



Preferences of Turkish people for irradiated, GM or organic foods

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Abstract

Through commercial application, new technologies may improve health, agriculture, farming practices and the quality of foods. However, along with the array of potential benefits are potential risks and uncertainties surrounding the commercial applications of these technologies. In this study, a survey was prepared to receive opinion of Turkish People living in the most populated area of Turkey about irradiated foods, food additives and organic foods and genetically modified foods. Survey questions were asked to 1226 people (626 women and 600 men) in 4 different age groups (15-30, 31-45, 46-60, 61-90 years old). Questions were generally prepared to expose their knowledge and awareness about food additives, organic foods, irradiation, genetically modified foods or hormone residues in foods. Most of them think that consuming food containing some of the food additives can lead to some health problems. The half of the participants did not have knowledge about food irradiation. The results of the current study also indicated that 9% of respondents did not concern for the safety of irradiated foods; however, 69% of them concerned very much. In addition, the present study indicated that only 8% of respondents thought that GM foods were safe, 69% thought that they were little risky, 23% of them thought they were extremely risky for our health. All participants with different age, gender, income level or education level had negative thought about hormone residues in food products. Interestingly, 29 and 18% of them did not have knowledge about organic foods and believed that they can be unhealthy, respectively. In conclusion, the most of the participants, especially 31-45 years old and high income people, were cautious about what they purchase.

Key words: Survey, irradiated, GM, organic foods, food additives, hormone residues.

Introduction

The role of consumer has changed dramatically in recent decades. Along with rapid changes and altered power relations in the food system, new problems and new opportunities for informed and competent consumers are emerging. There is need for increased knowledge of consumer attitudes and valuations in the marketplace.

Food irradiation, one of the new technologies, refers to the application of ionizing energy to foods. It is a nonthermal processing method that offers a means of preservation that destroys microorganisms. Since the quantity of energy absorbed by foods during irradiation process does not make them radioactive, safety and efficiency of food irradiation process has been approved by several authorities (FDA, USDA, WHO, FAO, Food Codex Alimentary, etc.) and scientific societies based on extensive research¹⁻³. However, in food industry, application of food irradiation is still limited due to poor consumer acceptance, and the refusal of major retailers to stock irradiated products has postponed the approval of this technology^{4,5}. From consumer surveys, people concern about carcinogenicity of irradiated foods, risk to workers in irradiation facilities, pollution from these facilities and risk of transportation of radioactive materials^{4,6,7}. People in Turkey also generally concern about safety of radiation use in food industry⁸. Due to only few survey studies on the awareness or attitude of Turkish people toward food irradiation, our pilot study will fill the gap in literature.

Genetically modified (GM) foods production is applied generally in order to improve the pesticide resistance of crops and to prolong the shelf-life of the end product. However, many of the potential hazards may arise in crop plants as a consequence of genetic engineering⁹. Risks may arise as a consequence of the biosynthesis of toxins, allergens or genetic hazards in foods derived from genetically engineered crops. Alternatively, hazards may occur from the elimination of metabolites that play important roles in reducing health risks, e.g., antioxidants. Unlike developed countries, regulations on GM foods in Turkey have been recently beginning to shape up. Cartagena, the first biosafety protocol, was signed with other countries in 2000 to ensure an adequate level of protection on biological diversity from the potential risks resulted by modern technology, specially focusing on trans-boundary movements. Moreover, the food law (No. 5179) that controls all commercialized foods was implemented in May 2004. A draft of national biosafety law has been given one month for public reactions or views and then was implemented¹⁰. GM foods are often outspokenly opposed to by consumer groups, and even more so by environmental organizations, especially in Europe¹¹⁻¹³. However, the results of other studies show that the consumers are much less worried about GM foods in the US and many developing countries¹⁴⁻¹⁶. Consumers' acceptance of GM food in US ranged from 50 to 59%¹⁶, but has declined slightly over time¹⁷. Likewise, in Turkey, according to one pilot survey conducted

among 670 students, about 60% of correspondents had not heard or they thought that GM foods are not safe¹⁸. However, this survey as a student survey may not be viewed as representative of the general public consumers.

