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Public perceptions of GMOs in food in Turkey: A pilot survey

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Abstract

Since first introduced to consumers in the early 1990, genetically modified organisms (GMOs) manufactured through bio-engineering have raised economic, ethical, moral and environmental issues. The socioeconomic effect that GMOs have on agriculture in both developed and developing countries is great. Marketing of GMO derived food products places a responsibility on each contributing side (e.g., researchers, academics, research organizations, policy makers, legal authorities, private companies, farmers and at last but not least the consumers). The objective of this study was to assess beliefs and knowledge and to explore ideas on the impact of biotechnology among educated young Turkish adults. The pilot survey was conducted among 670 randomly selected students who were queried about their knowledge and attitudes toward the use of agricultural biotechnology, perceptions of risks associated with biotechnology applications and ethics. The questionnaire focused on five main areas concerning GMOs: general knowledge of genetic modifications, agricultural applications, labeling expectations for food, purchasing trends and governmental regulations. The results showed that one third (36.2%) of the participants surveyed had not heard about the genetic modification. Nearly 10% of the correspondents believed that by consuming genetically modified food products ones genes can also change and 23.7% thought that GM foods are "extremely risky". The findings showed that 65.3% of the Turkish consumers do not find the information on the food package convincing, and 80% of the correspondents want to have labeling on the GM foods. The results were compared with those obtained in previous surveys carried out in several other countries.

Key words: Agriculture, biotechnology, consumer, diet, food, GMO, genetic modification, pilot survey, Turkey, public survey.

Introduction

Genetically modified organism (GMO) is a general term defined as organisms derived from microorganisms, plants or animals that have been manipulated at the molecular level to provide them with desired traits [1]. Several surveys have been conducted to determine the public perception of GMOs in the USA, Europe and elsewhere. However, very few surveys have been conducted to study, how the GMOs are perceived in developing countries [2, 3], and this is the first such study carried out in Turkey. To provide an initial investigation into this issue, a survey was undertaken with 670 undergraduate students, a well demographically representative sample at Suleyman Demirel University in Turkey. The students came from 7 provinces and 54 different cities. The survey consisted of 370 female and 300 male students aged between 20 and 28 from junior or senior classes. It is assumed that students close to higher education (close to graduate students) would be more informed on GMO and its use in food systems. Six hundred seventy randomly chosen students from 15 Colleges of Social and Life Sciences of the Suleyman Demirel University were distributed as follows: administrative and social sciences 186, engineering 254, life sciences 230. Students were therefore diverse in their educational and socio-economic backgrounds as well in their cultural and ethnic origins. The standardized "GMO questionnaire" administered within a 6-week period in April-May 2003, covering a mix of day times.

The main objective in this pilot study was to evaluate the awareness, attitude and perception, general willingness and expectations among Turkish consumers with regard to GMOs and GM foods in general, and furthermore, to determine respondents' preference on the type of GMO labeling. For the survey, parts of questionnaires employed in several countries were translated into Turkish. The first part was adopted from an international survey conducted in USA, Norway, Japan and Taiwan [4]. It contained general questions such as: Is cultivating GM crops harmful to the environment? Does GM crops produce nutritious food? Is it useful to produce GM crop that are resistant to pests and diseases? If the price was the same would you buy and consume GM foods? The second part adapted from a national survey conducted in Costa Rica [3] included also more specific questions, such as: How much willing to consume GM foods if they reduce the amount of pesticide applied to crops? How important to label GM foods? What type of labeling would you support?

Results and Discussion

Biotechnology has become one of the great drivers in the food market. GMO is an important issue in the food industry, but the knowledge and attitude in Turkey have not been elucidated. A national sample of 670 students from 15 colleges of Suleyman Demirel University in Turkey participated in this study by completing questionnaires. It revealed that 62% of students were aware of GMOs, while only 3.3% answered they were "very well informed" about GM foods prior to the survey. Roughly 68% of the correspondents knew the definition of GMO and nearly one third (36.2%) of the participants surveyed had not heard about

the GMOs before. "Media" was the most cited source of information. Students, who generally considered themselves well informed about the impending changes in biotechnology and GMOs, heard about it from media (90%), mainly tv and newspapers. A recent study indicated that media accounts are often seen as causes rather than consequence of the existence of public controversy [5]. Sharing and dissemination of proper information is essential, and lack of dissemination of information and communication among participants might mislead [6]. It was emphasized earlier that in the case of sensitive issues like GMOs media often lack adequate scientific training in order to cover complex molecular methods and their applications [1]. Therefore, it is critical that the scientists must take into account concerns expressed by the public and also must communicate cautiously with the media.

