International Journal of Natural and Engineering Sciences 2 (2): 53-57, 2008
ISSN: 1307-1149, www.nobelonline.net

Attitudes of Turkish Consumers Towards Genetically Modified Foods

Derya KAHVECĶ Beraat ÖZ¢ ELĶK*
Istanbul Technical University, Food Engineering Department, 80626 Maslak - İstanbul / TURKEY

*Corresponding Author
E-mail: ozcelik@iku.edu.tr

Received: December 06,2007
Accepted: January 29, 2008

ABSTRACT

This study reports attitudes towards genetically modified (GM) foods among Turkish consumers. The 408 subjects, aged 18-60, were asked to fill a questionnaire including questions specifically concerning attitudes about such foods. Most of the participants were rather negative about GM foods. It was observed that majority of the subjects refused to consume GM foods. However, in the case of such foods' being healthier or cheaper than traditional foods, fraction of participants who refused them decreased a bit. Women and highly educated ones were more positive than men and those with lower education level.

Keywords: Genetically modified foods, consumer attitudes, questionnaire

INTRODUCTION

Genetically modified (GM) foods are considered to have the potential to change the world food industry. They had a great growth rate in the past decade; however, arguments over the topic are still up-to-date. Besides some science groups, consumers are doubtful about GM foods as well. Studies aiming to determine attitudes of consumers towards such foods resulted in different ways according to the subject group. Consumer acceptance of GM products varied according to many aspects. Type of application of the genetically modifying technology was one of them. It has been shown that medical applications are considered to be more beneficial than food applications [1].

It was reported that attitudes of consumers differed among countries. American consumers seem to be more positive towards GM food products (2) than consumers in Europe (3). There can be a number of reasons for the change in attitudes of consumers in different countries, such as income level of the country, informative policies of the governments, etc.

It was observed from previous studies that female subjects were more skeptical about GM foods (4-9). Education level was also effective on consumers' attitudes. However, some results have been contradictory. It was stated that higher education level resulted in lower acceptance (3, 6, 7), whereas the other studies stated the opposite [4, 5, 9, 10].

Public opinion in Turkey is rather negative towards GM foods. Turkish Consumers Union publishes detailed news about the risks of GM foods on its website. The Union's main concern about the topic is the risk of antibiotic resistance development in human bodies as a result of consuming these resistant genes from GM foods. Another risk that the Union mentions is that some genes causing allergic diseases can be transferred to GM foods and this can result in serious diseases, even cause to death in consumers. In 2004, 'Say NO to GMO' Platform was built up by 49 different civil society organizations. This platform's aim is to inform public about the risks of GM foods, and to have the government make strict laws about producing and importing such foods in Turkey [11].

To our knowledge, there exists only one scientific study that focuses on Turkish concumers' opinions about GM foods [12]. Although the mentioned study included more subjects than the present one – 670 and 408, respectively – it cannot be considered to be representative of the population, since the subjects were all students. This study aims to reveal how Turkish consumers respond to GM foods and includes subjects from different regions who have different education and income levels. Results were evaluated with respect to participants' demographics and purchasing habbits.

METHOD

Questionnaire preparation

The questionnaire was made up of questions specifically concerning general attitudes about GM foods, interest in purchasing GM foods, the use of genetic engineering (GE) in specific food products, and current status of GM foods in Turkey [13]. All questions were multiple-choice in order to prevent participants to skip them. An option of "No comment" was included in appropriate questions to make sure that participants did not answer unfamiliar questions randomly.

At the beginning of the questionnaire, some general information about participants was collected, such as gender, city where they live, occupation, education, and income level. Questionnaire is given in Table 1. Their criteria about purchasing food products and opinions on newly developed foods were also asked before the questions focusing on GM foods. First question of the part about GM foods aimed to determine which property was defined as "the most important foodborne threat against

human health" by the participants, and GM foods was one of the options. Next question directly asked their comment on GM foods. The participants were asked about their purchasing tendency of and safety concerns about GM foods in third and fourth questions respectively. Next three questions were about current status of GM foods in Turkey. The participants were asked whether a well-rounded legal regulation should be made about GM foods and these foods should be labeled properly or not. It was also asked if the participants recalled seeing GM foods in markets to see their familiarity about the subject, since GM foods, if they exist, are not labeled in Turkey because it is not obliged. The participants were asked in which circumstances they consider buying GM foods. Their opinion on GM foods' long-term effects on health was investigated and at the last question, in which they were free to choose more than one options, the participants were asked in which food products genetic engineering is used.

