Consumer Attitude Towards Consumption of Genetically Modified Foods in Arab Countries

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Abstract: No research has been conducted on consumer attitudes towards consumption of GM foods across Arab countries. Therefore, the objective of this study is to investigate consumer perceptions and their acceptance of consuming GM foods across Arab countries. Data were collected and analyses were conducted such as central tendency, factor analysis and analysis of variance to evaluate the initial assumption that Arabs are indifference to GM foods and as such they don't have a negative attitude towards GM foods. The results demonstrated that Arabs have negative perceptions towards GM foods. The present study concludes that Arab consumers were not in favour of consuming GM foods based on health related issues and prefer instead to consume traditional foods.

Key words: GM Food · Arabs · Consumers · Consumption

INTRODUCTION

Globalisation completely pervades the contemporary lifestyle. Agricultural industry is one of the most genetically modify organisms (GMOs) promising sectors of the economies. The need to feed ever-increasing consumers necessitates the need to improve the standard and quantity of production through genetic technology [1]. This genetic technology on food production started with advanced nations but its consumption has no boundary [2]. Currently, in our contemporary world, daily consumption of GM foods or its components is inevitable. However, the commercialization of GM products has generated arguments for and against technologically enhanced foods among stakeholders such as government, scientists, investors, academicians as well as consumers represented by non-government organizations (NGOs). On one hand, academicians have spent ample time and resources justifying the need of GM foods. On the other, others have serious reservations and concerns about the future consequences of technologically developed food processing [3-6].

The need to produce GM foods and the justification of its commercialization does not confer its acceptance and consumption by the consumers. This is evident in the public reaction of the EU regarding the commercialization of GM foods [6,7]. Similar actions have been reported across the world. For example, Chen and Li [8] reported that despite positive influence of knowledge about GM foods on Taiwanese consumer perception on genetic technology, they nevertheless reported that there were a number of Taiwanese who are sceptical of risks in GM foods consumption. Kikulwe *et al*. [9] expressed similar concerns among rural and urban citizens in Uganda. The Ugandan GM crop producers (rural people) were in favour of GM banana produce for economic benefits. Conversely, the urban population (consumers) were concerned with the perceive risks associated with genetic technology. Based on this, there is a need to study consumer perceptions of GM foods and its substances. To this end, different research designs and variables such as culture, religion, education, gender, region, attitudinal, motivational, behavioural and demographic factors interact to influence consumers [6,8,9]. These

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variables have been employed and tested in understanding the public opinion regarding the acceptance and rejection of GM foods. Most of the literature investigates specific anxiety or consumer's satisfaction with GM foods or products.

Regionalization has provided clues to this puzzle of cynical attitudes toward GM food consumption. The continental study of consumer perceptions and acceptance of GM foods has yielded mixed results. It reported various levels of acceptance and rejection such as studies by Kikulwe *et al*. [9] and Bett *et al*. [5] reports on Africans, Chen and Li [8] on Taiwanese, as well as Americans, Canadians and Europeans [6,10-16]. The attitudes of EU consumers were negative towards GM foods [6,10,17] while the majority of US consumers neither accepted or rejected GM foods (they were neutral) [18]. Studies on the consumption of GM foods in notable African countries such as South-Africa, Nigeria, Uganda and Kenya etc. also revealed varied results. Nigeria, Kenya and Uganda showed a negative/confined interest in the adoption of GMOs in its agricultural production [19]. However, the perception and awareness of Ugandan consumers differed across social classes [9]. South Africa has commercialized GM food production [19,20]. Australian consumers prefer natural foods compared to GM foods [21]. Similar research has been conducted on the perception and acceptance of GM foods among Asian consumers. The results of Zhong *et al*. [22] revealed that the majority of Chinese were not aware of GM foods and unfortunately, the more they knew, the greater their anxiety regarding their future health and the adverse consequences on the environment.

