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Awareness regarding biodegradable meat packaging among the stakeholders

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Abstract

Packaging is an essential and prominent component of food industry. Although conventional petro-chemical based packaging materials are economical and abundantly available, their non-degradable nature is of severe concern to the environmentalists in the current scenario. To combat this menace, biodegradable materials are the possible substitutes. Meat packaging sector is very much familiar with, and already practicing bio-degradable packaging since long. However, the level of awareness among different stakeholders of packaging industry is ambiguous. In the current research an attempt has been made to assess the awareness regarding the biodegradable meat packaging among different key populaces associated with packaging sector. A questionnaire consisting 10 different questions was distributed randomly to collect the required data. Among the 134 responses received out of 200 respondents, majority of the scientific community are quite aware about the biodegradable packaging and the associated benefits in the food industry than the packaging retailers and manufacturers. Upon further statistical evaluation of the obtained data from 10 different questions using MANOVA, a significant difference ($p < 0.05$) has been observed regarding different aspects pertaining to the awareness about biodegradable meat packaging among different target groups of packaging sect.

Keywords: Meat packaging, packaging sect, technological science, prominent component, food industry

Introduction

Packaging is a technological science that helps to protect, store, promote and distribute a commodity to the costumers. Conventional petro-chemical based plastics are classical example for the packaging materials which are economical and easy to handle. In 2021, global production of plastics was about 390.7 million metric tons which increased by 4% compared to previous year [1]. Indiscriminate usage of plastics led to generation of large quantity of municipal solid waste which is difficult to decompose and cause environmental pollution. In order to control environmental pollution, petro-chemical based plastics can be replaced with biodegradable packaging materials. Biodegradable packaging materials are the packaging materials which are made from renewable raw materials like agricultural byproducts, leaves, grass, papers etc. These materials undergo decomposition naturally into biomass, carbon dioxide and water without affecting the environment. Biodegradable packaging materials are of two types, natural and synthetic. Natural biodegradable packaging materials include carbohydrate based (Starch, alginate etc.), protein based (Collagen, gelatin, casein, soy, gluten etc.), made with the help of microorganisms like Poly Hydroxy Alkanoate (PHA), Poly Hydroxy butyrate (PHB) etc. Synthetic biodegradable packaging materials are produced by biotechnological applications which include Poly Lactic Acid (PLA), Poly Caprolactone (PCL) etc. with this updated technology of biodegradable packaging presumed to reduce the environmental pollution definitely, the present research was designed to evaluate the levels of awareness regarding the various facets of biodegradable packaging available in the market, among different stakeholders of meat packaging industry.

Methodology

A survey was conducted for evaluating the level of knowledge about biodegradable packaging materials available in the market among the public. This survey principally targeted three different communities, namely scientific community, packaging material retailers and biodegradable packaging material manufacturers through Google forms, using the link.

<https://forms.gle/knvdWc2vuPvGwExw9>

The scientific community includes the teaching faculty and students of food technology course including veterinary stream as respondents. The packaging material retailers include both the packaging material retail sellers as well as purchasers. The biodegradable packaging material manufacturers include the commercial as well as researchers involved in packaging field.

The questionnaire, comprising of 10 different questions was distributed to 200 respondents selected by simple unstratified random sampling. Out of 200 respondents, 134 responses were received. The data obtained was subjected to Levene's Test of Equality of Error Variances (Multivariate analysis (MANOVA), using SPSS 25.0 version. The difference between the groups was estimated by conducting Tukeys's HSD Post Hoc Test.

Results

Simple random survey was carried out in the present research, as, if stratified random survey was designed the number of respondents from each stratum would be minimized. The results obtained from the survey were tabulated and presented in Table 1. Most of the respondents in the scientific community (54.5%) were aware about biodegradable packaging materials in the food industry. However, most of the retailers of the packaging industry (30.6%) were not

aware. A large number of (55.2%) respondents in the scientific community preferred biodegradable packaging materials over conventional petroleum based plastics, while a nearly equal mixed response was received from the retailers of packaging industry about preferring (19.4%) and not preferring (17.2%) the biodegradable packaging materials. Majority of the scientific community (47.0%) could differentiate the biodegradable packaging materials from the plastics available in the current market, whereas the majority of the retailers of packaging industry (30.6%) could not. The identity of biodegradable packaging materials, its symbol, could be identified by 42.5% of the scientific respondents, however, only 3.0% of the retailers of packaging industry could identify, which is a very minute proportion, while 33.6% of the retailers of packaging industry could not identify the biodegradable symbol. Nearly half (48.5%) of the respondents from the scientific community were familiar with more than five biodegradable packaging films, while many (33.6%) respondents from retailers of packaging industry were familiar with less than five biodegradable packaging films. A bulk fraction (52.2%) of respondents from scientific community had an idea about the source from which the biodegradable packaging films were made, but a bulk proportion of retailers of packaging industry (30.6%) had no idea about the source from which the biodegradable packaging films were made.

