

Food Safety Perceptions of Fresh Fruits and Vegetables Consumers

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The objective of this study was to determine the perceptions regarding food safety of the fresh fruits and vegetables consumers in Canakkale. Face to face interviews were carried out with 166 consumers who were determined via Proportional Sampling Method. A Five-Point Likert Scale was used to define the perceptions consumer and Multidimensional Scaling Analysis was used for determining the perception dimensions. Survey results show that half of all the consumers were women. About half of consumers have more than 11 years of education. About 89.2 % of fresh fruits and vegetable consumers have monthly food expenses of 250 Euros or less and 69 % spend 50 Euros or less on fresh fruits and vegetables. As a result of study; consumers are of the opinion that fresh fruits and vegetables include hormones, pesticides, fertilizer remains and Genetically Modified Organisms.

Keywords: Consumer perceptions, food safety, fresh fruits, fresh vegetables.

Yaş Meyve ve Sebze Tüketicilerinin Gıda Güvenliği Algıları

Bu çalışmanın amacı Çanakkale'deki yaş meyve ve sebze tüketicilerinin, yaş meyve ve sebzelerdeki gıda güvenliği algılarının ölçülmesidir. Oransal Örnekleme Formülü ile belirlenen 166 tüketici ile yüz yüze anketler yapılmıştır. Tüketicilerin algılarının ölçülmesi için 5'li Likert Ölçekli yargılardan, algı boyutlarının ölçülmesi için ise Çok Boyutlu Ölçekleme Analizinden yararlanılmıştır. Anket sonuçlarına göre tüketicilerin yarısı kadındır. Tüketicilerin yaklaşık yarısı 11 yıldan fazla eğitim almıştır. Taze meyve ve sebze tüketicilerinin % 89.2'si aylık 250 Euro veya daha az ve % 69'u ise taze meyve ve sebzelerde 50 Euro veya daha az harcama yapmaktadır. Çalışma sonuçlarına göre; tüketiciler yaş meyve ve sebzelerin hormon, pestisit, gübre kalıntısı içerdiğini ve Genetiği Değiştirilmiş Organizmalar kullandığını düşünmektedir.

Anahtar kelimeler: Tüketici algısı, gıda güvenliği, yaş meyve, yaş sebze.

Introduction

The concept of food safety can be expressed as the degree of confidence that food will not cause any sickness or harm to the consumer when prepared, served and eaten based on its intended use (FAO/WHO, 2003). It is also defined as the conditions and measures required for production, processing, storage, distribution and preparation of food in order to assure that it is safe, sound, wholesome, and fit for human consumption (Badrie et al., 2006). The last decade has pushed forward the concept of food safety as a significant quality of food (Grunert, 2005; Röhr et al., 2005). Consciousness related with health is on the rise nowadays in addition to flourishing predispositions for improvements in well-being

mandatory factor for putting appropriate food safety behaviors into practice (Redmond and Griffith, 2004). As much, physiological, behavioral

and health as a result of food choices (Ragaert et al., 2004). Health risks related with food consumption have started to cause more concern among consumers during the past decade (Lobb et al., 2007). Preventive behaviors are triggered due to impressions related with personal vulnerability to disease (Redmond and Griffith, 2004). Therefore, it is expected that interest in safe foods will increase as a result of this social and political environment (Roitner-Schobesberger et al., 2008).

Food safety influences the perceptions of consumers with regard to food as well as with the decisions related with food preferences (Rijswijk and Frewer, 2008). Personal responsibility related with food safety should be well noticed as a

and cognitive factors related with consumer experience are all influenced by sensory properties of food products thereby applying pressure on

consumer perceptions (Imram, 1999; Costell et al., 2010; Vabo and Hansen, 2014). Thus, inconsistencies related with attitudes and behaviors of consumers are especially important (Rimal et al., 2001).

Psychological factors related with foods influence the selection of food greatly in comparison with the physical attributes of food products. Awareness of risks related with food safety have significant effects on both the behavior and attitude of consumers during the decision making process for purchasing (Yeung and Morris, 2001).

Consumers use their senses for experiencing the appearance, taste, scent and texture of the product (Schifferstein and Cleiren, 2005). Consumer satisfaction in developed countries has transformed into a more daunting task for producers due to increasing critical and varied demands of consumers regarding food selection thus resulting in both vertical and horizontal quality differentiation (Grunert, 2005).

Fresh fruits and vegetables are rich sources of vitamins and are thus very important for consumer health (HU, 2015). They are also part of a group of products with the highest amount of chemical residue due to flawed applications during production (UM, 2010). Thus, studies on food safety using fresh fruits and vegetables are significant for public health.