The existence of such technologically enhanced foods is undeniable in the third world countries. The United Nations (UN) food aids program is among the major channels through which technologically enhanced foods are circulated among malnourished children [23]. Beyond food aid is the importation of foods and items from advanced countries which might expose technologically based foods to consumers. In their efforts to establish whether there are genetically enhanced foods and its substance in Saudi Arabia consumer market, for example, Abdal-Mawgood *et al*. [24] collected two hundred and two food samples across Saudi Arabian markets. These samples included canned foods, flours, seeds, pre-fried and frozen potatoes, frozen meats, pastes and canned tomatoes etc. Their results revealed that the majority of tested samples contained technologically enhanced substances. A similar study was conducted by Premanandh *et al*. [25] in the United Arab Emirate (UAE).

A test of the selected food sample (vegetables and noodles, rice, maize, soya and wheat) showed that the majority were genetically developed. They were concerned over the presence of unwanted GM foods imported to the country. The studies on GM food consumption in Saudi Arabia and UAE reported that consumers unknowingly consumed foods containing genetically modified substances [24], [25,26]. With extensive studies across the globe, it seems that the published studies on the perceptions and acceptance of GM foods among Arab consumers are near non-existent. This is concerning as research indicates the availability of GM foods substances in the Saudi Arabian and United Arab Emirate consumer markets [24,25]. Several researches have highlighted consumer attitudes towards genetically modified foods (GM foods) in countries such as North American, Europe, Australia, Africa and Asia. However, to the best of our knowledge, no research has been conducted on consumer attitudes towards consumption of GM foods across Arab countries. Therefore, the objective of this study is to investigate consumer perceptions and acceptance of consuming GM foods or agricultural products containing GMO substances across Arab countries in order to determine the level of consumer acceptance or rejection of biotechnologically modified agricultural produces.

The study takes into consideration the factors or variables that affect consumer acceptance such as the identification of GM foods, the indifference between traditional foods and GM foods, labelling, preference, taste, awareness and availability etc. [5,6,27]. In addition to these variables, attention is also directed to the Arab culture. Among the peculiarities of Arab culture is that Arab men patronize the market instead of women, they prefer fresh foods, prefer meat over fish and based on their belief in God, they consume anything that are Islamic acceptable (non-prohibited (halal) without the fear of the possible health hazards associated with certain foods. The justification for this is the manifestation of God's Might, in that neither food nor human beings can afflict anyone with diseases or poverty without the Will of God. Oppenheim [28] operationalized the conceptual model, which gave rise to the following research hypotheses which are posited and analysed by Chi-square:

H1: *Arab consumers are indifferent to the perceive risks associated with the consumption of GM food.*

H2: *Arab consumers knowingly and willingly consume GM foods over traditional foods.*

MATERIALS AND METHODS

The Conceptual Model: To achieve the objective of this research a conceptual model was established according to consumer perceptions and acceptance of consuming GM foods or agricultural products containing GMO substances. This is identified in the framework outlined in Figure 1. The framework addresses the relationship between consumer attitudes toward the consumption of traditional foods and GM foods such as grains, meat, dairy, fruits and vegetables.

Material: After an extensive study of the existing literature on the factors that influence consumer attitudes towards the consumption of traditional and GM foods, a questionnaire was designed to identify preferences and attitudes. The questionnaire was drafted in two languages, namely Arabic and English in order to avoid ambiguity and misunderstanding. Arabic is the only medium of communication among the Bedouins (nomadic Arabs). The questionnaire consisted of three sections. In section A, a brief introduction of GM foods was provided. Section B is a series of demographic questions to obtain adequate information about the participant's background such as gender, age, educational background (master, PhD and professional) and favourite foods (grains, meat, dairy and fruits/vegetables). Section C asked a series of questions regarding consumer perceptions and acceptance of consuming GM foods or agricultural products containing GMOs substances. This section was measured by using a four points likerts scale as 1 "strongly agree", 2 "agree",