Organic food refers to food production practices that avoid most synthetic pesticides and fertilizers, genetically modified crops, antibiotics in livestock productions, irradiation, using food additives and using sewage sludge as fertilizer. As shoppers continue to work toward well being through diet, they are likely to include organic foods. In Turkey, unlike European countries, organic food production has begun in 1986 through request of companies on import-export business. The production was made agreeable with regulations prepared by the imported countries for this subject until 1992. Thereafter, with the code of 2092/91 Turkish government published the first regulation on organic food production especially for the exporters. According to Agricultural Census, organic food production in Turkey increased only 8-10% during last 3 years since consumer demands did not meet with farmer expectations. Moreover, the lack of information about the public awareness and perception of organic foods may be the reason on this drop. The finding of the present study also may fill up this gap.

Foods produced or processed by using of the new technologies leads challenging problems for the producers interested in the factors responsible for consumer choice, acceptance and purchase behavior. Sensory quality of the product will not guarantee success every time. Consumer perceptions about the safety, cost and risk/benefits associated with new technologies can negatively influence consumer choice. Because of few published public surveys about these topics in Turkey, in the present research a survey study was conducted to receive public perception for irradiated foods, food additives, hormone residues in foods, organic foods and genetically modified foods in the most populated area of Turkey.

Materials and Methods

Questionnaire preparation: The questionnaire contained 20 questions about food additives, irradiation, genetically modified foods, hormone residues and organic foods. The first questions were prepared to obtain general information such as gender, age, income and education level of participants. Questions in the questionnaire were prepared to obtain information about whether surveyors were aware of irradiated foods, GM foods, food additives, hormone residue in foods and organic foods and whether they preferred to buy them or not. In addition, the following questions exposed their concerns on their risk on health. Several attributes of irradiated foods, GM foods and organic foods were measured by means of the five-point Likert scale anchors of 1 = low or bad degree of the characteristics, 5 = high or good degree of characteristics. The survey was completed in one month and 140 college students worked in this study.

Questionnaire distribution: The survey was conducted in Northwest of Turkey where about 20% of the population lives. Table 1 shows information about participants. Total of 1226 surveyors were composed of 626 women and 600 men in 4 different age groups (15-30 years old 26%, 31-45 years old 28%, 46-60 years old 24%, 61-90 years old 22%). Twenty of them were uneducated (2%), 427 were primary school graduate (34%), 118 were middle

school graduate (10%), 411 were high school graduate (41%), 237 were collage graduate (19%), 12 had Master of Science degree (1%) and 1 had Doctor of Philosophy degree (0%). The income level of participants also was reported and monthly income of 27% was less than €199, 43% earned €200-499, 24% earned €500-999, 5% earned €1000-1999 and only 1% earned €2000-3000. The data was collected in an interview. The purpose of the questionnaire was explained to respondents prior to the interview. No identification information of respondents was recorded.

Evaluation of the questionnaire: Data from 1226 completed questionnaires were coded and entered into a Microsoft Excel worksheet. Percentage frequencies were obtained to all questions. ANOVA and correlation analysis were performed to examine the differences in buying behavior and attitudes among consumer groups. The level of comparison was set at <0.05. All statistical analyses were made using Microsoft Excel.

Results and Discussion

Irradiated foods: The results of the questionnaire indicated that about half of the participants did not have knowledge about food irradiation (Table 2). Younger people with higher education (Corr. = 94%) and higher income level (Corr. = 92) had more knowledge about food irradiation technology (Fig. 1). In the worldwide, consumers' knowledge of new food technologies like irradiation is generally very inadequate. For example, a study conducted in the U.S.A. showed that 87.5% of consumers did not know much about food irradiation¹⁹. Likely, Gunes and Tekin⁸ reported that majority of the survey participants (81%) have not heard about food irradiation in Turkey.

