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The proceedings are the papers of students, undergraduates, doctoral students and young researchers on topical issues of natural and technical sciences and humanities.

В сборник вошли доклады студентов, магистрантов, докторантов и молодых ученых по актуальным вопросам естественно-технических и гуманитарных наук.

GENETICALLY ENGINEERED FOOD IS ONE OF THE MOST POTENTIAL WAYS TO SAVE OUR PLANET FROM HUNGER

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Abstract

The paper concerns a global issue, a genetic engineering. This issue focuses on food, because nowadays there are so many debates about genetically modified food. Further, this problem was explored very deeply in order to know whether such kind of food is safe or dangerous. Moving to the investigation, we used both primary and secondary researches. Primary research was a research when the investigator invents his/her own surveys in order to see the situation of problem much better. Secondary research was a research when we used the information from qualified experts and compared with the information we had gained before. Therefore, we were going to ask many people and see their attitudes on the situation of genetically modified food. Their opinions helped us greatly for making different analysis.

Keywords: Genetically modified food (GM food), crop, genome, deoxyribonucleic acid (DNA)

Introduction

Nowadays genetically engineered food takes a big place in our world. It is becoming an actual and controversial issue because some people believe that this kind of food is beneficial for humanity, whereas others feel that it is harmful for people and their health.

This paper intends to investigate genetically engineered food and to find out whether it is safe or dangerous for people. All the problems concerning food are very significant for all of us; therefore we should pay more attention and take it more seriously because genetically modified food is already in our life and we can eat it even without knowing that.

On the other hand, not long ago there was news devoted to the hunger and sick people in African countries. Surprisingly, the new solution for these problems might be genetically engineered food. It was the reason of our intention to make researching especially on this topic, and our researching tends to help people. However, there is enough information in the mass media that genetically modified food has negative effects and it can lead to bad consequences in the future. Despite this, we strongly believe that genetically modified food has more positive sides than negative. This research work will help to clarify some points and give an opportunity to look at this problem more thoroughly. Furthermore the research can increase the interest of our people who are not aware much about the situation connected with GMO in Kazakhstan.

Theoretical background

There are about 7 billion people in our world and some regions of our planet are starving, but after 40-50 years there will be approximately 10 billion, and what we need to do then? However, if the percentage of genetically modified food increases, the future population will avoid the hunger. As we must act and make something in order to stop starving, one potential way to save the planet from hunger is genetically modified food. However, as it is very controversial, and needs to identify both negative and positive sides of this kind of food.

Initially, genetic engineering is a direct manipulation of organism's genome using biotechnology. It occurred when humans started to domesticate organism in 12000 BC. The first transfer from one organism to another was accomplished by Herbert Boyer and Stanley Cohen in 1973. Those promotions have allowed scientists to do great things such as manipulating and adding genes to different organisms, also inducing range of effects. The technology has been

commercialized since 1976. After that many companies started to produce and sell medicine and genetically altered food.

Genetically engineered food is an issue which had entered the mainstream media in many countries during the past decade, and even then people already had started debating. "European environmental organizations and public interest groups have been actively protesting against genetically modified foods for months, and recent controversial studies about the effects of genetically-modified corn pollen on monarch butterfly caterpillars have brought the issue of genetic engineering to the forefront of the public consciousness in the U.S. As time goes on, we are able to see how our world is rapidly developing and biotechnology could be the wave of the future and genetically modified foods could really provide alternatives to help increase food production" [1]. Moreover, it means that in the future we will possibly use genetically modified food therefore our world should be ready to face different consequences.

This issue is not actual in Kazakhstan, that is why we have not an opportunity to analyze it as a local problem. It will be very hard for or even impossible, because when we asked people about this, some of them had never heard that such food exists. However, there are three leading countries in producing genetically modified crops: The United States, Argentina and Brazil. There is a statistic where is shown their global area of GM crops in million hectares (MH). In 2006, The United States took the first place with 54.6 MH, Argentina is the second country with 18 MH and the last country of top three is Brazil with 11.5 MH [2].