According to 2011 data, Turkey is ranked eighth among fresh fruit vegetable exporting countries with regard to export value (EUROSTAT, 2015). It is a self-sufficient country in the sense of fresh fruits and vegetables consumption of the country's population excluding exotic products. Both sustainability of export and environment and public health issues within the country make food safety a priority in this food group which interests broad consumer mass.

The averages of 2011/2013 indicate that, Canakkale province meets 2.16 % of the fruit production and 2.87 % of Turkey's vegetable production (TSI, 2015). The city has important contributions on crop production and export value

especially in relation with the sense of specific fruit and vegetable species. Fresh fruits and vegetables consumption level is important since the city is an important center of tourism. The number of studies in literature carried out on food safety perceptions of consumers has increased during the last decade (Rimal et al., 2001; Yeung and Morris, 2001; Redmond and Griffith, 2004; Grunert, 2005; Röhr et al., 2005; Badrie et al., 2006; Lobb et al., 2007; Rijswijk and Frewer, 2008). There are also studies on consumer perceptions related with fresh fruits and vegetables (Fillion and Kilcast, 2002; Ragaert et al., 2004; Peneau et al., 2006; Peneau et al., 2009). Some of these studies cover organic products (Harper and Makatouni, 2002; Roitner-Schobesberger et al., 2008; Hoefkens et al., 2009; Naspetti and Rafaele, 2009; Oraman and Unakitan, 2010).

Studies have been carried out recently in Turkey on food safety perceptions of consumers (Ergönül, 2013; Oraman and Unakitan, 2010) and their knowledge levels (Bal et al., 2006; Unusan, 2007; Onurlubaş and Gürler, 2016). However, no study was observed in both international and national literature on the fresh fruits and vegetables food safety perceptions of consumers which make up one of the food groups with the highest amount of pesticide residue regardless of any organic and conventional distinction. Hence, it is thought that the study will fill an important gap in the relevant literature. The objective of the study was to put forth food safety perceptions of consumers for fresh fruits and vegetables in Canakkale. Variables related with food safety perceived differently by fresh fruits and vegetables consumers have been put forth in two dimensions.

Material and Methods

Results of surveys carried out in 2015 among consumers from the center of Canakkale province comprised the main material for the current study. Sample size was determined via proportional sampling method, based on fruits and vegetables consumers, using the formula below (1):

$$n = \frac{z^2 \cdot p(1-p)}{d^2}$$

(1)

n= sample size

z^2 = confidence factor of the desired confidence level (2.58 for 99 %)

p= population ratio

d= margin for error

$$\frac{2.58^2 \cdot (0.5) (0.5)}{(0.10)^2} = 166$$

n is the sample size, z is the table value of confidence level (assumed to be 99 %), p is the probability of the examined situation occurring (p=0.5 is used due to the absence of preliminary information concerning consumers' food safety awareness levels about fruits and vegetables), q is the probability of the situation not occurring (q=1-p), and d is the margin for error (assumed to be 10 %). Estimated sample size was calculated as 166 and was distributed proportionally based on the population.

There are seven districts in the center of Canakkale province. These districts are divided into five groups according to income (1=Highest income group, 5=Lowest income group). A total of 166 surveys were carried out in seven districts in compliance with the income groups by means of face-to-face meetings with fresh fruits and vegetables consumers living in these districts.

Items prepared by means of the Five-Point Likert Scale were used in measuring the perceptions of fresh fruits and vegetables consumers in terms of food safety one stands for "Strongly Disagree" and five for "Strongly Agree". The common rating format for surveys is Likert Scale. They vary between a group of categories-least to most-asking people to put forth how much they agree or disagree, approve or disapprove or believe to be true or false. Likert Scale cannot be generated erroneously. Care should be given to including at least five response categories (Allen and Seaman, 2007). Multidimensional Scaling (MDS) Analysis was used in turn to analyze the data. MDS is a technique for analyzing similarity and dissimilarity data on a set of objects. MDS attempts to model such data as distances among points in a geometric space. The main reason for doing this is that one wants a graphical display of the structure of the data, one that is much displays the essential information in the data, smoothing out noise (Cox and Cox, 2001; Borg and Groenen, 2005). MDS has

three different applications. These are known as; full-metric MDS with intervals between the proportional input and output data, non full-metric MDS with ordinal input and ordinal output data and non-metric MDS with ordinal input and metric output data (Özdamar, 2013). Full-metric MDS method was used in the study since the data and results obtained via Five-Point Likert Scale were interval scale. The acquired data were transformed into distance matrix between observations using the Alternating Least Square (ALSCAL) and were interpreted as such. ALSCAL enables grouping for making binary comparisons when the acquired data do not have a weight of preference (Kalaycı, 2010). ALSCAL method was preferred since there was no weight of preference for the data used in the study. Euclid distance was selected as a means of acquiring distance since the data in the study had an interval scale. The variables used in MDS analysis and their definitions are given in Table 1.