The results of the current study also indicated that 9% of respondents did not concern for the safety of irradiated foods; however, 69% of them concerned very much. When we evaluated the consumer acceptance of irradiated foods we saw that only 12% of them bought irradiated foods and 73% did not check irradiation sign on the package and did not have conscious about whether they consumed irradiated foods or not (Fig. 2). One of the reasons of reported low perception must be because of that lack of knowledge among consumers regarding food irradiation can serve as a major obstacle to their acceptance. Another reason of this negative attitude must be the belief of radioactive risk of irradiated foods^{8,9}. The results also showed that the participants at different groups based on income levels ($p = 0.09$), age ($p = 0.17$), gender ($p = 0.62$) or education levels ($p = 0.75$) significantly have same negative attitude towards irradiated foods (Fig. 3). However, Hunter⁵ claimed that the elderly and young people in North America behaved differently towards food irradiation. The elderly people act positive due to the fact of using irradiation to kill harmful bacteria. Oppositely, younger people tend to act against irradiation since they believe that irradiation or any other new technology may lead to pollute the environment. Unlike our results, Hunter⁵ also reported that education is another distinguishing factor for people's attitude towards food irradiation. It was concluded that highly educated people reacted more positive by receiving the right information about food irradiation; however, uneducated or low educated people reacted more negative due to not receiving enough information.

Irradiation is a preferred preservation method in food industry due to the increasing concern over food-borne illnesses. However,

Table 1. Distribution of participants based on their gender, age, education and income levels.

Monthly income (€)	Gender	Age	Education						
			Uneduc.	Primary school	Middle school	High school	College	Master	PhD
0-199	M	15-30		4	8	37	6		
		31-45		4	1	3			
		46-60		7	4	4	1		
	W	61-	1	18	3	3			
		15-30		6	7	77	7		
		31-45		22	4	12	3		
200-499	M	46-60		31	4	4	2		
		61-	8	39	2				
		15-30		7	2	28	10		
	W	31-45		12	12	31	17	1	
		46-60		24	14	20	5		
		61-	4	50	13	13	4		
500-999	M	15-30		4	8	26	16	1	
		31-45		25	9	24	14	1	
		46-60	2	42	8	9	6		
	W	61-	2	51	1	5	1		
		15-30		2	16	15	15		
		31-45		8	3	19	30	1	
1000-1999	M	46-60		9	3	20	22	3	
		61-		18	1	5	3		
		15-30		4	8	26	16	1	
	W	31-45		12	2	10	21		
		46-60		12	4	10	7		
		61-		9	2	2	2		
2000-3000	M	15-30		1	1	4	13	3	
		31-45		1	1	4	13	3	
		46-60		1	1	3	5		
	W	61-	1	1		2			
		15-30				1	1		
		31-45				3	4	1	
2000-3000	M	46-60		2	1	1	2		
		61-		2					
		15-30		1			2		
	W	31-45		1	1				
		46-60		1			4		
		61-		1			1		

to be successful in marketplace, manufacturers should provide proper education and promotion, and then this technology will be accepted around the world for the benefit of everyone.

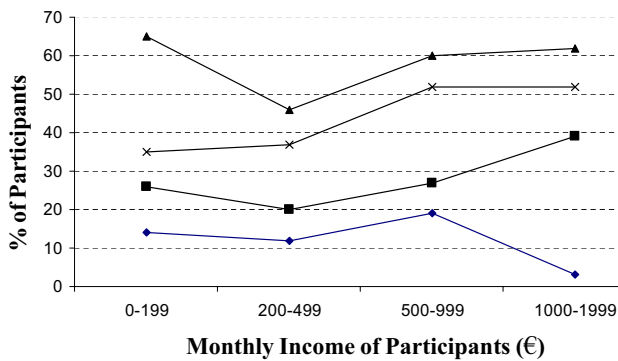
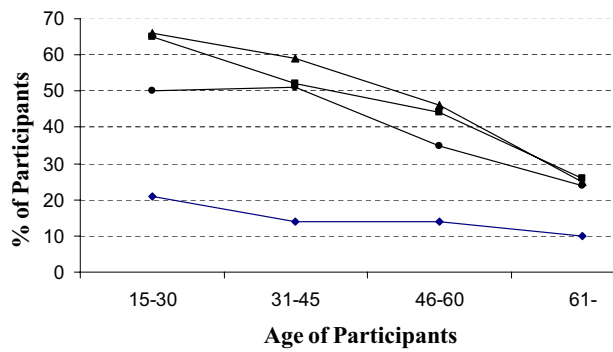
Genetically modified foods: The responds showed that 25% of respondents knew nothing about GM foods (Table 2). The younger with higher education level or higher income level were more aware of GM foods than older people with lower education or lower income were. The correlation between age and knowledge of participants about GM foods was 93%; however, the correlations between income or education level and knowledge of participants about GM foods were 99 and 98%, respectively (Fig. 1). The general low levels of knowledge about genetic engineering that are found in this survey were consistent with the findings from other surveys^{18, 20}. Over the past decade, awareness appears to have risen in Europe due to increased media coverage. For example, in Europe, anti-GM food articles during 1999 very much increased awareness of Europeans, despite knowledge of biotechnology remained same^{20, 21}. However, Europeans were more likely (41 to 48%) to say they understood “some” or “a lot” about GM food than Canadians or Americans (37 and 21%)²². In Turkey like in other countries, media is the major education source; however, it often lacks sufficient scientific training in order to cover complex

