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The Role of Perceived Risk, Uncertainty Avoidance, and Innovativeness in Willingness-To-Buy Genetically Modified Foods

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Abstract: *This research has two fundamental purposes. The first purpose is to determine whether uncertainty avoidance and innovativeness-in-food has an effect on perceived risk and willingness-to-buy genetically modified foods. The second purpose is to determine whether perceived risk has a mediator role in the relationship between willingness-to-buy and uncertainty avoidance, and willingness-to-buy and innovativeness-in-food; and whether innovativeness-in-food has a mediator role in the relationship between willingness-to-buy and uncertainty avoidance. Data were gathered from consumers by using survey through face-to-face interviews. Regression and mediation analysis were used to test the hypotheses. The findings suggest that willingness-to-buy was affected by both perceived risk and uncertainty avoidance negatively while affected innovativeness-in-food positively. They, also, clearly show that the perceived risk and innovativeness-in-food play fundamental roles in willingness-to-buy genetically modified foods.*
Keywords: *Genetically modified foods, perceived risk, uncertainty avoidance, innovativeness, consumer behavior.*

Algılanan Risk, Belirsizlikten Kaçınma ve Yenilikçiliğin, Genetiği Değiştirilmiş Gıdaların Satın Alınma İstekliliğindeki Rolü

Özet: *Bu çalışmanın iki temel amacı vardır. Birinci amaç; belirsizlikten kaçınmanın ve gıdada yenilikçiliğin, GDO'lu gıdaya yönelik algılanan risk ve satın alma istekliliği üzerinde etkisinin olup olmadığını tespit etmektir. İkinci amaç; algılanan riskin, GDO'lu gıda satın alma istekliliği ile a) belirsizlikten kaçınma ve b) gıdada yenilikçilik ilişkilerinde ve gıdada yenilikçiliğin, c) GDO'lu gıda satın alma istekliliği ile belirsizlikten kaçınma arasındaki ilişkide arabulucu rolü olup olmadığını belirlemektir. Veriler, tüketicilerden yüz yüze anket yöntemi kullanılarak elde edilmiştir. Hipotez testleri için regresyon ve arabulucuk analizi kullanılmıştır. Edinilen bulgulara göre; satın alma istekliliği, algılanan risk ve belirsizlikten kaçınmadan negatif yönde yenilikçilikten ise pozitif yönde etkilenmektedir. Bulgular ayrıca, genetiği değiştirilmiş gıdaların satın alma istekliliğinde algılanan risk ve yenilikçiliğin temel bir rol oynadığını göstermektedir.*
Anahtar Kelimeler: *Genetiği Değiştirilmiş Gıdalar, Algılanan Risk, Belirsizlikten Kaçınma, Yenilikçilik*

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1. INTRODUCTION

Providing a sustainable future, it is vital that nutrition needs of human populations are adequately met and in providing this, that we leave a habitable world for future generations. According to Food and Agriculture Organization figures, to meet the world's growing food demand, global food production must be increased 60 percent by 2050 (http://www.fao.org/nr/sustainability/food-loss-and-waste/en/, accessed: 19.11.2013). In Turkey, it is predicted that production of staples such as wheat, corn and rice will need to increase 100 percent as compared to current production levels to provide for the projected population increase in 2025 (Tüysüzoğlu&Gülsaçan, 2004). In this respect, genetically modified (GM) foods appear to be a promising solution for sustenance (Qaim, 2009). Besides, supplying the necessary food, having less effect on the environment during production and requiring less land, GM technologies are deemed worthy of support for sustainable agriculture (Chern, 2006). However, there is no definitive proof of the potential benefits or dangers of GM foods (Lea, 2005; Keles, 2011).

The potential dangers of GM to the environment and human health create ambiguity and suspicion in the consumer and generate perceived risk. The fact that perceived risk is a highly significant factor in shaping consumer behavior is widely accepted (Lim, 2003), and also emphasized in consumer behavior studies about perceived risk (Hossain&Onyango, 2004; Lusk&Coble, 2005). Its significance arises from the fact that consumer GM food purchasing behavior has been tied to the effects of perceived risk (Han&Harrison, 2007).

Although GM foods have been marketed in many countries, especially the United States, Canada and Australia, as a food production innovation arising from the advances in gene technology (Ronteltap, 2007), it is still a very new and technically complex product for consumers in these countries and especially Turkey. Uncertainty and suspicion regarding GMFs is observed in the public (Lang&Hallman, 2005) and we believe this is due to the fact that GM foods are new and complex and that they present uncertainties for the consumers. Then, to determine and understand consumer behavior regarding GM foods, detailed analysis of consumer concepts of uncertainty avoidance and innovation with respect to GM foods is essential. Literature research reveals that there is limited research on both uncertainty avoidance (Papastefanou et al., 2003; MacIsaac, 2012) and innovativeness (Weick&Walchi, 2002). In addition, the mediator variable, which is considered to be of significance in social and behavioral science, because it explains the cause-effect relationship between variables

(Mackinnon, 2001) and because it explains how and why the relationship between the variables takes form (MacKinnon, 2008), is key in enabling such studies to produce detailed and sound findings.

