Consumer Preference for Genetically Modified Halal Yogurt Drinks

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Consumers worldwide have reacted negatively to food products made from genetically modified (GM) ingredients. This study strives to understand the importance placed by consumers on the features of a product when purchasing halal yogurt drinks with GM or non GM ingredient along with the level of antioxidants, price, flavor and Halal certification from JAKIM. In addition, their attitudes towards genetically modified foods, in general, and their purchase intention towards genetically modified yogurt drinks, in particular, were also determined. Experimental design using a convenience sampling was used; 120 eligible responses were received from the study using three types of yogurt drinks. The research findings showed that nutrition was deemed as being the most important product feature that influenced the decision in purchasing yogurt drinks, followed by freshness, price, flavor, variety, and origin. Furthermore, it was found that respondents presented a neutral attitude and purchase intention towards genetically modified yogurt drinks. The recommendations to market practitioners, research limitations, as well as suggestions for future studies are also discussed.

Keywords: Consumer Preference, Genetically Modified, Yogurt Drink, Halal, Malaysia, Consumer Behavior

Introduction

Genetic modification technology is a modern introduction to the agri-food system but consumers have reacted differently toward genetically modified (GM) food. GM food is a result of scientific endeavor, which involves the premeditated modification of the genetic material of plants, which causes a challenge to the society and individuals in evaluating this technique. Such technology produces potential benefits and risks. Some of the perceived benefits from using genetic modification technology, particularly in food content, included the low cost of production, less usage of pesticides and herbicides, an increase in farming productivity, a reduction in the price for consumers, and the enhancement of food attributes (Bawa & Anilakumar, 2013). On the other hand, some of the perceived risks included allergic reaction, durable health and environmental effects, cultural and moral factors, religion, and the possible creation of new viruses or toxins (Bawa & Anilakumar, 2013; Maghari & Ardekani, 2011).

Previous research showed that consumers worldwide have reacted negatively to food products made from GM ingredients (Bawa & Anilakumar, 2013; Curtis, McCluskey, & Wahl, 2004). Considering their perceptions and the risks entailed, it is likely that the consumers will avoid consuming GM food. Given the option, consumers will be willing to pay more for their food products to avoid purchasing GM food (Kaneko & Chern, 2003). The extent of consumer acceptance towards GM food, however, differs greatly from country to country. Studies in the USA mostly indicate that there is a higher acceptance rate by consumers towards biotechnology and GM food compared to consumers in other countries (H.-Y. Chen & Chern, 2002). Major countries that are keenly working on modified crops in Asia are China, India, the Philippines, Malaysia, and Indonesia (Cohen, 2005).

Most studies on GM technology have been conducted in developed Western countries with similar views and cultural values. Consumers in Asia, especially Muslim consumers in Malaysia, hold different values compared to the Western and European countries. However, there is inadequate research concerning the values of Muslim consumers in many developing

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countries in respect of GM food (Hassan, John Kua, & Harun, 2016). The role of religion and the respective value systems in influencing the consumption of food with GM properties is poorly understood and is neglected in developing countries, even though this type of food is available on the supermarket shelves (Hassan & Hamdan, 2012; Hassan et al., 2016).

Thus currently, a few studies have attempted to provide a detailed view concerning the values considered in the assessment of GM foods and the extent to which these values differ among the consumers in a developing country like Malaysia. In addition, it is important to know how these values affect subsequent preferences towards food products, particularly GM food products in a Muslim market, which have, to date, been inadequately addressed. In this study, we will investigate the values and preferences of Malaysian Muslims with respect to genetically modified food, in general, and halal yogurt drinks consumption, in particular (Hassan et al., 2016).

The concept of halal and tayyib has been conceptually proposed by a few scholars (Adnan, 2011; Al-Qardawi, 1997; Arif & Ahmad, 2011) as a guideline for Muslim consumption activities. Halal is a Qur'anic term that means permitted, allowed, lawful, or legal. Its opposite is Haram (forbidden, unlawful, or illegal). In Islam and according to Shariah (Islamic Law), all issues concerning halal or haram and even all disputes should be referred to Qur'an and Sunnah. Halal and haram are universal terms that apply to each activity carried out by man, whether it is related to his religious rituals (ibadat), trade (muamalat), or relationship (mua'sharah). Tayyib on the other hand should complement halal in terms of consumption (Adnan, 2011). The religious element has a vital effect on the Muslim bioethical tradition especially concerning genetically engineered food (Isa, Baharuddin, Man, & Chang, 2015).

In Asia, the results of consumer surveys that have been conducted in China, Indonesia, and the Philippines suggested that most of the Asian consumers have positive attitudes toward GM foods (Asian Food Information Center, 2002, 2003). Research findings revealed that about two thirds of consumers not only accepted GM foods but also believed that they would personally benefit from consuming them. In Malaysia, the National Fatwa Committee and the Islamic Affairs Department (JAKIM) declared that "the transgenic genetically modified organisms (GMOs) are "halal" (permissible) if the transgenes contained were derived from "halal" sources (Fatwa Committee National Council of Islamic Religious Affairs Malaysia, 1999). This means that if the genes are obtained from halal sources such as plants to create GM foods, the food produced are acceptable in Islam according to the shariah law. However, according to Malaysian Islamic scholars, further discussion is needed on the production of GM animals or animal by products, including the transfer of genes from plants to animals and vice-versa.

