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Consumers' Behaviour towards Sustainable Packaging: A Study among the Students and Alumni of Faculty of Food Science and Nutrition Universiti Malaysia Sabah

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ABSTRACT

This study aims to identify the consumers' behavior toward sustainable packaging. This study involved 284 students and alumni of the Faculty of Food Science and Nutrition, Universiti Malaysia Sabah. A questionnaire was used to garner the data, covering the participants' demographic, consumers' behavior, and meal preferences, as well as their knowledge of the benefit of sustainable packaging and the danger of migration of chemical substances into food from the food packaging. The obtained data were subjected to descriptive analysis. It is found that most of the respondents (71.5 percent) were aware of the benefits of sustainable packaging and the risk of migration of chemical products into food. However, the purchase of sustainably packaged products was only 43.3 percent. The education level and income of the respondents have significantly affected their purchasing behaviour. However, the family size of the respondents does not affect their purchasing behaviour. The low purchase of sustainably packaged products may be caused by numerous factors such as higher cost of sustainably packaged products, lack of information, availability, and awareness of sustainably packaged products.

I. Introduction

Food packaging has become an essential aspect in the food industry. A food package enhances and protects a product throughout the processing, manufacturing, handling, storage, and finally, in the hand of the consumer. Lacking proper packaging can cause the product to be messy, inefficient, and unappetizing to the consumer. Food packaging also helps maintain the food quality during long-distance and period transport. It also helps to prevent the food from deteriorating. Food packaging ensures that the food is being delivered to the consumer in the best condition and quality (Lockhart, 1997). Additionally, food packaging is also defined as a coordinated system of food preparation used to produce foods for safe transport, distribution, storage, and retail, so that the product is delivered to the customer at an optimum cost while maximizing sales (Coles, 2011).

There are many levels of food packaging. First, primary packaging allows the packaging to have direct contact with the contained product. This packaging is usually in the form of a major protective barrier, such as metal cans, paper board cartons, glass bottles, and plastic. At a retail outlet, customers usually purchase products with this primary packaging. Meanwhile, the secondary package can be defined as a box that contains a certain number of primary packages. The purpose of secondary packaging is for the physical distribution carrier of the primary packages. In comparison, tertiary packaging is made up of several secondary packages. An example of this would be a stretch-wrapped pallet of corrugated cases (Robertson, 2013)

The function of food packaging ranges from containment, protection, convenience, and communication (Robertson, 2013). As a containment, food packaging functions as a tool to safely move food from one place to another. An example of food packaging as containment is a bottle of energy drink, a packet of chips, and even a cup of instant noodles. The containment of the product

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ensures the avoidance of product loss and pollution. The containment also functions to help keep the environment safe from any product leakage or leaching, while faulty packaging can affect the environment negatively. For instance, the containment of oil does not only ensure that the product is kept at its best quality but also can ensure the oil does not leak into the environment.

Packaging also assures the protection of the product since it acts as a protective barrier from the outside environment effects such as water, water vapor, gases, odour, microorganisms, dust, shocks, vibrations, and compressive forces (Robertson, 2013). Examples of these packaging functions are aseptically packed milk and fruit juices in paper board cartons, in which the product remains aseptic if the package provides protection. Another example would be the packaging of milk powder, whereby the packaging protects the milk powder from absorbing moisture. Therefore, if the packaging is breached, the product can no longer be preserved.

Packaging also secures convenience for the consumers. Recently, the number of pre-prepared food in cans that can be reheated or cooked in the microwave has been widely increasing. Besides, sauces, dressings, and condiments are now being sold in squeezable packages to minimize waste and mess. Hence, convenience is a crucial aspect for consumers. Apart from that, the food packaging also maintains the freshness of the product and lengthens its shelf life. Food and beverage packaging should be resealable to ensure its freshness if not consumed right away (Robertson, 2013). Additionally, the package must also contain an appropriate size for a consumer since the too extensive volume of food might get deteriorated before the consumer completely consumes it.

Packaging also acts as a medium of communication or 'silent salesman.' There is a famous quote on the role of packaging that says that 'a package must protect what it sells and sell what it protects'. With great packaging, consumers can identify products through distinctive shapes, branding, and labelling, so the packaging function as a salesman on its own.

Recently, many technological advances have helped in extracting information from the packaging of a product (Marsh & Bugusu, 2007), such as the scanning equipment at retail checkouts. The scanning equipment relies on the UPC (Universal Product Code) that can be read accurately and rapidly. The current usage of QR (Quick Response) codes is also increasing as this code contains information in both the vertical and horizontal direction, whereas a bar code contains data in one direction only. Hence, QR codes have a greater volume of information rather than bar codes. Food packages also exhibit the food's nutritional information on its surface, providing substantial information for the consumers (Robertson, 2013). In international trades of goods where different languages are spoken, the use of readily understood symbols on the packaging is needed. Meanwhile, UPCs that hand-held barcode readers linked to a computer are also used in warehouses to accelerate efficient stock-taking. Besides, RFID (Radio-frequency identification) tags attached to secondary and tertiary packages are also revolutionizing the supply chain.

