

Changing public opinions on genetically modified organisms through access to educational resources

Matthew Klein¹, Dr. Christopher Gordon^{1,2}

¹Summer Ventures in Science and Mathematics at University of North Carolina at Charlotte, North Carolina

²Lenoir-Rhyne University, Hickory, North Carolina

SUMMARY

Genetically modified organisms (GMOs) are crops or animals that have been genetically engineered to express a certain physical or biological characteristic. Genetically modified foods have become increasingly popular based on the various benefits that genetically modified crops can provide, such as pest and drought resistance and increased yield and nutritional content. However, the public has had mixed reactions on the use of GMOs, as some believe it is an advancement in technology, while others are skeptical of their safety. The purpose of this study was to evaluate how opinions on genetically modified foods can change from exposure to small amounts of information. The following question guided the study: How do personal opinions on genetically modified organisms (GMOs) change after being exposed to a small amount of educational information on GMOs? We tested the hypothesis that if participants were given educational resources to learn about GMOs, then they would have a more favorable opinion. We collected preliminary opinions via a survey, exposed the participant to a small sample of educational information about GMOs, and then collected opinions again. At the end of the survey, the percentage of participants who agreed with the use of GMOs in the United States increased by 27%. As the agricultural industry becomes increasingly aware of the benefits of GMOs, consumers must also approve of GMOs for them to be implemented. GMOs could be a possible solution to world hunger and climate impacts from agriculture, but they will be useless unless consumers feel confident and are educated in the science behind GMOs.

INTRODUCTION

Genetically modified organisms (GMOs) are living things engineered on a genetic level by modifying the DNA of a living organism. GMOs have become increasingly popular in the scientific community and the agriculture industry due to the plethora of benefits they can provide (1). Typically, GMOs are crops. However, genetic modification could potentially be extended to other organisms. Genetically modified crops can be much more efficient in agriculture than traditional crops for various reasons. Some genetically modified crops can be more resistant to pests because they can produce natural pesticides, thereby allowing farmers to reduce pesticide applications (2). For example, *Bacillus thuringiensis* (Bt) corn

is a genetically modified corn crop that produces a natural pesticide chemical, enabling the reduced use of externally applied pesticides (2).

Additionally, genetically modified crops can be drought-resistant or survive with less water. This drought-resistance helps farmers in dry areas grow crops and reduce water use for irrigation (3). As a result, less water would be used, and human agricultural activity would have a reduced impact on the environment. Also, genetically modified crops can have increased yield (3). With higher yields, fewer farmers can support a larger population. This genetic modification could be a solution to the evolving food shortage crisis as the human population grows (4). The increased yield could possibly enable developing countries to manage and reduce their food shortages.

Furthermore, the increased nutritional content that genetically modified crops can provide could help populations, especially in developing countries, that lack certain nutrients because of the limited availability of certain foods (2). Genetically modified crops can be engineered to provide certain nutrients. For example, Golden Rice is a genetically modified rice crop with increased levels of vitamin A, which is a nutrient that many developing countries lack (2).

Taking everything into consideration, GMOs provide many benefits. However, there is a strong counter-movement against GMOs. Greenpeace is an organization that spearheads the opposition to GMOs, and in the United States, GMOs have specific labeling protocols (1). There are some valid concerns, such as potential allergic reactions to new proteins introduced into organisms because of genetic modification, but there

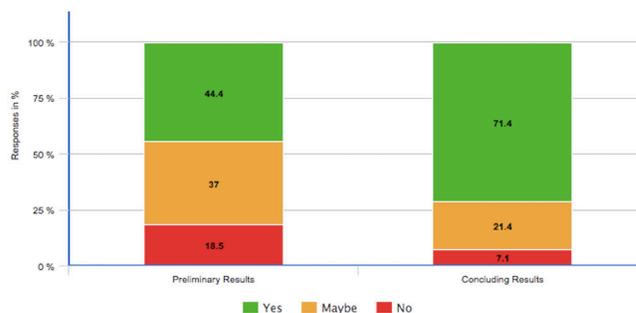


Figure 1: Preliminary vs concluding opinion poll results for question one: “Do you support the use of GMOs in the United States?” Results were gathered via Google Forms, and data was accumulated and analyzed on Google Sheets. The sample size was 28 participants (n=28).