molecular methods and genetic applications. Therefore, awareness or knowledge of Turkish people will be remaining same unless the scientists communicate cautiously with the media.

The responds indicated that 27% never purchase GM foods (Fig. 2). The participants with high income and high education level comparing to the participants with low income and education level buy or consume less GM foods. Moreover, 3% of participants believed that appearance and taste of GM foods were not different from those of regular products; however, 62% of them thought opposite and rest of them cannot distinguish GM foods. Similar to our results, in another pilot study among college students in Turkey, Basaran *et al.*¹⁸ reported that the majority of respondents

Table 2. Knowledge of respondents about food additives, irradiated foods, GM foods or organic foods.

	% of respondents			
	Food additives	Irradiated foods	GM foods	Organic foods
Do not know	22	47	25	22
Heard about	28	21	27	20
Know little	42	17	23	17
Know reasonable amount	-	13	21	30
Know very well	8	2	4	11



Legend: ● Irradiated Foods ■ GM Foods ▲ Food additives × Organic Foods

Figure 1. Comparison of knowledge of participants at the different age groups or with different income level about irradiated foods, GM foods, food additives or organic foods.

(64%) appeared unwilling to purchase GM food products. It is expectable since college students must be more educated and more conscious about irradiated foods than our participants who were chosen from the different education levels in the current survey.

The present study indicated that 23% of the respondents thought they were extremely risky for our health (Table 3). As Fig. 4 shows, GM foods were found to be the second most concerned foods by the participants after foods polluted by hormone residues. Age ($p = 0.22$), gender ($p = 0.11$), income ($p = 0.47$) or education ($p = 0.15$) of the participants does not significantly impact on their opinion about GM foods (Fig. 3). Similar to our results, Basaran *et al.*¹⁸ reported that only 23.7% of college students in Turkey found GM foods very unsafe. Concern and uncertainty play an important role in the process of adopting new technologies like GM foods²⁴. The studies in the literature found that generally majority of the consumers was less likely to accept and rate GM foods risky to human health²⁵. However, Chern and Rickertsen²⁶ indicated that there was a very variable perception of GM foods in countries

Table 3. Concern of respondents about food additives, irradiated foods, GM foods or organic foods.

	% of respondents			
	Food additives	Irradiated foods	GM foods	Organic foods
Promote health	2	2	2	48
Unconcerned	-	7	6	-
Somewhat concerned	38	21	23	18
Concerned	28	39	46	5
Very concerned	11	9	10	-
Do not know	21	22	13	29