3 "disagree" and 4 "strongly disagree" [26]. The researchers ensured that the study sample reflected original Arabs without discrimination. The sample size in this research was calculated based on the following formula:

$$SS = \frac{\left(Z^2\right) \times (p) \times (1-p)}{C^2}$$

SS = Sample Size
Z = Z-value
P = Percentage of population.
C = Confidence interval

Procedure: Data was generated from a survey conducted in two universities located in Kuala Lumpur, Malaysia, namely the University of Malaya (UM) and the International Islamic University Malaysia (IIUM). The targeted respondents were postgraduate students from these two universities. It was assumed that participants possessed stable schema[1] based on their maturity regardless of their specialisation. This is based on previous literature in cognitive studies that show that undergraduate respondents possess unstable schemas [29-31]. Participants were selected from IIUM and UM for the following reasons: 1) It is not easy for the researchers to visit all Arab nations sampled in this research. 2) The majority of Arab students from the selected countries study at IIUM and UM. The survey was conducted face-to-face. Welcoming the participant and clarifying the purpose of the research were contained in the cover letter of the questionnaire. The respondents were, further interviewed on matters relating to GMOs, specifically its
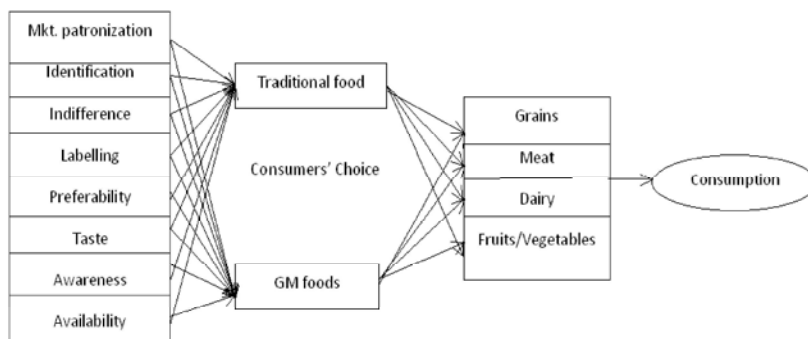

Fig. 1: The conceptual model.

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[1] Is define as a cognitive system of knowledge with, regards to a specific conceptual domain built up by experience. Similarly, schemas function in significant consciously and unconsciously human activities and also sieve how things are interpreted. The discussion about schema is beyond this study. Thus, for more kindly refer to McIntosh, D. N. [32] "Religion-as-Schema, With Implications for the Relation Between Religion and Coping" International Journal for the Psychology of Religion, 5, 1-16 and Bakkar, A. "The Intellectual Composition: Scientific Steps" In Abdul Karim, B. (First eds.). KSA: Wojooh Publishing and Distributing House, 2010.

application in food products, in order to gain insights whether they are good representation in measuring perceptions and acceptance of GMOs among Arabs. The researchers selected participants who displayed that they have some knowledge of GMOs. Further clarifications were made on specific items on the questionnaire. The ultimate goal was to facilitate their honest opinions regarding the questions. Participants were from 10 Arab countries in both African and Gulf countries. The respondents identified themselves as Algerians, Iraqis, Jordanians, Libyans, M oroccans, Omanis, Palestinians, Saudi Arabians, Sudanese and Yemenis. Assurance was given to the participants that they had the right to withdraw at any time and their identities would remain secure. Participants were then

given the questionnaire. The study was conducted between January and February 2012. Out of 150 questionnaires, 113 were received and 10 dropped out due to incomplete demographic data and other factors leaving 103 questionnaires for analysis. 54 participants identified themselves as male and 49 as female. The average age of the participants was 24. Participants varied greatly in educational background between master degree holders, PhD holders and professionals aged 55, 25 and 23 respectively. The common religious and ethnic background was Islam and Arab.