Sustainable packaging is beneficial, safe, and healthy for individuals and communities. Many food companies are spending money on research to ensure their products are placed in better, more environmentally friendly packaging since studies and research have shown that food packaging contributes to many problems in our surroundings. Hence, an investigation of the consumers' behaviour and practices when it comes to sustainable packaging is essential.

The amount of food packaging waste has kept increasing over the years and is positioned as a huge problem requiring quick solvency in all industrialized countries. The future generation of food packaging should significantly lower waste from both food and packaging materials, as well as their negative impacts on the environment. Lifelong, low-dose exposure to FCMs (Food Contact Materials) has raised concern because it presents numerous controversially discussed chemicals. One of those chemicals is EDCs (Endocrine-Disrupting Chemicals). The WHO and the UNEP (United Nations Environment Programme) recently concluded that EDCs are a global public health threat (Muncke, 2014). Therefore, examination of consumers' knowledge and awareness of food packaging is crucial since it affects their purchasing decision.

II. Method

A. Population of Study

This study involved the students and alumni of the Faculty of Food Science and Nutrition, Universiti Malaysia Sabah, who were around 21 to 40 years old.

B. Location of Study

This study was conducted in the Faculty of Food Science and Nutrition, Universiti Malaysia Sabah.

C. Sampling

The sample size was calculated using Slovin's formula since, according to Ellen, Day, & Davies, (2018), this formula enables accurate sample size calculation. The Slovin's formula aided us in selecting the sample randomly among the students and alumni of the Faculty of Food Science and Nutrition. Slovin's formula is presented below.

$$n = \frac{N}{1+Ne^2} \quad (1)$$

in which,

n = number of respondents needed for the study
N = total number of students of the Faculty of Food Science and Nutrition
e^2 = margin of error (usually 5% or 0.05)

The calculation using Slovin's formula is presented below.

$$n = \frac{N}{1+Ne^2}$$

$$n = \frac{976}{1+(976)(0.05^2)}$$

= 284 respondents

D. Questionnaire

After we determined the number of participants, the Google form was used as an instrument to distribute the questionnaire regarding consumer behaviour concerning sustainable packaging. The questionnaire consisted of close-ended questions. The respondents were given ample 15 - 20 minutes to answer the questionnaire. The language used in the questionnaire was bilingual (Bahasa Malaysia and English) to ensure the respondents' understanding before they provided their accurate answers. The questionnaire was divided into four parts, consisting of demographic information (A), consumer behaviour relevant to their meal preferences (B), sustainable packaging (C), and migration of chemical substances into food (D).

1) Part A: Demographic

This part of the questionnaire was used to attain respondents' demographic information, ranging from their gender, age, race, education, monthly income to family size. This section was presented using a nominal scale with numbers used to represent a variable. This part requires no mathematical calculations (Uma & Bougi, 2009). The data obtained from this section was analysed descriptively to simplify the data for easier understanding (Cronk et al., 2011).

2) Part B: Consumers' Behaviour and Their Meal Preferences

The questions presented in this section were used to attain information on respondents' consumer behaviour and meal preferences. An example of questions on consumers' meal preferences was whether they cook at home or eat out. Besides, this section was used to identify their takeout foods' packaging and if the packaging was made of sustainable materials.

3) Part C: Sustainable Packaging

This section aims to evaluate the knowledge of the respondents on sustainable packaging. The presented questions facilitated us to understand the consumers' level of awareness of sustainable packaging and determine the factors that affect their purchasing correlated with sustainable packaging.

4) Part D: Migration of Chemical Substance into Food

This section gathered information on consumers' knowledge related to the migration of chemical substances from food packaging into food. Through the data obtained in this part, we analysed the importance of food safety and the role of food packaging for the consumer.

E. Data Collection

The respondents consisted of 284 alumni and students of the Faculty of Food Science and Nutrition, Universiti Malaysia Sabah. The questionnaire was distributed and recollected from June 2020 to July 2020. On average, the respondents took 20 to 30 minutes to answer the questionnaire. The questionnaire was used to obtain information related to participants' demographic, consumer behaviour, meal preferences, and knowledge of sustainable packaging and migration of substances into food. The questions asked were close-ended questions whereby the respondents only had to choose one or more answers from the option given.

F. Statistical Analysis

Statistical analysis was carried out using the *Statistical Program for Social Science SPSS* (version 24.0). The descriptive test consisting of the standard deviation, mean, median, and frequency was used to simplify the data. The chi-square and one-way ANOVA (Analysis of Variance) were also used in analyzing the data.

1) One-way ANOVA

One-way ANOVA was used to compare the variables between the group and within the group. The F ratio was calculated, in which a larger value represented a difference between the group. A significant value of the F ratio signified the rejection of the null hypothesis and no significant difference in the population. The significant difference for all the tests was determined at 0.05.

G. Pilot Test

The pilot test was conducted to obtain a better and deeper understanding of the data collection and analysis processes. The questionnaire was also revised following feedback on the efficiency and clarity of the questionnaire items. A total of 15 respondents were involved in the pilot study.

III. Results and Discussion

A. Demographic

The demographic section of the questionnaire consisted of socio-demographic questions, such as gender, race, age, level of education, monthly income, status, and family size. The answers' frequency and percentage table for every aspect were presented using the descriptive analysis (Table 1).