Taking into consideration the above issues and the gaps in consumer literature, two fundamental purposes had been determined in this study. The first was to determine whether uncertainty avoidance and innovativeness-in-food has an effect on perceived risk and willingness-to-buy GM foods. The second was to determine whether perceived risk has a mediator role in the relationship between willingness-to-buy GM foods and uncertainty avoidance, and willingness-to-buy GM foods and innovativeness-in-food; and whether innovativeness-in-food has a mediator role in the relationship between willingness-to-buy GM foods and uncertainty avoidance. We hope the study will enable a clear and more detailed understanding of consumer behavior regarding willingness-to-buy GM foods, for theory and practice. This research can be contribute to the consumer behavior literature by being one of the first to examine the willingness-to-buy GM food regarding the uncertainty avoidance and innovativeness-in-food in Turkish consumers. It can also be useful to fill the gaps in the literature regarding the mediation effect of perceived risk and innovativeness-in-food in relationship between the willingness-to-buy GM foods and uncertainty avoidance.

In the study, there is a literature and hypotheses section aiming to develop the theoretical background and hypotheses on the subject. Following this are sections titled Methodology, which describes the methods used in the study, Findings, which presents statistical analyses, and Discussion and Conclusion, where the findings are evaluated and, limitations and suggestions for future studies are included.

2. Literature and Hypotheses

2.1. Perceived Risk

Perceived risk in consumer behavior was defined as having two components: uncertainty and adverse effect. Since then, the concept of uncertainty has been valued in determining and explaining perceived risk (Chunningham, 1967; Dowling & Staelin, 1994; Mitchell, 1999; Frewer et al., 2003).

In situations where the product is new, technically complex and not very well known (Odabaşı & Barış, 2003), and where the consumer could be psychologically or physically harmed (Moven&Minor, 1998), perceived risk would emerge and under such conditions, increase. Because there is no definitive proof of the effects of GM foods on human health and the environment, consumers cannot foresee the consequences of buying and

consuming GM foods. Taking the definition of perceived risk to be the uncertainty consumers face when they cannot foresee the consequences of their buying decisions (Schiffman & Kanuk, 2004), it can deduced that this creates perceived risk on the part of the consumer. For the most part, in literature, consumer perceived risk levels concerning GM foods have been found to be high (Onyango et al., 2004; Townsend & Campell, 2004; Wu, 2004; Matos et al., 2006).

In previous studies especially, it has been found that beliefs that GM foods are dangerous for human health and the environment affects prevalent perceived risk and levels of acceptability for the consumer (Saba et al., 2000; Subrahmanyan&Cheng, 2000; Bredahl, 2001; Cook et al. 2002; Hu et al., 2004; Qin&Brown, 2008; Poveda et al., 2009). Furthermore, it is accepted that perceived risk is one determiner of GM food purchasing behavior (Han & Harrison, 2007). It has been also argued that the perceived risk decreases willingness-to-buy GM foods (Brown & O'Cass, 2004; Brown & O'Cass, 2005; Tsakiridou et al., 2007; Keles, 2011).

Hypothesis 1: As perceived risk increases, willingness-to-buy GM foods will decrease.

2.2. Uncertainty Avoidance

Hofstede (1984:390) defines uncertainty avoidance as "a characteristic of a culture, defines the extent to which people within a culture are made nervous by situations that they con-sider to be unstructured, unclear, or unpredictable, and the extent to which they try to avoid such situations by adopting strict codes of behavior and a belief in absolute truths". In other words, uncertainty avoidance is related to how much fear members of a culture feel in the face of uncertainty and unfamiliar situations (Hofstede, 2001). While individuals in high uncertainty avoidance cultures are described as being active, aggressive, sensitive, security seeking, and intolerant, those in low uncertainty avoidance cultures are described as thoughtful, less aggressive, accepting of personal risk and tolerant (Hofstede, 1984). When these features are taken into account, Turkey is a country where uncertainty avoidance is high (85 points) (Hofstede, 2001).