Thus, the aim of this study is to investigate the relationship between the characteristics of GM yogurt drinks and the demographic characteristics of consumers' attitudes towards GM food, GM preferences, and environmental protection. Specifically to investigate the influence of characteristics of genetically modified yogurt drinks (GMYD) on attitudes towards GM, environmental protection, and consumers' preference for GMYD. The objective is also to explore consumers' preference for GMYD based on the characteristics of yogurt drinks and the influence of consumers' demographic characteristics on the attitude towards using GMYD. This study also exhibits the influence of GMYD consumers' demographic characteristics on the attitude towards environmental protection; and the influence of consumers' demographic characteristics on their preference for GMYD.

In this study, GM food preference is defined as a consumer only preferring GM yogurt drinks and no other GM food. The acronym GMYD and the term genetically modified yogurt drink are used interchangeably as both are intended to convey the same meaning. The paper begins with a brief literature review and followed by research methodology. The results then are presented in subsections followed by discussion. Finally, the conclusions are provided together with the study limitations.

Literature Review

In general, GM food in particular represents a controversial topic within the scientific com-

munity and also in public opinion. Scholderer (2005, p. 263) reviewed the recent history of GM organisms as "first they were hailed as a triumph of modern science, then abandoned as a threat to consumer health and the environment, now resurrected and about to enter the European food markets". Many terms existed to label this novel organism, such as genetically modified, genetically engineered, genetically manipulated, bioengineered, and biotech. The United States Department of Agriculture (USDA) uses 'bioengineered' or 'biotech' to describe crops produced through genetic technology (Markosyan, McCluskey, & Wahl, 2009).

The United Nations Convention on Biological Diversity in 1992 defined biotechnology as any technological application that uses biological systems, living organisms, or derivatives to produce or alter products or processes for specific use (United Nations, 1992). Biotechnology is a combination of disciplines including genetics, molecular biology, biochemistry, and cell biology that are linked to other disciplines, such as chemical engineering, information technology, and robotics. Biotechnology has diverse applications in not only agriculture but also healthcare and industrial processes, products, and services.

Meanwhile, Centre for Science and Technology Information, MASTIC (2009) defined biotechnology in two different ways. One definition, which is more general, refers to any technique that uses living organisms to make or modify products, improve plant or animal productivity or to develop microorganisms for specific use. The other definition is more specific and identifies biotechnology as a new 'high-end' biotechnology, involving recombinant deoxyribonucleic acid (DNA), cell fusion, and novel bioprocess engineering techniques, such as gene transfer and embryo manipulation (MASTIC, 2009). Biotechnology is among the main technologies that would assist Malaysia to become a developed nation by 2020. The R&D activities are categorized into seven sectors, namely, food, animal, plant, biopharmacy, molecular biology and industry or environment biotechnology (BIOTEK, 2008, 2009). All these developments contribute to the introduction of applied genetics and recombinant DNA technology together with protoplast fusion, which permits new programming of the biological properties of organisms.

Attitudes towards GM Food

GM food is new to the food scene and people are unfamiliar with it, hence they have trouble in distinguishing it from non-GM food. People are more inclined to apply their general attitudes in assessing new and unfamiliar foods instead (M.-F. Chen & Li, 2007; M. Zhang & Liu, 2015). The general attitudinal variables include general promise and concern of modern biotechnology, biotechnology as threatening the natural order of things, attitude towards labeling (the need for labeling), confidence in regulation, attitude to patenting, and societal value. Pardo, Midden, and Miller (2002) recognized general promise and reservation (concerns) as two important attitude schemes towards biotechnology among the Europeans. They reported that the general promise scheme strongly predicts the perceived benefits of biotechnology applications and is inversely related to perceived risk.

Product characteristics may be informative for consumers since it can influence attitude towards the product. Consumers can choose whether to buy or not to buy, or to consume such product depending on the attributes of the product itself (Mohapatra, Priyadarshini, & Biswas, 2010). In relation to GM food, Fortin and Renton (2003) found that genetic modification had negative influence on consumer attitudes. For instance, if the content label of the food product indicates presence of genetically modified ingredients, it would increase hazard perception and decrease purchase intentions in relative to a non-label food (Hellier et al., 2012). However, denoting the positive attributes of GM food can reduce consumers' negative reactions on such food (Teisl, Radas, & Roe, 2008). Thus, it is important to examine the relationship between GM food characteristics and attitudes toward GM food, which is a new product introduced in the consumer marketplace.

