

Knowledge and acceptance of genetically modified foodstuffs in Hungary

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Summary

The safety evaluation of genetically modified (GM) foodstuffs is a highlighted research topic. European consumers are cautious with GM plants, their release into the environment and the consumption of GM foods. Technological changes and achievements are more and more difficult to be understood and thought to bring additional risks into consumers' life. Consumers perceive risks on a different way than experts. This article summarises results of two surveys, carried on between 2003 and 2005. In first survey 556 respondents were involved focusing on food safety than 1000 respondents were involved in the questioning survey intending to reveal consumers' knowledge and opinion about GM products and techniques. The opinion of consumers and professionals about gene technology is mostly negative as far as 35% of the consumers can recall more negative than positive information about GM foodstuffs and 13% can recall only negative ones. Nevertheless even if Hungarian consumers predominantly refuse GM products this proportion is approximately the same as in Western-Europe. According to 73% of the respondents it is essential to indicate the GM content on the packaging. Consumers are not sufficiently aware of the concept of biotechnology and often misunderstand it. The results reflect the insufficient information level of the Hungarian consumer and the misunderstanding of biotechnology concept.

Keywords

biotechnology; consumer research; survey

The modification of the genetic structure in agricultural raw materials and foodstuffs is one of today's most debated issues and one of the most controversial research areas [1]. On the one hand a large number of arguments have been mentioned concerning the economical and environment friendly nature of genetically modified (GM) products [2]. Increasing attention is paid to food related risks and to the environmental impact of human activities and the application of scientific achievements [3]. The safety evaluation of GM foodstuffs is a highlighted research topic [4]. Many international organizations are involved in the risk assessment and safety evaluation of GMOs working out relevant methods and principles [5, 6]. Meanwhile consumers, particularly the European ones, are cautious with genetically modified plants, their release into the environment, the consumption of GM foods and other novel technologies, too.

Technological changes and achievements are more and more difficult to be understood for the consumers. Novel technologies and the products of the biotechnology industry are thought to bring

additional risks into consumers' life according to their perception [7]. Consumers perceive risks on a different way than experts [8]. Experts believe that certain chemical and physical risks are far less disquieting than for instance biological, especially microbiological risks [9]. Moreover certain physical food preservation methods (including irradiation) are considered much safer (due to the lack of residues) in terms of consumer health than chemical preservation, but this view hasn't been accepted by the consumers [10]. Customers' decision concerning the purchase of foodstuffs is not primarily influenced by the latest scientific results but by several other socio-economic, emotional, political, ethical, environmental factors. According to experts and the surveys carried out in this field irradiation of foodstuffs should have become a widely used physical preservation technique. However, due to emotional reasons and lack of appropriate information, consumers haven't accepted it, and what is more in many cases they definitely refused this way of food preservation [11].

May the appearance and acceptance of GM

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plants and crops face similar consumer distrust in European markets as well? Why are consumers so suspicious about GM products? Do Hungarian consumers possess appropriate information about GM foodstuffs? What is the evaluation of genetically modified foodstuffs like (consumers recall positive or negative information and news)? Which products (traditional or GM ones) are preferred by domestic consumers? Are consumers aware of the meaning of genetically modified foodstuff? To what extent are consumers concerned about the safety of GM foodstuffs? Should it be indicated on the label that the given product contains GM ingredient?

MATERIALS AND METHODS

We have been looking for the answers for the abovementioned questions within the framework of the recently established consumer science and consumer risk perception surveys in Hungary. The study of consumer risk perception and factors influencing risk communication is a part of our contribution to the establishment of the national food safety strategy.

Our research is made up of two major steps. First a general food safety questionnaire was compiled in order to reveal the differences between consumers and professionals. The concept of "professional" or "expert" is always a relative one. For practical purposes, we have considered the respondents, having an MSc or equal level in field of agriculture, food science and technology and another similar disciplines as "professionals", however in case of people, who acquired their diploma some decades ago, the level of education of latest

results of genetics was much lower developed. Number of respondent to this questionnaire was 556. This questionnaire contained a distinct chapter with questions on genetically modified products. The results reflect the opinion of the Hungarian influential middle class. Following the results of the preliminary studies, in the next step only GMO related questions were asked. In this survey 1000 respondents were involved.