Food safety perceptions of the fresh fruits and vegetables consumers

Survey results show that 50 % of all the consumers were women. About 51 and 20.5 % of the consumers underwent fewer than nine and more than 11 years of education, respectively. The percentage of families consisting of less than five members was detected to be 66. Approximately 57.2 % of fresh fruits and vegetables consumers have monthly household incomes of 625 Euros or less. About 89.2 % of fresh fruits and vegetable consumers have monthly food expenses of 250 Euros or less, and 69 % spend 50 Euros or less on fresh fruits and vegetables.

A total of 13 questions prepared via Five-Point Likert Scale were asked to the consumers in order to measure their perceptions on fresh fruits and vegetables food safety.

Table 1. Variables used in MDS analysis

Variable Names	Variable Definitions	Scales
Standardization	Thinking that there is standardization for issues like length, color for fruits and vegetables (Berdegue et al., 2005)	
Freshness	Paying attention to consuming fruits and vegetables in their fresh form (Bond et al, 2009)	
Physical appearance-(1)	Crushed fruits and vegetables having adverse effects on the purchasing decision (Kays, 1999; Oraman and Unakitan, 2010)	
Physical appearance-(2)	Worm, bug etc. on the fruits and vegetables having adverse effects on the purchasing decision (Kays, 1999; Oraman and Unakitan, 2010)	
Cold chain	Thinking that cold chain is given importance in the production and marketing of fruits and vegetables (FAO, 2004)	
Traceability	Not being able to ensure traceability during the production and marketing of fruits and vegetables (Liao et al., 2011)	
Audit during production	Consumers thinking that the audits at the farms are sufficient (Safefood, 2007)	1= I certainly do not agree
Audit during sales	Consumers thinking that the audits during sales are sufficient (Bal et al., 2006; Safefood, 2007)	2= I do not agree
Hormone	Consumer opinion regarding the use of hormones by farmers (Smith and Reithmuller, 1999; Oraman and Unakitan, 2010)	3= I neither agree nor do not agree
Pesticide residue	Consumer opinion that there is pesticide residue on the fruits and vegetables (Safefood, 2007; Oraman and Unakitan, 2010)	4= I agree
Fertilizer residue	Consumer opinion that there is chemical fertilizer residue on fruits and vegetables (Yılmaz et al., 2010)	5= I certainly agree
Genetically Modified Organism (GMO)	Consumer opinion that the fruits and vegetables contain GMO (Rodriguez-Lazaro et al., 2007; Oraman and Unakitan, 2010)	
Quality	Thinking that the fruits and vegetables are of low quality (Harker et al., 2003)	

The scale averages calculated in accordance with the responses of the consumers to these questions have been given in Table 2. Accordingly, consumers accept the judgment that fruits-vegetables are freshly presented to the market (4.43). Consumer choice of fruits and vegetables depends significantly on freshness (Ragaert et al., 2004; Bond et al., 2009; Peneau et al., 2009). Consumers agree that the physical appearance of fresh fruits-vegetables is important in purchasing decisions (4.19 and 4.03). The appearance of fresh fruits and vegetables is a primary criterion in making purchasing decisions (Kays, 1999; Resnicow et al., 2001; Whitehead et al. 2012). Consumers also agree with the judgment that hormone (4.07) and GMO (4,03) are used in fruits-vegetables sold and that fruits-vegetables contain pesticide (3.89) and fertilizer (3.86) remains. Consumers neither agree nor disagree with the judgments that the required care is provided to the cold chain for fruits-vegetables being sold (3.06), that the products are

of low quality (3.05) and that standardization (2.96) and traceability (2.51) are attained. Finally, consumers have also put forth that they do not agree with audit during sales (2.20) and audit during production (2.17). Stress value is a criteria used for deciding on the accordance of the solution in MDS. Low stress value is desired. Accordingly, the table published by Kruskal in 1964 for the interpretation of the stress value is shown in Table 3. Two dimensions were used in the study for an easier understanding of MDS analysis as is the case in many other studies (Gündüz, 2011). Two dimensions optimize the object locations and facilitating interpretation. Because of this reason, two dimensions are used in this study too.

