
The Opinion of Palestinian Society in Tulkarm District on Genetically Modified (GM) Crops

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Abstract

The issue of genetically modified (GM) crops becomes recently an important aspect worldwide, and this is due to the food shortage and continuous population increasing. There are confusion and disagreement about using GM crops among different nations globally. GM crops are relatively a new issue in Palestine. To our best knowledge, there is no previous information about the opinion of the Palestinian people about GM crops. The aim of this paper was to screen the opinion of the Palestinian people in Tulkarm district about GM crops. This district will be a first step in screening the opinion of the people in all Palestinian's districts about GM crops. The research was carried out by distributing a structured questionnaire with 36 questions to 350 persons. The questions implicitly concentrated on three main aspects: perception, strategies for improving public awareness and regulation in the legalization of GM products. Data analysis was carried out using Chi-square tests in Statistical Package for Social Sciences (IBM, SPSS, version 15), and Microsoft Excel 2007 (Microsoft Office, 2007) was used for making graphs. Answers of the questionnaires were examined in their significance differences ($p < 0.05$) with four independent variables (age, gender, education and career). It was found that there is mixing between GM crops and other related concepts. Different media can be used for disseminating GM crops information. However, internet, radio and TV are the most preferred media methods. Further research still needed for making a clear picture of GM crops issue in Palestine.

Keywords

Genetically Modified (GM) Crops, Local Society, Palestine, Tulkarm, Perception, Awareness, Dissemination

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1. Introduction

There is a huge increase of the earth population and need for food. It is expected that the human population will reach nine billion in the coming decades. In the next coming 40 years, it is essential for human being that food production will increase greatly, due to the limited availability production factors, *e.g.* arable land, water, and climate change (ISF, 2011; Jacobsen *et al.*, 2013; Mabaya *et al.*, 2015).

The increase of the world's population inspires scientists to think about reasonable ways to solve the problem of food deficiency and starvation. One of the ways is genetically

modified (GM) crops. There are many concepts related to GM crops. Jacobsen *et al.* (2013) tried to distinguish between agro-biodiversity and GM crops. They stated that agro-biodiversity can be defined as all non-GM cultivated species including varieties and landraces. While GM crops are defined as new varieties of crop species developed by molecular modification through the insertion of foreign genetic material (Chen and Lin, 2013). Transgenic plants are plants that have been genetically engineered, a breeding approach that uses recombinant DNA techniques to create plants with new characteristics. They are identified as a class of GM crops. Grunewald *et al.* (2013) gave a short history of GM plants and their great effect on society and agriculture.

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The GM crops were first commercially grown in 1996. Their application has achieved remarkable success in terms of both economic and environmental effects (Chen and Lin, 2013). However, first trials on GM began in 1947 (Grunewald *et al.*, 2013).

The entire GM crops industry was primarily supported by two simple traits, herbicide tolerance and insect resistance, or both of them (Editorial, 2013a; Chen and Lin, 2013). These traits just give benefits to growers and not consumers. However, several of the next generation of GM crops, which benefit the ultimate consumer by providing more healthy nutrients; such as vitamin A, oleic acid and omega-3 fatty acid; are coming to the market (Chen and Lin, 2013).

Due to the importance of GM crops, Nature magazine has published special issue related to GM (Editorial, 2013a). This issue was translated to Arabic language (Editorial, 2013b).

One of the most important points stated in the special issue of Nature magazine (Editorial, 2013a) was that the scientists and producers should regulate the GM products, neither improving the technology that produces them. The GM food regulation framework in USA and EU was discussed deeply in Dudek (2015).

There is recently about 1.5 billion ha arable land available worldwide, 170 million ha (about 12% of total arable land) are planted with GM crops. Among 170 million ha, there is 152 million ha in five countries, they are: USA, Brazil, Argentina, Canada and India. The popular GM crops are soya beans, maize (corn), cotton and canola (Editorial, 2013a).

Among Arab countries, who recently planted GM crops are Sudan and Egypt (Editorial, 2013a). Assem (2014) discussed the issue of commercializing Bt-maize product in Egypt and its opportunities and challenges.

In Palestine, the issue of GM crops is relatively new. However, the issue of GM crops and its importance were tackled in a way or another in several researches (Ali-Shtayeh *et al.*, 2008; Arafah *et al.*, 2002; MOA, 2010; Sawalha *et al.* 2008). However, to our best knowledge there is no previous available information about the knowledge of the local society about GM crops' concepts and applications.