Furthermore, a poor understanding about GM food characteristics creates confusion for certain people as they tend to see more disadvantages instead of advantages on genetically engineered foodstuffs (Mohapatra et al., 2010;

X. Zhang, Huang, Qiu, & Huang, 2010). Consumer beliefs about GM foods are constructed between the conflicts of safety and benefit in their consumption; however the perception of benefits itself is still not enough to offset the perception of low safety (Arvanitoyannis & Krystallis, 2005). Consumers would only accept the use of biotechnology in food production when they truly understand the context and purpose of its use (Hossain, Onyango, Schilling, Hallman, & Adelaja, 2003). Hossain, Onyango, Schilling, Hallman, and Adelaja (2003) and Onyango (2004) found that consumers in the US are confident about the possible benefits of GM food and feed; however, they are also concerned about the associated health, safety, and environmentally harmful consequences (Hassan, 2011).

Food biotechnology, which is a dimension in the biotechnological industry, deals with improving the food production technology and creates product differentiation in the food industry, which would also cater to the consumers' preference for change (Costa-Font & Gil, 2009). Consumer's attitude is their tendency to evaluate a particular entity with favor or disfavor to a certain extent (Eagly & Chaiken, 1993). In general, an attitude towards the use of gene technology is found to be influenced by both perceived risks and perceived benefits of genetic modification technology in food production (Kim, 2012; Pauwels et al., 2015).

Methods

The questionnaire was design to gauge perceptions of respondents about GM food in particular and then introduces them to a valuation scenario of yogurt drink. The experimental design study with convenience sampling method was used in this study. A total of 120 respondents participated in this study. A structured questionnaire, which comprised of four sections, was designed and distributed to the respondents. The first part was designed to capture the importance placed on the product features that influenced purchase decision. The yogurt drinks are described using five characteristics: the level of antioxidants, presence of genetically modified organism or not, the price, the flavor, and the Halal certification from JA-

KIM. Each question has three different yogurt drinks commination features. The yogurt drink (YD) Option A that is widely available now is not GM. The others are types of yogurt drink B and C that could be available in the future which both are halal and genetically modified.

The second part of the questionnaire was designed to measure the attitude of the respondents towards genetically modified foods. The items for measurement were adopted from previous researches and sources (Small, Peddersen, Wilson, & Parminter, 2002). A 5-item measure was employed, which used a 5-point Likert scale ranging from 1=strongly disagree to 5=strongly agree. The third section measured the respondents' purchase intention in respect to genetically modified yogurt drinks (Annelies, Xavier, & Jacques, 2002; Small et al., 2002) . This section was measured using a 5-point Likert scale ranging from 1=strongly disagree to 5=strongly agree. Lastly, the respondents' profiles were recorded in the fourth part of the questionnaire.

Statistical Package for the Social Science (SPSS) version 19.0 was used for data analysis. There were five stages of data analysis. First, frequency analysis was performed to capture the respondents' profile. Second, a descriptive analysis was run to measure the importance of the product characteristics in influencing the purchase decision in respect of yogurt drinks. Third, a descriptive analysis was performed to measure the respondents' attitude towards genetically modified foods. Fourth, a descriptive analysis was done to measure the respondents' purchase intention towards genetically modified yogurt drinks. Last, a regression analysis was used to analyze the relationship between the characteristics of GM yogurt drinks and the attitude towards GM food, GM preferences, and environmental protection. The same analysis was also performed in respect of the consumers' demographic characteristics with the three dependent variables.

Results

For comparison purposes, the results for the full sample of 120 respondents are presented in Table 1. In this study, all the respondents were Muslim consumers. The purchasers of the yogurt drinks comprised of 67.5% female

Table 1. Demographic information of respondents

Characteristics	%
Gender	
Male	32.5
Female	67.5
Age	
Below 20	2.5
21 – 25	10.0
26 – 30	13.3
31 – 35	21.7
36 – 40	13.3
41 – 45	15.0
46 – 50	10.8
51 – 55	11.7
56 – 60	1.7
Total Income (MYR)	
Below 2,000	8.3
2,001 – 4,000	21.7
4,001 – 6,000	32.5
6,001 – 8,000	21.7
8001 – 10 000	10.0
10,001 – 12,000	1.7
12,001 – 14,000	1.7
14,001 – 16,000	0.8
16,001 – 18,000	0.8
18,001 – 20,000	0.8
Purchase organically grown food	
Never	1.7
Rarely	17.5
Sometimes	47.5
Often	25.0
Always	8.3
Main shopper	
Yes	58.3
No	41.7

Table 2. Respondents' ranking of characteristics or properties of genetically modified yogurt drinks

Characteristics	Respondents ranking as most important (%)	Respondents ranking as least important (%)
Price	28.3	0.0
Nutrition	50.0	1.7
Flavor	11.7	0.0
Variety of yogurt drinks	8.3	0.0
Freshness	38.3	1.7
Imported vs. Domestic	10.0	0.0

and 32.5% male. This gender distribution of the sample is representative of the main household shoppers in Malaysia. The age distribution is mostly in the adult cohort, with more than half of the respondents being between 31 to 35 years old, which is estimated to be 21.7%. Meanwhile, only 2.5% of the respondents are below 20 years old. The household income of the respondents mainly ranged from RM2,001 to RM10,000, which constituted 75.9% in total. In terms of organically grown food usage, the results showed that 1.7% of the respondents never purchased any organic food, 17.5% rarely purchased, and 47.5% purchased organic food, followed by often and always 25% and 8.3%, respectively.