RESULTS AND DISCUSSION

256 persons out of the 556 respondents possess university degree in food industry and food science. 83.7% of the respondents have heard about the genetic modification of foodstuffs, which is good compared with the European average. The opinion of consumers and professionals about gene technology is mostly negative (Fig. 1). 35% of the consumers can recall more negative than positive information about GM foodstuffs; meanwhile 13% can recall only negative ones. Considerable number (40.17%) of the respondents remember news and information with neutral content, which largely influence their approach to the topic. Relatively a small proportion of consumers can recall more positive than negative (7.7%) or mainly positive (3.85%) information.

In the case of professionals the proportion of those, which recall mostly negative (17.95%) or more negative (37.61%) information is somewhat bigger. By chi-square test it can't be proven, that there is a significant difference between the distribution of attitudes towards the GM products between the non-professionals and experts. The

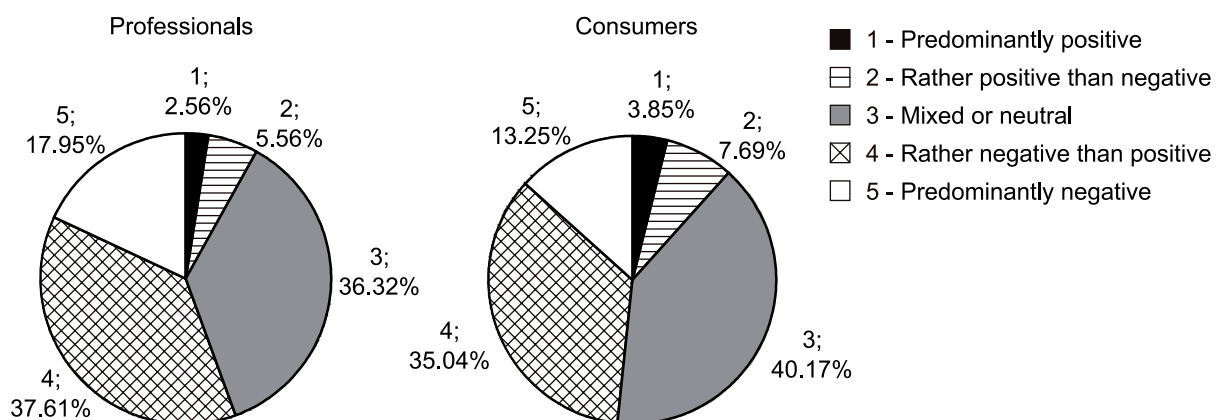


Fig. 1. Evaluation of genetically modified foodstuffs.

Question: What kind of pieces of information can you recollect, when you see the concept: foodstuff, containing genetically modified vegetable parts? Please, evaluate these pieces of information on scale below.

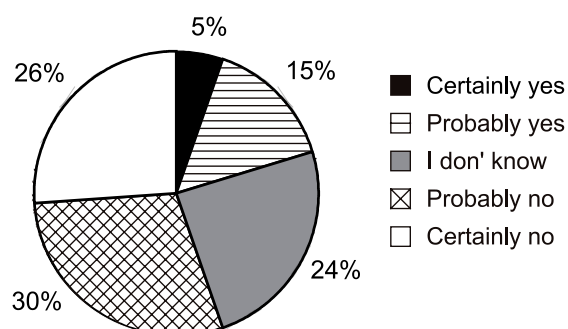


Fig. 2. Selection choice between foodstuffs made of GM and traditional raw materials.

Question: Would you buy a food, possessing better taste and appearance, longer shelf life for the same consumer price than the traditional one, if this product contains agricultural raw material with modified genetical structure?

uncertainty is mirrored in fact, that the proportion of “mixed” answers is the largest in both groups.

Respondents then were asked to choose between two products, one of which contains theoretically GM ingredient, but possess better taste, appearance, lower price and longer shelf life than the traditional one. Results of analysis are summarised in Fig. 2. In this case there was not any significant difference between the opinion of “average consumers” and experts, that’s why the results were pooled. It is obvious, that the share of respondents, who “certainly” or “probably” would buy GM products is 20%. Share of unsure respondents was 25%. These results are in line with the European tendencies. In 1999 the Eurobarometer carried out a survey on attitudes on Western-European consumers towards the biotechnology [12], based on responses of more than 16 thousand citizens. These results show that approximately 22% of consumers would buy genetically modified fruit, if it tasted better. The same was the share of acceptors

of vegetable oil, produced from GM soya. This part of the survey outlines that far-reaching conclusions (concerning the refusal of GMOs) cannot be drawn from the emotional replies given to general questions. Since GM products are more accepted if they offer particular advantages [13].

