

Impacts of Genetically Modified Organisms (GMOs) on Human Health

Demir Aynur

Abstract—In this study, the potential impacts of Genetically Modified Organisms (GMOs) on human health were investigated. 143 people consisting of students and instructors participated in the survey applied in Aksaray University. The survey assessed knowledge levels of participants concerning GMOs as well as their views about the potential risks of GMOs on human health. 55% of the participants stated that GMO-containing products are harmful. It was concluded that 43 % of the participants were of the opinion that the use of GMOs would have negative impacts on human health.

Keywords— GMO, GM Foods, Biotechnology, Human Health.

I. INTRODUCTION

TRANSFERRING an organism's property, which cannot be naturally transferred, using genetic engineering techniques is referred to as gene transfer, and the resulting product is referred to as Genetically Modified Organism, or simply GMO. The production and distribution of genetically modified organisms and products containing GMO are increasing in the world and accordingly in our country over time. The reason behind this increase is that products containing GMO have properties which cannot be gained through conventional ways of production.

These gains in plants, animals and organisms obtained through genetic modifications can be listed as follows [1,2,5]:

- Producing industrial products (amino acids, vitamins, hormones, certain organic compounds such as enzymes, organic acids and alcohols, etc.) more efficiently and economically using genetic modification of microorganisms, which are traditionally obtained from natural sources,
- The production of vaccines,
- Increasing the yield of agricultural products in order to satisfy the increasing food need of the world population,
- Searching new resources as an alternative to restricted natural resources,
- Producing more durable foods with long shelf life that can stay for a long time without getting spoilt,
- Reducing the need for agrochemicals,
- Improving the tastes and looks of agricultural products,
- Enhancing the nutritional values of agricultural products,
- Producing more on a smaller space,

- Cultivating appropriate plant varieties on damaged agricultural areas,
- Reducing post-harvest losses,
- Increasing the tolerance of products against factors such as cold, heat, drought and salinity,
- Increasing the productiveness of animals in terms of meat, milk and nutritional value.

The fact that GMOs have certain risks and disadvantages in addition to their advantages is also frequently disputed. As the biotechnology practices are relatively new and there is no certain information about its potential harmful effects, serious suspicions have aroused about risks that these practices may lead to in the long run. The basic argument mounted on the basis of these suspicions is that GMOs may pose various risks on the human health [2,4,6]. It is well-known that the consumption of GMO-containing products arouses antibiotic resistance in human body in addition to triggering toxic and allergic reactions. Apart from the abovementioned ones, it is alleged that GM products have carcinogenic impacts [1,3]. Furthermore, the transgenes transferred to the agricultural products can change the nutritional values of these agricultural products by either increasing some nutritional values or decreasing the others. Such agricultural products should be regarded as a serious risk threatening the human health. An other important point is that some fatal microorganisms or super plants emerge during the biotechnology experiments or field tests, these species are released provided that severe measures are not taken and threaten the environmental balance and human health.

It is a well-known fact knowledge level is of paramount importance in making an accurate assessment on advantages and disadvantages of GMOs, minimising the potential risks and acting carefully. Considering these debates, this research aimed at determining the potential impacts of GMOs on human health.

II. MATERIAL AND METHOD

It was prepared an interview form about the evaluation of effects to the human health of GMOs in the research. It were used a study, which was done in 2002 in Sweden, in the development of interview form. The prepared interview forms were applied to the 143 participants who were scientists and students from Aksaray University, Department of Biology in Turkey between 5th November- 2nd December 2013.

Data obtained in the research were analyzed through SPSS 15.0 package programme. Factor analysis was performed to assess the answers given to the questions and numerical data, frequency distributions and percentages were obtained. Besides, the obtained data were transformed into tables by means of chi square and one-way ANOVA method.

III. RESULTS AND DISCUSSION

64 % of the participants were in the group of 18-25 while 15 % of them were in the age group of 26-35. While 30% of the participants were instructors, 70% of them were students. Furthermore, 57 % of the participants had undergraduate while 34 % of them had Doctorate degrees (Table 1).