Uncertainty arises from complex, unpredictable situations involving uncertainty, when information is inaccessible or inconsistent, or in situations where the information individuals or the general public receives appears to be unreliable (Ronteltap et al., 2007). Uncertainty also exists in the current debate around GM foods. This is because technical complexity, the inability to predict the results of GM food production and consumption, the lack of agreement between scientists and the fact that consumers don't have adequate information on the subject give rise to the current state of

uncertainty. It is also known that GM foods cause fear in consumers (Laros et al., 2004). According to findings of a limited number of studies which have analyzed uncertainty avoidance regarding GM foods, consumers in West Germany, where uncertainty avoidance is low, have a positive attitude towards GM foods (Papastefanou et al., 2003) and it is predicted that the tendency toward uncertainty avoidance will influence consumer willingness-to-buy GM foods (MacIsaac, 2012). Although consumer behavior researchers accept that the consequence of any purchase is uncertain (Dowling&Staelin, 1994), it is possible that uncertainty regarding GM foods will hinder willingness to buy these foods.

Uncertainty avoidance is said to be the level of risk tolerance (Tolba&Mourad, 2011). In conditions of high uncertainty avoidance, risk aversion is observed. People will be taking precautions against potential dangers in advance (Gegez, 2008). It is said that people in cultures where uncertainty avoidance is prevalent feel anxiety related to uncertainty and risk (Sun et al., 2009). In other words, as level of uncertainty increases, perceived risk also increases (Chakrabarti & Baisya, 2009). Therefore, uncertainty, which is a component of perceived risk, could in turn create perceived risk in individuals who show tendency towards risk avoidance. Considering this, it is possible that GM foods, which are associated with numerous uncertainties, will create perceived risk in consumers who avoid uncertainty. Our literature research has revealed there to be no studies that has analyzed uncertainty avoidance and perceived risk together in relation to GM foods. However, Brown and O'Cass (2005) found that consumer risk perceptions about GM food products are effected positively by uncertainty orientation.

Mediation emerges in the event that an independent variable gives rise to a mediator variable and the mediator variable leads to a dependent variable (MacKinnon et al., 1995). The fact that perceived risk affects willingness-to-buy GM foods and is determined by uncertainty avoidance brings to mind the possibility that perceived risk could be a mediator variable in the relationship between uncertainty avoidance and willingness-to-buy GM foods. Assuming perceived risk to be a mediator variable could enable a better understanding of why and how the relationship between uncertainty avoidance and willingness-to-buy GM foods occurs. Thus;

Hypothesis 2: As uncertainty avoidance increases, willingness-to-buy GM foods decreases.

Hypothesis 3: As uncertainty avoidance increases, consumers' perceived risk increases.

Hypothesis 4: Perceived risk is a mediator in relationship between uncertainty avoidance and willingness-to-buy GM foods.

2.3. Innovativeness

According to Steenkamp et al. (1999), consumer innovativeness is the tendency to purchase new and different products and brands rather than maintaining previous preferences and consumption patterns. However, not all consumers are innovative, and it can be quite difficult for some consumers to accept uncertainties about the innovation (Moses, 1999). Therefore, regarding new product acceptance and distribution, uncertainty avoidance is a factor that should not be ignored. When they encounter a new product, consumers' uncertainty avoidance behavior is sometimes revived and the new product eliminated during consumers' evaluation of the alternatives (Sığrı & Tığlı, 2006). In particular, it is put forth that the diffusion of a new product, whose purchase leads to a degree of risk, depends on the level of uncertainty avoidance in a society (Maheswaran & Shavitt, 2000).

Innovation brings about many uncertainties and the more radical the innovation, the more risk it brings. Thus, it is argued that in societies where adaptation to radical innovation is slower in societies where there is uncertainty avoidance (Kalliny & Hausman, 2007). Yeniyurt and Townsend (2003) have suggested that uncertainty avoidance hinders new product adoption. In other words, it is argued that uncertainty avoidance has an adverse effect on consumer innovativeness (Steenkamp et al., 1999). Mooij and Hofstede (2011) have stated that individuals with high uncertainty avoidance are less open to change and innovation than those with low uncertainty avoidance.

Hofstede (2011) has argued that countries with low uncertainty avoidance are more open-minded about accessing innovation. In such countries, it is easier for consumers to accept new ideas and methods. It is said that this is because these consumers are more enthusiastic about individual acceptance. Higher adaptation to change is also observed in these consumers (Lindquist & Sirgy, 2009). It has been also claimed that new product take off happens more quickly in countries with low uncertainty avoidance (Tellis et al., 2003). Uncertainty avoidance is said to be related to situations where uncertainty is experienced and with the fear that risk creates. Therefore, new and unusual situations trigger fear in consumers with high uncertainty avoidance (Dobre et al., 2009). Yaveroğlu and Donthu (2002) have found that innovativeness is low in countries where uncertainty avoidance is high. They state that individuals who avoid uncertainty also avoid risk and show resistance to change. Therefore, among causes of resistance to innovation, uncertainty regarding a product's performance resulting in perceived risk is regarded as a major cause of resistance (Sheth,

1981). In the literature, it has been said that perceived risk is an important cause of the creation of resistance against innovation (Kleijnen et al., 2009; Sheth, 1981). In this context, as perceived risk increases, resistance to innovation increases. However, studies which have looked into GM foods in terms of innovativeness are limited in number (Weick & Walchi, 2002). Weick and Walchi (2002) have studied GM foods in terms of the five factors affecting innovation diffusion suggested.