There are often positive and negative information spread about GMOs, which quite often has an impact on consumers’ emotions. Some of them is to prove the essential nature of GMOs, meanwhile others emphasize risks from nature and consumer point of view. Following the original methodology of Likert-type attitude scales [14] a number of items were collected to represent the content domain. Five-point anchored rating scales were used as response choices for each item. The meaning of weithling numbers were as follows: 1 - strongly disagree with the statement, 2 - somewhat disagree with statement, 3 - neither agree nor disagree with the statement, 4 - somewhat agree with statement, 5 - strongly agree with the statement.

We studied on a 1–5 Linkert-scale how the respondents agree with the most frequently mentioned opinions on genetically modified plants. Table 1 shows that the biggest concern (3.93) is the disturbance of the natural balance and biodiversity. Concerns about the potential harmful effects on the human body are also significant (3.79). Consumers are rather uncertain, whether the GM plants were the ultimate solution for the feeding problems of the world’s increasing population or not.

1000 respondents were involved in the questioning survey intending to reveal consumers’ knowledge and opinion about GM products and techniques. Consumers are not sufficiently aware of the concept of biotechnology and often misunderstand it. More than two third (64%) of respondents meant bioproduction and ecological farming as part of biotechnology, thus demonstrating total confusion of terminologies (Fig. 3). A bit more than

Tab. 1. Opinions on genetically modified products.

Statement	Average score
GMOs can disturb the natural balance and biodiversity	3.93
GMOs can damage our body	3.79
We mustn't intervene in God's work / in Nature	3.24
These are important in order to decrease the use of insecticides	3.01
GMO is the solution for poor countries struggling with starvation	2.93
It is important for foodstuffs with better taste and composition	2.81
More and more people need to be fed	2.40
GMOs are reliable as these were preceded by scientific experiments	2.38

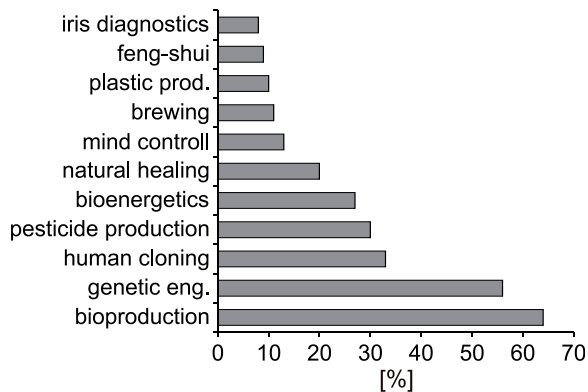


Fig. 3. Interpretation of the biotechnology concept. Question: In the following table you will see numerous concepts. Please indicate, which joints to concept: "biotechnology". The graph shows the share of respondents, who paired the corresponding concept to the "biotechnology" as a per cent of total responses.

half of the respondents (55%) considered the modification of plant and animal genetic material as part of biotechnology. Those involved in disciplines (e. g. food production, food distribution, health-care, agricultural production) where the modification of the genetic material is applied in the practice were of course more informed about the topic. Only 10% of the respondents considered brewing as a biotechnological method. Approximately the same number of respondent replied that feng shui, the ancient Chinese art and iris diagnostics, a way of natural healing are related to biotechnology.

The results reflect the insufficient information level of the Hungarian consumer and the misunderstanding of biotechnology concept. Those committed to modern biotechnological methods often refer to surveys according to which consumers answer "no" to the following question "Would you consume foodstuffs that contain DNA?" Thus justifying why energy and attention shouldn't be paid to incompetent consumer opinions and expectations. However consumer uncertainty and ignorance can be understood if we take the fact into consideration that DNA was discovered only a few decades ago and this discipline has been developing enormously. Consumers belonging to the older generation didn't have the opportunity either to learn about DNA or about the results of modern biotechnology and molecular genetics at school. Only some one third (34.5%) of those possessing university degree consider their biology and biotechnology knowledge as sufficient. Similar number of people believes they have basic knowledge in this field. Neither those having primary school nor

those having secondary school (48.6%) qualification think they possess sufficient amount of information about the topic (Fig. 4). One third of those with university qualification consider themselves appropriately trained and they believe that learned the basic principles. About half of those having secondary school qualification and 64% of those possessing primary school qualification replied that they didn't remember studies related to the topic. Of course, these results can serve merely as an orientation, because there was not any possibility to test the effective knowledge of respondents. As a consequence of different disturbing factors (e.g. desire to appear more informed before the questioners) the real level of knowledge of respondents at all probability is lower, than it has been evaluated by themselves. This possibility has been supported by deep-interviews with some respondents.