Table 1 shows that 208 and 76 respondents were female (73.2%) and male (26.8%), respectively. In the age category, 250 respondents were 18 to 25 years old (89.28%), 24 (8.45%) were 26 to 30 years old, and 10 (3.52%) were 31 to 40 years old. Meanwhile, around 140 (49.29%) respondents were Malay, 78 (27.46%) were Chinese, 15 (5.28%) were Indian, 30 (10.56%) were Bumiputra Sabah, and 21 (7.44%) were Bumiputra Sarawak. Besides, 60 (21.12%) of the respondents were first-year students, 70 (24.64%) were second-year students, 50 (17.61%) were third-year students, 70 (24.64%) were fourth-year students, and 34 (11.97%) were alumni of Faculty of Food Science and Nutrition, Universiti Malaysia Sabah. From their income, 250 (88.65%) of respondents were unemployed, 19 (6.73%) earned RM1000 - RM2000, 10 (3.54%) earned RM2001 - RM3000 and 5 (1.77%) earned more than RM3000. For the respondents' marital status, 232 (81.7%) of them were single, while the other 52 (18.3%) were married. Additionally, 195 (68.7%) of respondents lived alone, 17 (6.0%) were couples, 38 (13.4%) had three to five people in their family, and 34 (12.0%) had more than five people in their family.

The respondents' demographic information is crucial since it provides statistics on the relevant essential factors such as gender, level of education, and monthly income. These demographic factors may affect the consumer's behaviour towards sustainable packaging.

Table 1. Respondent's Demographic Distribution

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	76	26.80
	Female	208	73.20
Age	18 - 25	250	89.30
	26 - 30	24	8.45
	31 - 40	10	3.52
Race	Malay	140	49.29
	Chinese	78	27.46
	Indian	15	5.28
	Bumiputra Sabah	30	10.56
	Bumiputra Sarawak	21	7.44
Education	First-year student	60	21.12
	Second-year student	70	24.64
	Third-year student	50	17.61
	Fourth-year student	70	24.64
	Alumni	34	11.97
Income	Unemployed	250	88.65
	RM1000 - RM2000	19	6.73
	RM2001 - RM3000	10	3.54
	More than RM3000	5	1.77
Status	Single	232	81.70
	Married	52	18.30
Family Size	Individual	195	68.7
	Two people	17	6.0
	Three to five people	38	13.4
	More than five people	34	12.0

B. Consumer's Meal Preference

Many factors affect consumers' meal preferences. Table 2 shows the effects of crucial factors such as education, income, and family size on the consumers' meal preferences. Their preference for having meals can be divided into three, namely dining in at restaurants, take away, and home cooked. Under the family size category, families with more than five people mostly preferred having home-cooked meals, shown by the highest mean of 2.56 ± 0.86. This group of respondents also showed a lower habit of dine-in at restaurants and buying takeaway food.

Table 2. Consumers' Meal Preferences based on Their Family Size, Income, and Education Level

How do you usually have your meals?	N	Dining in	Take away food	Home-cooked food
Family size				
Unmarried	195	3.29 ± 0.46^{a}	3.10 ± 0.45^{a}	2.23 ± 0.44^{b}
Two people	17	2.88 ± 0.44^{b}	2.47 ± 0.87^{ac}	2.31 ± 0.74^{a}
Three to five people	38	3.16 ± 0.37^{a}	3.29 ± 0.46^{ac}	1.81 ± 0.95^{a}
More than five people	34	2.04 ± 1.20^{b}	1.93 ± 1.03^{bc}	2.56 ± 0.86^{a}
Income				
Unemployed	157	1.86 ± 1.17^{b}	1.73 ± 0.96^{c}	2.53 ± 0.86^{ac}
RM1000-RM2000	25	2.90 ± 0.40^{a}	2.56 ± 0.58^{b}	2.04 ± 0.29^{abc}
RM2001-RM3000	58	3.27 ± 0.45^{a}	3.29 ± 0.45^{a}	1.66 ± 0.98^{b}
More than RM3001	44	2.81 ± 0.99^{a}	2.75 ± 0.94^{b}	2.41 ± 0.49^{ac}
Education				
Alumni	110	1.65 ± 1.15^{c}	1.58 ± 1.02^{c}	2.66 ± 0.91^{a}
First year	56	2.96 ± 0.83^{a}	2.76 ± 0.87^{a}	2.32 ± 0.47^{b}
Second year	18	3.33 ± 0.49^{a}	3.33 ± 0.48^{a}	1.58 ± 1.03^{b}
Third year	43	3.23 ± 0.43^{a}	3.23 ± 0.47^{a}	2.44 ± 0.83^{a}
Fourth year	57	2.31 ± 1.03^{a}	2.10 ± 0.62^{b}	1.89 ± 0.77^{b}

[a]Note: Same alphabet superscript appearing at the same column are not significantly different at the 5% significant level.

From the income category, respondents who are currently unemployed also preferred home-cooked meals, as represented by a mean of 2.53 ± 0.86, compared to those who are working.