It is pertinent to remember that the demographic information is very important in this study particularly education and age. They are important because the research assumed that postgraduate students are more exposed to the growing debate on GM substances and are capable of making rational choices [30,31]. Postgraduate students at IIUM and UM were expected to be familiar or possess a basic knowledge of GM and traditional foods. This assumption is based on Malaysia being a propagator of GM foods in dairy, meat and grains to name few. Furthermore, Malaysian consumer markets contain both traditional and GM foods [33]. However, it is difficult to differentiate between the two foods in the market. The Malaysian government has special allocations for research on GM foods in both private and public organizations such as IIUM and UM thus explaining the reason why the study sample was chosen from these two universities.

Statistical Analysis: This study conducted a series of statistical analyses such as a reliability test of the model, central tendency, factor analysis and analysis of variance (ANOVA) with Friedman's Chi-square Test. The results were analysed by using SPSS®, version 17 [34].

Table 1: Percentage and Mean Response regarding Demographic Information

	Frequency	Percentage (%)
Gender		
Male	54	52.4
Female	49	47.6
Total	103	100
Education:		
Master	55	53.4
PHD	25	24.3
Professional	23	22.3
Total	103	100
Age:		
20-29	5	4.9
30-39	64	62.1
40-49	28	27.2
50-59	6	5.8
Total	103	100

Preliminary Analysis: This section focuses on the analysis of the participants' demographic statistics as well as the reliability of the data set used to measure Arab consumption habits through the Cronbach's Alpha normally used to measure model goodness of fit.

As evident in Table 1, 53% of the respondents identified themselves as Masters Students, 24% as PhD and 22% as professional. The results indicate that on average participants are well educated and are presumably aware of their consumption habits.

RESULTS AND DISCUSSIONS

Descriptive Statistics: The descriptive statistics employed in this study are frequency, percentage, mean and standard deviation of the respondents. Each question was given four response options, namely agree, strongly agree, disagree and strongly disagree. Although five different response options guaranteed a differentiated response result, findings were simplified by merging "strongly disagree" and "disagree", as well as "strongly agree" and "agree".

Table 2 shows the percentage, mean and standard deviation of the responses to the items, which measured the description of Arab consumer perspectives, acceptance and knowledge of GM foods. Approximately three-quarters (56.3%) of the respondents disagreed that they prefer GM foods consumption to traditional foods while 43.7% agreed with the mean score of 2.4 and Std. Dev. = 1.10. Based on the frequencies shown in Table 2, it could be concluded that more than half of the respondents prefer consuming traditional foods to GM foods. The mean and standard deviation are considered moderate in relation to the data. Furthermore, half of the