The objectives of this study were to investigate the opinion and knowledge of the Palestinian population in Tulkarm city on GM crops, and to recommend the best methods to deliver the correct information about GM crops to the local society.

2. Materials and Methods

As a first step to study the opinion of Palestinian people on GM crops in different Palestinian districts, this study was carried out in Tulkarm district, where our university is

located, and it is one of the biggest cities in the Northern part of Palestine.

The study was conducted during February to June 2014, through a survey and data collecting using a structured questionnaire in Arabic language. The questionnaires were distributed inside randomly selected zones in Tulkarm for 350 persons. The questionnaire used in this study was compiled and designed by the authors, and formed a total of 36 questions.

The questionnaire was pre-tested on ten respondents in some areas of Tulkarm district, prior to its effective use and distribution. This was to ensure the easy of reading, understanding, systematic and logical arrangement of questions and layout for local people. Some issues that required adjustments were corrected such that asked questions would lead to obtaining the intended information. Questionnaires were then distributed randomly to 350 persons throughout Tulkarm district. The average time taken to complete a single questionnaire was 30 minutes.

Data analysis was performed using Chi-square tests for significantly difference ($p < 0.05$) in Statistical Package for Social Sciences (IBM, SPSS, version 15). Microsoft Excel 2007 (Microsoft Office, 2007) was used for calculation and presentation of figures.

In this study there are four independent variables: age (has five levels), gender (has two levels), education (has five levels) and career (has five levels). Responses of respondents of all the questions were considered as dependent variables. The questions implicitly concentrated on three main aspects:

- Awareness, perception and consumption pattern of GM crops.
- Proposed measures and strategies for improving public awareness and regulation of GM crops in the region.
- Contribution of official/non-official authorities, and the standpoint of religions in the legalization of the GM products.

In this paper, and due to limited space, we will just present the most relevant information that can help in drawing a clear picture about the opinion of Palestinian people on GM crops, and find out the best methods to disseminate GM information in the future for the benefit of the local society.

3. Results and Discussion

3.1. Respondents' Information (Independent Variables)

The questionnaire investigated the profile of the respondents: their age, gender, education level and career.

The respondents' ages distribution were: 15-18 years (14.3%), 19-23 years (45%), 24-40 (22.5%), 40-50 years (9.8%) and over 50 years (8.4%).

The study surveyed 198 males (56.5%) and 152 females (43.5%).

The educational levels of respondents were: secondary students (14.9%), finished secondary school (12.7%), institute and/or university students (29.1%), bachelor holders (36.8%) and master levels or higher (6.5%).

Their career ranged from school and university students (43.7%), housewife holders (7.1%), construction workers (8.9%), teachers (11.2%), engineers (9.2%), governmental & non-governmental workers (14.5%) and others (5.4%).

There was almost an equal mixture of respondents from rural and urban areas in Tulkarm city.

3.2. Relation Between Independent Variables and Questions

3.2.1. Age

It was found that there are significant differences ($p < 0.05$) between different respondents' ages levels and the questions below (*i.e.* the answers of these questions depends on different levels of respondents' ages as an independent variable):

- 1 Do you eat GM products without knowing the nature of the modifications occurred to them? (Figure 1).
- 2 Are you aware of the latest developments on GM crops? (Figure 2).
- 3 Have you heard about genetic engineering? (Figure 3).
- 4 Has genetic engineering a role in improving agricultural production? (Figure 4).
- 5 What is the impact of genetic engineering on the plants' quality? (Figure 5).
- 6 What are the possible implications of using GM in medical products? (Figure 6).
- 7 What are the most types of media, which you often use to get general information? (Figure 7).
- 8 What are the sources of your information about GM crops? (Figure 8).
- 9 To which degree do you trust the information coming from governmental institutions/schools and universities about GM crops? (Figure 9).
- 10 In which methods would you like to get more information about GM crops? (Figure 10).

3.2.2. Gender

It was found that there are significant differences ($p < 0.05$)

between different respondents' gender levels and the questions below:

- 1 In which methods would you like to get more information about GM crops? (Figure 10).
- 2 Do you think that genetically modified foods have damage effect on human's health? (Figure 11).
- 3 How do you evaluate the current information available about GM crops? (Figure 12).

3.2.3. Education

It was found that there are significant differences ($p < 0.05$) between different respondents' education levels and the questions below:

- 1 Have you heard about genetic engineering? (Figure 3).
- 2 Has genetic engineering a role in improving agricultural production? (Figure 4).
- 3 What is the impact of genetic engineering on the plants' quality? (Figure 5).
- 4 What are the most types of media, which you often use to get general information? (Figure 7).