Questionnaire distribution

Questionnaire forms were sent randomly to 442 people in 6 cities via mail or e-mail. Forms which are distributed in İstanbul are generally filled by college students and bank employees. In Kocaeli, nearly all forms were filled by military members. The participants were mostly composed of college students in Sakarya, whereas the dominant group in Malatya and Ankara was doctors, nurses, and pharmacists. Forms distributed in Muğla were received by participants from many kinds of professions.

Questionnaire evaluation

Due to unproper filling, 408 of 442 forms were evaluated. Microsoft® Excel worksheet was used to obtain percentage frequencies for all questions. Respondents' attitudes towards GM foods were evaluated as affected by demographic factors and purchasing habits.

RESULTS

Demographics and purchasing habits

Since a part of the forms were sent to military members, proportion of men (59%) was greater than women (41%). Participants' ages varied from 17 to 62, where the dominant group (63%) was in the range of 18-29, which is expected since college students widely participated in the study. Same trend was seen in evaluating education level. Most of the participants (59%) were from University, as a undergraduate student (52%), master's student (5%), or academic member (2%). The proportion of participants who had lower education than high school was 8%. About 36% of the participants have low income (lower than 500 Turkish Liras, 1 Turkish Lira is equal to ~1.4 US Dollar), 56% of them have medium income (500-2000 Turkish Liras), and 8% of them have high income (above 2000 Turkish Liras). İstanbul was the leading city with the proportion of 34% of all forms, which can be considered as a well representative group since 15% of Turkey lives in this city. Kocaeli is the second widely participated city (26%). Other cities had proportions of less than 15%.

First question was aiming to determine the participants' criteria for purchasing foods and also their opinions about buying new food products. There were three groups of options in the first question, and subjects were asked to choose one from each group. It is observed that, among the first group (trade mark, advertisements, being used to the product, nutrition facts, price), trade mark was the most important parameter affecting purchasing behavior (36%). In the same way, participants chose product's being healthy (64%) from the second group (product's being healthy, green production, being an organic food product, certificates of the producer such as ISO, HACCP, etc.) and product's being easy to carry with (48%) from the third group (being easy to carry with, 'green' package, great appearance).

Second question was asking opinions about newly developed food products. Sixty-nine percent of the participants stated that they would buy "if they are interested", whereas only 8% of them would definitely buy those products. The most important factors that make those products good enough to buy were a good and different taste (53%), promotions (22%), being easy to prepare (18%), and interesting package (7%).

Attitudes towards GM foods

From the responses to the questions focusing directly on GM foods, it is observed that the participants are generally negative towards them. First question of this part was a multiple choice question which was aiming to see which options would be defined as "the most important food borne threat against human health". Food additives were chosen by one-fourth of the participants, and it was followed by GM foods (20%), food hormones (18%), microorganisms (18%), unfresh foods (16%), and irradiated foods (3%).

Next question was directly asking opinions of the participants about GM foods. More than half of them (52%) said that such foods are unhealthy. Those who stated that they wonder GM foods' long-term effects on human health were 30% of all. About 14% of the participants claimed no comment on the issue, whereas only 2% for each said that GM foods have no harm to human health, or they are useful because they improve foods' quality. As a result, considering that the group concerned about GM foods' long-term effects was also uncertain about the issue, it can be said that about 80% of the participants were defining such foods as unreliable.

Figure 1 shows the fractions of participants according to their responses to the question "Would you buy GM foods?". Most of the participants (67%) would not buy GM foods. It can be said that, besides those who directly said that GM foods are unhealthy in the previous question, there was another group who did not exactly think that such foods are unhealthy, but still, would refuse to buy them.

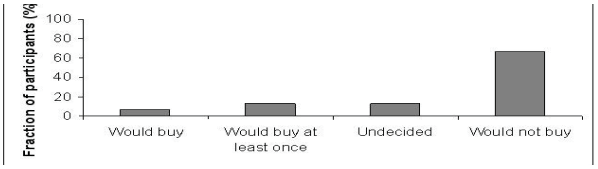

Figure 1. Fractions of participants according to their responses to the question "Would you buy GM foods?".

In the case that the participants were asked if GM foods are reliable or not, again most of them (65%) stated that they are not reliable, whereas 29% of them were undecided, and only 6% of them defined such foods as reliable.