Because innovative consumers are regarded as consumers who prefer new and different products and brands (Steenkamp et al., 1999), it is possible that consumers willing to buy GM foods will be consumers with the innovativeness characteristic. Moreover, in the literature, it has been emphasized that besides uncertainty avoidance, perceived risk also has a significant role in adoption of food innovations (Ronteltap et al., 2007). Thus, it is important for a clear understanding of the issue of consumer acceptance of GM foods that food innovation regarding these foods be analyzed within the scope of uncertainty avoidance and perceived risk. It will be possible to assume that perceived risk and innovativeness have mediator roles. The fact that perceived risk affects willingness-to-buy GM foods and is related to innovativeness, brings to mind the possibility that it may be the mediator variable in the relationship between innovativeness and willingness-to-buy GM foods. When the relationship between innovativeness and uncertainty avoidance and innovativeness' effect on willingness-to-buy new products are taken into consideration, it is seems possible that innovativeness regarding food plays a mediator role in the relationship between uncertainty avoidance and willingness-to-buy GM foods. Analysis of perceived risk and innovativeness-in-food as a mediator variable will enable a better explanation of why and how the said relationships exist. Thus;

Hypothesis 5: As innovativeness-in-food increases, willingness-to-buy GM foods increases.

Hypothesis 6: As innovativeness-in-food increases, perceived risk decreases.

Hypothesis 7: Perceived risk is a mediator in the relationship between innovativeness-in-food and willingness-to-buy GM foods.

Hypothesis 8: Innovativeness-in-food is a mediator in the relationship between uncertainty avoidance and willingness-to-buy GM foods.

3. Methodology

3.1. Sampling

The population of the study was comprised of consumers living in Adana, Turkey. Adana is the fifth biggest city in Turkey to which many immigrants from other cities come for education and working purposes, resulting in a population of different demographical features. Thus, consumers in Adana can be expected to ensure useful information about the willingness-to-buy GM foods of Turkish consumers. In the study, sampling from the shopping mall was used because of the advantages such as access to consumers of different demographic features and a large number of individuals (Gegez, 2010,) and interviewing in a short time for a low cost (McDaniel&Gates, 2007). Time dependent sampling which is said to ensure randomness (Nakip, 2003) was used.

3.2 Data Collection and Preparation of the Questionnaire

In this study, data was collected by using survey method. The questionnaire used in the survey was administered through face-to-face interviews by five trained interviewers. Considering possibility of the inaccurate and uncompleted questionnaire, 650 questionnaires were decided to be applied, 638 of which were useful for the analysis. The questionnaires were administered on weekdays and on Saturday during hours of high customer attendance, in line with recommendations and permissions from the shopping mall administration. Questionnaires lasted 10-12 minutes on average.

The questionnaire form comprised of 21 statements and 5 questions. The first part included statements about variables of the study and the second part included questions aimed at identifying the demographic features of the respondents. To create scales for the variables we used previous studies. For the uncertainty avoidance scale Erdem and others' (2006) and Thatcher's (2003); for the perceived risk scale Klerck and Sweeney's (2007) and Stone and Gronhaug (1993); for innovativeness-in-food scale Barcellos and others' (2009), Goldsmith and Hofacker (1991) and Huotilainen and others' (2006); and for willingness-to-buy GM foods scale Traill and others' (2006) articles were utilized. To determine whether participants agree with the statements, a five-point Likert scale was used. The scale presented the following alternatives: 5 for absolutely agree, 3 for neither, and 1 for absolutely disagree.

3.3. Data Analysis

Simple linear regression analysis was used to test the hypotheses regarding the effects and regression analysis recommended by Baron and Kenny (1986) was conducted to test the hypotheses regarding the mediation

using SPSS 16 software. Baron and Kenny (1986) have determined three conditions for a variable to become a mediator variable: a) when change in the independent variable causes the variable assumed to be the mediator variable to significantly change, b) when the change in the mediator variable causes change in the independent variable significantly, c) when with the inclusion of the mediator variable as an independent variable, the independent variable's effect on the dependent variable disappear or decrease. When the mediator variable is included in the analysis, it is said that if the effect of the independent variable upon the dependent variable is insignificant, the mediator variable is the "full mediator," and if it is significant but reduced, that it is a "partial mediator."