Table 2: Frequency and descriptive of participants' responds

Questions	Variables	Frequency	Percentage (%)	Mean	Standard dev.
I prefer to consume GM foods with additional nutritional values.	Consumption:				
	1. Agree	34	33	2.4	1.1
	2. Strongly agree	11	10.7		
	3. Disagree	42	40.8		
	4. Strongly disagree	16	15.5		
I visit/patronize consumers' raw foods market frequently or daily	Mkt. Patronization:				
	1. Agree	33	32	2.4	1.13
	2. Strongly agree	16	15.5		
	3. Disagree	34	33		
	4. Strongly disagree	20	19.4		
All my foods items such as vegetables, meat etc. are traditional foods	Traditional food:				
	1. Agree	25	24.3	2.5	1.01
	2. Strongly agree	20	19.4		
	3. Disagree	44	42.7		
	4. Strongly disagree	14	13.6		
All my foods items such as meat, vegetables, fruits etc. are GM foods	GM foods:				
	1. Agree	6	5.8	2.9	0.81
	2. Strongly agree	20	19.4		
	3. Disagree	53	51.5		
	4. Strongly disagree	24	23.3		
I cannot differentiate between traditional foods and GM foods	Identification:				
	1. Agree	25	24.3	2.2	0.87
	2. Strongly agree	32	31.1		
	3. Disagree	41	39		
	4. Strongly disagree	4	3.9		
I prefer consuming GM foods for longer periods regardless of its negative consequences.	Indifference:				
	1. Agree	10	9.7	3.2	0.92
	2. Strongly agree	3	2.9		
	3. Disagree	41	39.8		
	4. Strongly disagree	47	45.6		
If GM foods were labelled I would not purchase it .	Labelling:				
	1. Agree	24	23.3	2.3	0.91
	2. Strongly agree	30	29.1		
	3. Disagree	40	38.8		
	4. Strongly disagree	7	6.8		
I prefer traditional foods to GM foods	Preferability:				
	1. Agree	40	38.8	1.7	0.65
	2. Strongly agree	54	52.4		
	3. Disagree	4	3.9		
	4. Strongly disagree	2	1.9		
Traditional foods taste better than GM foods .	Taste:				
	1. Agree	32	31.1	1.9	0.74
	2. Strongly agree	49	47.6		
	3. Disagree	15	14.6		
	4. Strongly disagree	2	1.9		
I am aware and well informed on GM foods .	Awareness:				
	1. Agree	26	25.2	2.4	0.98
	2. Strongly agree	16	15.5		
	3. Disagree	49	47.6		
	4. Strongly disagree	9	8.7		
I am aware that GM foods are available in consumer markets in my country.	Availability:				
	1. Agree	36	35	2	0.89
	2. Strongly agree	35	34		
	3. Disagree	28	27.1		
	4. Strongly disagree	4	3.9		

respondents visited or patronised consumer food markets daily while half do not visit the market on a daily basis. However, there was no question about how frequently they visited the markets. The respondents were asked whether all their food items are GM free foods. 56.3% disagreed and 43.7% agreed with a mean of 2.5 and Std. Dev. of 1.01. This means that the majority of the respondents are sceptical about the availability of traditional food items in the consumer markets in their country.

Similarly, respondents were asked whether all their food items were GM products. Three-quarters (74.8%) of the respondents disagreed that all food items are GM foods and 24.2% agreed with the mean score of 2.9 and Std. Dev. of 0.92. The results show that the majority of the respondents disliked or did not accept GM foods. This was followed by a statement whether the respondents are indifferent to the consumption of GM foods with its alleged negative consequences. The researchers' impetus is to measure the effect of the results of previous research findings on the consumers' perceived fear of health hazards related to the consumption of GM foods and the respondents' belief in God [26]. Previous research demonstrated perceived fear of the unknown health related issues. However, Arab or Muslim believes that God is the originator of all good, bad, animate and inanimate. According to such a view, however, arguably things are predestined diseases and health do not relate to human beings or foods [26]. More than three-quarters (85.4%) of the respondents showed that they avoided GM food consumption based on its alleged health concerns. This sheds light on the level of unpopularity of GM foods among the representatives of selected Arab countries. Despite this result, more than half (52.4%) agreed that they would purchase GM foods even if it were label. 45.6% disagreed leaving a mean score of 2.3 and Std. Dev. of 0.91.

On one hand, the results show that based on the respondents' indifferent attitude toward the consumption of GM foods, it can be concluded that a number of participants are risk takers. On the other hand, 91.2% of the respondents prefer traditional foods if they are readily available in the markets. The results show that the mean score is 1.7 and Std. Dev. is 0.65. The interpretation of these results is that the majority would rather purchase traditional foods even if GM foods are abundantly available in consumer markets. Likewise, in regards to the respondents' answers regarding which tastes better, traditional foods or GM foods, 78.7% of the respondents agreed that traditional foods are tastier than GM foods.