According to the next question, a dominant group with a fraction of 79% would like the government to prepare a special legal regulation regarding GM foods. Five percent of them thought that would be unnecessary, 11% of them were uncertain, and 5% of them were not interested in the issue.

Nearly all of the participants (90%) wanted GM foods to be labeled properly, while 5% were uncertain, 3% said that it was not necessary, and 2% stated that they would not care.

Next question aimed to determine the participants' current knowledge and interest in GM foods by asking if they had seen such foods on markets. About 4% of them said that they had, which was impossible since GM foods, if they exist, are not labeled because it is not obliged. Sixty-four percent of the participants said that they had not seen GM foods on markets, and 32% of them said that they did not pay attention on them.

In the case of GM foods' being superior to others in many ways, like appearance, taste, shelf life, 67% of the participants still would not buy such foods. On the other hand, the proportion of participants who had said that they would buy GM foods in a previous question has risen from 7% to 13% in the stated situation.

Figure 2 shows the proportions of the participants according to their intent to buy GM foods. As can be seen, more than half of them stated that they would never buy such foods in any circumstances. However, in the case of GM foods' being healthier than conventional ones, participants willing to buy them have increased to 37%, which states that health issues is one of the most important parameters that define purchasing behaviors of consumers.

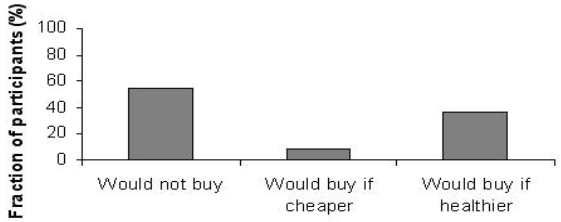

Figure 2. Proportions of the participants according to their intent to buy GM foods.

According to the next question, 36% of the participants said that GM foods would definitely cause health problems in long-term usage, whereas 37% thought that such foods were likely to be harmful for health. Only 7% said that GM foods would not cause health problems. It can be observed that, nearly three-fourth of the participants thought that GM foods would, definitely or not, be harmful for human health in long-term.

In the last question, which was requiring more knowledge about GM foods, was a multiple-choice one in which participants were free to choose more than one. It was asked in which food products genetic engineering was being used the most. They thought that this technique is mostly used in fresh fruits and vegetables (36%), tomatoes in particular (35%), animal products (26%), corn and its products (23%), soybean and its products (22%), cereals (16%), oil seeds (9%). About 20% did not make any comments. It seemed that participants were unaware of wide usage of genetic engineering in corn and soybean products.

Differences between demographic groups

Age. From the point of the participants' ages, it was observed that those in the range of 30-39 years-old were the most negative group towards GM foods. They had the greatest proportion in most questions by stating that GM foods were unreliable and likely to cause health problems, and that they would not buy such foods, and also that GM foods must be labeled properly. Ones who were 18-29 or 40-49 years-old were less doubtful about consuming GM foods. Participants who were younger than 18 or older than 59 were generally less informed about the issue, which could be expected.

Gender. Women were more negative towards GM food than men. Parameters affecting participants' purchasing behavior were also differing according to the gender. Figure 3 shows reasons for buying GM foods according to the participants' gender. Men said that they could consider buying such foods if they were cheaper, while being healthier was more important for women.

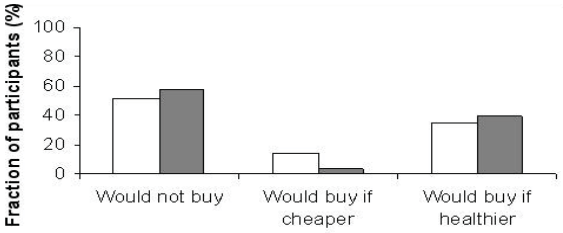

Figure 3. Reasons for buying GM foods according to the participants' gender. White bars, male; grey bars, female.

Education. It was observed that participants' intent to purchase GM foods increased as their education level increased. Figure 4 represents proportion of participants according to their education who stated that they would or would not buy GM foods. Nearly one-fourth of those who had a college or master degree stated that they would, at least once or more, buy GM foods, whereas this proportion was lower in lower educated ones.