have been no notable incidents where proteins caused large-scale allergic reactions (1). Moreover, as previously illustrated, GMOs could benefit humanity in a surfeit of ways. However, the issue is most likely that many people oppose GMOs because they do not understand the science behind them. The purpose of this study was to test whether a small amount of education could change personal opinions in favor of GMOs for the sake of humanity’s future. A similar study was conducted to test the opinions on genetically modified crops before and after education (5). However, the study involved participants taking a three-week course to learn about GMOs (5). We conducted this study to test the effects on opinions about GMOs from a small amount of educational information on GMOs rather than an in-depth education from the previous study. Our results suggested that information on GMOs may create more favorable opinions on the usage of GMOs.

RESULTS

Our results showed an increase in support for the use of GMOs. In the preliminary and concluding opinion polls, we asked participants the following question: “Do you support the use of GMOs in the United States?” In the preliminary polls, only 44.4% of participants said yes; however, in the concluding polls, 71.4% of participants answered yes (Figure 1). This was a 27% increase in participants that agreed with GMO use in the United States after reading the article on GMOs.

Furthermore, we asked participants another question: “Do you support the use of GMOs in developing countries?” In the preliminary polls, only 57.1% of participants said yes; however, in the concluding polls, 82.1% of participants answered yes (Figure 2). This 25% increase indicated that more participants agreed with GMO use in developing countries after reading the article on GMOs.

Finally, we asked participants a concluding question: “Are you open to buying food containing genetically modified ingredients?” In the preliminary polls, only 64.3% of participants said yes; however, in the concluding polls, 78.6% of participants answered yes (Figure 3). This 14.3% increase

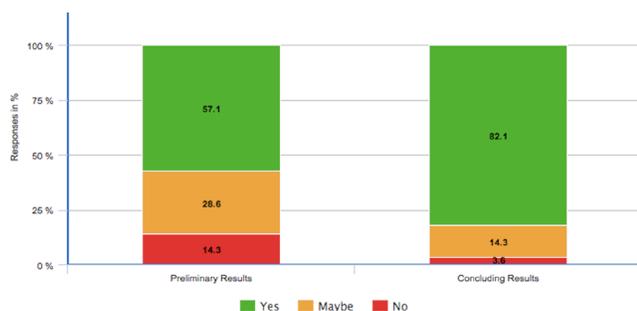


Figure 2: Preliminary vs concluding opinion poll results for question two: “Do you support the use of genetically modified foods in developing countries?” Results were gathered via Google Forms, and data was accumulated and analyzed on Google Sheets. The sample size was 28 participants (n=28).

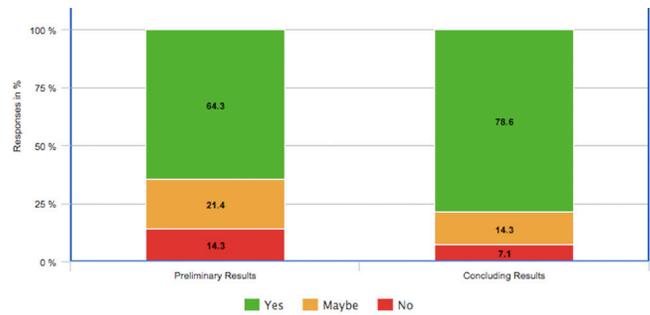


Figure 3: Preliminary vs concluding opinion poll results for question three: “Are you open to buying foods containing genetically modified ingredients?” Results were gathered via Google Forms, and data was accumulated and analyzed on Google Sheets. The sample size was 28 participants (n=28).

suggested that more participants were open to buying food containing genetically modified ingredients after reading the article on GMOs.

DISCUSSION

Taking everything into consideration, our results illustrated the potential effects of exposure to a small amount of educational content in favorably changing public opinion on GMOs. This increase in favorability is important because GMOs could be possible solutions to food shortages and human impacts on climate from agriculture, but GMOs can only provide these benefits if consumers accept them.

Our survey used information from generally reputable and well-known sources: The first article was from Harvard University (2), and the second was a short, interactive website developed by the Purdue University Agricultural Program (3). Using these materials, our study showed that providing information about GMOs can make public opinions on GMOs more favorable. However, it is important to consider that the sample size for this experiment could be insufficient to draw definite conclusions. This study would benefit from being repeated to verify results.