Firstly, there are many experts' views and they are all almost divergent and conflicting. Many scientists emphasize that there is a huge amount unknown and unclear information, such as firstly; the health consequences of eating genetically modified food. It means that this kind of food is not expected for us yet as safe food, therefore we cannot eat it in order to avoid unpredictable consequences. Many corporations fought to prove that it was healthy food, but then it was proved the opposite. Many scientists are worried that after consuming the genetically modified food, it may make any mutations like the canola plants on the roadsides of North Dakota [3].

Secondly, once the mutant genes are out of the bag, there is no going back. Genetically altered organisms contaminate the existing seeds. If it happens, we can be left only with modified organisms and there would not be any organic food. For example, recent studies in North Dakota showed that 80%of wild canola plants consisted of at least one transgene. Moreover, in Japan, modified bacteria created new amino acid, which was not found in the nature. It was used in protein drinks and it could lead to horrific consequences such as severe mental and metabolic damage to hundreds as well as several deaths. After that, Japan banned GMOs immediately [3].

Thirdly, GMOs are not the answer for global food security, because genetically altered crops have not shown any increase in yield and any decrease in pesticide use. In many cases, other farm technology has proven more successful; also even Monsanto claims that its genetically modified crops yield less than ordinary farming [3].

Moving to positive sides, there is much information from different experts about the advantages of GM food firstly, genetically altered food's crops can be cold tolerant. It means that it would not be destroyed by any unexpected frosts. For instance, scientists made an experiment by taking an antifreeze gene from cold water fish, and then it had been introduced into plants such as tobacco and tomato. After that those crops were able to tolerate cold temperatures that normally would kill unchanged crops [1].

Moreover, genetically engineered crops are able to have disease resistance. It is really significant for us, because we know that there are many viruses, bacteria and fungi which cause plant diseases. Therefore, plant biologists are working for creating plants with genetically modified resistance to these diseases [1].

Additionally, scientists created crops which are pest resistant; because there are many crops losses and it may lead to financial crisis for farmers and to starvation in developing countries. Moreover, farmers use a lot of pesticides in order to avoid so big crop losses, but consumers do not wish to eat food that has been treated by pesticides, because of potential health hazards [1].

As for licenses for farmers, there is almost everything nicely. Moreover, the European Union was asked by Britain to relax restrictions on the licensing of genetically modified crops for human consumption amid growing scientific evidence that they are safe, also surveys showed that they were supported by farmers [4]. It means that there are quite stringent requests for licenses in certain countries.

Being really controversial and highly debatable, this question cannot leave people indifferent so there are some people who are against GM food and those who consider it to be very beneficial for the mankind. There is some statistic data from America:

"Barely more than a third of the public believes that genetically modified foods are safe to eat. Instead 52 percent believe such foods are unsafe, and an additional 13 percent are unsure about them. That's broad doubt on the very basic issue of food safety.

Nearly everyone, moreover 93%, says the federal government should require labels on food saying whether it's been genetically modified, or "bio-engineered" (this poll used both phrases). Such near-unanimity in public opinion is rare.

Fifty-seven percent also say they'd be less likely to buy foods labeled as genetically modified. That puts the food industry in a quandary: By meeting consumer demand for labeling, it would be steering business away from its genetically modified products" [5].

Approaches and methods

The purpose of this research is to investigate the opinions of people about genetically engineered food in Kazakhstan and in the world. We would like to find out what people think and know about that complex issue, and its positive or negative effects. It is very important to research and to know public opinion towards Genetically Modified food.

Consequently, the research questions in this work were:

• What are students' opinions about the using genetically engineered food?

• To what extent do students in Kokshetau think whether it is beneficial or harmful for people?