The appearance of modern biotechnology in interpersonal communication as a conversational topic (Fig. 5) largely depends on the qualification. Only 30.6% of those having university degree initiate conversation about the interesting relations of biotechnology, meanwhile 38.8% rarely mention the issue.

The trust in information sources is a question of decisive importance in communication with general public on genetically modification [15, 16]. The respondents has been asked to evaluate their level of trust in different sources of information (Table 2). Analysing the results it is obvious, that the scientific authorities have a relatively high level of trust.

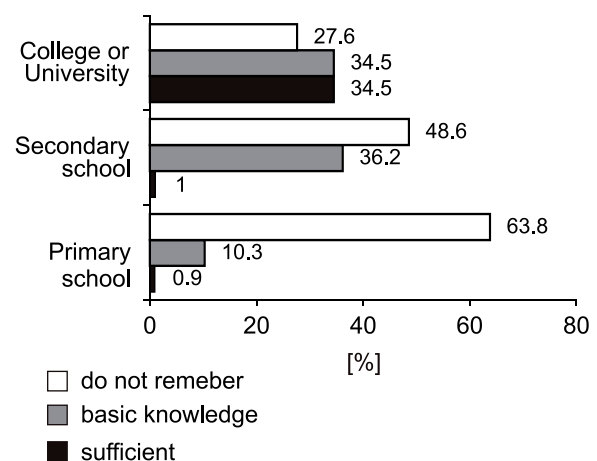


Fig. 4. Correlation between the school related studies and knowledge of biotechnological results. Question: Please evaluate your knowledge on genetics, thought at school. Numbers in per cent of the qualification-bracket.

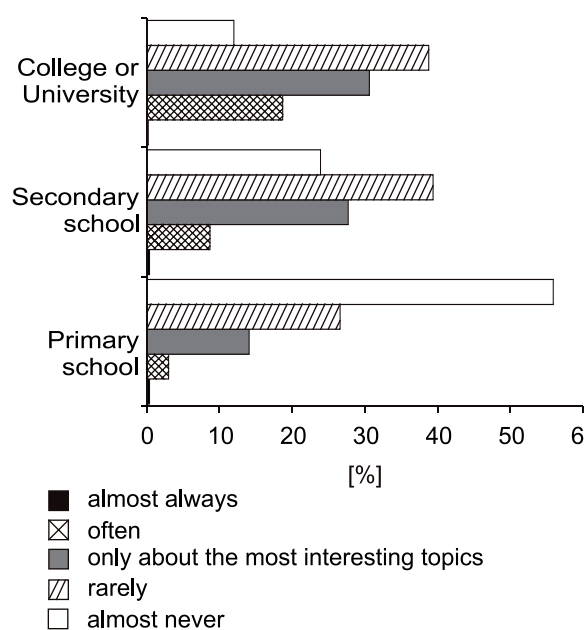


Fig. 5. The relation of biotechnology as a conversation topic and qualification.
Question: How often do you speak with your friends on latest results of biotechnology?
Numbers in per cent of the qualification-bracket.

During the investigation of factors determining and threatening food safety (Fig. 6) one might conclude that genetic modification was not considered among the most “dangerous” factors. In this respect there was no significant difference between the opinion of professionals and consumers. Both

groups believed that harmful substances resulting from environment pollution, agricultural chemical residues, harmful substances dissolving from the packaging and pharmaceutical residues in meat are more dangerous. Mycotoxins, pathogenic microorganisms and poisonous weed residues were also considered more risky but concerning these latter factors there were significant differences between professional and consumer opinions. Regarding all above factors professionals reckoned them more dangerous than consumers. On the other hand consumers considered genetically modified food-stuffs, natural allergens, artificial preservatives, other additives and artificial sweeteners more risky than professionals did.

CONCLUSIONS

The majority of Hungarian consumers, just like EU consumers, refuse the genetic modification of plants and food raw materials. Concerning GMOs they recall rather negative than positive information and substantially agree with frequently mentioned statements about natural damages and threatening of human health. In actual buying decision situations, the share of undecided consumers (those who do not have any prejudice against the genetic modification, is rather high, that's why there is a rather wide scope of activity for the influence of consumers.

The evaluation and acceptance of GMOs may be influenced by biological and biotechnologi-

Tab. 2. The estimation of level of trust in different sources of information, measured on a 1-5 scale.