3.2.4. Career

It was found that there are significant differences ($p < 0.05$) between different professional levels and the questions below:

- 1 Have you heard about genetic engineering? (Figure 3).
- 2 What are the sources of your information about GM crops? (Figure 8).
- 3 In which methods would you like to get more information about GM crops? (Figure 10).
- 4 Do you know the difference between the genetic improvement and genetic modification? (Figure 13).

Table 1 shows the summary of questions that have significant differences ($p < 0.05$) between the four independent variables (*i.e.* age, gender, education and career) and different respondents' answers. The total number of significantly different questions is thirteen (*i.e.* thirteen figures show the significance difference between the four independent variables and the correspondents' answers). This contributes to about one-third of the total questions of the questionnaire (*i.e.* $13/36 = 36\%$). This explains the difference of viewpoints of many sectors in the society regarding GM. These questions can be a guide to know the problems and to recognize the best methods to disseminate the correct information, to increase the society awareness and to get more acceptances for GM crops in terms of research and use.

The age variable was the most independent variable that has

non-significantly relationship with some questions. Therefore, information about GM to different ages should be delivered.

It was found that there are many common points that significantly differences shared between all independent variables (Figures 3-5, 7-8 and 10; and Table 1). These question contributed to about 20% of the total questions (*i.e.* 6/36 = 17%).

For the four independent variables, it can be noticed that many people are not aware of the concept of GM, and they mix it with other concepts (*i.e.* genetic engineering and transgenic plants). Moreover, the positive effects of GM in different applications are not clear for many people, and some people think that GM is harmful for human beings (Figures 1-6, 11 and 13). Furthermore, the current information available about GM crops are mostly not enough (56.8%) and confused (25.5%) (Figure 12).

The media play a big role in getting information about GM crops. Generally people get information mostly from internet (52.5%) and radio & TV (about 29.9%) (Figure 7). For GM crops, still these two types of media are the most important sources for getting information about GM crops (*i.e.* internet 37.2%, and radio & TV 18.1%) (Figure 8).

The future preferred media methods for getting information about GM crops are internet (33.9%), radio & TV (28.2%), brochures (13.1%), seminars & workshops (11.7%), newspaper & magazines (7.1%), labels in streets & public transportation (5.4%) and others methods (0.6%) (Figure 10).

For religion factor, there were no significant differences between independent variables and the respondents' answers related to questions on religion. However, just 5.2% take their information about GM crops from trusted religion experts (Figure 8).

For reliable information about GM crops, there was trusting in some media types (*e.g.* NGOs, radio & TV, researchers, magazine & newspapers and physicians). However, when considering age as independent variable, there was no trust regarding information coming from governmental institutions/schools and universities about GM crops (Figure 9). This is really a problem that should be tackled and working on, so the people re-trust the governmental institutions/schools and universities. This can be done though more interaction with society through *e.g.* workshops, meetings and interviews. This information revealed the suggested strategies for decision makers for improving public awareness and regulations for GM crops, and information should be delivered to the public as they preferred and according to the most types of media used for getting information.

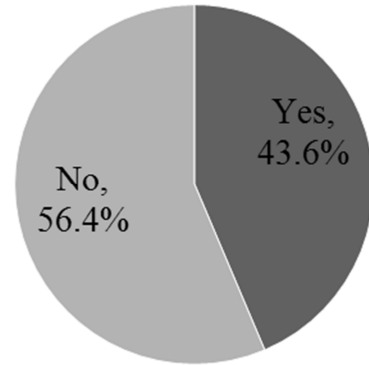


Figure 1. The response regarding the question of “Do you eat GM products without knowing the nature of the modifications occurred to them?”.

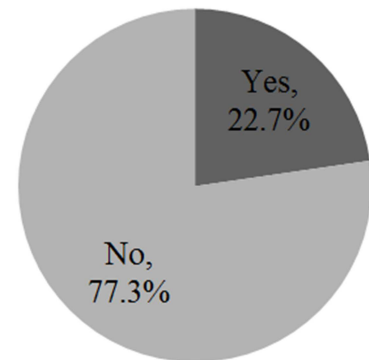


Figure 2. The response regarding the question of “Are you aware of the latest developments on GM crops?”.

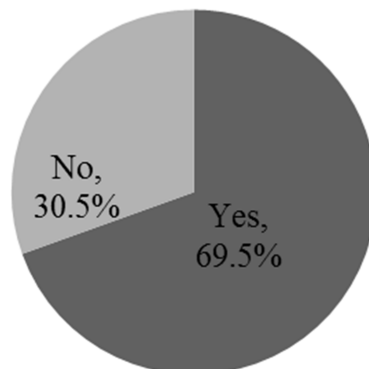


Figure 3. The response regarding the question of “Have you heard about genetic engineering?”.