• Do people think that genetically engineered food can save our world from hunger? (According to the students' opinions)

This paper includes several ways of finding answers for the research questions. It is very important to have a mixture of varied methods, because it was important for us to compare the results gained from different methods and had an opportunity to arrive at a reliable and reasonable conclusion.

As for the secondary research, we used the Internet, because there were many good and credible sources with a lot useful and necessary information related to our topic. We could find a lot of sources there and tried to sort out the most appropriate and the most reliable.

As for the primary research we created a survey and decided to conduct an interview, where questions were a bit similar to each other. We used quantitative questions in survey, because those questions were more appropriate in surveys. Getting the answers from quantitative questions, we were able to do analysis; also we received more exact results due the fact. Turning to another type of questions, we needed full and detailed answers and that is why we decided to organize interviews with qualitative and specific questions. We got full answers with reasons and arguments, and after that we compared our results with experts' views.

For surveying people we used a website "surveymonkey.com" which was a really helpful and supportive tool for gathering information from a large number of people, it included ten questions, where one of them was qualitative and others were quantitative. We added one qualitative question in order to expand answer and analyze the results in a more effective way. After that, we interviewed a few people and compared the answers with survey answers.

We interviewed students from Nazarbayev Intellectual School (NIS) from 7th up to 12th grades, because we needed opinions from different age groups. Initially we supposed to survey approximately 80 people from all five grades: each grade would contain 16 people where 8 of them are boys and another 8 are girls. After that we would able to know overall opinion of students in

NIS in order to know opinions of boys and girls separately. All gained data was analyzed and added to the research questions.

Results

The secondary research was really valuable and enough information was received to write this report and be able to analyze the problem. Summarizing the information, there are enough people who are seeing more negative sides than positive ones. The majority of people do not think that genetically modified food is good and can save our world. Firstly, we would like to show the proportion of males and females completed the survey. As it was said before, there should be equal number of boys and girls. However, the total number of people was 55 people and there were 5 grades, therefore from each grade 5-6 girls and 5-6 boys had to answer the questions. We tried to make equilibrium in gender proportion, but we did not get it, because there were more girls than boys in our school. (Figure 1)
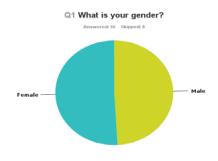
Figure 1 – Gender proportion

Despite those facts, we asked 55 people and it really helped us to analyze the whole data. Almost all people have heard about GM food and only 72 percent of them have eaten this food. 73 percent people believe that GM food is very harmful for people. Moreover, from this total percentage 13 boys and 13 girls only agree that it is dangerous, while 5 boys and 9 girls strongly agree that it not safe food for people. They are sure this kind of food is more dangerous than beneficial. It means that they support the Shilo Urban's view, who said that the health consequences of eating genetically modified food are largely unknown. (Figure 2, 3, 4)
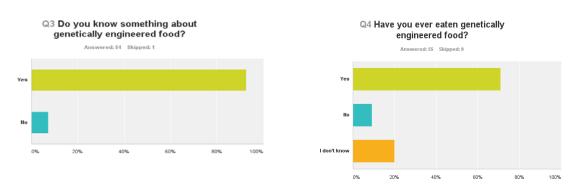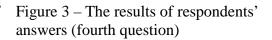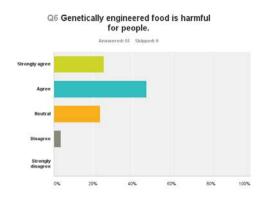
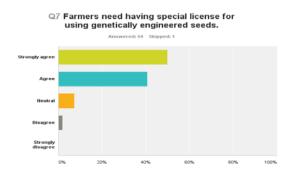Figure 2 – The results of respondents' answers (third question)

Figure 3 – The results of respondents' answers (fourth question)

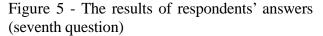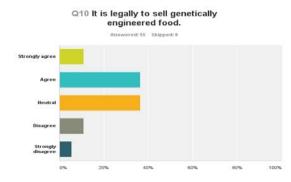Figure 4 - The results of respondents' answers (sixth question)

