

Genetically modified organisms and Danish opinion

Abstract

After its creation planet earth has been inhabited by countless species but only Homo Sapiens have been able to exploit it and have the most impact on this planet. Advancement in technology has led to the creation of genetically modified organisms (GMO). The purpose of this study was to collect data about the knowledge and consumption of GMOs among Danish youth. This study was carried out at European School where an anonymous e-survey was filled by students and teachers, and this showed that to their opinion regarding consumption and production of GMOs. Results of the survey show that approx. 31% of the youngsters have shown concerns on the use of GMOs and 40% think more research work is needed while only 8.2 % support the idea of banning GMOs. Our results clearly depict that teenagers are open to new technologies, but older generations need to be educated about the concept.

Keywords: genetically modified organisms, consumption, selective breeding, scepticism

Volume 12 Issue 1 - 2025

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Received: September 16, 2024 | **Published:** January 08, 2025

Introduction

Human population has been on rise since the dawn of mankind reaching to 8 billion, our ancestors invented ways like “selective breeding” or “artificial selection” to feed the increasing population. This process date back around 9000 years and has played some role in altering the genetic make-up of these organisms. But with the advancement of modern technologies, it is believed that genetic modification can solve the problem of scarce food.¹ In 1973 the first genetically modified organism was created by Boyer and Cohen, as they managed to take the antibiotic kanamycin resistant gene of one bacterium and incorporate it into the plasmid in the presence of other bacteria making it resistance to kanamycin.² In 1974 Rudolf Jaenisch from the university of Munich managed to create the first ever genetically modified animal, a mouse and first transgenic livestock was created in 1985. It followed the creation of transgenic crops including Vitamin-A enriched golden rice, soyabeans and eggplants and inserting genes from jelly fish into rabbits.³

The question is whether or not humans should consume food from genetically modified organisms is still debatable and in their article Zhang et al. 2016 discussed that use of GM crops seems the only plausible solution if we run out of fossil fuels and want to safeguard our planet from global warming but still they suggested that more research work is needed before flooding our food chain with GMOs.⁴ Later another group of scientists discussed that GM crops might pose some environmental risks like, generation of super weed, development of tolerance to target herbicide, loss of biodiversity and sustainable resistance in insect pests, through gene flow but they also suggested that these risks can be minimized using different molecular techniques such as, maternal inheritance, male sterility, cleistogamy and apomixes, genetic use restriction technologies, genome incompatibility, controlling gene expression and transgenic mitigation.⁵

Recent studies highlight diverse public opinions on genetically modified (GM) products, reflecting varying degrees of skepticism and acceptance globally. A Pew Research Center study found that a median of 48% of people in 20 countries view GM foods as unsafe, with significant skepticism in nations like Russia, Italy, and India. Only 13% consider them safe, and 37% feel they lack enough information to decide. Gender and education levels also influence views, with women and those with less scientific education often

more skeptical.⁶ However, newer technologies like gene editing (e.g., CRISPR) tend to receive more favorable media coverage and public support compared to older GM technologies. Studies suggest this may stem from perceived benefits such as sustainability and reduced pesticide use.⁷

These findings reveal both persistent concerns and emerging acceptance, shaped by regional, educational, and gender differences. And in this context we decided to conduct a survey at our high school where we recorded the opinion of Danish youth on the use of GMOs since European Union has strict legislations on the production and consumption of GMOs (https://food.ec.europa.eu/plants/genetically-modified-organisms/gmo-legislation_en)

Materials and methods

The possibility of transferring genes from one species to another and having genetically modified organisms with industrial utility has created an enormous growth of biodiversity and generated commercial interests. Despite the numerous advancements in GMOs and the possible positive impacts it may have in terms of agriculture and public health, many people are sceptical of its health benefits. As there is currently no evidence of GMOs not being harmful, people are hesitant to accept GMO products and start consuming foods that have been genetically modified.

For the purpose of this survey we followed the strategy adopted by Pew research⁶ and we sent out questionnaire to the college students in Denmark about their perspectives on consumption of GMOs. Questionnaire comprised a total of 11 questions was circulated among the staff and students of the European college, a total of 134 people responded and their responses were analysed using pie chart with the use of excel software.

Results

A total of 134 people of ages between 15 to 60 responded to the survey out of which 71.6 % were between the age of 16-18 %, 11.2% between 25-50, 10.4% were over 50 and 6% were between 19-21. In terms of gender, women were the most frequent respondents to the survey with 59%, followed by men with 38.1%.

It was important to know if our study group had any knowledge of biology and most of the people (75.4%) who responded to our survey are those who have studied biology at school or high school or who

are currently studying biology, others had at higher level but 6% of the people had never studied biology. Almost 85.1% of the respondents have heard of GMOs while 14.9% had no knowledge of GMO's as shown in Table 1.

Question regarding finding GMO or GMO-free labelled product in Danish supermarket came up with 26.1% of positive responses which is strange as for as Denmark is concerned. 38.8% claimed to have eaten a genetically modified product.

About the consumption of GMOs young people are still very sceptical and only 27.6% said yes to consuming even if it is labelled healthy while 44% are still at May be. But teenagers are more open to use the non-food GMO products since almost 84% think they might accept products like blankets or bags etc. And the explanation of this lies in the next answer (not shown in Table 1 where almost 40% are concerned that GMOs are not suitable for our health or environment while 40% are of the view that more research should be done while only 20% feel safe as for as GMOs are concerned.