The stress value calculated according to the MDS results carried out on the two-dimensional plane continued until the fourth iteration. Iteration was stopped when the stress value was lower than 0.001 for k=2.

Table 2. 5 Point-Likert Scale averages of the variables used in the study

	Mean	Standard Deviation	N
Standardization	2,96	1,09	166
Freshness	4,43	0,84	166
Physical appearance-(1)	4,19	1,08	166
Physical appearance-(2)	4,03	1,09	166
Cold chain	3,06	1,08	166
Traceability	2,51	1,03	166
Audit during production	2,17	1,01	166
Audit during sales	2,20	1,05	166
Hormone	4,07	0,91	166
Pesticide residue	3,96	0,79	166
Fertilizer residue	3,86	0,85	166
Genetically Modified Organism (GMO)	4,03	0,92	166
Quality	3,05	1,16	166

Table 3. Stress values and levels of accordance

Stress value	Accordance
≥ 0.20	Unsuitable
$0.10 < 0.20$	Low accordance
$0.05 < 0.10$	Good accordance
$0.025 < 0.05$	Perfect accordance
$0.00 < 0.025$	Full accordance

Accordingly, the value of 0.00028 obtained for the study corresponds to the full accordance interval. There was full accordance between the variables used in the study and the MDS model. Square of the correlation index (R^2) is evaluated for understanding how good the current data in the MDS model represent the model. A value greater than 0.60 is desired for this variable. The R^2 value was calculated as 0.95 for this study. Accordingly, data used in the study explain a significant ratio of the model as high as 95%. This indicates the strength of the model.

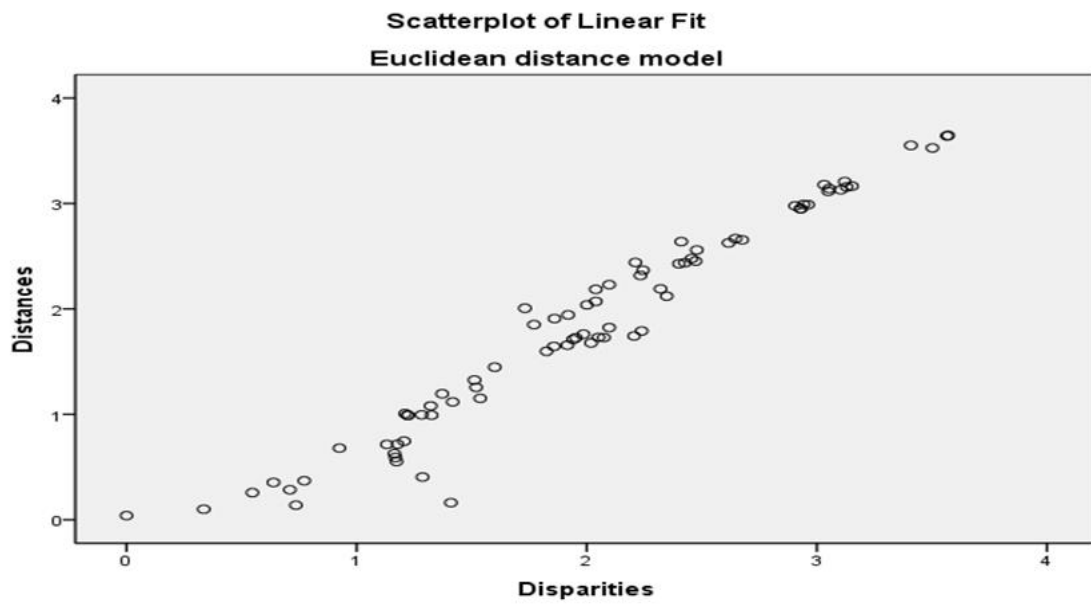
The relationships between the examined variables have been given in Graph 1. Accordingly, the distances and differences between the variables have a linear relationship as should be the case. Graph 2 is related with the projection of the distances and closeness between the examined variables in two dimensional space. Accordingly, pesticide residue, fertilizer residue, hormone and GMO variables are those that are perceived as similar by the consumers if the variables are to be grouped based on their appearance in space. Whereas the second group consists of physical appearance-(1) and physical appearance-(2) variables. Standardization and cold chain variables are in another group. Production and sales audit which are perceived by the consumers as similar seem close to each other with regard to position.