Question: Please indicate your level of trust in the following sources of information.
5 - high level of trust, 4 - fair level, 3 - middle level, 2 - rather weak level, 1 - low level of trust.

Source of information	Mean	Std. Deviation
Hungarian Academy of Sciences	4.26	0.80
Expert of Food Research Institute	4.12	0.82
Expert of EU commission	4.11	0.85
Chief medical officer	4.04	0.94
Expert form FAO, WHO	4.00	0.86
University lecturer	3.86	0.93
Family doctor	3.72	0.93
Phisicist-natural healer	3.69	0.96
Food industrial specialist	3.50	0.96
Article of a physicist in a popular magazine	3.14	1.05
Daily newspaper	2.98	0.88
State-owned TV channel	2.91	0.97
Tabloid newspaper	2.76	0.88
Commercial TV channel	2.70	0.99

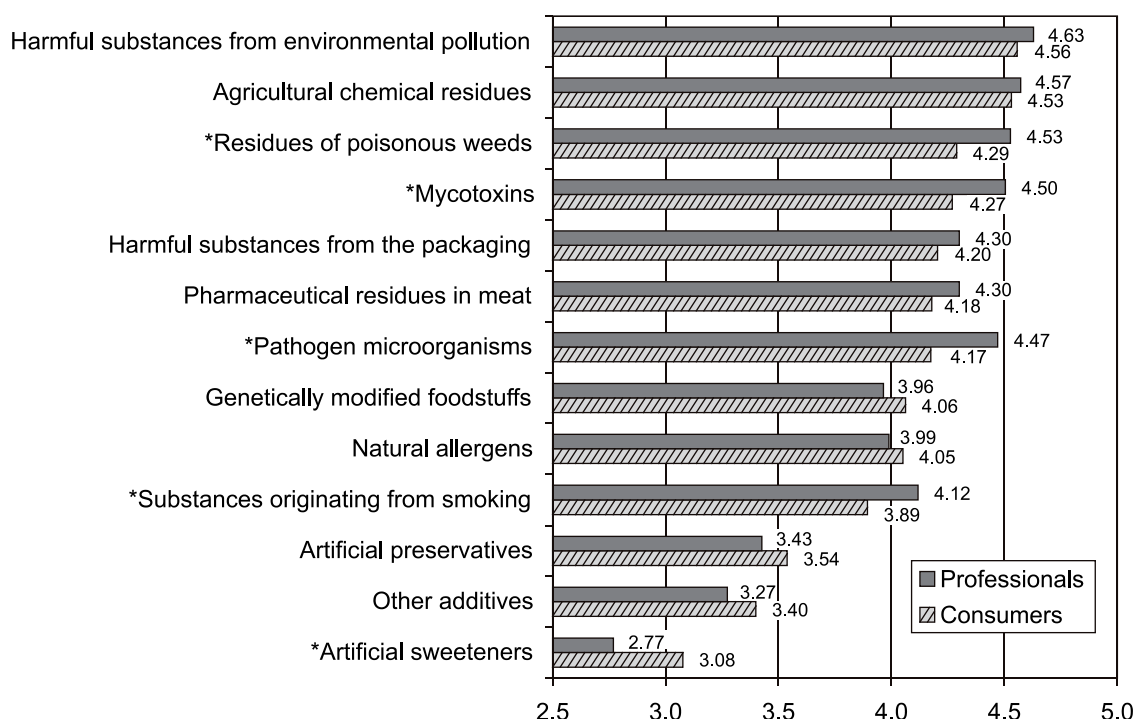


Fig. 6. Risks attributed to genetically modified foodstuffs compared to other risk factors. Question: Please evaluate on a 1–5 scale the potential danger for public health of factors as follows.

cal awareness, knowledge and appropriate information. Consumers are not provided sufficient, processed and easy-to-understand information. The social dialogue concerning genetically modified crops and GMO containing foodstuffs is quite poor. Processing the information available exceeds the skills of the average consumer. The development of biotechnology, molecular genetic knowledge and genetic engineering tools is faster than the codification or the establishment of legal and ethical norms.

The development of this discipline is far quicker than the widening of experts' knowledge. As the "biotech scissor" is opening there is an increasing difference between science, its practical applications and social judgement, acceptance. Information expected by consumers should immediately be supplied in proper and clear form. Regulations should be based on up to date scientific results of food safety research – taking into consideration the limitations of the means and knowledge available (e.g. application of the precautionary principle), consumer expectations and other legitimate factors influencing their decisions. Risk communication must be improved and based on the results of risk assessment and safety evaluation.

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