TABLE I
DEMOGRAPHIC DISTRIBUTION OF PARTICIPANTS

Variables	N=143	%
Age		
18-25	91	63.63
26-35	21	14.68
36-42	20	13.98
42-55	7	4.89
56-65	3	2.09
66+	1	0.69
Occupation		
Students	100	70.0
Instructors	43	30.0
Education		
Doctorate	49	34.26
Post Graduate	12	8.39
Undergraduate	82	57.34

The questionnaire included questions designed to assess participants' knowledge levels of the meaning of the Genetically Modified Foods. In their answers to these questions, 43 % of the participants described GM foods as foods whose natural characteristics were modified while 44 % of them stated that GM foods contain gene additives (Table 2)

TABLE II

ANSWERS TO THE QUESTIONS AIMED AT MEASURING THE INFORMATION LEVEL REGARDING THE "GMFS"

Questions	Frequency	percent age (%)	P value*	t-statistics
GM products are hormonal products	13	9,09	<0.001	2.024
GM products are naturally modified products	62	43,3	<0.001	0.035
GM products contain gene	63	44,0	<0.001	-0.058
GM products are natural (organic-ecologic) products	5	3,49	<0.001	0.151
Total	143	100,0	0.012	-0.002

*P<0.001 significant

In their answers to the question concerning the use of Genetically Modified Organisms, 46 % of the participants stated that they are used in foods while 19 % of them stated that they are used in agricultural practices, 27 % of them expressed that they are used in the health sector. As for the products in which GMOs are used, 45 % of the participants

pointed out to soybean-corn-cotton, 36 % of them pointed out to tomato-pepper-corn, 10 % of them specified barley-wheat while 8 % of them pointed out to cucumber-peppe (Table 3). Table 3 includes assessments about the potential risks of the use GMOs and GMO-containing products in terms of human health. According to the answers, 55 % of the participants were thinking that GMO-containing products were harmful. Participants were asked to make risk assessments about the potential impacts of the use of GMOs on the natural balance. 38 % of the participants stated that the use of GMOs is highly risky as it disturbs natural balance while 31 % of them expressed that it is risky. On the other hand, 58% of the participants agreed with the conviction that the use of GMOs would have adverse effects on human health. Another question was asked to find out the general detrimental effects of GMOs and 43 % of the participants expressed that they would lead to health problems while 27 % of them stated that they would reduce biodiversity of the nature.

TABLE III

ANSWERS TO THE QUESTIONS REGARDING THE USAGE AREAS OF GMOS AND PRODUCTS BEING PRODUCED

Questions	Answers	N=103	%
Do you think products with GMP are harmful?	Yes	85	82.5
	No	13	12.6
	I don't know	5	4.9
Do you think products with GMP are healthy?	Yes	6	5.9
	No	88	85.4
	I don't know	9	8.7
Which products are produced most frequently by using GMPs?	Soybean-Corn-Cotton	65	45.45
	Tomato-Pepper-Corn	51	35.66
	Barley-Wheat	15	10.48
	Cucumber-Pepper	12	8.39
What are the harms of GMPs?	Decreases the biological diversity	29	28.15
	Creates health problems	52	51.51
	Causes abundant use of pesticide in agriculture	8	7.76
	Causes patent and monopolization problems	8	7.76
	I don't know	6	5.82
In what areas are the GMPs used the most?	Health	38	26.57
	Environment	12	8.39
	Agriculture	27	18.88
	Food	66	46.15
Possible effects of GMPs disturb the natural balance in the risk assessment	Very risky	34	33.94
	Risky	44	42.7
	Acceptable	8	7.76
	I have no idea	11	10.7
	Riskless	6	4.9
GMPs are harmful to the human health	Strongly disagree	9	8.7
	Disagree	15	14.6
	Undecided	19	18.4
	Agree	60	58.3

IV. CONCLUSION

The present research revealed that 69 % of the participants were thinking that GMOs “carry risk” human health. It was determined that the variables of age, knowledge level and education status affected the attitudes towards GMO-containing products. Beside this, the study has shown that women were more sensitive about GMO compared to men, the rate of reading the product label increased with age and education level, and the general stance toward products with GDO was negative. Besides, it was found out in the research that the consumption of GMO-containing products carry certain risks which may lead to troubles in terms of human health. The obtained data emphasised that the society should be informed about genetically modified foods and an accurate risk communication was needed..

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