Figure 5 - The results of respondents' answers (seventh question)

There is some disagreement in public opinion about farmers' licenses: if they should have such a license or should not. 90 percent people support that all farmers must have licenses for selling GM food, 10 percent people do not have any ideas about this question and others just disagree. (Figure 5)

Moreover, there is a question about whether legally to sell it or not. The half of surveyed people absolutely agrees and does not see there any dangers, while more than 27 percent people are just neutral. (Figure 6)
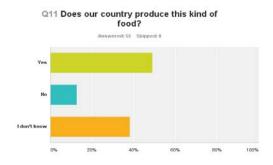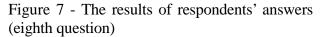

Figure 6 - The results of respondents' answers (seventh question)

Figure 7 - The results of respondents' answers (eighth question)

According to the results of the survey, 50 percent of students think that Kazakhstan produces GM food, meanwhile 39 percent do not know and others consider that we do not produce. In addition, there are 15 boys and 13 girls of those 50 percent who think that our country produces GM food. (Figure 7)

There was one open question, where students had to write their opinions about GM food in the future, especially what they expect from this kind of food. There were some opposing answers, because the issue itself is very controversial and debatable. Nevertheless, the majority of people, approximately 55-60 percent, consider that it will be beneficial for the next generations to use GM food, as long as they have enough information all strengths and weaknesses of genetically altered food. It means that the people now are ready to GM food and they agree that it is useful for people but they want to know the exact and true information about the consequences which they might face. However, about 30 percent of students think that people will stop using this food and find new one, because nowadays it has different harmful effects.

Turning to the interview, we asked 7 people and only two of them gave us really useful answers. Their answers were quite fully and expanded, which made us to analyze critically. The one interesting thing was that they both opposed to each other. The first person claimed that GM

food is beneficial and it will be able to save our world from hunger, because then scientists will be much cleverer and know more than now. Moreover, he thinks that our country produces genetically modified food. However, another person considered that genetically altered organisms are so harmful for humanity, and it may lead to hazardous consequences. She also suggested removing this kind of food entirely. Concerning our country, she was confusing and just supposed that Kazakhstan does not produce GM food. Despite these debating answers, they had common opinion about farmers' licenses. Both of them said that farmers must have licenses for selling genetically engineered food.

Conclusion

After getting the results, we concluded and answered the questions of our researching:

- What are students' opinions about the using genetically engineered food?

The answers were really interesting and controversial as issue itself. The surveyed people can be divided in two parts, where one of them considers GM food is dangerous and another part thinks that it is safe for people. However, the research was conducted on young people at school and therefore this may not be true for older people. It is not possible to generalize to the whole population.

- To what extent do students in Kokshetau think whether it is beneficial or harmful for people?

As it was mentioned in a previous research question, there were two parts of people. The first one claimed that it is harmful, while the second part said that it is beneficial for humanity. The results showed that the first part had much higher percentage than the second one.

- Do people think that genetically engineered food can save our world from hunger? (According to the students' opinions)

There is a controversial situation, especially if taking present situation, because people still cannot determine either it is good or bad. Analyzing the results, we understood that this kind of food likely is not able to save our world now. However, after some period of time it might be taken as a safe solution to the problem of hunger.

While doing our research, we understood that people are not interested in this issue and some people even do not know what genetic engineering is, so there is a need in our society to raise the awareness of this issue. It can be assumed from the given answers that many people are not interested in this topic, because genetically engineered food is not actual issue yet in Kazakhstan.

Taking into account these circumstances, we could make a generalization: the majority of students of NIS Kokshetau consider that genetically engineered food is very harmful for humanity and for nowadays it cannot be taken as a way for saving the world. If judging by gender, there more girls than boys who are thinking that GM food is not safe.

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