Whereas the variables of quality, freshness and traceability are perceived by the consumers differently than all other variables and do not form a group. Based on this, it is possible to say that the 13 variables present in the beginning are collected under seven different groups thus decreasing the number of variables. These seven groups can be listed as: variables that have physiological effects on fresh fruits and vegetables, variables that have physical effects on fresh fruits and vegetables, standardization and cold chain, audit, quality, freshness and traceability.

The exact distances between variables related with food safety are included in the matrix table for variables (Table 4). The three relationships in the table with the highest similarity were between pesticide residue and fertilizer residue (0.000), between audit during production and audit during sales (0.336) and between pesticide residue and hormone (0.547).

Accordingly, consumers perceive these variables as very close to each other with respect to food safety in fresh fruits and vegetables. Whereas the relationship with the largest difference for the examined variables can be listed respectively as; audit during production and freshness (3.571), audit during sales and freshness (3.565), audit during sales and physical appearance-(1) (3.502).

Graph 1. Scatterplot of linear fit



Graph 2. Derived stimulus configuration

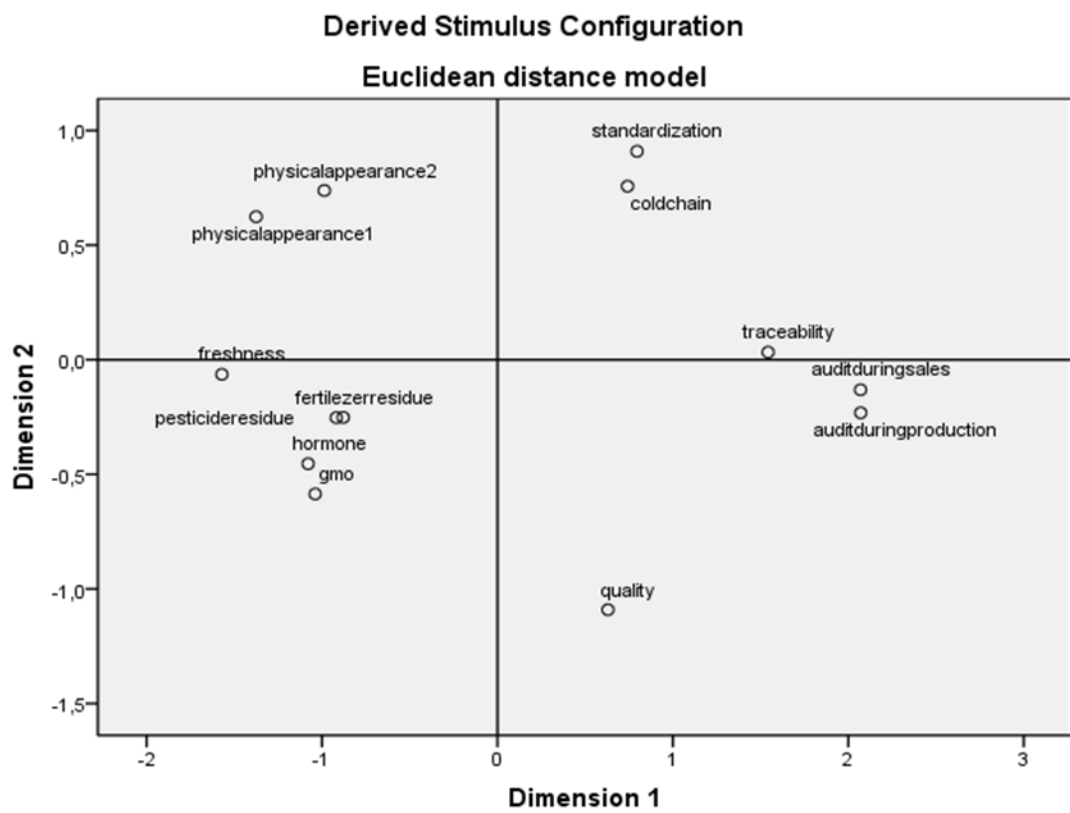


Table 4. Optimally scaled data

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	0.000												
2	2.478	0.000											
3	2.321	1.131	0.000										
4	2.239	1.326	1.287	0.000									
5	1.410	2.473	2.347	2.074	0.000								
6	1.537	3.049	2.906	2.617	1.322	0.000							
7	1.940	3.571	3.409	3.121	1.916	1.169	0.000						
8	1.857	3.565	3.502	3.031	1.825	1.173	0.336	0.000					
9	2.233	1.165	1.417	1.372	2.039	2.646	3.130	3.153	0.000				
10	2.039	0.925	1.222	1.222	1.919	2.455	2.962	2.942	0.547	0.000			
11	2.001	1.177	1.210	1.283	1.860	2.427	2.929	2.931	0.710	0.000	0.000		
12	2.244	1.206	1.519	1.512	2.098	2.675	3.104	3.053	0.736	0.639	0.773	0.000	
13	1.732	2.400	2.411	2.211	1.771	1.600	2.019	2.051	2.098	1.986	1.953	2.206	0.000