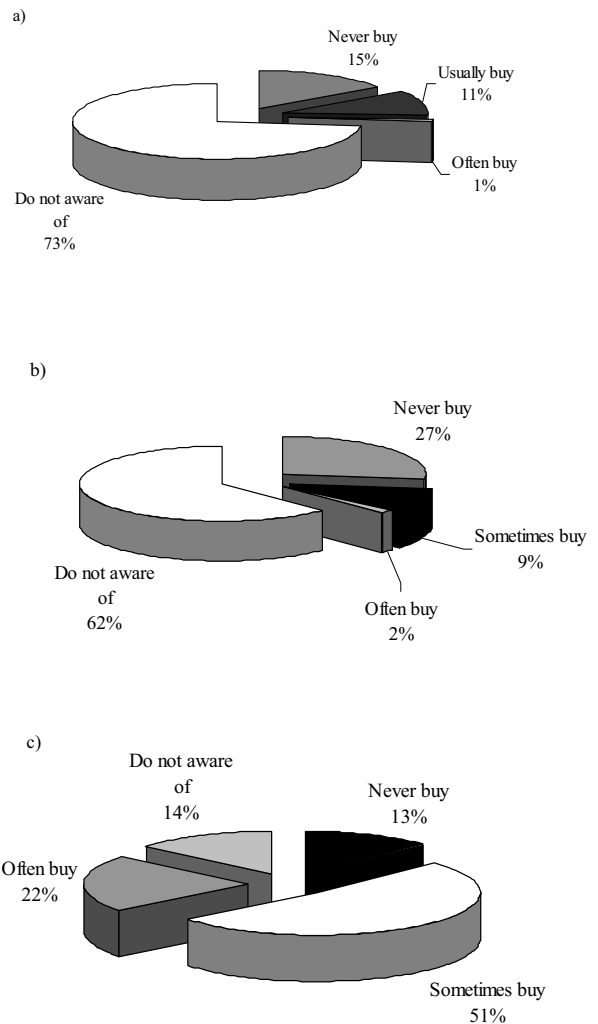


Figure 2. Purchase decision of the respondents for (a) irradiated foods, (b) GM foods (c) organic foods.

where the survey was conducted. For example, Europeans concern more for GM foods when compared to Americans¹¹. Specifically, 9.4% of consumers in the U.S. think that GM foods are “extremely risky” while the corresponding figure for the Nordic (Denmark, Finland, Norway and Sweden) respondents is 33.7%²⁷.

Foods contaminated with hormone residues: Certain synthetic hormones can make young animals gain weight faster and also make vegetables grow at low temperatures in greenhouses. In addition, they help reduce the waiting time and the amount of feed eaten by an animal before slaughter in meat industries. In dairy cows, hormones can be used to increase milk production. Thus, hormones can increase the profitability of the vegetables, meat and dairy industries.

Since Turkish media often issues hormone usage in agricultural products in Turkey, the majority of the people believe that they know reasonable amount about the topic. We searched for the answer of whether Turkish people have preferences or suspicious about using hormones in agriculture. The results indicated that 46 or 35% of participants believed that some or most of the food products in the supermarket contained hormone residues, respectively (Fig. 4). In case of vegetable production, only some of the vegetables, such as tomatoes, zucchini or eggplants, grown

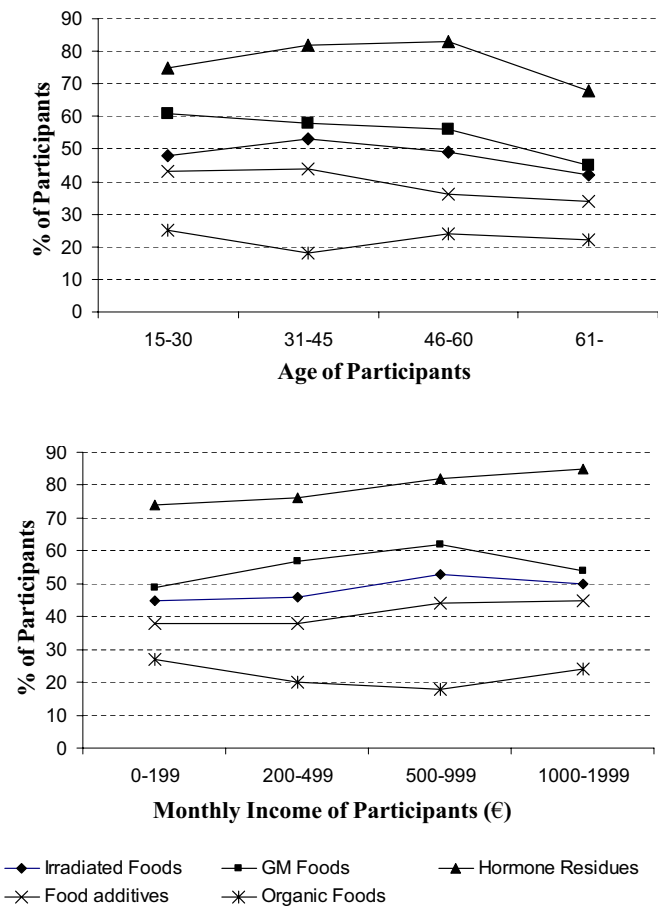


Figure 3. Comparison of negative attitude of participants at the different age groups or with different income level towards irradiated foods, GM foods, hormone residues, food additives or organic foods.

in the greenhouse need hormones to breed at low temperatures. Producers prefer synthetic hormones use other than heating due to economical reasons. In the winter time, hormonal residues in some vegetables in market can be possibly detected.