Table 1: Responses received from 134 respondents pertaining to the awareness regarding BDMP

Question		Group			Total
		Scientific Community	Retail Marketers	Manufacturers	
Awareness	Yes	73 (54.5%)	8 (6.0%)	8 (6.0)	89 (66.4%)
	No	4 (3.0%)	41 (30.6%)	0	45 (33.6%)
Preference	Yes	74 (55.2%)	26 (19.4%)	7 (5.2%)	107 (79.9%)
	No	3 (2.2%)	23 (17.2%)	1 (0.7%)	27 (20.1%)
Differentiate	Yes	63 (47.0%)	8 (6.0%)	8 (6.0%)	79 (59.0%)
	No	14 (10.4%)	41 (30.6%)	0	55 (41.0%)
Identify the Symbol	Yes	57 (42.5%)	4 (3.0%)	7 (5.2%)	68 (50.7%)
	No	20 (14.9%)	45 (33.6%)	1 (0.7%)	66 (49.3%)
Number	Yes	65 (48.5%)	4 (3.0%)	4 (3.0%)	73 (54.5%)
	No	12 (9.0%)	45 (33.6%)	4 (3.0%)	61 (45.5%)
Sources	Yes	70 (52.2%)	8 (6.0%)	8 (6.0%)	86 (64.2%)
	No	7 (5.2%)	41 (30.6%)	0	48 (35.8%)
Profitable Market	Yes	73 (54.5%)	25 (18.7%)	8 (6.0%)	106 (79.1%)
	No	4 (3.0%)	24 (17.9%)	0	28 (20.9%)
Nature of Degradation	Yes	70 (52.2%)	8 (6.0%)	7 (5.2%)	85 (63.4%)
	No	7 (5.2%)	41 (30.6%)	1 (0.7%)	49 (36.6%)
Constraints	Yes	13 (9.7%)	41 (30.6%)	3 (2.2%)	57 (42.5%)
	No	64 (47.8%)	8 (6.0%)	5 (3.7%)	77 (57.5%)
Suggest	Yes	70 (52.2%)	32 (23.9%)	8 (6.0%)	110 (82.1%)
	No	7 (5.2%)	17 (12.7%)	0	24 (17.9%)

Most of the respondents from the scientific community (54.5%) opined that biodegradable packaging films can be marketed profitably. Nearly equal proportion of retailers of packaging industry expressed that marketing of biodegradable packaging films can be profitable (18.7%) in spite of the cost, and not so profitable (17.9%) because of the cost. More than half of the respondents of the scientific community (52.2%) had a better idea about the nature of degradation of biodegradable packaging materials, whilst a lesser proportion of retailers of packaging industry (30.6%) had an idea about the process of biodegradation.

When questioned about if there were any constraints in popularizing Bio-Degradable packaging films, 47.8% of the scientific community responded that there were no constraints, however, 30.6% of retailers of packaging industry

replied that there were constraints in popularizing biodegradable packaging films, especially for meat packaging. When enquired whether biodegradable packaging films were suggested over conventional petro-chemical based packaging films, most of the scientific community (52.2%) as well as most of the of retailers of packaging industry (23.9%) replied that biodegradable packaging films are suggestible, in view of the environmental hazards caused by conventional petro-chemical based packaging films.

The collected data was analyzed by Levene's Test of equality of error variances (Multivariate analysis (MANOVA), using SPSS 25.0 version. The results of Multivariate analysis for mean difference of the respondent groups were shown in Table 2 To assess the difference between the respondent groups, Tukeys's HSD post hoc test was conducted.