The habit of purchasing organically grown food has been associated with the choices of GM food (Bukenya & Wright, 2007; Burton, Rigby, Young, & James, 2001). Therefore the respondents were questioned about their purchase of organically grown food. The survey included five questions on the topic. When asked to estimate the percentage of their purchases, 33.3% chose 'often' and 'always', while only 19.2% selected 'never' and 'rarely'.

Table 3. Responses to attitudinal statement

	Strongly Agree (%)	Agree (%)	Neither Agree Nor Disagree (%)	Disagree (%)	Strongly Disagree (%)	Don't Know (Dk) (%)
GM Food preferences						
Q15. I choose the yogurt drinks with the best flavor	18.3	55.0	11.7	8.3	6.7	0.0
Q18. I would buy yogurt drinks that are genetically modified	3.3	22.5	35.8	18.3	13.3	6.7
Q19. I choose the least expensive yogurt drinks	10.0	47.5	32.5	8.3	1.7	0.0
GM attitude						
Q16. The use of genetic modification technology in food production offers a solution to the world food problem	3.3	31.7	33.3	15.0	3.3	13.3
Q17. Producing genetically modified food is too risky to be acceptable to me	21.7	27.5	27.5	11.7	1.7	10.0
Q22. Too many pesticides are used to produce food. Using genetic modification technology fits with my cultural and spiritual beliefs	6.7	30.8	37.5	13.3	6.7	5.0
Q23. Genetic modification technology is tampering with nature	13.3	30.8	34.2	6.7	3.3	11.7
Q24. Genetically modified products are environmentally friendly	1.7	25.8	29.2	20.0	15.0	8.3
Environmental attitude						
Q20. Natural environment has a right to exist for its own sake, regardless of human concerns and uses	18.3	47.5	17.5	13.3	3.3	0.0
Q21. We should try to get by with a little less so there will be more left for future generations	10.0	62.5	19.2	5.0	0.0	3.3

Table 4. Cross-tabulation of Question 17 and 16

	Q16 Responses						
Q17 Responses	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree	Don't Know (Dk)	Total
Strongly Agree	4	2	6	8	4	2	26
Agree	0	14	14	3	0	2	33
Neither Agree Nor Disagree	0	12	12	3	0	6	33
Disagree	0	4	8	2	0	0	14
Strongly Disagree	0	0	0	2	0	0	2
Don't Know (Dk)	0	6	0	0	0	6	12
Total	4	38	40	18	4	16	120

In addition to profiling the respondents to understand their demography, it is important to examine how the respondents rank the characteristics of genetically modified yogurt drinks. Table 2 provides a summary of the results between the respondents who were ranked as most important and those who were ranked as least important. The two most important characteristics of yogurt drinks for respondents were nutrition and freshness. Nutrition received the highest percentage, 50%, whereas the second most important characteristic, which is freshness, received a percentage of 38.3%. The least important characteristics were price, flavor, and variety of yogurt drinks and imported vs. domestic, all of which were estimated at 0.0%.

The next section of the survey instrument solicited the attitude of the respondents concerning several issues. The respondents were given several statements and were asked whether they agree or disagree with the statements based on a 5-point Likert scale. The statements are related to three general topics: GM food preferences, genetic modification, and environmental attitudes. The responses are presented in Table 3 and each topic is discussed in turn. First, for GM food preferences, most of the respondents indicated that they chose the least expensive yogurt drinks with the best flavor. Likewise, most of the respondents disagreed that they would buy yogurt drinks that are genetically modified.

Second, the statement about GM technology also elicited various responses. To the question of whether GMF is too risky, nearly half of the respondents strongly agreed and agreed with the statement, while the rest – 11.7% out of 120 respondents – were concerned about the riskiness of GMF. In another question, concerning

Table 5. Friedman Test, Respondents' ranking of characteristics of genetically modified yogurt drinks

Characteristics	Mean Rank of GMYD Most Important Characteristics
Nutrition	2.28
Freshness	2.60
Price	3.24
Flavor	3.60
Variety of yogurt drinks	4.34
Imported vs. Domestic	4.93

Table 6. Frequency analysis results for YD A & B in future and current markets

		Frequency	%
Version A	YD A	50	41.7
	YD B	32	26.7
	YD C	38	31.7
Version B	YD A	18	15.0
	YD B	82	68.3
	YD C	20	16.7

Table 7. Frequency analysis results for YD B & C in future and current markets

		Frequency	%
Version A	YD A	24	20.0
	YD B	84	70.0
	YD C	12	10.0
Version B	YD A	28	23.3
	YD B	40	33.3
	YD C	52	43.3

whether they thought that genetic modification technology is tampering with nature, a large majority, at 44.1%, agreed with this statement. This suggested that the naturalness of technology is viewed differently compared to its riskiness.

Third, two statements were used to assess general environment attitudes. Most of the respondents expressed agreement with these statements, notwithstanding their responses to other questions. In addition, their responses to these two statements were nearly identical, so they appear to be capturing the same reaction from the majority of the respondents.