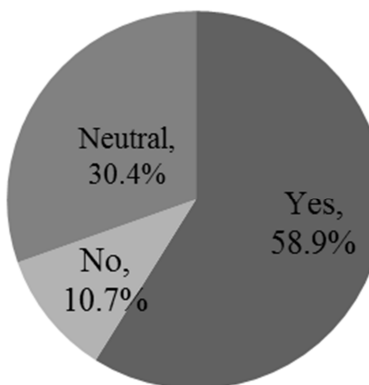


Figure 4. The response regarding the question of “Has genetic engineering a role in improving agricultural production?”.

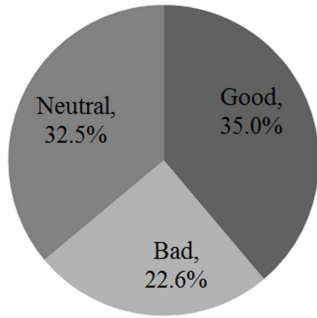


Figure 5. The response regarding the question of “What is the impact of genetic engineering on the plants’ quality?”.

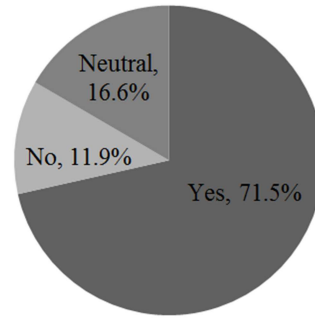


Figure 9. The response regarding the question of “To which degree do you trust the information coming from governmental institutions/schools and universities about GM crops?”.

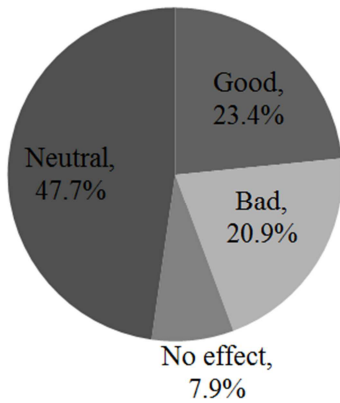


Figure 6. The response regarding the question of “What are the possible implications of using GM in medical products?”.

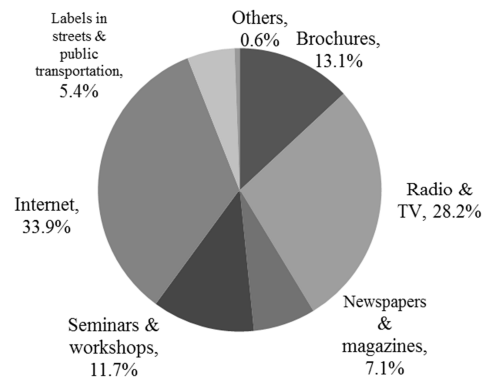


Figure 10. The response regarding the question of “In which methods would you like to get more information about GM crops?”.

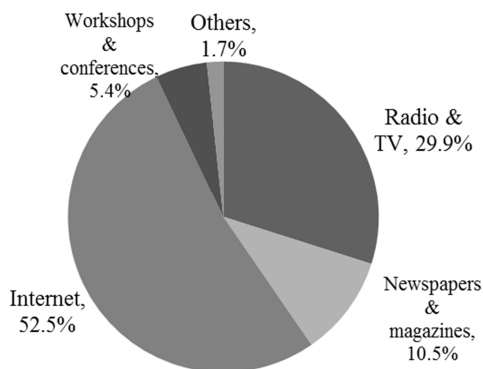


Figure 7. The response regarding the question of “What are the most types of media, which you often use to get general information?”.

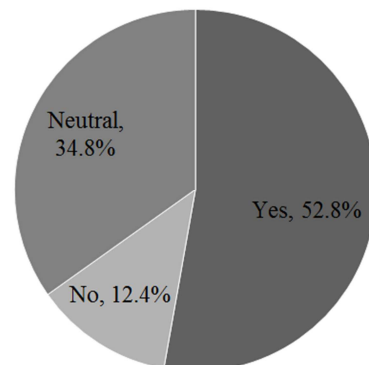


Figure 11. The response regarding the question of “Do you think that genetically modified foods have damage effect on human’s health?”.