Consumers perceive these variables very differently in comparison with one another with regard to food safety for fresh fruits and vegetables. Consumers establish a close relationship between taking care to consume fresh products and audits. Turkey is an important producer of fruits and vegetables which enables finding fresh fruits and vegetables in all seasons. Whereas taking care to consumer fresh products depends on the consumer, carrying out proper audits is independent of the consumer. Hence, the variables that were perceived by the consumers to be farthest apart from each other were these two. They also perceived sales audit and physical appearance as distant from each other. Since fresh fruits and vegetables can be found in all seasons in Turkey due to the climate conditions, it is not common to buy crushed fruits and vegetables. These products, especially fruits, are used in the fruit processing industry (TUGEM, 2016). Products with good physical appearance are generally sold as table-top items.

Conclusions and Suggestions

MDS results indicate that consumers perceive hormone, pesticide residue, fertilizer residue and GMO criteria as similar. According to consumers, applications that cause changes in the genetic and chemical structures of fresh fruits and vegetables have similar adverse effects on human health. It was observed that consumers perceive the audits carried out during production and sales to be similar as factors that are important for food safety. Audits are necessary to ensure food safety. Consumers perceive all attributes related with the

physical appearances of fresh fruits and vegetables as comparable. In addition, providing standardization and cold chain comprise another variable group that is perceived to be similar with respect to the consumers. Quality, freshness and traceability are variables that are perceived by the consumers as different from all other variables and among themselves. Consumers think that these factors are different from the others.

There was no study in literature about food safety perceptions of fresh fruit and vegetable consumers by MDS. There are few study about consumer perception of fruit and vegetables with different statistical analysis methods (Fillion and Kilcast, 2002; Ragaert et al. 2004; Peneau et al. 2006; Peneau et al. 2009). Similar to this study, Ragaert et al. 2004 found that freshness and appearance variables were also under different factors. Peneau et al. 2006 and Peneau et al. 2009 could not find significant at the high level the appearance variable on the freshness. Baker (1999), Harker et al. (2003) and Yahaya et al. (2015) puth forth that reduced pesticide and safer products are quite effective on the purchasing decisions of consumers too.

In this context, allowed pesticide types and maximum permissible amounts have been strictly determined via legal frameworks in the European Union (EU). Pesticides which are considered as highly dangerous are not permitted. In addition, products that are on sale in the market are collected via sampling method and are subject to analyses. Farmers are directed towards alternative agriculture methods.. It is suggested to put these applications into practice in Turkey as well. Fresh fruits and vegetables producers should be

informed by extension programme about the means with which they can use less chemicals as well as the reasons why they should do so. Consumers should increase their awareness. The consumers should start gaining awareness at an early age by way of education provided during the primary school years. The increase of the number and activities of Non-governmental Organizations related with health and nutrition is also very important for increasing the awareness of consumers. EU has put into effect the **Rapid Alert System for Food and Feed (RASSF) Consumers' Portal** in order to inform consumers about the use of pesticides (EC, 2017). It is suggested that the consumers should demand the putting into effect of this system in Turkey as well.