Table 3: Coefficient of Beta (β) on Participants' Perception on Consumption

Model	Standardized Coefficients		
	Beta	T	Sig.
1 (Constant)		2.261	.027
Mkt Patronization	-.375	-3.225	.002
Traditional food	.069	.681	.498
GM foods	.130	1.283	.203
Identification	-.267	-2.623	.011
Indifference	.279	2.604	.011
Labelling	-.153	-1.483	.142
Preference	.049	.429	.669
Taste	-.213	-1.742	.086
Awareness	-.147	-1.466	.147
Availability	.125	1.230	.222
Gender	.182	1.549	.126
Education	-.271	-1.919	.059
Age	.307	2.276	.026
Edu Location	-.051	-.423	.673

The mean score is 1.9 with Std. Dev. is 0.75. It can be suggested that traditional foods maintain its natural role despite the nutritional content of GM foods. Half of the respondents showed that they were somehow aware of GM food products and their availability in their country's consumer markets. 59% of the respondent confirmed the availability of GM foods products in their consumer markets. Finally, more than half (55.4%) of the respondents could not differentiate between traditional foods and GM foods without proper labelling. 43% agreed they could differentiate between traditional foods and GM foods. The researchers expected these results as all participants are postgraduate students with sufficient international exposure. Perhaps those who are more aware are those specialised in science related studies.

Factor Analysis: The descriptive statistics provided general insights on the participants' attitudes and perceptions of consumption of GM foods in Arab countries. However, it fails to show which of the independent variables has a direct effect on the dependent variable. As such, the coefficient of beta was employed to determine the factor that influences the consumption (Table 3).

From the above table, holding other variables constant at different time intervals, it can be observed that independent variables such as Market Patronisation β= -.375 (t = -3.225, Sig. =.002), Identification β= -.267 (t = -2.623 Sig. =.011), Indifference β=.279 (t =2.604, Sig. =.011), Age β=.307 (t = 2.276, Sig. =.026) either positively or negatively explain the predictor. Three independent

Table 4: ANOVA with Friedman's Test

		Sum of Squares	Df	Mean Square	Friedman's Chi-Square	Sig
Between People		.857	6	.143		
Within People	Between Items	73.420[a]	15	4.895	45.734	.000
	Residual	95.143	90	1.057		
	Total	168.563	105	1.605		
Total		169.420	111	1.526		

Grand Mean = 2.2232

a. Kendall's coefficient of concordance W = .433.

variables were found to have impacted on the consumption attitudes and perceptions of the consumers on the acceptance and availability of GM foods in Arab countries.

The above results indicate that different factors affect the Arab consumers' decisions concerning the consumption of GM foods. The consumers acknowledge the relevance of GM technology but there remains some reservation due to perceived or unknown health hazards. Market patronization, identification, indifference and age influence Arab consumers in their decision making on GM foods consumption or rejection.

Reliability Statistics: The reliability test of the items surveyed in this study was performed through Cronbach's Alpha that led to the retention of all 11 items used during the pilot study. The Cronbach's Alpha measured is α = .81 in the group of items. Having. 81 Cronbach's Alpha for these items shows how reliable they are in measuring the consumption habit and the internal consistency of the data. It was reported that a reliable Cronbach's Alpha must be a minimum of 70.

The analysis of variance (ANOVA) results show that our α =.05 and the p-value=.000 (Table 4). According to the rule of thumb, we reject the null hypothesis when p-value $\leq \alpha$. Thus, in our result p-value=.000 $\leq$.05 we could conclude that consumer behaviours and perceptions of GM foods across selected Arab countries are similar to consumers in developed and developing countries. It further shows the rejection of GM foods in Arab countries by consumers especially where its availability is without the knowledge of the masses. The results confirmed some sort of perceived fear of health problems related to the consumption of GM foods.

CONCLUSION AND RECOMMENDATIONS

Overall, there was a perceived fear of the unknown health hazards among the respondents. They preferred traditional foods. The overall results and findings of this study lead us to reject our initial hypothesis. The respondents displayed negative perceptions about GM foods. We strongly suggest that a similar and larger study be conducted in the selected Arab countries.

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