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ARTICLE

Knowledge and acceptance of genetically modified foodstuffs in Hungary

Diána Bánáti*, József A Szabó

Central Food Research Institute, Budapest, Hungary

ABSTRACT 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 for consumers. Novel technologies and the products of the biotechnology industry are thought to bring additional risks into consumers' life according to their perception. Consumers perceive risks on a different way than experts. 556 respondents were involved in the first survey 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 still much smaller than 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.
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KEY WORDS

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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. On the one hand a large number of arguments have been mentioned concerning the economical and environment friendly nature of genetically modified (GM) products. Increasing attention is paid to food related risks and to the environmental impact of human activities and the application of scientific achievements. The safety evaluation of GM foodstuffs is a highlighted research topic. Many international organizations are involved in the risk assessment and safety evaluation of GMOs working out relevant methods and principles. 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. Consumers perceive risks on a different way than experts. Experts believe that certain chemical and physical risks are far less disquieting than for instance biological, especially microbiological risks. 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. 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.

May the appearance and acceptance of GM 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?

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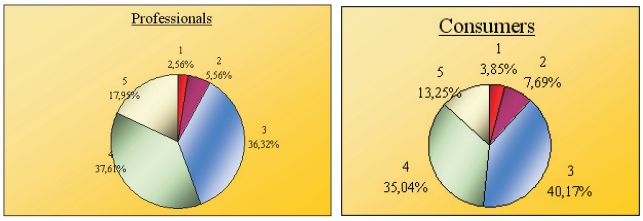
*Corresponding author. E-mail: d.banati@cfri.hu



	1	Predominantly positive
	2	Rather positive than negative
	3	Mixed or neutral
	4	Rather negative than positive
	5	Predominantly negative

Figure 1. Evaluation of genetically modified foodstuffs.

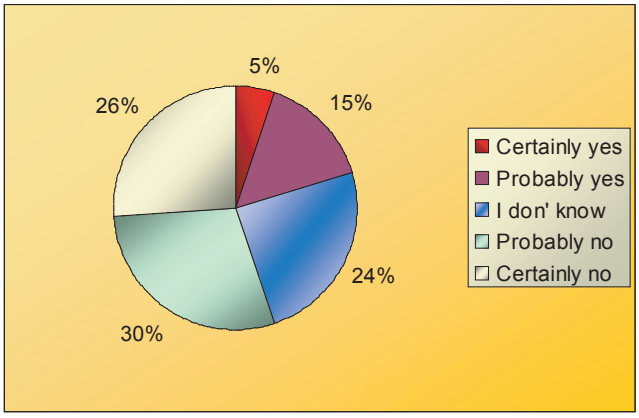


Figure 2. Selection choice between foodstuffs made of GM and traditional raw materials.

We have been looking for the answers for the above-mentioned 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. 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. Altogether 556 respondents were involved in the survey. 256 persons out of them 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 (Figure 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, that recall mostly negative (17.95%) or more negative (37.61%) information is bigger. Therefore there is a significant difference in this respect between expert and non-professional respondents. The proportion of "neutral" 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. The analysis of the replies (Figure 2.) shows that even if the majority still refuses (51%) the number of uncertain opinions decreased by 15%. Consequently some 15% of the respondents could have been convinced with the advantageous properties of the GM product.

Altogether it can be stated that even if Hungarian consumers predominantly refuse GM products this proportion is still much smaller than in Western-Europe. Those GM products that possess better properties than the traditional ones are not preferred either, as only 5% of the respondents gave unambiguous yes answer for the above question. One fifth (20%) of the respondents would choose the genetically modified product if had the opportunity to select. 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. The same principle was seen during the selection between traditional and genetically modified animals, with the latter possessing better features. Therefore it is easy to understand why the acceptance of GM cereals – which appeared in public production in 1996 - is so low, as these crops possessed benefits (e.g. bigger yield and thus bigger profit) mainly for producers and not really for consumers. However the appearance of second and third generation GMOs may result in better acceptance. Then consumers were asked whether they expect distinct labelling of foodstuffs containing genetically modified ingredients (Figure 3).

According to 73% of the respondents it is essential to indicate the GM content on the packaging. Further 25% answered that it would be interesting to know and 2% replied

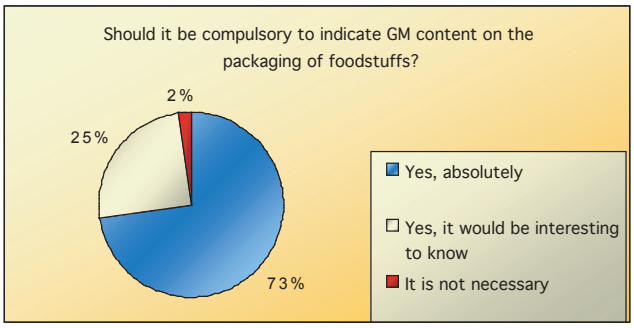


Figure 3. Opinions concerning the distinct labelling of GM foodstuffs.