References

- Allen, I. E. and C. A. Seaman. 2007. Likert Scales and Data Analysis. *Quality Process* 40(7):64-65.
- Badrie, N., A. Gobin, S. Dookeran, and R. Duncan, 2006. Consumer awareness and perception to food safety hazards in Trinidad, West Indies. *Food Control* 17(1):370-377.
- Baker, G. A. 1999. Consumer preferences for food safety attributes in fresh apples: market segments, consumer characteristics and marketing opportunities. *Journal of Agriculture and Resource Economics* 24(1):80-97.
- Bal, H. S., Z. G. Göktolga, ve O. Karkacıer. 2006. Gıda güvenliği konusunda tüketici bilincinin incelenmesi: Tokat İli Örneği. *Tarım Ekonomisi Dergisi* 12(1): 9-18.
- Berdegue, J.A., F. Balsevich, L. Flores and T. Reradon. 2005. Central American supermarkets' private standards of quality and safety in procurement of fresh fruits and vegetables. *Food Policy* 30(3): 254-269.
- Bond, J. K., D. Thilmany, and C. Bond. 2009. What influences consumer choice of fresh produce purchase location?. *Journal of Agricultural and Applied Economics* 41(1): 61-74.
- Borg, I. and P. J. F. Groenen. 2005. *Modern Multidimensional Scaling Theory and Applications*. New York: Springer.
- Costell, E., A. Tarrega and S. Bayarri. 2010. Food acceptance: the role of consumer perception and attitudes. *Chemosensory Perception* 3(1):42-50.
- Cox, T. F. and M. A. A. Cox. 2001. *Multidimensional Scaling*, USA: Chapman and Hall/CRC.
- Ergönül, B. 2013. Consumer awareness and perception to food safety: a consumer analysis. *Food Control* 32(2):461-471.
- European Commission (EC). 2017. <https://ec.europa.eu/> (accessed 16 March 2017).
- European Statistics (EUROSTAT). 2015. <http://ec.europa.eu/eurostat> (accessed 26 February 2015).
- Food and Agriculture Organization (FAO)/World Health Organization (WHO). 2003. *Codex Alimentarius*, Italy.
- FAO. 2004. *The Role of Post Harvest Management in Assuring the Quality and Safety of Horticultural Produce*. FAO Agricultural Services Bulletin, No:152, Rome/Italy.
- Fillion, L. and D. Kilcast, 2002. Consumer perception of crispness and crunchiness in fruits and vegetables. *Food Quality and Preferences*, 13(1):23-29.
- Grunert, K. G. 2005. Food quality and safety: consumer perception and demand. *European Review of Agricultural Economics* 32(3):369-391.
- Gündüz, S. 2011. Uzaklık fonksiyonlarının çok boyutlu ölçekleme algoritmalarındaki etkinliğinin incelenmesi ve uygulamalar. Çukurova Üniversitesi Fen Bilimleri Enstitüsü İstatistik Bölümü. Master Tezi, Adana/Türkiye.
- Hacettepe University (HU). 2015. *Sebze ve meyve grubu; Türkiye'ye özgü besin ve beslenme rehberi*. Ankara: Merdiven Tanıtım ve Reklam.
- Harker, F. R., A. F. Gunson, and S. R. Jaeger, 2003. The case for fruit quality: an interpretive review of consumer attitudes and preferences for apples. *Postharvest Biology and Technology* 28(3):333-347.
- Harper, G. C. and A. Makatouni, 2002. Consumer perception of organic food production and farm animal welfare. *British Food Journal* 104(3/4/5): 287-299.
- Hoefkens, C., W. Verbeke, J. Aertsens, K. Mondelaers and V. J. Camp. 2009. The nutritional and toxicological value of organic vegetables: consumer perception versus scientific evidence. *British Food Journal* 111(10):1062-1077.
- Imram, N. 1999. The role of visual cues in consumer perception and acceptance of a food product. *Nutrition and Food Science* 99(5): 224-230.
- Kalaycı, Ö. 2010. *SPSS Uygulamalı Çok Değişkenli İstatistik Teknikleri*. Ankara: Asil Yayın.
- Kays, S. J. 1999. Preharvest factors affecting appearance. *Proharvest Biology and Technology* 15 (3): 233-247.
- Kruskal, J. B. 1964. Nonmetric multidimensional scaling: a numerical method. *Psychometrika* 29(1):115-129.
- Liao, P. A., H. H. Chang, and C. Y. Chang. 2011. Why is the food traceability system unsuccessful in Taiwan? Empirical evidence from a national survey of fruit and vegetable farmers. *Food Policy* 36:686-693.
- Lobb, A. E., M. Mazzocchi and W. B. Traill. 2007. Modelling risk perception and trust in food safety information within the theory of planned behaviour. *Food Quality and Preference* 18(1):384-395.
- Naspetti, S. and Z. Rafaele, 2009. Organic food quality and safety perception throughout Europe. *Journal of Food Products Marketing* 15(3):249-266.
- Onurlubaş, E. ve A. Z. Gürler, 2016. Gıda güvenliği konusunda tüketicilerin bilinç düzeyini etkileyen faktörler. *Gaziosmanpaşa Üniversitesi Ziraat Fakültesi Dergisi* 33(1):132-141.
- Oraman, Y. and G. Unakıtan, 2010. Analysis of Factors Influencing Organic Fruit and Vegetable Purchasing in Istanbul, Turkey. *Ecology of Food and Nutrition* 49(6):452-466.
- Özdamar, K. 2013. *Paket Programlar ile İstatistiksel Veri Analizi*. Eskişehir:Nisan Kitap Evi.