Table 2: Multivariate analysis of variance (MANOVA) of responses received regarding awareness about bio-degradable meat packaging

			Mean Difference	Std. Error	Sig.
Awareness	Scientific Community	Retail Marketers	-.78*	0.052	0.000
		Manufacturers	0.05	0.105	0.874
	Retail Marketers	Scientific Community	.78*	0.052	0.000
		Manufacturers	.84*	0.108	0.000
	Manufacturers	Scientific Community	-0.05	0.105	0.874
		Retail Marketers	-.84*	0.108	0.000
Preferable	Scientific Community	Retail Marketers	-.43*	0.064	0.000
		Manufacturers	-0.09	0.130	0.785
	Retail Marketers	Scientific Community	.43*	0.064	0.000
		Manufacturers	.34*	0.133	0.029
	Manufacturers	Scientific Community	0.09	0.130	0.785
		Retail Marketers	-.34*	0.133	0.029
Differentiate	Scientific Community	Retail Marketers	-.65*	0.068	0.000
		Manufacturers	0.18	0.138	0.389
	Retail Marketers	Scientific Community	.65*	0.068	0.000
		Manufacturers	.84*	0.142	0.000
	Manufacturers	Scientific Community	-0.18	0.138	0.389
		Retail Marketers	-.84*	0.142	0.000
Identify Symbol	Scientific Community	Retail Marketers	-.66*	0.070	0.000
		Manufacturers	0.13	0.143	0.614
	Retail Marketers	Scientific Community	.66*	0.070	0.000
		Manufacturers	.79*	0.147	0.000
	Manufacturers	Scientific Community	-0.13	0.143	0.614
		Retail Marketers	-.79*	0.147	0.000
Number	Scientific Community	Retail Marketers	-.76*	0.063	0.000
		Manufacturers	-.34*	0.129	0.023
	Retail Marketers	Scientific Community	.76*	0.063	0.000
		Manufacturers	.42*	0.132	0.006
	Manufacturers	Scientific Community	.34*	0.129	0.023
		Retail Marketers	-.42*	0.132	0.006
Sources	Scientific Community	Retail Marketers	-.75*	0.058	0.000
		Manufacturers	0.09	0.117	0.719
	Retail Marketers	Scientific Community	.75*	0.058	0.000
		Manufacturers	.84*	0.120	0.000
	Manufacturers	Scientific Community	-0.09	0.117	0.719
		Retail Marketers	-.84*	0.120	0.000
Market Profit	Scientific Community	Retail Marketers	-.44*	0.064	0.000
		Manufacturers	0.05	0.130	0.916
	Retail Marketers	Scientific Community	.44*	0.064	0.000
		Manufacturers	.49*	0.133	0.001
	Manufacturers	Scientific Community	-0.05	0.130	0.916
		Retail Marketers	-.49*	0.133	0.001
Nature of Degradation	Scientific Community	Retail Marketers	-.75*	0.060	0.000
		Manufacturers	-0.03	0.121	0.957
	Retail Marketers	Scientific Community	.75*	0.060	0.000
		Manufacturers	.71*	0.124	0.000
	Manufacturers	Scientific Community	0.03	0.121	0.957
		Retail Marketers	-.71*	0.124	0.000
Constraints	Scientific Community	Retail Marketers	.67*	0.070	0.000
		Manufacturers	0.21	0.143	0.322
	Retail Marketers	Scientific Community	-.67*	0.070	0.000
		Manufacturers	-.46*	0.147	0.006
	Manufacturers	Scientific Community	-0.21	0.143	0.322
		Retail Marketers	.46*	0.147	0.006
Suggest	Scientific Community	Retail Marketers	-.26*	0.067	0.001
		Manufacturers	0.09	0.136	0.781
	Retail Marketers	Scientific Community	.26*	0.067	0.001
		Manufacturers	.35*	0.139	0.037
	Manufacturers	Scientific Community	-0.09	0.136	0.781
		Retail Marketers	-.35*	0.139	0.037

Based on observed means.

The error term is Mean Square (Error) = .133.

*. The mean difference is significant at the .05 level.

Discussion

The fast moving commodity market sector is wondering about the quantity of waste being produced annually. Global discussions on packaging, its usefulness, usability, reusability and above all, ecological aspects are escalating^[2], even with consumer movements on zero-waste ideology are popularizing.

The results of current research with ten different questions to evaluate different stakeholders reveal the levels of awareness of biodegradable meat packaging among them. The difference in the level of awareness regarding the biodegradable packaging materials in food industry was non-significant ($p < 0.05$) between the scientific community and the manufacturers of biodegradable packaging materials, but there was a significant difference ($p < 0.05$) between these two groups and the group consisting of retailers of packaging industry. The results corroborate well with^[3] who noticed that Society's environmental awareness is escalating consistently. According to a survey carried out during December 2018, 70% of Americans are "concerned" about climate change, 29% are "very concerned"^[4, 5]. Also pointed out that negative climate change is the prime awareness concern among the 7.6 million people, reported in a global research conducted at the end of 2019.