As can be seen in this study, we used several attitudinal statements, both positive and negative. Thus, we cross tabulated the positive and negative statements to test for yea saying, as shown in Table 4. The table presents results from the cross-tabulation of the responses to question 17, a 'positive' statement about GM, with responses to question 16, a 'negative' statement.

Apart from the yea-saying test, Table 5 presents the results of the Friedman test to rank the characteristics of genetically modified yogurt drinks from the most important to the least

important by consumers. It was found that for consumers, the most important characteristics of GMYD are nutrition and freshness followed by price and flavor.

As the characteristics of GM yogurt drinks were tested earlier, we proceeded to test them in terms of the market availability of the drink. In other words, we conducted a frequency analysis by comparing the five characteristics of the yogurt drinks (e.g. the level of antioxidants, presence of genetically modified organisms, price, flavor, halal certification) in the current and future markets. The next few tables focus on the respondents choosing yogurt drinks based on the five characteristics and their availability in the current and future markets. The current market represents version A while the future market is version B.

Table 6 denotes that 41.7% of the respondents chose YD A, which is available in the market with the following characteristics: current level of antioxidants, not GMO, RM3.00/250ml, and current flavor with halal logo. In addition, the YDs in version B were chosen as the yogurt drink with acceptable characteristics from the consumers' point of view (68%). YD B differs in price (RM2.70/250ml) and has im-

Table 8. Frequency analysis results for YD A in future and current markets

		Frequency	%
Version A	YD A	84	70.0
	YD B	2	1.7
	YD C	34	28.3
Version B	YD A	72	60.0
	YD B	38	31.7
	YD C	10	8.3

Table 9. Frequency analysis results for YD A & C in future and current markets

		Frequency	%
Version A	YD A	76	63.3
	YD B	12	10.0
	YD C	32	26.7
Version B	YD A	24	20
	YD B	12	10
	YD C	84	70

Table 10. Frequency analysis results for YD B in future and current markets

		Frequency	%
Version A	YD A	38	31.7
	YD B	56	46.7
	YD C	26	21.7
Version B	YD A	32	26.7
	YD B	81	67.5
	YD C	7	5.8

Table 11. Frequency analysis results for YD A in future and current markets

		Frequency	%
Version A	YD A	50	41.7
	YD B	34	28.3
	YD C	36	30.0
Version B	YD A	70	58.3
	YD B	40	33.3
	YD C	10	8.3

proved its flavor compared to YD A.

Table 7 shows that 70% of the respondents chose YD B from version A and 43% selected YD C from version B. These two YDs differ in their level of antioxidants, which is 100% more in YD C compared to YD B; the rest of the characteristics are similar.

In Table 8, between versions A and B, the respondents selected YD A in both categories, which have similar characteristics (current level of antioxidants, do not contain genetically modified organisms, price RM3.00/250ml, current flavor, halal certification).

From Table 9, the percentages for comparing GMYD with different attributes are as follows. From the first version, 63% of the respondents selected YD A and 70% chose YD C from version B. YD C is different from YD A in its level of antioxidants, which is 50% higher, 30 cents cheaper than YD A, and improved in flavor.

These attributes lead consumers to choose YD C over YD A.

In Table 10, as the results of the frequency analysis revealed, the respondents selected YD B in both versions A and B, 46% and 67%, respectively. The level of antioxidants in YD B from version B is 50% higher and it is RM1.5 cheaper than YD B from version A. The results in Table 11 show that the respondents chose YD A with similar attributes in terms of price, flavor, level of antioxidants, halal logo, and GMO attributes.

As the choosing behavior of the consumers of the drink in terms of characteristics and market availability has now been established, we proceed to investigate whether the demographic characteristics could help form the consumers' attitude with respect to GM. Table 12 provides the findings concerning the regression analysis between the dimensions of demo-

Table 12. Relationship between demographic characteristics and GM attitude

Independent Variable	Dependent Variable GM Attitude
Gender	-0.05
Likelihood of purchase OGF	-0.25
Age	-0.05
Income	0.09
Education	-0.82
R^2	0.09
Adjusted R^2	0.01
F Change	1.18

Table 13. Relationship between demographic characteristics and GM preference

Independent Variable	Dependent Variable GM preference
Gender	0.04
Likelihood of purchase OGF	-0.10
Age	0.17
Income	0.20**
Education	0.05
R^2	0.21
Adjusted R^2	0.14
F Change	3.05

Table 14. Relationship between demographic characteristics and attitude towards environmental protection

Independent Variable	Dependent Variable Attitude Towards Environment
Gender	-0.32**
Likelihood of purchase OGF	0.55
Age	-0.31**
Income	-0.80
Education	-0.32***
R^2	0.26
Adjusted R^2	0.20
F Change	4.00

graphic characteristics and GM attitude, which indicated that the relationship between these two variables is not significant. In other words, the demographic characteristics do not have any significant relationship with the attitude towards GM.