- Peneau, S., E. Hoehn, H. R. Roth, F. Escher and J. Nuessli. 2006. Importance and consumer perception of freshness of apples. *Food Quality and Preference* 17(1/2):9-19.
- Peneau, S., A. Linke, F. Escher and J. Nuessli. 2009. Freshness of fruits and vegetables: consumer language and perception. *British Food Journal* 111(3):243-256.
- Ragaert, P., W. Verbeke, F. Devlieghere and J. Debevere, 2004. Consumer perception and choice of minimally processed vegetables and packaged fruits. *Food Quality and Preference* 15(1): 259-270.
- Redmond, E. C. and C. Griffith, 2004. Consumer perceptions of food safety risk, control and responsibility. *Appetite* 43(3):309-313.
- Resnicow, K., A. Jackson, T. Wang, K. A. De. F. McCarty, W. N. Dudley, and T. Baranowski. 2001. A Motivational Interviewing Intervention to Increase Fruit and Vegetable Intake Through Black Churches: Results of the Eat for Life Trial. *American Journal of Public Health* 91(10): 1686-1693.
- Rijswijk, W. V. and L. J. Frewer, 2008. Consumer perceptions of food quality and safety and their relation to traceability. *British Food Journal* 110(10):1034-1046.
- Rimal, A., M. F. Stanley, K. H. McWatters, S. K. Misra, and S. Deodhar. 2001. Perception of food safety and changes in food consumption habits: a consumer analysis. *International Journal of Consumer Studies* 25(1):43-52.
- Rodriguez-Lazaro, D., B. Lombard, H. Smith, A. Rzezutka, M. D'Agostino, R. Helmuth, and A. Schoeter, et al., 2007. Trends in analytical methodology in food safety and quality: monitoring microorganisms and genetically modified organisms. *Trends in Food Science and Technology*. 18(6): 306-319.
- Roitner-Schobesberger, B. R., I. Darnhofer, S. Somsook, and C. R. Vogl. 2008. Consumer perceptions of organic foods in Bangkok, Thailand. *Food Policy* 33(1):112-121.
- Röhr, A., K. Lüddecke, S., Drusch, M. J., Müller, and R. V. Alvensleben. 2005. Food quality and safety–consumer perception and public health concern. *Food Control* 16(1):649-655.
- Safefood. 2007. A Review of the Fruit and Vegetable Food Chain: Consumer Focused Review of The Fruit and Vegetable Food Chain. February 2007.
- Schifferstein, H. N. J. and M. P. H. D. Cleiren. 2005. Capturing product experiences: a split-modality approach. *Acta Psychologica* 118(1):293-318.
- Smith, D., and P. Reitmuller, 1999. Consumer concerns about food safety in Australia and Japan. *International Journal of Consumer Economics* 26(6):724-743.
- Türkiye Gelişim Merkezi Platformu (TUGEM), (2016), "Fasıl 12-Yağlı tohum ve meyveler; muhtelif tane, tohum ve meyveler; sanayide ve tıpta kullanılan bitkiler; saman ve kaba yem", available at: https://www.tugem.com.tr/component/mevzu_atlar/?mlid=1888 (accessed 10 August 2016).
- Turkish Statistical Institute (TSI), (2015), available at: <http://www.tuik.gov.tr> (accessed 23 July 2015).
- University of Maryland (UM). 2010. Improving the safety and quality of fresh fruits and vegetables: a training manual for trainers. FDA Joint Institute for Food Safety and Applied Nutrition. Maryland/USA.
- Unusan, N. 2007. Consumer food safety knowledge and practices in the home in Turkey. *Food Control* 18(1):45-51.
- Vabo, M. and Hansen, H. 2014. The relationship between food preferences and food choice: a theoretical discussion. *International Journal of Business and Social Science* 5(7):145-157.
- Whitehead, R. D., G. Özakıncı, I. D. Stephen, and D. I. Perret, D. I. 2012. Appealing to vanity: could potential appearance improvement motivate fruit and vegetable consumption?, *American Journal of Public Health* 102(2):207-211.
- Yahaya I., F. A. Yamoah and F. Adams F. 2015. Consumer motivation and willingness to pay for safer vegetable in Ghana. *British Food Journal* 117(3):1043-1065.
- Yeung, R. M. W. and J. Morris. 2001. Food safety risk: consumer perception and purchase behaviour. *British Food Journal* 103(3):170-187.
- Yılmaz, H., V. Demircan, and M. Gül. 2010. Examining of chemical fertilizer use levels in terms of agricultural environment relations and economic losses in the agricultural farms: the case of Isparta, Turkey. *Bulgarian Journal of Agricultural Science* 16(2):143-157.