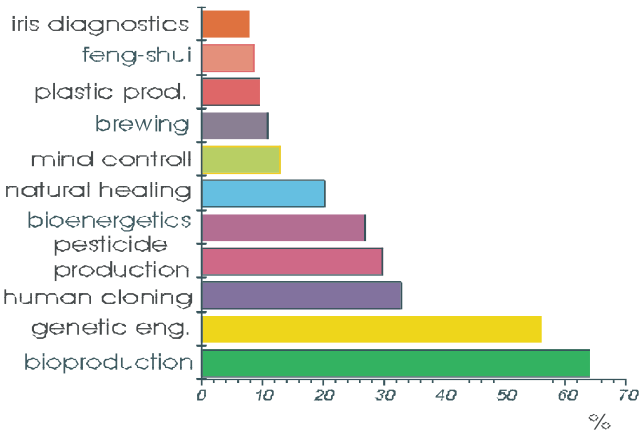


Figure 4. Interpretation of the biotechnology concept.

that it is unnecessary to mark GM content on the label. These answers confirmed the outstanding and increasing importance of foodstuffs' labelling from customers' point of view.

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. We studied on a 1-5 Linkert-scale how the respondents agree with the most frequently mentioned opinions on genetically modified plants. During the preparation of the questionnaires the traditional 1-5 scale was chosen as it is well known from the national school evaluation, furthermore it enabled the subsequent mathematical-statistic process. 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 do not believe that GM plants are the ultimate solution for the feeding problems of the world's increasing population.

1000 respondents were involved in the questioning survey intending to reveal consumers' knowledge and opinion about

Table 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

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 (Figure 4). A bit more than 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, healthcare, 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 believe 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

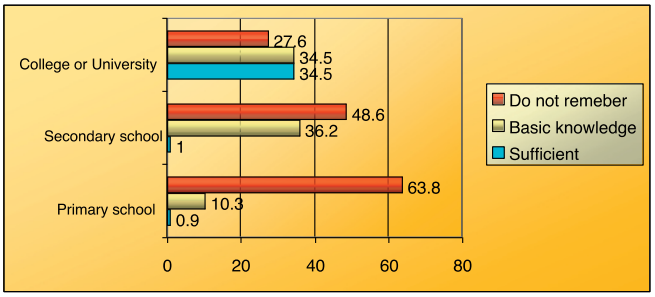


Figure 5. Correlation between the school related studies and knowledge of biotechnological results.

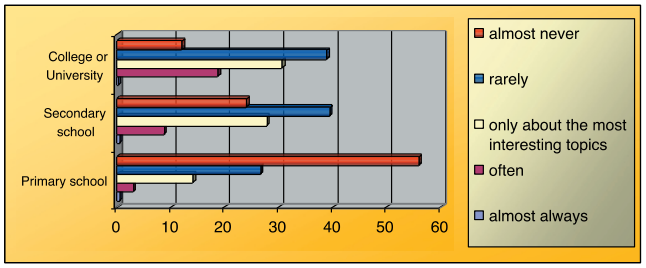


Figure 6. The relation of biotechnology as a conversation topic and qualification.

(Figure 5). 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.

The appearance of modern biotechnology in interpersonal communication as a conversational topic (Figure 6) 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.

Respondents attributed similar roles to food control authorities, consumer protection NGOs, research institutes, universities and scientific associations in the protection of consumer interest. The trust towards the actual government and the press is significantly different. The results thus obtained a bit differ from the "trust index" experienced during other food safety surveys. In previous questioning research studies consumers unambiguously referred to independent researchers, research groups, the Hungarian Scientific Academy and the Central Food Science Research Institute as the most reliable organizations in the field of food safety. In the case of genetically modified foodstuffs, respondents probably feel that food control authorities should urgently take consistent steps in order to protect consumers' interest.

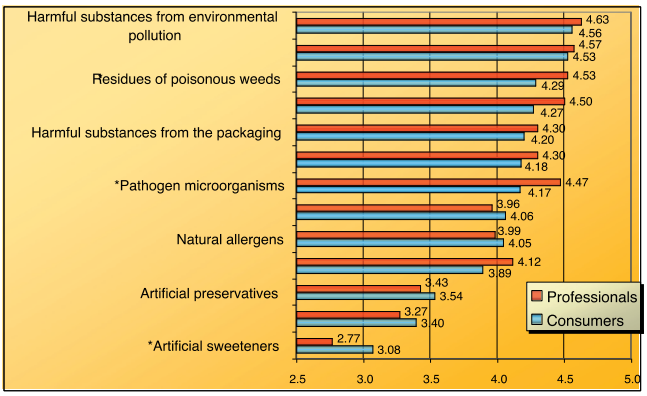


Figure 7. Risks attributed to genetically modified foodstuffs compared to other risk factors.

During the investigation of factors determining and threatening food safety (Figure 7) 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 foodstuffs, natural allergens, artificial preservatives, other additives and artificial sweeteners more risky than professionals did.

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. Although the evaluation of GMOs is basically not so favourable from professional and consumer viewpoints as well, they are less refusing than it is experienced in old EU member states. The number of uncertain consumers significantly decreases if the GM foodstuff offers advantageous properties to the consumer compared to the traditional one.

The evaluation and acceptance of GMOs may be influenced by biological and biotechnological 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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