Apart from testing the relationship with GM attitude, the demographic characteristics were also tested with GM food preference to determine whether such characteristics influence consumers' preference for GM food. The regression analysis was conducted to ascertain the variance in the GM food preferences based on the five dimensions of the respondents' demographic characteristics (gender, age, income, and education). The results are summarized in Table 13. Based on the results, it was found that the five dimensions of the demographic characteristics of the respondents explained the 21% of the variance in GM food preference (R2=

0.21). Only one of the five dimensions of the respondents' demographic characteristics is positively and significantly associated with GM food preference, namely, education (β= 0.20, p< .05). Thus, the respondents with a higher level of education have a higher preference for GM food.

In addition, we tested whether the demographic characteristics could form the respondents' attitude towards environmental protection. The results are presented in Table 14. As shown in the table, gender (β= -0.32, p< .05), age (β= -0.31, p< .05), and education (β= -0.32, p< .05) are found to be significant predictors of the attitude towards the environment, although they account for only 26% of the variance in the dependent variable (R2= 0.26). In other words, the demographic characteristics comprised of gender, age, and education are found to have a negative relationship with attitude towards the

Table 15. Relationship between characteristics of GMYD and GM attitude

Independent Variable	Dependent Variable GM Attitude
Price	0.21**
Nutrition	-0.27***
Flavor	0.29**
Variety	-0.17
Freshness	0.32
Imported vs. Domestic	0.27
R^2	0.15
Adjusted R^2	0.10
F Change	2.88

Table 16. Relationship between characteristics of GMYD and GM food preference

Independent Variable	Dependent Variable GM food preference
Price	0.27***
Nutrition	-0.21**
Flavor	0.61***
Variety	-0.46***
Freshness	-0.02
Imported vs. Domestic	-0.04
R^2	0.32
Adjusted R^2	0.29
F Change	9.23

Table 17. Relationship between characteristics of GMYD and attitude towards environment

Independent Variable	Dependent Variable attitude towards environment
Price	0.20**
Nutrition	0.14
Flavor	-0.06
Variety	0.09
Freshness	-0.08
Imported vs. Domestic	-0.19*
R^2	0.07
Adjusted R^2	0.02
F Change	1.57

environment, indicating that young consumers with a higher education level have less concern for the environment.

After the demographic characteristics have been tested with GM preference, GM attitude, and environmental protection, we proceed to relate the characteristics of GMYD with the three dependent variables. Table 15 provides the results of the regression analysis concerning the relationship between the characteristics of GMYD and GM attitude. The results of this analysis indicate that price (β= 0.21, p< .05), nutrition (β= -0.27, p< .05) and flavor (β= 0.29, p< .05) of the GMYD have an impact on the attitude towards GM. In addition, it found that only 15% of the attitude towards the GM variance is explained by the GM characteristics.

Table 16 showed the relationship between the characteristics and GM preference. The findings provided in Table 16 indicated that 32% of the variance in GM food preference is attributed to the GM characteristics. It also found that the consumers' preference for GM food is significantly affected by price, nutrition, flavor, and variety of the GM yogurt drinks.

In Table 17, we present the results of the regression analysis to determine the relationship between the characteristics of GMYD and attitude towards the environment. The characteristics of GM yogurt drinks explained only a relatively small percentage (7%) of variation in attitude towards the environment. Price (β= 0.20, p< .05) is significant and has a positive relationship with attitude towards the environment.

Discussion

This current study demonstrated the relationship between the characteristics of GM yogurt drinks and the attitudes toward GM food, GM preferences and environmental protection. The same has been done between the demographic characteristics and attitudes of the consumers. The following pages will discuss in detail the interpretations of the findings.

Food Preferences, Genetic Modification, and Environmental Attitude

The respondents were given several statements related to three general topics: food preferences, genetic modification, and environmental attitude. They were asked whether they agreed or disagreed with the statements. Most of the respondents indicated that they chose the least expensive yogurt drinks with the best flavor for their food preference. In addition, the majority chose yogurt drinks because of the flavor of the beverage. The respondents sought yogurts with the best flavor because they believed that food should not only be healthy but also tastes good and not bland. They felt that yogurt drinks should not only provide them with functional quality (health) but should also have a hedonistic quality (delicious taste and flavor). Therefore, yogurt drinks that are healthy and delicious can satisfy the hedonistic consumers who are looking to indulge in the delicious flavor of the drinks. As for the respondents who preferred the lowest prices, they believe that spending on yogurt should not be expensive. They are probably seeking value for money when buying yogurt drinks especially choosing the one with the lowest price, which could help them achieve savings from a few cents to more than a ringgit. In one case, YD B was preferred over YD A because it not only contained an additional 50% antioxidants but it was also cheaper by RM1.50. YD B seems to carry greater value not only for its lower price but also for its higher nutritional content compared to the other yogurt drinks. Likewise, most of the respondents disagreed that they would buy yogurt drinks that are genetically modified. The reason for the respondents' disagreement is that they have doubts about genetically modified as

a feature of yogurt drinks. As the consumers may not have adequate knowledge of GM food and its implications, they may doubt whether consuming the drink may cause a deviation of their faith as Muslims. GM food contains the genes of some source. The genes must originate from a source that is halal and not from one that is prohibited in Islam, as it will render the food as haram (prohibited to consume) (Isa et al., 2015). Therefore, it is possible that this worry and doubt caused most of the respondents to disagree with buying yogurt drinks that are genetically modified.