There is the issue of "negative" ingredients which although derived from GMOs, do not contain any GMO due to processing (e.g. soy oil) [7, 8]. Although most of what students had heard was correct, some, however, had misconceptions. Thirteen percent respondents expected that modified sequences of DNAs are not detectable in vegetable oil, while majority (64%) responded that they do not know the correct answer. Correct responses were highest (65.4%) in the question concerning the consumption of GMOs and their effect on changing human genes. About 10% of the correspondents believed that by consuming genetically modified food products ones genes can also change. On two of the knowledge questions on GMO consumption altering ones genes and the soy oil, the average score for females was greater than for males (16.6% versus 5.9%). In general, males were more accepting of genetic manipulations than females, and "do not know" responses were higher among women. The results also suggested that overall administrative and social sciences students had less interest in genetic modifications and biotechnology in general than the others, and that the knowledge of genetic engineering among social science students was found rather limited. From these results we concluded that provision of accurate, easily understandable information regarding GM products to a broad section of the public is an important step.

Risk and uncertainty play a number of distinct roles in the process of adopting new technologies [5]. In previous studies, it has been shown that consumers are less likely to accept GM foods if they rate them risky to human health [9]. When asked whether GM foods are safe or risky to human health to Turkish consumers, 37% thought it does not pose a hazard, 24% feared that GM foods pose a serious hazard to consumer and the remaining 35% were unsure. Only 4% found GMOs very safe. In Europe, the support for GM foods is low when compared to the U.S.[10]. In this regard, Turkish consumers are in more line with European consumers than the Americans. Specifically, 23.7% of the Turkish respondents think that GM foods are "extremely risky" while the corresponding figure for the Nordic **(**Denmark, Finland, Norway and Sweden**)** respondents was 33.7%[11]**.** When the same question was presented to randomly selected adults in the USA during a telephone interview (1999), 53% thought it does not pose a hazard, 27% believed that it poses a serious hazard to consumers and only 9.4% of American respondents considered as extremely risky. The results of Chern and Rickertsen [4] showed that there is a very variable perception of GM foods in countries where the survey was conducted**.** In our survey the results also demonstrated that those which were most familiar with the issue were also the most supportive. To determine the assimilation of information concerning biotechnology thaught in the classroom, a 10 year survey was conducted in biology classes in the USA[12]. The results show that when the knowledge of students increased, the perceived risk due to biotechnology applications has been found decreased [12]. The results of the pilot survey in this study indicate that the knowledge and attitude of students in Turkey is inadequate and it suggests the need for dissemination of information and education to be improved.

The highest concurrent correspondence (91%) was concerned about the labeling and found important to label GMOs. Overall the findings showed that 80% of the correspondents want to have labeling on the GM foods. Similarly in Taiwan a market survey of GMO acceptability showed that the majority of people (94%) agreed that labeling must be required even under a premarketing approval [13]. There is an increasing lack of acceptance of foods containing GM crops by consumers in several European countries. In 1999 a survey done in eleven European nations showed that 61% of the shoppers avoid GMO products. In UK a significant majority of the consumers opposed to GM food and 77% of the consumers supported a ban on commercially growing of GMO crops. Fifty-three percent of respondents said they would pay more for non-GM foods whereas 36% would not [14]. In lieu of EU rules, the European food industry adopted tentative measures for voluntarily labeling GM products in 1998. Those voluntary measures were eventually formalized as legislative proposals. In 1999, the EU decided that it would call for a suspension of further authorizations for the commercial release of GM crops and foods, which also urged for caution with regard to the commercialization of GMOs. In July 2001 the European Commission has proposed to require labeling of all food and feed derived from GMOs. Current EU labeling regulations (based on the EU directives 258/97 and 1139/98) relating to GM foods require that foods containing genetically modified ingredients at or above the 1% threshold, must have clear labeling to indicate that it contains GM ingredients. It states a mandatory labeling for products that consist of GMO or contain GMO ingredients [15]. In Europe strong opposition and resistance to GMOs resulted in 39% cancellation of GMO research project over the last four years as reported by a European research commissioner[16]. In the USA, a main GMO producer and exporter in the world, the labeling is required only when the GM foods and their conventional counterparts are not substantially equivalent in the constituent and nutritional properties, according to the guidance drafted for the foods developed through biotechnology since 2001 [3].