4. RESULTS

4.1. Descriptive Statistics

Of the respondents 47.6% were female and 52.4% were male. The majority of the respondents were married (61%). Most of the respondents (33%) were 30-39 years old and 54.1% had less than undergraduate degrees. The biggest ratio of the income group was respondents within the 1000-1999TL income group. Demographic characteristics of respondents are detailed below in Table 1.

Table 1: **Demographic Characteristics of Respondents**

Variables	**n**	**%**	**Variables**	**n**	**%**
Gender			**Age**		
female	304	47,6	20-29	176	27,6
male	334	52,4	30-39	211	33
Education			40-49	165	25,9
under bachelor's	345	54,1	Over 50	86	13,5
bachelor's	258	40,4	**Income (TL)**		
master	35	5,5	Less than 1000	146	22,9
Marital Status			1000-1999	246	38,5
married	392	61,4	2000-2999	128	20,1
single	246	38,6	3000 and over	118	18,5

The complete statistical information for the research variables and reliability analysis results for scales used in the study are presented in Table 2. In order to determine the reliability of the scales used in this study, Cronbach α coefficients for the said scales were calculated. The calculated α coefficients were seen to exceed the value of 0.70 which is required to deem a scale reliable (Nunnally, 1983). Upon analysis of averages for the variables, it was concluded that respondents avoided uncertainty, perceived GM foods as risky, and that they were neither innovative about food nor willing to buy GM foods. Moreover, a weak level of correlation between the computation of the correlation coefficients and variables was observed (Table 2).

Table 2: Cronbach's Alpha and Descriptive Statistics of the Research Variables

Research Variables	α	Mean	Std Dev.	UA	PR	FI	WTB
UA	0.740	4.2833	.49958	1	.355**	-.118**	-.117**
PR	0.861	4.4683	.51122	.355**	1	-.137**	-.417**
FI	0.929	2.0372	.97852	-.118**	-.137**	1	.318**
WTB	0.945	1.3945	.76162	-.117**	-.417**	.318**	1

UA: uncertainty avoidance, PR: perceived risk, FI: food innovativeness, WTB: willingness to buy

1: certainly disagree……3: neither agree nor disagree …… 5: certainly agree

4.2. Hypothesis Tests

Results of the simple linear regression analysis carried out to test the hypotheses are included in Table 3.

Hypothesis 1: According to the results of the analysis, perceived risk has a statistically significant effect on willingness to buy GM foods (β=-0.641 and $p<0.01$ in Model 1). So, perceived risk has a negative effect on the willingness to buy GM foods. Therefore, hypothesis 1, which states that as perceived risk increases, willingness to buy GM foods decreases is verified.

Hypothesis 2: From the analysis, it has been determined that uncertainty avoidance has a statistically significant direct effect on willingness to buy GM foods (β=-0.178 and $p<0.01$ in Model 2). Therefore, hypothesis 2 has been accepted. The said direct effect was determined to be negative. The higher the uncertainty avoidance, the less the willingness to buy GM foods becomes.

Hypothesis 3: That the direct effect with positive direction is statistically significant is evidence that increase in uncertainty avoidance will lead to

perceived risk (β=0.498 and $p<0.01$ in Model 3). Thus, the hypothesis, which means the positive effect of uncertainty avoidance upon perceived risk is accepted.

Hypothesis 5: There is a statistically significant positive linear effect of innovativeness in food on willingness to buy GM foods (β=0.248 and $p<0.01$ in Model 4). The willingness to buy GM foods will increase as innovativeness in food increases. Therefore, hypothesis 5 has been accepted.

Hypothesis 6: It was observed that innovativeness in food has an effect on perceived risk and that this effect was negative in direction as a result of the regression analysis (β=-0.072 and $p<0.01$ in Model 5). Therefore, hypothesis 6 has been confirmed. As innovativeness in food increases, it can be said that perceived risk regarding GM food will decrease.

In this study, where mediation analysis proposed by Baron and Kenny (1986) has been utilized, the results of the mediation analysis are presented in Table 4.