Therefore, respondents' preference for home-cooked meals may be affected by the cost since cooking your own meals is cheaper than buying food. In contrast, respondents who earn RM2000 and above tend to purchase meals outside of their homes. Based on the education level, alumni consumed more home-cooked meals than students. Alumni have more home-cooked meals since they have the time and convenience to prepare their own meals compared to students who are mostly living on their own. Apart from that, alumni may also be preparing their own meals due to health reasons. As most women now are working, households are getting smaller. Their longer working hours contribute to consumers' preference for ready-to-eat meals (Boumphrey, 2020). However, a survey revealed that about 55% of respondents worldwide still cook a meal from raw ingredients regularly, while 38% of them use pre-prepared ingredients. Additionally, the high unemployment and recession have also forced many individuals to cook their own meals as pre-prepared meals cost them higher.

Table 3 shows the participants' frequency of having meals prepared from outside in the period of daily, weekly, and monthly. From the family size category, the larger families rarely eat out as they obtained the lowest frequency. Meanwhile, smaller families and unmarried individuals frequently have meals prepared from outside. There is a significant difference in eating out habits between larger families and other families.

Table 3. Frequency of Having Meals Prepared from Outside based on the Family Size, Income, and Education

How often do you have meals prepared outside of the home?	N	Daily	2 - 3 times a week	Once a week	Once a month
Family size					
Unmarried	195	3.29 ± 0.46^{bc}	3.00 ± 1.16^{ab}	2.47 ± 0.87^{a}	2.11 ± 0.78^{a}
Two people	17	2.47 ± 0.87^{ac}	2.53 ± 0.87^{b}	2.34 ± 0.74^{a}	1.84 ± 0.37^{a}
Three to five people	38	3.07 ± 0.48^{ac}	2.16 ± 0.68^{b}	2.94 ± 0.81^{b}	2.90 ± 1.21^{a}
More than five people	34	1.99 ± 1.25^{abc}	1.71 ± 0.46^{a}	1.78 ± 1.15^{ab}	1.71 ± 0.46^{b}
Income					
Unemployed	157	1.80 ± 1.24^{c}	1.72 ± 0.45^{b}	1.60 ± 1.04^{b}	3.07 ± 1.02^{a}
RM1000-RM2000	25	2.52 ± 0.59^{b}	2.84 ± 0.47^{a}	2.08 ± 0.40^{b}	2.08 ± 0.40^{b}
RM2001-RM3000	58	3.27 ± 0.45^{a}	3.19 ± 1.12^{a}	2.78 ± 0.86^{a}	1.72 ± 0.45^{b}
More than RM3001	44	2.81 ± 0.99^{ab}	2.18 ± 0.99^{b}	2.59 ± 1.24^{a}	2.18 ± 0.99^{b}
Education					
Alumni	110	1.69 ± 1.21^{b}	1.67 ± 0.48^{c}	1.58 ± 1.03^{b}	1.67 ± 0.49^{b}
First year	56	2.78 ± 0.91^{a}	$2.35 \pm 0.74b^{c}$	2.03 ± 0.96^{a}	2.04 ± 0.83^{b}
Second year	18	3.33 ± 0.48^{a}	2.71 ± 1.05^{b}	$3.00 \pm .0.84^{a}$	3.30 ± 1.22^{a}
Third year	43	3.23 ± 0.43^{a}	1.79 ± 0.47^{c}	2.63 ± 0.85^{a}	1.77 ± 0.43^{b}
Fourth year	57	2.08 ± 1.18^{b}	3.41 ± 1.04^{a}	1.59 ± 1.08^{b}	2.58 ± 0.94^{c}

[b.]Note: Same alphabet superscript appearing at the same column are not significantly different at a 5% significant level

From the income category, people who earn more than RM2000 can afford to eat out more frequently than people with lesser earnings. However, in the once-a-month frequency, unemployed people had the highest mean, 3.07 ± 1.02, with a significant difference compared to the rest of the groups. Alumni scored the lowest score in all daily, weekly, and monthly categories for having meals outside. On the other hand, students eat out more often regardless of the duration. Boumphrey (2020) revealed that people mostly purchase prepared food due to its convenience. Similarly, students have less time preparing their meals since it requires planning, cooking, and skills. About 45% of the respondents stated that they do not have the time to cook. Even if prepared meals are not considered a cheap option compared to home-cooked meals cooking, students are willing to compromise paying a higher price. This situation may be affected by their low cooking skills. The lack of basic cooking skills in individuals has been reported as a significant factor in the increasing popularity of instant and prepared foods.

Table 4 shows the most frequently used packaging material. Plastic (34.15%) and polystyrene (29.5%) were the most popular food packaging material. Further, most of the food packaging was disposed of (76.4%) after its product had been consumed, as illustrated in Figure 1. Claudia et al., (2018) stated that eco-friendly consumption of foods and the disposal of their packaging is highly correlated with consumers' environmental awareness. However, since most food packed in food

packaging cannot be recycled, the consumers do not have any other option other than disposing of it. We may have more recycled food packaging if a more recyclable plastic container is used as food packaging. A study conducted by Barnes, et al., (2011) identified that most respondents support a local ban on polystyrene and plastic takeout food packaging. They are ready to pay for alternative products with higher sustainability and the ability to reduce pollution in the long term. However, about 97% of the respondents said that they would recycle or the recyclable food packaging. However, consumers prefer food packaging that can be microwaved, water-resistant, and price competitive as an alternative packaging. Therefore, consumers may prefer paper and plastic-based packaging if the packaging has a reasonable price. Figure 1 shows that most food packaging is being disposed of after being used, with only a small number of respondents reusing their packaging.