According to the answers, only 2% of respondents believe that hormone residues found in products do not have effect on our health (Fig. 4). In addition, 8% of them do not have idea about whether hormones used in agricultural field cause unhealthiness. Results showed that the participants most concerned for hormone residues (Fig. 3). The attitudes of women or men participants were found significantly same towards hormone residues in food products ($p = 0.34$). The younger people comparing to older ones are significantly less cautious for hormone residues in foods ($p = 0.007$). Avoidance behavior of consuming risky foods was observed in older age people with higher education ($p = 0.002$) and income level ($p = 0.01$). The consumers have a growing interest in agricultural issues, and they have concerns about how food is produced and food safety. Although the suitable use of hormones does not have any known negative effect on public health, the consumers' concerns have to be taken into account in livestock or vegetable production. These concerns probably increase the interest in organic farming in many countries.

Food additives: Result of the questionnaire showed that only 8% of the people participated to the questionnaire know very well about food additives (Table 2). When we analyzed between

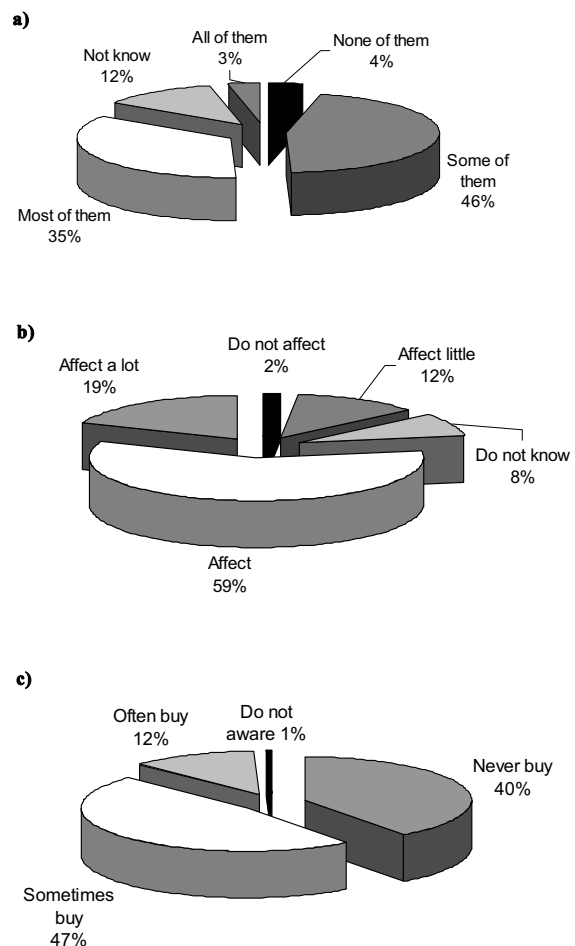


Figure 4. Responds of the participants for the survey questions of a) Do foods contain hormones residues in market place? b) Do hormones residues affect our health? c) Do you purchase food containing hormone residues?

relationship of education, income level or ages and knowledge of food additives, correlation between education or income level and knowledge about food additives was found as 96 and 85%, respectively; however, correlation between age and knowledge about food additives was negative (-97%) (Fig. 1). These results are understandable since old participants in our survey usually have low education level (Corr - 95.5%).

Most of the respondents think that consuming foods containing some of the food additives can lead to some health problems. Only 2% of them think food additives are safe for our health. Negative thought about food additives increases with increasing age, education and income level (Fig. 3). Turkish people view food additives as a major food threat; however, in terms of health risk, food additives would come in at the end of the line, after food-borne microorganisms, environmental contaminants and naturally occurring toxins. Food additives play a very important role in today's plentiful and nutritious food supply. Regulations require evidence that each substance is safe at its intended levels of use before it may be added to foods.