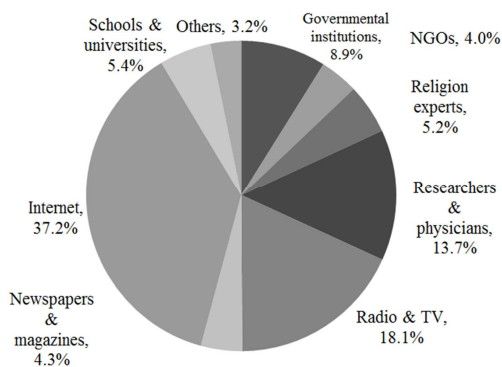


Figure 8. The response regarding the question of “What are the sources of your information about GM crops?”.

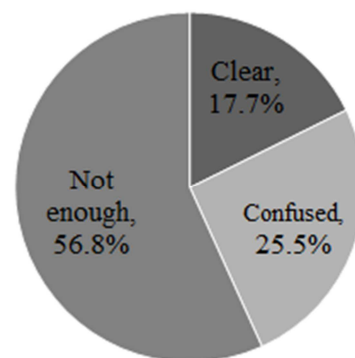


Figure 12. The response regarding the question of “How do you evaluate the current information available about GM crops?”.

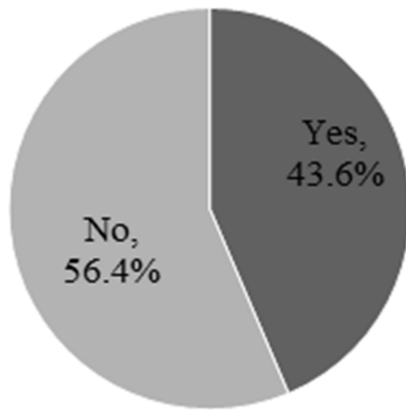


Figure 13. The response regarding the question of “Do you know the difference between the genetic improvement and genetic modification?”.

Table 1. Relations between independent variables (*i.e.* age, gender, education and career) and different respondents’ answers that are significantly difference ($p < 0.05$) using Chi-square tests.

| Nr. | Independent variables | Questions |
|-----|---------------------------|---|
| 1 | Age | Do you eat GM crops products without knowing the nature of the modifications occurred to them? (Figure 1). |
| 2 | Age | Are you aware of the latest developments on GM crops? (Figure 2). |
| 3 | Age, education and career | Have you heard about genetic engineering? (Figure 3). |
| 4 | Age and education | Has genetic engineering a role in improving agricultural production? (Figure 4). |
| 5 | Age and education | What is the impact of genetic engineering on the plants’ quality? (Figure 5). |
| 6 | Age | What are the possible implications of using GM in medical products? (Figure 6). |
| 7 | Age and education | What are the most types of media, which you often use to get general information? (Figure 7). |
| 8 | Age and career | What are the sources of your information about GM crops? (Figure 8). |
| 9 | Age | To which degree do you trust the information coming from governmental institutions/schools and universities about GM crops? (Figure 9). |
| 10 | Age, gender and career | In which methods would you like to get more information about GM crops? (Figure 10). |
| 11 | Gender | Do you think that genetically modified foods have damage effect on human health? (Figure 11). |
| 12 | Gender | How do you evaluate the current information available about GM crops? (Figure 12). |
| 13 | Career | Do you know the difference between the genetic improvement and genetic modification? (Figure 13). |

Moreover, the results of this research gives indirectly ideas and signals indicating about the required contribution of official/non-official authorities in GM crops related issues (when connecting the answers of the people and the selected independent variables).

The results of this research are in agreement in some points with Sakr and Ali (2011), who made a survey in Egyptian society about GM crops. In their research, they found that there were mixing between GM crops and using hormones for food production, and some people thought that GM crops

is harmful. For dissemination information about GM crops, media was the most important factor to disseminate the idea of GM crops. Education played a big rule in their study also.

Further researches are needed for more investigations and covering the opinion of the Palestinian in all different districts.

4. Conclusion

From the results of this research, it can be concluded that:

- There were different viewpoints in many social sectors regarding GM crops.
- The concept of GM crops still vague for the majority of the society, and there should be more activities towards explaining the concept.
- There was mixing in understanding the concept of GM crops and its benefits to the human being with other related concepts (*e.g.* transgenic plants and genetic engineering).
- Varieties of media should be used to disseminate the trustworthy information about GM crops to the society, mostly internet, radio and TV.
- Different public sectors need to be guided and instructed for the right information about GM crops.
- Further researches are needed for getting a clearer picture about GM crops concepts and use.

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