Table 4. Type of Food Packaging Frequently Purchased by Consumers'

Type of packaging	Frequency (N)	Percentage (%)
Polystyrene	84	29.57
Plastic	97	34.15
Paper bag	58	20.42
Recyclable plastic container	45	15.84

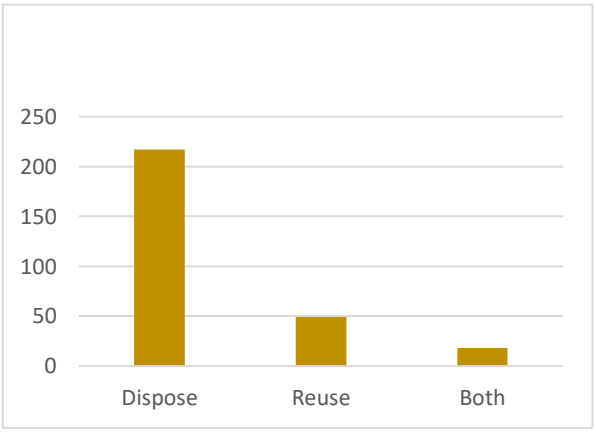

Fig. 1.Food Packaging Final Use

Orzan et al., (2018) have mentioned that over half of respondents (58.2%) stated that products packaged in ecological packaging are more expensive. Consequently, although sustainable packaging offers environmental protection, the price of the packaging becomes an essential factor that affects consumers' purchasing decisions. A higher purchase of food with plastic and polystyrene packaging leads to packaging disposal, since it cannot be recycled.

C. Sustainable Packaging

Sustainable packaging does not harm the environment and can be recycled, producing lower waste. The sustainable use of food packaging as shown in Table 5 has become a growing trend in the food industry. Figure 2 illustrates that around 203 (71.5%) of our participants are aware of sustainable packaging. However, more than half of the respondents do not buy sustainably packaged products. Palmer (2000) explained that the buying decision is affected by various influencing factors. Conventional buying is determined by three main factors, namely psychological factors (motivation, perception), purchase situation (personal background, surrounding environment), and social factors (culture, reference group) (Weber & Villebonne, 2002).

Table 5. Consumers' Habit of Purchasing Sustainably Packaged Products

Consumers buy sustainable packaged products	Frequency (n)	Percentage (%)
Yes	123	43.3
No	161	56.7

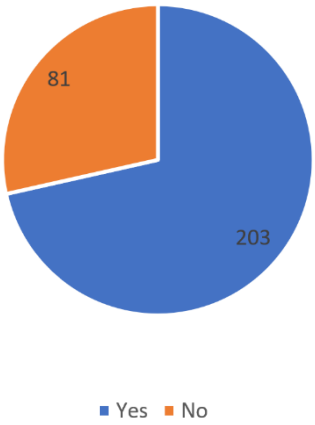

Fig. 2.Consumers' Awareness of Sustainable Packaging

Consumers' preference for purchasing non-sustainably packaged products, even if they have great awareness of it, maybe caused by the lack of environmental knowledge. Environmental knowledge is obtained through education and self-experience. A study carried out by Laroche et al., (2001) has shown that higher environmental knowledge induces more purchases of green commodities. Meanwhile, Orzan et al., (2018) described that Romanian consumer are more inclined to purchase sustainable products after they are aware of food packaging's effect on the environment to reduce the amount of waste. A similar study suggests that consumers' objection to purchase more expensive green packaging is caused by a lack of information and budget to purchase sustainable packaging.

Table 6 presents the consumer's source of information on sustainable products, such as the products' labels, a campaign from the manufacturers, the Internet, and other sources. Our participants mainly obtain information directly from the products label, while the alumni prefer getting their information from campaigns, the Internet, and other sources. Their significantly different source of information may be affected by their different age and maturity. Alumni use various ways to learn about sustainable packaging, while students mostly depend on the product itself.

Table 6. Consumers' Source of Information for Sustainable Products

Education Level	N	Directly from the label of the products	From campaigns by the manufacturers	Internet	Other sources
Alumni	110	1.70 ± 1.22^{c}	3.00 ± 1.24^{a}	3.31 ± 1.19^{a}	2.51 ± 0.87^{a}
First year	56	2.64 ± 0.94^{ab}	2.05 ± 0.84^{b}	2.35 ± 0.94^{b}	1.85 ± 0.70^{c}
Second year	18	3.33 ± 0.49^{a}	1.39 ± 0.51^{bc}	2.35 ± 0.94^{bc}	1.33 ± 0.49^{c}
Third year	43	2.97 ± 0.71^{ab}	1.77 ± 0.43^{bc}	1.84 ± 0.53^{bc}	1.91 ± 0.28^{c}
Fourth year	57	2.45 ± 0.91^{b}	2.51 ± 0.87^{b}	2.61 ± 0.97^{b}	1.18 ± 0.12^{b}

[c]Note: Same alphabet superscript appearing at the same column are not significantly different at 5% significant level.