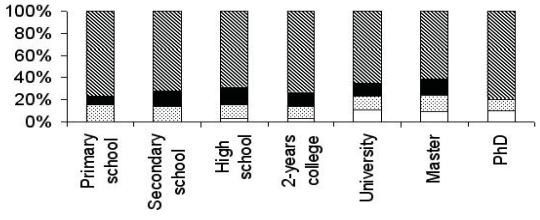

Figure 4. Proportions of participants according to their education. White bars, would buy; dotted bars, would buy at least once; black bars, undecided; striped bars, would not by.

DISCUSSION

Attitudes towards GM foods

In general, consumers who took part in the study were negative towards GM foods. This result is in accordance with some previous studies [4-8, 12]; on the other hand, there exists a few studies resulting in the opposite way [2, 14]. The proportion of subjects stating that GM foods were unhealthy was 61,2% in a study conducted in England [8], while this value was 73% in the present study. Participants who thought that

such foods are unreliable had the same fraction with those who were a part of the study made in Ireland [7]. Although general trend was negative towards GM foods in Croatia, nearly half of those in our study (32%) stated that those products were harmful for health (6). In a wide study conducted in European Union countries showed that more than half of the subjects (54%) said that GM foods would cause health problems [3]. In contrary, three-fourth of the participants of a study made in China, Indonesia, and Philippines were willing to buy GM foods and the also thought that such foods were healthy [14]. This trend was very small in the present study.

It was observed that 67% of the subjects were definitely refusing to consume GM foods. Similarly, fractions of those also refusing such foods were 62% in Sweden (5), 46% in Italy, 44% in Norway, and 45% in England (15). On the other hand, according to a study conducted in the USA, half of the participants would buy GM corn products [2].

Participants who would like the government to prepare a special legal regulation regarding GM foods were in a similar fraction with some European countries [15], as well as those in a study conducted in Turkey previously [12].

It was found that 67% of the subjects would not buy GM foods even if they are cheaper than and superior to conventional foods. This value was 48.9% in Croatia (6), and nearly 60% in the European Union (3). An interesting comparison can be made at this point with a study in which Irish academic personnel were the subjects (16). In this study, the observed fraction of the participants who claimed that they would buy GM foods cheaper than and superior to conventional foods is nearly equal to that of subjects in the present study with the opposite opinion. This trend can be explained by the fact that education level strictly affects purchasing behaviors of consumers, which was also observed in this study as well as in the previous ones.

Differences between demographic groups

It was found that those with higher education degrees are more positive towards GM foods. There are a number of studies with the same result [4, 5, 9, 10]. On the other hand, there are studies which claimed that consumers' intent to purchase GM foods decreases as their education level increases (3, 6, 7).

Consumers with a positive attitude towards GM foods were generally college students [4-7], as it was observed in the present study. The result that was well-matched with those previous ones was that women were more doubtful about GM foods than men [4-8, 10].

CONCLUSION

Consumer acceptance of GM foods depends on many factors. The results of the present study cannot be generalized to include the overall attitudes of Turkish population since the sample size is not large enough; however, subjects were from different regions and their education levels, incomes, and purchasing habits were differing from each other, so the results can be considered informative.

Majority of the consumers who took part in the present study are rather negative towards GM foods. Most of them refuse to buy such foods, thought that they are harmful for health, and want a special legal regulation to be made for such foods. However, these results are not true for all of them; highly educated men who are aged between 18-29 or 40-49 are more positive than others. The study resulted in a similar way with those previous ones.

According to the present study, it can be said that Turkish consumers need to be informed well about for and against of GM foods; and a well-designed risk communication is also needed.

Acknowledgement

Authors would like to thank Damla Gülbay for her efforts during the study.

REFERENCES

[1] FREWER, L. J. and SHEPHERD, R. 1995. Ethical concerns and risk perceptions associated with different applications of genetic engineering: Interrelationships with the perceived need for regulation of the technology. Agriculture and Human Values, *12*, 48-57.

[2] HEFFERNAN, J.W. and HILLERS, V.N. 2002. Attitudes of consumers living in Washington regarding food biotechnology. Journal of the American Dietetic Association *102(1)*, 85-88.

[3] EUROBAROMETER. 2005. Europeans, Science and Technology. Commission of the European Union. INRA – European Coordination Office, Brussels.

[4] MUCCI, A., HOUGH, G. and ZILIANI, C. 2004. Factors that influence purchase intent and perceptions of genetically modified foods among Argentine consumers. Food Quality and Preference *15*, 559-567.