A non-significant difference ($p < 0.05$) was noticed between the scientific community and the manufacturers of biodegradable packaging materials, regarding the opinion about the preference for biodegradable packaging materials in food industry compared to conventional petro-chemical based plastics for meat packaging, while there was a significant difference ($p < 0.05$) about the preference for biodegradable packaging materials between these two groups and the retailers of packaging industry group.^[6] Expressed that greater number of consumers are inclined for packaging which is both safe as well as compliant with the environment, apart from being attractive, innovative, and functional. Herrmann et al.^[7] observed that consumers are willing to pay for packaging that they recognize to be eco-friendly and are not willing to pay for packaging's which are not, or about which they are uncertain.

Recognizing the respondents who can distinguish the biodegradable packaging materials from others is critical and it is also essential to assess the stakeholders who actually know which packaging material is truly biodegradable and which is not^[2]. In the current research, there was a non-significant difference ($p < 0.05$) between the scientific community and the manufacturers of biodegradable packaging materials, in differentiating the biodegradable packaging materials in food industry from plastic based meat packaging materials. The ability to differentiate biodegradable packaging materials from plastic based meat packaging materials in food industry was significantly different ($p < 0.05$) between the retailers of packaging industry group and rest of the two groups.

The biodegradable or eco-friendly symbol on meat packaging can be identified both by scientific community and the manufacturers of biodegradable packaging materials with a non-significant difference ($p < 0.05$) between them in identifying the symbol. Whereas a significant difference ($p < 0.05$) existed between these two groups and the group consisting of retailers of packaging industry in identifying the biodegradable or eco-friendly symbol. Illegal labeling of a lot of products with ecological graphic symbols has been increasing now-a-days^[8]. European Commission Research discovered that roughly 50% of companies use fake or

deceptive environmental communications, 37% use ambiguous or vague terms related to the word "eco"^[8]. Hence the stakeholders need to be sensitized regarding biodegradable or eco-friendly symbol.

The number of biodegradable film varieties in meat packaging sector with which stakeholders were familiar with, differed ($p < 0.05$) significantly between the three groups of respondents. The scientific community were familiar with significantly more ($p < 0.05$) number of biodegradable film varieties than the rest of the two groups while the retailers of packaging industry group were familiar with significantly lesser ($p < 0.05$) number of biodegradable film varieties than the rest of the two groups. This might be due to the knowledge levels of scientific community compared to other groups. Higher is the level of educated respondents, better will be the identifying capacity of 100% biodegradable packaging^[2].

The knowledge about the source from which the biodegradable packaging films are made, the opinion about the marketing of biodegradable packaging films profitably inspite of its cost differed non-significantly ($p < 0.05$) between the groups of scientific community and the manufacturers of biodegradable packaging materials. Conversely, a significant difference ($p < 0.05$) was observed between these two groups and the group consisting of retailers of packaging industry pertaining to the knowledge about the source as well as the opinion about the profitable marketing of biodegradable packaging films. The source of biodegradable films was outlined^[9]. Profitability of biodegradable packaging films was congruent with earlier findings^[2].

The remarks of the scientific community about the constraints in popularizing the biodegradable packaging films in meat industry did not vary significantly ($p < 0.05$), with the remarks of manufacturers of biodegradable meat packaging materials. Nevertheless, remarks of the retailers of packaging industry group about the constraints in popularizing the biodegradable packaging films in meat industry differ significantly ($p < 0.05$) with rest of the two groups.

Biodegradable meat packaging films were suggested by all the three groups of respondents. But, a non-significant ($p < 0.05$) difference is perceived between the suggestions of scientific community and manufacturers of biodegradable meat packaging materials and between the suggestions of scientific community and retailers of packaging industry. On the contrary, a significant ($p < 0.05$) difference is observed between the suggestions of manufacturers and the retailers of biodegradable meat packaging materials.

Conclusions

The focus on green packaging is drawing greater attention and gaining momentum globally. The knowledge levels about the utilization of these packaging materials in meat industry have to be updated to various stakeholders of this sector. A knowhow about the awareness regarding the diverse facets of this eco-friendly technique will enable to ascertain the status of different individuals involved in meat packaging. The scientific community group as well as the manufacturers has a superior awareness regarding biodegradable packaging materials. However the levels of retailers of packaging industry are relatively low and measure like campaigns, trainings about the implications and novel initiatives may be imparted to them to enhance their levels of awareness.

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