Orzan et al., (2018) described that the lack of information prevents the consumer from adopting sustainable behaviour. Another study identified that 65.6% of the respondents agreed that they do not have enough information about sustainable packaging. The consumers mentioned that non-profit organizations and the Ministry of Environment should play a more active role in educating the consumers. The same study also revealed that sustainable packaging's advantages and long-term impact on the environment should be campaigned to the consumers to encourage greater support for sustainably packaged products.

Table 7 presents the consumers' frequency of buying sustainable packaging based on their educational background. The alumni had the highest frequency of buying sustainably packaged products in all the categories (daily, weekly, monthly). Besides, alumni also had the lowest number of frequencies for never buying sustainably packaged products. Meanwhile, more students are reported to never buying sustainably packaged products. Further, the chi-square test results indicate a significant difference among consumers from all educational backgrounds. Therefore, the older group

has a higher frequency of buying sustainable products because of their higher level of knowledge and awareness.

Table 7. Consumers' Frequency of Buying Sustainably Packaged Products based on Education Level

Education Frequency	Alumni	First-year student	Second-year student	Third year student	Fourth year student
Daily	28	6	5	4	8
Weekly	50	3	3	10	4
Monthly	45	2	7	5	4
Never	5	15	20	25	35

Koenig-Lewis et al., (2014) described that a consumer has an evaluation process before they purchase a product, involving unconscious judgments, subjective evaluation, and psychological aspects. Apart from that, the consumer filter down the product to a manageable rank to be evaluated. Martin and Schouten (2014) also explained that in some situations, buyers are calculative and logical. This behaviour can also be developed by experience and maturity. Similarly, our findings suggest that alumni, the older group of consumers, seem to have a better understanding and purchasing of sustainably packaged products.

Table 8 shows consumers' frequency of buying sustainably packaged products based on their income. Unemployed individuals scored the highest frequency in never buying sustainably packaged products, while individuals that earn the most buy most of the sustainably packaged products. Therefore, individuals with higher earnings have a greater chance of buying sustainably packaged products. The chi-square test results also suggest a significant difference among all the different levels of income.

Table 8. Consumers' Frequency of Buying Sustainably Packaged Products based on Income

	Income (N)			
Frequency	Unemployed	RM 1000 - RM2000	RM 2001 - RM3000	More than RM 3000
Daily	2	20	25	60
Weekly	3	10	18	22
Monthly	2	19	30	23
Never	41	6	5	5

Our analysis results suggest that people who earn more have a higher frequency of buying products with sustainable packaging. Thus, products' prices and the consumers' budget are the essential factors in the buying decision. The consumers' choice of packaging is entirely an economic decision. They will judge the expected costs and benefits before purchasing a product because the consumer cannot buy all kinds of products responsibly.

In addition, being a responsible consumer is deemed time-consuming, economically unfavourable, and stressful (Biswas & Roy, 2015). Although sustainably packaged products are not extremely expensive, conventional products are cheaper. Thus, customers with a tight budget do not consider buying products that surpass their budget. The price point is a more powerful influencing factor of purchasing decisions than environmental protection (Radulescu et al., 2012).

Table 9 shows the consumers' frequency of buying sustainably packaged products based on their family size. Unmarried individuals scored the highest frequency in never buying sustainably packaged products, while families with more than three people (large families) frequently buy sustainably packaged products. However, the chi-square test results showed no significant difference among all consumers' different family sizes of the consumers. Therefore, family size carried no effects on the purchase of sustainably packaged products.

Table 9. Consumers' frequency of Buying Sustainably Packaged Products based on Family Size

	Family Size (N)			
Frequency	Two people	Two to three people	More than three people	Unmarried
Daily	11	18	23	18
Weekly	15	18	12	15
Monthly	11	19	16	16
Never	24	22	17	29

D. Migration of chemical substances into food

Table 10 presents consumers' awareness of the chemical migration from food packaging into food. The alumni have stated that they all are aware of the possible chemical substance's migration, while the students have varied awareness of the migration of this chemical substance. Among the students, their level of awareness increases following the increase in their education level since more fourth-year students understand chemical substances migration than the first-year students. Thus, education level has an essential role in people's awareness of chemical substances migration. Similarly, the chi-square test results also showed a significantly different understanding of chemical substance migration among the alumni and the students.

Table 10. Consumers' Awareness of the Chemical Migration from Food Packaging into Food

Education level	N	Yes	No
Alumni	34	34	0
First-year	61	12	49
Second-year	70	30	40
Third year	50	40	10
Fourth year	69	69	0
Total	282	185	99

Jayaraman et al., (2011) stated that some individuals prefer green products with eco-labels on their packages. Many companies have been adopting the green concept due to pressure from competitors and customers. Apart from that, the Restriction of Hazardous Substances Directive regulations imposed by the EU (European Union), has forced manufacturers to be more responsible for their products. Thus, companies' support for the green movement and marketing increases consumers' awareness.

Table 11 demonstrates numerous factors affecting the migration of chemicals from the food packaging into food, such as the type of package's material, temperature, storage time, and size of the package. More than half of the respondents mentioned that the package's material and temperature are the most common factors affecting chemical substance migration. About 35.3% of respondents agreed that all the factors mentioned in the questionnaire affect chemical migration from food packaging into food.