Moreover, according to the survey, 16% of participants when they shop never look at the ingredients written on the label of the food package; however, 35% of them sometimes and 49% of them always look at the labels on the packages. Young people comparing

to old people have more tendency to read the food additives written on the label. The correlation between income level and awareness of ingredients on the labels was found as 87%.

Organic foods: More than half of the survey participants have knowledge about organic foods (Table 2). The participants with high education or high income level know better about organic foods than others (Fig. 1). The correlations between education, income level or age and awareness of organic foods were 99, 75 and -91%, respectively. More educated people with higher income have more knowledge about organic foods comparing to older people. When we asked them about their purchase preferences about organic foods, their responds showed that 22% of them often bought organic foods (Fig. 2). Most of them agreed that organic foods were unreachable by two reasons. One of the reasons was that the price of organic foods was very high due to inadequate quantity and extreme hardness of organic farming. Other reason was that organic foods could not be found in every marketplace in Turkey since 85% of the organic foods are exported to European countries.

The responds also indicated that older people with lower income have significantly less perception for organic foods ($p = 0.0025$). The correlation between education level and positive behavior towards organic foods was also found very high (96%). Understandably, 31-45 years old participants have maximum perception and conscious about organic foods compared to people at other age groups. In one survey study conducted in the U.S., it was reported that the income and the education level were not only factors which affect on interest of organic foods²⁸. For example, it was found that religious people or people for whom food plays an important role in their life on lower income or with less education are more interested in organic foods than are higher income and more educated groups. They also claimed that high income and more education people mostly purchase organics due to the fashion and peer-related influence.

In evaluation of the question of their concern about organic foods, expectedly, 48% of participants think that organic foods are good for our health; however, 5% of them think opposite (Table 3). In fact, inadequate knowledge makes people suspicious about organic foods. We observed in this study people in Turkey need to be more educated about organic farming and organic products. Organic farming is extremely rising due to high demands from exporter companies in Turkey; however, the organic food producers should increase promotions for organic foods to achieve the same demand inside the country.

Conclusions

Consumer acceptance or refusal of organic foods, irradiated foods, GM foods or food additives certainly depends on the awareness and the knowledge of the benefits or risks of these technologies. The knowledge of people in Turkey mostly limited to TV programs they watch or knowledge of people around them. Scientific based TV programs are rarely shown not to risk watchers rating, so improvement of awareness or knowledge of benefits or risks about new developments in food producing must be put off for a while. In our study, awareness or knowledge of respondents usually increases with education or high income level. The survey participants mostly have negative attitudes towards GM foods, irradiated foods, food additives and also hormone usage in food

products. Unfortunately, consumers are not very familiar with organic products in the market. Therefore, promotional activities on organic products could be necessary for Turkish consumers. Visible displays in the selling place as well as promotion through media should be considered. What action would be effective is beyond the scope of this project, labeling and consumer education must all figure in any proposed action.

