. ISBN 978-80-210-7861-1.

Jamborová, M. 2016. Poultry and eggs. Situation and outlook report to the date 31/12/2015. Bratislava, Slovakia : NPP VÚEPP. Available at: http://www.vuepp.sk/dokumenty/komodity/2016/Hyd06_16.pdf

Jing, H., Yap, M., Wong, P. Y., Kitts, D. 2011. Comparison of physicochemical and antioxidant properties of egg-white proteins and fructose and inulin Maillard reaction products. *Food and Bioprocess Technology*, vol. 4, no. 8, p. 1489-1496. https://doi.org/10.1007/s11947-009-0279-7

Missmer, S. A., Smith-Warner, S. A., Spiegelman, D., Yaun, S. S., Adami, H. O., Beeson, W. L., van den Brandt, P. A., Fraser, G. E., Freudenheim, J. L., Goldbohm, R. A., Graham, S., Kushi, L. H., Miller, A. B., Potter, J. D., Rohan, T. E., Speizer, F. E., Toniolo, P., Willett W. C., Wolk, A., Zeleniuch-Jacquotte, A., Hunter, D. J. 2002. Meat and dairy food consumption and breast cancer: a pooled analysis of cohort studies. *International journal of epidemiology*, vol. 31, no. 1, p. 78-85. https://doi.org/10.1093/ije/31.1.78 PMid:11914299

Paluchová, J., Benda Prokeinová, R. 2014. Creation of responsible behavior and impact on sustainable customer

buying behavior in retail sector. *Visegrad journal on bioeconomy and sustainable development,* vol. 3, no. 1, p. 39-45.

Prahalad, C. K. 2014. The fortune at the bottom of the Pyramid, USA : Prentice Hall, 407 p. ISBN 013-3829136.

Rong, Y., Chen, L., Zhu, T., Song, Y., Yu, M., Shan, Z., Sands, A., Hu, F. B., Liu, L. 2013. Egg consumption and risk of coronary heart disease and stroke: dose-responsemeta-analysis of prospective cohort studies. *BMJ, p.* 346:e8539. https://doi.org/10.1136/bmj.e8539

Ruan, Ch. Q., Chi, Y. J., Zhang, R. D. 2010. Kinetics of hydrolysis of egg white protein by pepsin. *Czech Journal of Food Sciences,* vol. 28, p. 355-363. https://doi.org/10.17221/228/2009-CJFS

Sakai, S., Adachi, R., Teshima, R. 2015. Detection and control of eggs as a food allergen. In A volume of *Woodhead Publishing Series in Food Science, Technology and Nutrition* [online]. p. 313-340. https://doi.org/10.1533/9781782420217.3.313

SAS Product Documentation, Freeman-Halton test. Available at: http://support.sas.com/documentation/cdl/en/procstat/63963/HTML/default/

SAS Product Documentation. Available at: http://support.sas.com/documentation/cdl/en/procstat/63963/HTML /default/viewer.htm#procstat_freq_a0000000561.htm

Shin, J. Y., Xun, P., Nakamura, Y., He, K. 2013. Egg consumption in relation to risk of cardiovascular disease and diabetes: a systematic review and meta-analysi. *Am. J. Clin. Nutr*., vol. 98, p. 146-159. https://doi.org/10.3945/ajcn.112.051318

World Hunger and Poverty Facts and Statistics. 2015. Available at: http://www.worldhunger.org/articles/Learn/world%20hunger %20facts%202002.htm.

Zhang, C. X., Pan, M. X., Li, B., Wang, L., Mo, X. F., Chen, Y. M., Lin, F. Y., Ho, S. C. 2013. Choline and betaine intake is inversely associated with breast cancer risk: a two-stage case–control study in China. *Cancer Sci*. vol. 104, p. 250-258. https://doi.org/10.1111/cas.12064

Contact address:

Dagmar Kozelová, Slovak University of Agriculture, Faculty of Biotechnology and Food Sciences, Department of Hygiene and Food Safety, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia, E-mail: dkozelova@gmail.com

Dana Országhová, Slovak University of Agriculture, Faculty of Economics and Management, Department of Mathematics, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia, E-mail: dana.orszaghova@uniag.sk

Eva Matejková, Slovak University of Agriculture, Faculty of Economics and Management, Department of Statistics and Operations Research, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia, E-mail: eva.matejkova@uniag.sk

Martina Fikselová, Slovak University of Agriculture, Faculty of Biotechnology and Food Sciences, Department of Food Hygiene and Safety, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia; E-mail: martina.fikselova@gmail.com

Elena Horská, Slovak University of Agriculture, Faculty of Economics and Management, Department of Marketing and Trade, Tr. A. Hlinku 2 , 94976 Nitra, Slovakia; E-mail: elena.horska@gmail.com

Dominika Ďurdíková, Slovak University of Agriculture, Faculty of Biotechnology and Food Sciences, Department of Hygiene and Food Safety, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia, E-mail: durdikovadominika@gmail.com

Renata Matysik-Pejas, University of Agriculture, Faculty of Agriculture and Economics, Institute of Economics and Enterprises Management, 311 20 Krakow, Poland, E-mail: rrmatysi@cyf-kr.edu.pl