Hypothesis 4: As a result of the first and second steps of the mediation analysis performed, it has been found that a change in uncertainty avoidance (independent variable) causes a statistically significant change in perceived risk (mediator variable) and a change in perceived risk (mediator variable) causes statistically significant change in willingness to buy GM foods. So in this context, it was observed that the conditions a and b mentioned above (part 3.3) and required by Baron and Kenny for a variable to become a mediator variable were met. Regression analyses carried out to determine whether condition c proposed by the authors was met showed that this condition was also met. While uncertainty avoidance value p was 0.003 (3^{rd} step), upon inclusion of perceived risk (4^{th} step), uncertainty avoidance value p became 0.354 ($p>0.05$). In this case, the effect of uncertainty avoidance regarding GM foods on willingness to buy GM foods has disappeared upon inclusion of the mediator variable as an independent variable. Perceived risk was seen to have full mediator role in the relationship between uncertainty avoidance and willingness to buy GM foods. Thus, Hypothesis 6 has been confirmed.

Hypothesis 7: in steps 1 and 2, a change in innovativeness in food (independent variable) causes statistically significant change in perceived risk (mediator variable) and a change in perceived risk (mediator variable) causes willingness to buy GM foods (dependent variable). Thus, the conditions a and b mentioned above and required to become a dependent variable were met. That the third condition, c, has been met was deduced from the regression analyses carried out in step 3 and 4.

Table 3: The Linear Regression Analysis Results

Hypothesis			β	StdE	p	Results
H1	Model 1 R^2= 0.174 Dependent Variables: WTB	Cons. PR	2.912 -0.641	0.241 0.044	0.000 0.000	Accepted
H2	Model 2 R^2= 0.014 Dependent Variables: WTB	Cons. UA	2.157 -0.178	0.259 0.060	0.000 0.003	Accepted
H3	Model 3 R^2= 0.126 Dependent Variables: PR	Cons. UA	4.171 0.498	0.038 0.164	0.000 0.000	Accepted
H5	Model 4 R^2= 0.318 Dependent Variables: WTB	Cons. FI	0.890 0.248	0.660 0.290	0.000 0.000	Accepted
H6	Model 5 R^2= 0.374 Dependent Variables: PR	Cons. FI	4.614 -0.072	0.046 0.021	0.000 0.001	Accepted

Whereas innovativeness in food's β was 0.248 and p was 0.000 (Step 3), once perceived risk was included (Step 4), the innovativeness in food's β dropped to 0.207 but p value remained 0.000 ($p<0.05$). In this case, since the effect of innovativeness in food on willingness to buy GM foods remained significant but dropped, it was deduced that perceived risk regarding modified foods was a partial mediator. Therefore, hypothesis 7, which stated that perceived risk played a mediator role in the relationship between innovativeness in food and willingness to buy GM foods, was confirmed.

Hypothesis 8: in Steps 1 and 2, it was found that a change in uncertainty avoidance (independent variable), leads to statistically significant change in innovativeness in food (mediator variable) and a change in innovativeness in food (mediator variable) leads to statistically significant change in willingness to buy GM foods (dependent variable). Thus, the necessary conditions a and b for creation of the dependent variable were met. It was

determined that condition c was also met through regression analyses in steps 3 and 4. The effect of uncertainty avoidance on willingness to buy GM foods (Step 3: β=-0.178 and p=0.0003) decreased when willingness to buy GM foods was included as a mediator variable (Step 4: β=-0.123 and p=0.034). In other words, because of the fact that uncertainty avoidance maintained its effect on willingness to buy GM foods while its value dropped, it was concluded that innovativeness in food is a partial mediator. Thus, hypothesis 8, which stated that innovativeness in food plays a mediator role in the relationship between uncertainty avoidance and willingness to buy GM foods, was confirmed.

The Sobel test (1982) was carried out to confirm that perceived risk has a mediator role in the relationship between willingness to buy GM foods and uncertainty avoidance as well as the relationship between willingness to buy GM foods and innovativeness in food. In other words, the statistical significance of the perceived risk mediator effect on the said relationships being different from zero has been tested. According to test results, it was verified that perceived risk has a full mediator role in the relationship between uncertainty avoidance and willingness to buy GM foods (z:7.275, $p<0.001$) and a partial mediator role in the relationship between innovativeness in food and willingness to buy GM foods (z:3.270, $p<0.001$). The Sobel test was utilized to test the statistical significance of the effect of innovativeness in food on the relationship between uncertainty avoidance and willingness to buy GM foods being different from zero. The result (z:2.820, $p<0.001$) confirmed that innovativeness in food plays a partial mediator role in the relationship between uncertainty avoidance and willingness to buy GM foods.

5. DISCUSSION AND CONCLUSION

In this study, GM foods, which present uncertainty and which are particularly new for Turkish consumers, was examined in terms of perceived risk, uncertainty avoidance, and innovativeness-in-food. The effect of perceived risk, uncertainty avoidance and innovativeness-in-food on willingness-to-buy GM foods was determined; and the questions of whether perceived risk has a mediator role in the relationship between willingness-to-buy GM foods and uncertainty avoidance and innovativeness-in-food; and whether innovativeness-in-food has a mediator role on the relationship between willingness-to-buy GM foods and uncertainty avoidance were answered.