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References

- ¹Lagunas-Solar, M. C. 1995. Radiation processing of foods: An overview of scientific principles and current status. *Journal of Food Protection* **58**:186–192.
- ²Morehouse, K. M. 2002. Food irradiation—US regulatory considerations. *Radiation Physics and Chemistry* **63**:281–284.
- ³Food Codex Alimentary. http://www.gammapak.com/English/teknik_dokumanlar_Yazi4.html (accessed Jan 2007).
- ⁴Henson, S. 1995. Demand-side constraints on the introduction of new food technologies: The case of food irradiation. *Food Policy* **20**(2):111–127.
- ⁵Hunter, C. 2000. Changing attitudes to irradiation throughout the food chain. *Radiation Physics and Chemistry* **57**(3–6):239–243.
- ⁶Resurreccion, A. V. A., Galvez, F. C. F., Fletcher, S. M. and Misra, S. K. 1995. Consumer attitudes toward irradiated food: Results of a new study. *Journal of Food Protection* **58**:193–196.
- ⁷Fox, J. A. 2002. Influences on purchase of irradiated foods. *Food Technology* **56**(11):34–37.
- ⁸Gunes, G. and Tekin, M. D. 2006. Consumer awareness and acceptance of irradiated foods: Results of a survey conducted on Turkish consumers. *LWT* **39**:443–447.
- ⁹Conner, A. J. and Jacobs, J.M.E. 1999. Genetic engineering of crops as potential source of genetic hazard in the human diet. *Mutation Research* **443**:223–234.
- ¹⁰General Directorate of Agricultural Research (GDAR). www.tagem.gov.tr (accessed April 2007).
- ¹¹Gaskell, G. 2000. Agricultural biotechnology and public attitudes in the European Union. *Ag. Bio. Forum* **3**:87–96.
- ¹²Magnusson, M. K. and Hursti, U.K. 2002. Consumer attitudes towards genetically modified foods. *Appetite* **39**(1):9–24.
- ¹³Grunert, K.G, Bredahl, L. and Scholderer, J. 2003. Four questions on European consumers' attitudes toward the use of genetic modification in food production. *Innovative Food Science & Emerging Technologies* **4**(4):435–445.
- ¹⁴Aerni, P. 2001. Assessing stake holder attitudes to agricultural biotechnology in developing countries. *Biotech. Dev. Mon.* **47**:3–7.
- ¹⁵Gaskell, G., Bauer, M. W., Durant, J. and Allum, N. C. 1999. Worlds apart? The reception of genetically modified foods in Europe and the US. *Science* **16**:384–387.
- ¹⁶Hallman, W. K., Hebden, W. C., Auino, H. L., Cuite, C. L. and Lang, J. T. 2003. Public perceptions of genetically modified foods: National study of Americans knowledge and opinion. Food Policy Institute, Cook College, Rutgers, the State University of New Jersey, New Brunswick, NJ. Available at: www.foodpolicyinstitute.org. (accessed Jan 2007)
- ¹⁷Hallman, W. K., Hebden, W. C., Cuite, C. L., Auino, H. L. and Lang, J. T. 2004. Americans and GM food: Knowledge, opinion & interest in 2004. Food Policy Institute, Cook College, Rutgers, the State University of New Jersey, New Brunswick, NJ. Available at: <http://www.foodpolicyinstitute.org>. (accessed Jan 2007).

- ¹⁸Basaran, P., Kilic, B., Soyuyigit, H. and Sengun, H. 2004. Public perceptions of GMOs in food in Turkey: A pilot survey. *Journal of Food, Agriculture & Environment* **2**(3&4):25–28.
- ¹⁹Cardello, A.V., Schutz, H.G. and Leshner, L.L. 2007. Consumer perceptions of foods processed by innovative and emerging technologies: A conjoint analytic study. *Innovative Food Science & Emerging Technologies* **8**(1): 73-83.
- ²⁰Morris, S.H. and Adley, C.C. 2001. Irish public perceptions and attitudes to modern biotechnology: An overview with a focus on GM foods. *Trends in Biotechnology* **19**(2):43-48.
- ²¹Braun, R. 2002. People's concerns about biotechnology: Some problems and some solutions. *Journal of Biotechnology* **98**(1):3-8.
- ²²Eurobarometer European Commission public-opinion surveys. <http://europe.eu.int/comm/dg10/epo/> (Accessed 2007).
- ²³Angus Reid World Poll. <http://www.angus-reid.com/polls/> (accessed Feb 2007)
- ²⁴Priest, S.H. and Gillespie, A.W. 2000. Seeds of discontent: Expert opinion, mass media messages, and the public image of agricultural biotechnology. *Sci. Eng. Ethics* **6**:529-539.
- ²⁵Cayford, J. 2003. GMO opposition not based on a mistake. *Nature Biotech.* **21**:493.
- ²⁶Chern, W.S. and Rickertsen, K. 2004. Studies utilizing willingness to pay methods. In Evenson, R. E. (ed.). *Consumer Acceptance of GM Foods*. CPL Press, Berks, UK, pp. 115-169.
- ²⁷Onyango, B., Bellows, A. C., Diamond, A. and Hallman, W. 2006. What we don't understand about public interest in organics. *Appetite* **47**:384.