Relationship between Demographic and Yogurt Drink Characteristics, Attitude towards GM, and Environmental Awareness

The characteristics of the yogurt drinks that are most important to the consumers were examined. Among the two most important yogurt drink characteristics for the respondents were nutrition (50.0%) and freshness (38.3%), while the least important were price, flavor, variety of yogurt drink and imported vs. domestic (The last four characteristics scored 0.0%). The consumers in this study viewed nutrition and freshness as the most important characteristics as they are increasingly concerned about their health. They are concerned about the implications of the type of food and drink they consume on their overall well-being. For instance, the majority of the consumers choose one yogurt drink out of the three alternatives available because of the additional antioxidants found in that drink, which help prevent and fight cancer. This driving concern is also fueled by the majority who consisted of educated and middle-income earners. In addition, the majority of the respondents consisted of women, who, generally, have a better understanding of a healthy lifestyle compared to men. If the female respondent is a mother, she has the duty of taking care of her family's health. Besides health, the freshness of the beverage is important. This is consistent with many previous studies that related to risk assessment of GM food in the marketplace (Nganje, Wachenhiem, & Lesch, 2009; Pauwels et al., 2015; Qaim & Kouser, 2013). If the yogurt is not fresh, consumers will not consume the drink since the health benefits of yo-

gurt are limited if it is not fresh. Overall, the respondents viewed yogurt as a healthy food and they prefer yogurt that contains a higher level of antioxidants. Therefore, consumers placed nutrition and freshness as the most important characteristics of a yogurt drink.

Since the results suggested that nutrition and freshness are important characteristics to the GMYD consumers, we tested the relationship between the demographic characteristics and consumers' attitude towards GM. This research found that demographic characteristics do not have any significant relationship with attitude towards GM. Previous research found that consumers may not relate their demographic characteristics to form attitude, but, instead, applied general attitude to evaluate unfamiliar food (M.-F. Chen & Li, 2007; Food Safety and Quality Division, 2013; Kim, 2012), such as GM food, which is a recent addition to the food industry. As GM food is a new concept, at this point, consumers may not have full knowledge concerning GM food and are uncertain about its implications to health, society, and religion, which are important, as all the respondents are Muslims. The consumers found it challenging to perceive GM food as a concrete product entity and had difficulty in forming an attitude towards GM food. It is even harder to also ask the consumers to relate their demographic characteristics to form that very attitude. Therefore, the results suggested that consumers do not perceive GM food according to their demographic characteristics.

Meanwhile, in terms of the relationship between demographic characteristics and GM preference, the results showed that only income has a positive relationship with GM preference. This is because when consumers earn a higher income, they prefer the idea of consuming such drinks. This is not to say that GM yogurt drinks are expensive but that there is a tendency to switch from other beverages to yogurt drinks as it becomes easier to buy the yogurt drinks, which incurs a low switching cost. This switching incurred in respondents earning an income exceeding RM2,000; a figure earned by over 70% of the respondents. This may explain the relationship between income and GM preference

As the demographic characteristics were tested in respect to consumer attitude towards GM, it is also important to know whether consumers' demographic characteristics also form the attitude towards environmental protection. The results suggested that only one demographic characteristic – younger and educated respondent – have less awareness concerning the environment. Although they maybe are educated and are highly likely to come across environmental issues and ways to minimize environmental damage, this sample does not believe that nature must continue to exist and does not consider environmental sustainability for the future generation. The educated respondents may have materialistic tendencies and may pursue materialism for their own benefit, even if it is harming the environment. This may also indicate that purchasing decision and behavior may not be driven by concern for the environment. Therefore, the results suggested that young and educated consumers in this study did not give much consideration to the environment in their attitude.

The results also indicated that the respondents with a higher level of education prefer GM food. One explanation for this finding may lie in the consumers' grasp of the concept of the benefits of GM food. Respondents may have learned about the benefits of eating GM food, probably from the Internet. Knowledge is an important key determinant in the acceptance of GM food (Mohapatra et al., 2010; Pauwels et al., 2015). The majority of the respondents is young and educated and thus, is able to use computers to surf the net. This explanation is especially applicable if the respondents educate themselves through websites that present GM food in a favorable flavor and the variety of the GM yogurt drinks. The respondents can learn about the benefits of consuming GM food which could have included solving the world's food problem, providing nutrition, and being beneficial to the society. The educated consumers may perceive that consuming GM food is as safe as eating non-GM food, and, thus, assume that consuming GM yogurt drinks are as beneficial as eating GM food. They then become not only willing but also dare to try this yogurt drink. Therefore, education has led them to prefer GM food, in particular, GM yogurt drinks, which is the subject in this study. This may ex-

plain the relationship between income and GM preference.