Table 4: The Mediation Analysis Results

Hypothesis	1. step	2. step	3. step	4. step	Results
H6	**UA-PR**	**PR-WTB**	**UA-WTB**	**UA,PR-WTB**	Accepted *Fully mediated*
	β:0.363 p:0.000 R^2:0.126 Se:0.038	β:- 0.621 p:0.000 R^2:0.174 Se:0.054	β:-0.178 p:0.003 R^2:0.014 Se:0.060	UA β:0.055 p:0.354 Se:0.059 PR β:- 0.640 p:0.000 Se:0.057 R^2:0.175	
	FI-PR		**FI-WTB**	**FI, PR-WTB**	Accepted *Partially mediated*
H7	β:-0.072 p:0.000 R^2:0.418 Se:0.021		β:0.248 p:0.000 R^2:0.101 Se:0.029	FI β:0.207 p:0.000 Se:0.027 PR β:-0.567 p:0.000 Se:0.052 R^2:0.243	
H8	**UC-FI**	**FI-WTB**	**UA-WTB**	**UA,FI-WTB**	
	β:- 0.261 p:0.003 R^2:0.014 Se:0.077	β:0.248 p:0.000 R^2:0.101 Se:0.029	β:-0.178 p:0.003 R^2:0.014 Se:0.060	UA β:-0.123 p:0.034 Se:0.058 FI β:0.240 p:0.000 Se:0.029 R^2:0.108	Accepted *Partially mediated*

The study findings were consistent with the literature. In literature, since it is expected that the novelty and complexity of a product (Odabaşı&Barış, 2003) and the potential dangers it presents leads to perceived risk (Moven&Minor, 1998), the finding shows that perceived risk reduces willingness-to-buy these foods are in parallel with previous study findings (Brown&O'Cass, 2004; Brown&O'Cass, 2005; Tsakiridou et al., 2007;

Keles, 2011). The information provided by the media, which is one of the important sources of information for Turkish consumers, tends to involve elements of fear and risk regarding GM foods. Thus, consumers perceive risk regarding GM foods and they are not willing-to-buy GM foods because they want to avoid those potential dangers. Therefore, it is necessary to reduce perceived risk to increase consumer willingness-to-buy GM foods.

According to the findings, as uncertainty avoidance increases, perceived risk increases and willingness-to-buy these foods decreases. Although we have not come across that looked into the effect of uncertainty avoidance perceived risk among previous studies, it may be said that we have found results that are in parallel with general claims on this topic (Hofstede, 1984; Yaveroğlu & Donthu, 2002; Tolba & Mourad, 2011). The finding that uncertainty avoidance reduces willingness-to-buy GM foods is consistent with predictions of a previous study (MacIsaac, 2012). It may be said that those who avoid uncertainty do not want-to-buy GM foods, which are said to have potential dangers for human health and the environment, to prevent a potential threat in advance, in line with uncertainty avoidance characteristics.

Based on the assumption that uncertainty is a component of perceived risk the idea that GM foods would lead to perceived risk in consumers who avoid uncertainty because of uncertainty surrounding GM foods, is congruent with the findings of this study. As perceived risk also decreases willingness-to-buy GM foods, it must be taken into account that perceived risk could mediate in the relationship between uncertainty avoidance and willingness-to-buy GM foods. Another important finding of this study is that perceived risk is a mediator in the relationship between uncertainty avoidance and willingness-to-buy GM foods. According to this finding, perceived risk must also be taken into account when investigating the relationship between uncertainty avoidance and willingness-to-buy GM foods. As perceived risk will be higher for consumers that avoid uncertainty, these consumers will not be willing to buy GM foods. In other words, consumers who have low uncertainty avoidance will perceive these foods as less risky and might be willing to buy these foods. Therefore, it may be expected that consumers who have low uncertainty avoidance will constitute a niche market for GM foods.

It is possible to say that if a consumer possesses innovativeness-in-food, he/she might be willing to buy GM foods. Although there is no previous study on this subject, when considering the claim that innovationist consumers are consumers who prefer new and different products and brands (Steenkamp et al., 1999) is taken into account, it is seen that the finding of this study is consistent with the literature. Another finding in the study is that

as innovativeness-in-food increases, perceived risk decrease. When the effect of perceived risk on adoption of innovation and resistance to innovation is taken into account, it may be said that GM foods will be seen as less risky and be adopted by innovationist consumers.