Table 11. Factors Affecting The Migration Of Chemicals Into Food From Food Packaging

Factors	Frequency (n)	Percentage (%)
Type of package's material	100	57.4
Temperature	108	56.8
Storage time	82	43.2
Size proportion	22	11.6
All of the above	67	35.3

A study conducted by Muncke et al., (2014) revealed that the type of food package material largely determines the potential and extent of chemical migration into food. For instance, inert materials such as stainless steel, ceramic, or glass, the chemicals lining the inner surface have direct contact with the food, leading to contamination and migration from closures or sealants that contain plasticizers. Altuntaş et al., (2014) described elements influencing the migration rate are food package's direct or indirect contact, packaging features in contact with food, migrant chemical property, migrant initial concentration in the packaging material, contact time, temperature, and the components in touch with the packaging material.

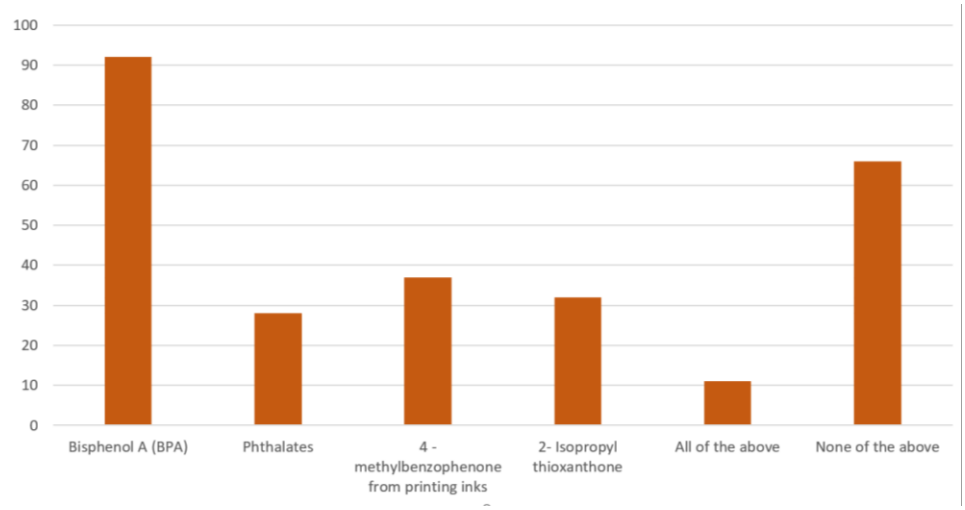

Fig. 3. Various chemical substances migrate from food packaging material into food

The chemical substance can migrate into food and cause adverse health effects to the human body in a short or long period. The examples of most common chemical substances are BPA (Bisphenol A) (), phthalates, 4 - methyl benzophenone from printing inks, and 2- isopropyl thioxanthone. Ninety respondents (31.6%) selected only one chemical substance from the provided list. Meanwhile, 12 (4.2%) respondents admitted that they had never heard of the chemical substance listed in the questionnaire. Consequently, the respondents know the chemical substance that most commonly migrates into food.

The most common chemical substance selected by the respondents was BPA 92 (48.4%), while phthalates were the least chosen. The Australia Food Standards described that bisphenol A is used in the manufacturing of polycarbonate plastics and coatings, the material for food packaging. It is the most hazardous chemical substance and is researched widely in epidemiology studies. The Food and Drug Administration has identified a relationship between BPA and various health issues. Additionally, phthalates are a class of compounds used as plasticizers in food packaging. Through animal studies, phthalates' efficient migration into food has been reported along with its effects on reproduction organs, primarily on males (Muñoz-Espín & Serrano, 2014). A study conducted in Italy in 2005 discovered that ITX (2-Isopropyl Thioxanthone) was found in liquid milk for babies packed in the printed cartoon. Therefore, studies on the long-term effects of ITX contamination must be carried out to evaluate its toxicity level. In 2009, German and Belgian legislators detected the migration of 4 - methyl benzophenone from packaging into cereal products. Further, the short-term exposure to contaminated breakfast cereals did not pose a threat to human health. However, further research is needed to obtain toxicity data corresponding to the level of exposure.

Table 12 shows the consumers' awareness of the FDA (Food and Drug Administration) regulation based on their educational background. Most of the alumni mention that they are aware of the FDA regulation on food packaging material. The obtained data suggest that people's awareness of FDA regulation rises following the increase in their education level. Among the students, the first-year students had the lowest awareness compared to the fourth-year students. Thus, their awareness of regulations grows with time. The chi-square test results showed a 0.000 score, showing a significantly different awareness among the alumni and the students.

Table 12. Consumers' Awareness of the Food and Drug Administration (FDA) Regulation on Food Packaging Material based on Their Education Level

Education	N	Yes	No
Alumni	34	30	4
First-year	61	7	54
Second-year	70	13	57
Third year	50	20	30
Fourth year	69	38	31
Total	284	108	176

Koenig-Lewis et al., (2014) carried out a study to understand the relationship between the consumers' emotional and rational evaluation of sustainable packaging. The results indicate that consumers' purchasing intention is greatly influenced by general environmental concerns. The research also identified the effects of sustainable packaging adoption on consumers' attitudes and behaviour towards a product. Therefore, consumers with a greater awareness tend to purchase a sustainable packaged product.