37.3% think that GMO's are necessary for the future, a larger group (45.5%) is still in doubt and only 17.2% think that they are not necessary. On the question of banning the production of GMOs only 8.2% said yes while 36.6% are still unsure. All these results are shown in Table 1 and Figure 1 below.

Table 1 Results from the questionnaire showing questions and response of the participants

Question	Yes	No	Maybe
Studied biology	111	23	-
Ever heard of GMO's	114	20	-
Ever seen a GMO marked product	35	99	-
Eat a GMO	52	25	57
Prefer it over non-GMO if it is healthier alternative	37	38	59
Concerned about the use of GMO's	42	39	53
Easier to accept non-food GMO products	57	22	55
GMO's necessary for the future	50	23	61
GMO's should be banned	11	74	49

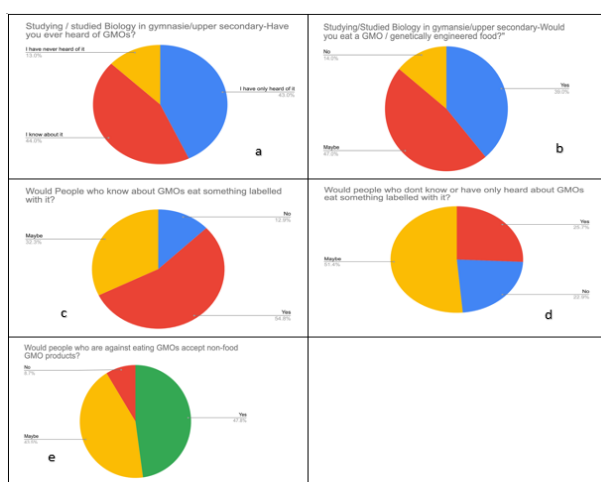


Figure 1 a: Pie chart showing percentage of participants who studied/studying biology

b: Acceptance of GMOs among individuals with biology knowledge

c: Percentage of people who are open to consume GMOs

d: Percentage of participants with no knowledge of GMOs

e: Acceptance of non-food GMO products over GMO food products

Discussion

The survey conducted on 134 respondents provides valuable insights into public perceptions of genetically modified organisms (GMOs). A notable trend observed in the results is the high proportion of respondents aged 16-18 (71.6%), which suggests that the views expressed may predominantly reflect the perspectives of a younger demographic. Additionally, the representation of women (59%) may highlight gender differences in attitudes toward GMOs, as previous research has suggested that women tend to express more concerns about GMOs compared to men.⁸ This age and gender skew may influence the interpretation of the results, with younger and potentially more informed individuals offering differing opinions compared to older populations.

The fact that 85.1% of respondents had heard of GMOs indicates a relatively high level of public awareness, likely owing to increased media attention, academic discourse, and governmental debates surrounding the topic. This aligns with global trends where awareness about GMOs, particularly in the context of food security and agriculture, has risen over the past few decades.⁹

However, while awareness is high, it is important to note that only 38.8% of respondents admitted to consuming GMOs. This figure suggests a gap between awareness and acceptance, a phenomenon that has been well-documented in GMO-related studies. Many individuals are aware of GMOs, but concerns about their health and environmental risks still influence their consumption choices.¹⁰

Interestingly, the survey revealed that only 27.6% of respondents were open to consuming GMO-labeled healthy products, which underscores the prevailing skepticism about the potential benefits of GMOs in food products. This cautious stance aligns with global trends where consumers express a preference for non-GMO or organic products, primarily due to perceived health risks, despite scientific evidence showing that GMOs are generally safe to consume.¹¹ These concerns often stem from fears regarding long-term health effects, ecological risks, and the lack of understanding about the regulatory frameworks governing GMO products.¹² Additionally, the low acceptance of GMO-labeled products can be attributed to the influence of anti-GMO advocacy and public relations campaigns, which have effectively framed GMOs as risky, despite scientific consensus on their safety.

Conversely, the acceptance of non-food GMOs, such as genetically modified blankets (84%), is significantly higher. This finding reflects a broader acceptance of GMOs in non-consumable goods, where concerns about health and safety are less prominent. Public acceptance of non-food GMOs, including those in medicine and agriculture, has generally been more favourable, possibly because the risks are perceived as more manageable and the benefits more apparent, such as increased durability or enhanced functionality of products.¹³ This distinction between food and non-food GMOs is crucial for policymakers and educators seeking to address public skepticism and foster a more balanced understanding of the potential benefits and risks associated with biotechnology. The mixed views on GMOs' necessity, as highlighted by the survey results, further underscore the need for more targeted educational efforts. A significant proportion of respondents appear uncertain about the necessity of GMOs, which points to gaps in understanding their potential role in food security, agriculture, and environmental sustainability. While GMOs have been shown to increase crop yields, reduce pesticide use, and contribute to food security in some regions, the general public remains divided on their broader social and environmental implications.¹⁴ Public opinion on GMOs is shaped by various factors, including perceived risks,

media portrayal, and trust in regulatory agencies, which means that education must be multifaceted and transparent to be effective.

Conclusion and future prospects

In conclusion, the survey results highlight both the potential for greater acceptance of GMOs and the challenges that remain in overcoming public skepticism. Education, clear communication of scientific evidence, and addressing concerns about health and environmental risks are essential steps toward fostering a more informed and balanced public discourse on GMOs. Future research should focus on understanding the underlying reasons for the skepticism and exploring the effectiveness of different educational strategies in promoting GMO acceptance.

Acknowledgments

None.

Conflict of interests

The authors declare that there are no conflicts of interest.

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