Our study results reveal that perceived risk have a mediator role in the relationship between innovativeness-in-food and willingness-to-buy GM foods. Perceived risk based on the mediator role clarifies the relationship between willingness-to-buy and innovativeness. It has been argued in previous studies mentioned above that perceived risk determines consumer behavior regarding GM foods and in this study, the conclusion that low perceived risk will increase willingness-to-buy these foods. Taking into account the mediator role of perceived risk, it can be said that perceived risk for innovationist consumers will be low and that this could increase willingness-to-buy GM foods. In other words, the fact that innovationist consumers are willing to buy GM foods might be due to their perceiving these foods as less risky when compared to other consumers. With this in mind, it might be predicted that a niche market where the innovationist consumers are the target segment is possible.

Innovativeness-in-food was founded as a mediator in the relationship between uncertainty avoidance and willingness-to-buy GM foods in this study. Consistent with the claim that individuals with high uncertainty avoidance are less open to change and innovation (Hofstede, 2001; Mooij&Hofstede, 2011), this study found that respondents with high uncertainty avoidance were low in willingness-to-buy GM foods. Consumers with high uncertainty avoidance are not willing to buy the already uncertainty prone GM foods because they also involve uncertainty since they are a new product. Consumers who avoid uncertainty will prefer foods that fit their old buying patterns and about which they have experience rather than GM foods whereas consumers who do not avoid uncertainty will be willing to buy GM foods because they are more open to innovation and because they can tolerate uncertainty. Considering the mediation analysis results, this situation may be expresses briefly as: innovationist consumers are consumers who do not avoid uncertainty and due to this feature, they will be willing to buy GM foods. Thus, innovationist consumers can comprise a niche market for GM foods.

Analysis of the study findings in the context of Turkey will provide researchers and implementers with useful information for the understanding of Turkish consumers' approach toward GM Foods. In Turkish culture it is necessary that, in the process beginning with production until consumption, food be suitable to traditional and religious norms. It's quite important for

consumers that food be clean and halal. Therefore, the way food is prepared is a major factor in the selection of food. Turkish consumers, being used to organic methods production and in reflection of their culture of uncertainty avoidance, prefer methods of production they are used to rather than opening up to new ones. Moreover, these consumers do not have experience with production and consumption processes of GM Foods which are produced with new biotechnical methods. This is because Turkish consumers have not yet come across GM Foods in the marketplace. Inexperience and potential dangers increase uncertainty and lead to suspicion and fear. Thus, Turkish consumers who predominantly avoid uncertainty might eliminate this new uncertain food when compared to other alternative foods in order to protect themselves from harm. Perceived risk and unwillingness-to-buy GM Foods, which are new and bring uncertainty, is expected for Turkish consumers who are in a culture of high uncertainty avoidance. The finding of mediation analysis showing the uncertainty avoidance generates perceived risk regarding GM foods which produces unwillingness-to-buy GM Foods is also meaningful for the society in high uncertainty avoidance. Thus, the study findings are consistent with the cultural features of Turkish consumers.

Considering the fact that food consumption has a vital role in human survival and maintaining quality of life, it is essential that NGOs, public institutions and producers provide illuminating information about GM foods so that uncertainty surrounding them will be eliminated. In the case that uncertainty avoidance is high, because compliance with laws and regulations are high due to security concerns protectors of the laws must continue their efforts for consumer protection and raise consumer awareness on this issue.

The limitations of this study are that GM foods are a very new biotechnical product and that they are not in the market yet. Therefore, consumer purchase, consumption and post-consumption experiences for GM foods are not yet available. Most information regarding GM foods is acquired through the media. Bearing these conditions in mind, we have tried to determine consumer behavior on GM foods about which consumers have formulated no definitive opinions, have little information, no experience, and only secondary opinions. These reasons above were important limitations that affected the adequacy of responses from participants in terms of expressing their opinions and their willingness to participate in the study. Furthermore, sample size and methods limit our capability to generalize the findings of the study. The study must be repeated with larger sample size and methods to ensure random sampling. Despite these limitations, it is expected that this study will open the way for discovery in testing consumer behavior regarding GM foods, especially Turkish consumers.

It has been argued that real consumer behavior towards GM foods cannot be properly analyzed unless GM foods are labeled and that this poses a problem for researchers (Han & Harrison, 2007). Therefore, it is recommended that this study be replicated when labeled GM foods are presented to the market, so that more definitive findings could be reached. Moreover, to enable detailed understanding of consumer behavior about this issue, longitudinal studies for comparison of the pre and post GM foods experience and studies employing qualitative methods for more detailed information are recommended for the future. There are other variables that serve as mediator in these relationships. Future studies can focus on variables that may mediate in these relationships.

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