In addition, Orzan et al., (2018) also stated that legislation, legal regulation, and policy also affect consumers' behaviour. The environmental protection legislation allows countries to use incentives to use sustainable technology. Thus, companies have started to become more responsible and make a more significant contribution to sustainably packaged products. Once the consumers see that their actions carry a positive impact on the environment, long-term sustainable behaviours can be cultivated.

IV. Conclusion

Our obtained data suggest that the consumers' behaviour concerning sustainable packaging among the students and alumni of the Faculty of Food Science and Nutrition, Universiti Malaysia Sabah, can be enhanced. Even though most students and alumni understand and are aware of the benefits of sustainable packaging and the risks of migration of chemical products into food, they have not shown significantly different action. The low number of respondents purchasing sustainably packaged products may be induced by various factors, such as higher cost of sustainably packaged products, lack of information on sustainably packaged products, the products' availability, and level of awareness. Future studies are suggested to adopt a larger sample population with various backgrounds to obtain a more extensive understanding of consumers' behaviour. According to the obtained demographic data, most of our respondents were 18 to 40 years old and had obtained tertiary education. Thus, the limitation of this study is that the sample does not accurately reflect the entire Malaysian consumers' behaviour. Thus, a larger population is required to better illustrate consumers' behaviour regarding sustainably packaged products.

References

Altuntaş, E., Gül, E. N., & Bayram, M. (2014). *The physical, chemical and mechanical properties of medlar (Mespilus germanica L.) during physiological maturity and ripening period*.

Barnes, M., Chan-Halbrendt, C., Zhang, Q., & Abejon, N. (2011). Consumer preference and willingness to pay for non-plastic food containers in Honolulu, USA. *Journal of Environmental Protection, 2*(09), 1264.

Biswas, A., & Roy, M. (2015). Green products: An exploratory study on the consumer behaviour in emerging economies of the East. *Journal of Cleaner Production, 87*, 463–468.

Boumphrey, S. (2020). *How will consumer markets evolve after Coronavirus.*

Claudia, C., Valeria, C., Daniele, D., Loreto, L., Tartaglini, D., & Di-Stasio, E. (2018). *The effects of a multidisciplinary education course on the burden, healthliteracy and needs of family caregivers*.

Coles, R. (2011). *Introduction to food and beverage packaging technology* (2nd ed.). Oxford, England: Wiley-Blackwell.

Cronk, N. J., Harris, K. J., Harrar, S. W., Conway, K., Catley, D., & Good, G. E. (2011). Analysis of smoking patterns and contexts among college student smokers. *Substance Use & Misuse, 46*(8), 1015–1022.

Ellen, D., Day, S., & Davies, C. (2018). S*cientific examination of documents: Methods and techniques*. CRC Press.

Jayaraman, K., Haron, H., Sung, G. B., & Lin, S. K. (2011). Consumer reflections on the usage of plastic bags to parcel hot edible items: An empirical study in Malaysia. *Journal of Cleaner Production, 19*(13), 1527–1535.

Koenig-Lewis, N., Palmer, A., Dermody, J., & Urbye, A. (2014). Consumers' evaluations of ecological packaging–Rational and emotional approaches. *Journal of Environmental Psychology, 37*, 94–105.

Lockhart, H. E. (1997). A paradigm for packaging. *Packaging Technology and Science: An International Journal, 10*(5), 237–252.

Marsh, K., & Bugusu, B. (2007). Food packaging—roles, materials, and environmental issues. *Journal of Food Science, 72*(3), R39–R55.

Martin, D. M., & Schouten, J. W. (2014). The answer is sustainable marketing, when the question is: What can we do? *Recherche et Applications En Marketing (English Edition), 29*(3), 107–109.

Muncke, J. (2014). Hazards of food contact material: Food packaging contaminants. *Encyclopedia of Food Safety, 2*, 430–437.

Muncke, J., Myers, J. P., Scheringer, M., & Porta, M. (2014). Food packaging and migration of food contact materials: Will epidemiologists rise to the neotoxic challenge? J *Epidemiol Community Health, 68*(7), 592–594.

Muñoz-Espín, D., & Serrano, M. (2014). Cellular senescence: from physiology to pathology. *Nature Reviews Molecular Cell Biology, 15*(7), 482–496.

Orzan, G., Cruceru, A. F., Bălăceanu, C. T., & Chivu, R. G. (2018). Consumers' behavior concerning sustainable packaging: An exploratory study on Romanian consumers. *Sustainability, 10*(6), 1787.

Radulescu, V., Cetina, I., & Orzan, G. (2012). Key factors that influence behavior of health care consumer, the basis of health care strategies. *Contemporary Readings in Law and Social Justice, 4*(2), 992.

Robertson, G. L. (2013). *Food packaging: Principles and practice* (3rd ed). Boca Raton: CRC press.

Uma, S., & Bougi, R. (2009). *Research Method for Business. A Skill Building Approach*. USA: John Wiley & sons Inc.