One of the primary goals of this research was to determine consumers' purchasing decision relative to any concern they might have for genetic engineering. According to a UK survey, four out of five people disbelieve health claims made by food manufacturers[17].

In our survey, similarly to European consumers, 65.3% of the Turkish consumers do not find the information on the food package convincing. It was also observed that gender was one of the determinant of attitudes towards the GM technology and purchasing. With regard to the claims made on the labels, fewer female correspondents (19.6%) say they believe the information provided on the label, while men more frequently (30.6%) find them reliable. Considering that culturally female shoppers in

Turkey are the decision-makers for purchasing of food, the results indicate that producers would need to pay more attention to labeling. Earlier studies showed that males consider themselves to have a better control of the things affecting their lives, while females generally exhibit a more negative attitude than their male counterparts [18, 19]. One of the most interesting results of the student survey was that 68.4% of Turkish consumers is supportive of research in genetic modification and they support the financial assistance for the national research on GMOs. Ironically, the majority of respondents (64%) appeared unwilling to purchase GM food products. In regards to organic products, most European consumers regard organic food as more healthful [17], likewise in our survey, 63.7% of the respondents feel that organic foods are "healthier", while 21.23% is "not sure".

The respondents confidence in national governmental organization to regulate GM crops was also evaluated by the questions such as: Are the Ministry of Health and Ministry of Agriculture capable of regulating GM foods? Nearly 42% answered the question "no" while 45% said they "do not know". The results clearly indicate that Turkish consumers are not aware of the activities of the governmental institutions about GMO regulations. A consumer survey on the technology of genetic engineering in Germany indicated that acceptance of the technology for different applications is very distinctive. For instance, application in medicine and pharmaceuticals is widely supported, while the application in agriculture is rejected by the majority due to the lack of the trust in science and the regulatory authorities [20]. Our results also indicate that policy to enable efficient and satisfactory regulations in the use of molecular modifications in agriculture is a source of great concern.

The main positive expectations from genetic engineering include increase in agricultural productivity, improved stale food (quality and yield), support sustainable development (reduction of chemical use in agriculture), environmental remediation, medical applications and improved animal production. On the other hand the major concerns or potential risks for genetic engineering and its applications are toxicity, contamination with food allergens or altered composition and nutritional value which result from introducing a new gene, potential risks posed to environment, unintentional gene transfer between species, public opposition and controversy, corrosion of public confidence in biotechnology in general, economic dominance of multinational corporations and dependence on large co-operations and intellectual property laws. Much research has been conducted to investigate whether GM food products can have negative effect on human health. Evidence to date has no indication that GM foods possess more risk than conventional products[21]. However, uncertainty about possible consequences of genetically modified food and trust in various sources of information still exists. It is believed that short falls in regulation on an international base could lead to avoidable public and ecological tragedies [22]. Public awareness of biotechnology is relatively lower in developing countries than in USA and Europe. There is the fear that developing countries might become test grounds for GM crops. Many of the technologies used to develop biotechnology applications are proprietary, and developing countries frequently lack the capacity in intellectual property law that would allow them to negotiate intellectual property right issues. An effective regulatory infrastructure with different authoritarian measures, such as governmental advisory committee with sufficient representation from independent scientists that are not linked to the private industry might be needed in developing countries.

The average level of technology related information held by the general public is generally expected to be very low [23]. Therefore, initially a pilot survey among students has been conducted. Since the student survey may not be viewed as representative of the general public consumers, our next research task is to conduct public surveys of consumers. It is very important to work with farmers to know what farmers' needs are, to show them what is ahead and to get their input. A new survey among Turkish farmers who involve in production and export to various countries have also been initiated in order to address their concerns/needs about GMOs.

Conclusions

The pilot survey clearly shows that there is a lack of information and expertise, as well as confidence among young Turkish adults in regard to use of biotechnology applications.

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