Relationship between GMYD Characteristics and GM Food Preferences, Attitude towards the Environment and GM Food

The questionnaire elicited responses that made the respondents express the relationship between the characteristics of genetically modified yogurt drink and genetically modified food preference. The preference of consumers for GM food is significantly affected by price and nutrition. They prefer the lowest priced yogurt drinks as they are probably seeking value for money when buying the yogurt drinks. In addition, they value the nutrition contained in the yogurt drinks, such as antioxidants. As for flavor, they like the taste and quite enjoy the drinks. The consumers also believed that yogurt drinks should have a variety of flavors, as they believed that they would get bored and tired of drinking only one type of yogurt drink.

Meanwhile, the results showed that the relationship between the characteristics of GM yogurt drinks and attitude towards the environment is influenced by the price. This may be due to those consumers being willing to pay more for a GM yogurt drink if consuming such a product will help protect the environment. Some respondents who care about the environment will practice a lifestyle that cares about protecting the earth. Given that they are young and educated, they are aware of the need for protecting the earth from destruction. The production of GM yogurt drinks may help the environment so they may pay more for this drink as part of their effort to save the environment at large.

The results also suggested that flavor, nutrition and price influence consumers attitude towards GM food. The relationship can be explained that consumers believe that GM food is environmentally friendly, a characteristic that makes them perceive the food possesses good nutrients with less use or without pesticides. It can also be explained that consumers believe that GM food may help solve the world food problem. They believe that the food created using GM will increase the food supply and will partially offset the food shortage. As they prefer

the lowest priced yogurt drink, they believe that an increase in food supply using GM technology will reduce the cost of producing such food (economies of scale), leading to lower pricing. Instances of consumers preferring the lowest priced drink have been demonstrated in the results.

Conclusion

In conclusion, price, nutrition, flavor, variety, and freshness have a significant relationship with the purchase intention in respect of genetically modified yogurt drinks. In addition, the research findings showed that nutrition was deemed as being the most important product feature influencing the decision to purchase yogurt drinks by consumers. Malaysians are health conscious nowadays and it is highly likely that this trend will continue in future.

Our study has practical implications for beverage manufacturers, especially those who are interested or currently pursuing the production of GM yogurt drinks. Marketing communication, including advertising of GM yogurt drinks must stress the importance of the nutritional aspects and freshness of the drinks. Since the results showed that nutrition and freshness are the top characteristics of yogurt drinks that matter to consumers, the marketing pitch should highlight nutrition as the number one benefit of drinking GM yogurt drinks. In this advertising, the attributes of rich in antioxidants should be highlighted, stating that antioxidants are very important to people's health as antioxidants may prevent serious diseases, such as cancer. Therefore, the market practitioners of this drink must take heed and launch advertising campaigns for GM yogurt drinks with a lot of emphasis on nutrition and freshness.

This research also contributes to a better understanding towards the halal modified yogurt drinks on the market and the process of economic change and development. A successful economy not only depends on creating new products or new techniques but also the consumer reaction to novelties that can have a profound impact on a product's market success. In this study, we discussed that consumers loved the taste and wanted a variety of GM yogurt drinks. Marketing practitioners should mobilize

the research and development team to come up with more flavors and varieties. The marketing department should liaise with the food technologists in the team to come up with more exciting and innovative flavors. Therefore, it is important for the manufacturers to expand the range of GM yogurt drinks to drive consumers to buy more of this novel product and help improve the country's economy.

In addition, it has been found that consumers would pay the lowest price for the GM yogurt drinks. In the future, if there is enough demand for such drinks, the manufacturers of GM yogurt drinks should step up production to achieve economies of scale and reduce the cost of production. The lower production cost of GM yogurt drinks may reduce the price to the lowest possible, making the drinks more affordable. However, not all consumers would pay for GM yogurt drinks at the lowest prices. The results suggested that one characteristic of GM yogurt drinks, which is price, has a positive relationship with environmental attitude, meaning that they are willing to pay more for the drink if consuming the drink helps to protect the environment. Again, the promotion and advertising can emphasize on consuming this drink as an effort to also protect the environment and hence draw consumers who are environmentally aware to increase their purchase of this drink.

Some disagree about buying genetically modified yogurt drinks when there is a clear impact on their religion or culture, given that all the respondents in this study are Muslims. Marketers must understand that when marketing GM yogurt drinks to Muslims, it is not straight forward as this food is still new. The genes used in making the food have an unclear source of origin, which may be deemed halal or otherwise. When marketing the yogurt drink, marketers must listen and incorporate religious reviews and debates on GM food to ensure that yogurt drinks are not only halal but also have a clear and properly declared source of origin. Only when a proper religious authority clarifies the safety of eating GM food, will Muslims be able to trust and buy genetically modified yogurt drinks.

This research is not without limitations. Our first limitation is regarding the choice of area for sample selection. This research intended to explore the relationship between the influencing factors and the consumer purchase intentions towards genetically modified yogurt drinks. Future researchers are encouraged to perform this study with consumers from different states of Malaysia, thereby representing the entire country. The generalization of the results in this study, however, is to be interpreted with caution. GM food is a topic that is contentious to the point that debates are still ongoing concerning both the production and consumption of such food. Therefore, marketing GM food like yogurt drinks needs to be done carefully by advising the consumers to take the drink in moderation.

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