[5] MAGNUSSON, M.K. and HURSTI, U.K. 2002. Consumer attitudes towards genetically modified foods. Appetite *39*, 9-24.

[6] RENKO, N., BRČIĆ-STIPČEVIĆ, V. and RENKO, S. 2003. Attitudes of the Croatian population toward genetically modified food. British Food Journal *105(3)*, 148-161.

[7] MORRIS, 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.

[8] KIRK, S.F.L., GREENWOOD, D., CADE, J.E. and PEARMAN, A.D. 2002. Public perception of a range of potential food risks in the United Kingdom. Appetite *38*, 189-197.

[9] BROWN, J.L. and PING, Y. 2003. Consumer perception of risk associated with eating genetically engineered soybeans is less in the presence of a perceived consumer benefit. Journal of the American Dietetic Association *103(2)*, 208-214.

[10] LUSK, J. and SULLIVAN, P. 2002. Consumer acceptance of genetically modified foods. Food Technology *56(10)*, 32-37.

[11] http://www.gdoyahayir.org/yayinlar/yayin_01.htm

[12] BASARAN, P., KILIC, B., SOYYIGIT, 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.

[13] GÜLBAY, D. 2005. Türk Tüketicisinin Fonksiyonel ve Genetik Modifiye Gıdalar Hakkındaki Görüşleri. Undergraduate Project Study. B. Özçelik (Advisor). ITU Food Engineering Department, Istanbul.

[14] ZHONG, G., MARCHANT, M.A., DING, Y. and LU, K. 2002. GM foods: A Nanjing case study of Chinese consumers' awareness and potential attitudes. AgBioForum *5(4)*, 136-144.

[15] MILES, S., UELAND, Ø. and FREWER, L.J. 2005. Public attitudes towards genetically-modified foods. British Food Journal *107(4)*, 246-262.

[16] MORRIS, S.H. and ADLEY, C.C. 2000. Genetically modified food issues: Attitudes of Irish university scientists. British Food Journal *102(9)*, 669-691.

Table 1. Questionnaire

Purchasing habits

Choose the criteria from each group that affects your choice of food product purchase.
- Trade mark, advertisements, being used to the product, nutrition facts, price
- Product's being healthy, green production, being an organic food product, certificates of the producer such as ISO, HACCP, etc.
- Product's being easy to carry with, 'green' package, great appearance

What is your opinion about newly developed food products?
- I definitely buy.
- I buy if it's interesting.
- I rarely buy.

Choose the most important factor that makes the newly developed products good enough to buy.
- A good and different taste
- Promotions
- Being easy to prepare
- Interesting package

Attitudes towards GM foods

Choose the most important food-borne threat against human health.
- Food additives
- GM foods
- Food hormones
- Microorganisms
- Stale foods
- Irradiated foods

What is your opinion about GM foods?
- GM foods are unhealthy.
- GM foods do not have any harm for humans.
- GM foods are useful because they improve foods' quality.
- I am concerned about the long-term affects of GM foods.
- I have no idea.

Would you buy GM foods?
- Yes I would buy.
- No I would not buy.
- I would buy at least once.
- I have no idea.

Are GM foods reliable or not?
- Yes they are reliable.
- No they are not reliable.
- I have no idea.

Would you like the government to prepare a special legal regulation regarding GM foods?
- Yes it is needed.
- No it is unnecessary.
- I have no idea.
- I'm not interested in this issue.

Do you think that GM foods should be labeled specifically?
- Yes it is needed.
- No it is unnecessary.
- I have no idea.
- I'm not interested in this issue.

Have you ever seen a GM food on the market?
- Yes I have.
- No I have not.
- I did not pay attention.

Would you buy a GM food if it is superior to others in many ways, like appearance, taste, shelf life?
- Yes I would buy.
- No I would not buy.
- I may buy.

Choose the reason that would make you buy a GM food.
- GM foods' being healthier than conventional ones
- GM foods' being cheaper than conventional ones
- I would never buy a GM food.

Do you think that GM foods will cause health problems in long-term usage?
- Yes, definitely.
- Yes, probably.
- No I don't think so.
- I have no idea.

Choose the food products in which genetic engineering is being used the most.
- Fresh fruits and vegetables
- Tomatoes
- Animal products
- Corn and its products
- Soybean and its products
- Cereals
- Oil seeds
- I have no idea.