Additionally, it is notable that similar research has been carried out to test the opinions on genetically modified crops before and after education. Previous research conducted by McPhetres, et al. involved participants taking a three-week course to learn about GMOs (5). In contrast to the extensive education the participants of McPhetres study experienced, we conducted this study to test the effects on opinions about GMOs from a small amount of educational information on GMOs. Therefore, this study required less involvement from the participants compared to the three-week course used in the previous study.

It would be beneficial to explore the effects of demographic characteristics, such as age and the number of children a participant has, on their receptiveness to the educational content on GMOs because GMOs are new to many age groups and parents may be more hesitant to feed GMOs to their children. As a whole, this study illustrated that educating

the public about GMOs could potentially increase support for the use of GMOs in agriculture.

MATERIALS AND METHODS

During this study, we conducted a survey to collect participants' opinions before and after being exposed to a small amount of educational information about GMOs. Before data collection, a proposal for a survey was approved by an Institutional Review Board from the Regional North Carolina Science and Engineering Fair. We created a survey using Google Forms. The survey consisted of an introduction, where we informed participants of the voluntary nature of the questions. All data for the survey was anonymous. We distributed the survey through a virtual classroom affiliated with the Summer Ventures in Science and Mathematics at The University of North Carolina at Charlotte and on social media. The survey collected the opinions of 28 voluntary participants.

Then, we asked participants a series of questions with a yes, no, and maybe option. The questions were as follows: "Do you support the use of genetically modified foods in the United States?", "Do you support the use of genetically modified foods in developing countries?" and "Are you open to buying foods containing genetically modified ingredients?" On a scale of one to five, the participants were also asked how much they knew about GMOs. The next section contained the short, interactive website from Purdue University. We required participants to read the first three sections of the interactive website (1). The website outlined the benefits of genetically modified organisms to agriculture (pest resistance, drought resistance, increased nutrition, increased yield, etc.) and addressed the possible allergy, labeling, and environmental concerns about genetically modified organisms. After the educational section, we asked participants the same questions from the preliminary opinion section. We collected responses in Google Sheets, then analyzed responses using Google Forms and data was compiled in Google Sheets.

ACKNOWLEDGMENTS

We would like to thank Allison Hahn Elowson, Kristen Fye, Dr. Gregory Wickliff, Dr. Paul Hunter, Becky Dalton, and The Center for STEM Education at the University of North Carolina-Charlotte for their guidance and encouragement.

Received: September 4, 2021

Accepted: January 3, 2022

Published: July 26, 2022

REFERENCES

1. Santiago, M. "Genetically Modified Organisms: The Good, the Bad, and the Future." *Science in the News*, 6 Apr. 2019, sitn.hms.harvard.edu/flash/2013/genetically-modified-organisms/.
2. Stebbins, Michael. "How GMOS Can Help Us To Feed Our Growing Population." *BIO*, 22 July 2019, www.bio.org/blogs/how-gmos-can-help-us-feed-our-growing-population#:~:text=A%20fresh%20new%20report%20from,10%20billion%20people%20by%202050.

3. Stearns, Stacey. "The Future Of GMO Crops." *Science of GMOs*, University of Connecticut, 3 Oct. 2017, gmo.uconn.edu/topics/the-future-of-gmo-crops/#.
4. "Why Do We Use GMOS?" *Why Do We Use GMOS?*, Purdue University, 6 July 2016. ag.purdue.edu/GMOS/Pages/WhyGMOS.aspx.
5. McPhetres, Jonathon, et al. "Modifying Attitudes about Modified Foods: Increased Knowledge Leads to More Positive Attitudes." *Journal of Environmental Psychology*, Academic Press, 3 May 2019, www.sciencedirect.com/science/article/abs/pii/S0272494419301045?dgcid=author.

Copyright: © 2022 Klein and Gordon. All JEI articles are distributed under the attribution non-commercial, no derivative license (<http://creativecommons.org/licenses/by-nc-nd/3.0/>). This means that anyone is free to share, copy and distribute an unaltered article for non-commercial purposes provided the original author and source is credited.