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Perception of Algerians consumers towards food biodegradable packaging

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Abstract

The present study aims to explore the perceptions of Algerian consumers towards biodegradable packaging. Investigating the factors influencing consumers perceptions provides insights into the Algerian context. Additionally, it highlights the challenges and opportunities for promoting the adoption of biodegradable packaging in Algeria. A survey was conducted among 2000 consumers across four wilayas, i.e., districts: Algiers, Constantine, Ouargla, and Oran, of different age groups. Our results confirm the hypothesis that conventional packaging and its effects on nature have induced significant changes in the purchasing behavior of Algerian consumers, especially in the case of plastic. The results show that most of the respondents have a positive attitude towards ecological packaging, whether it is their price or not.

Keywords: Consumers, food packaging, perception, biodegradable packaging, bioplastic, plastic.

Introduction

In contemporary commerce, packaging plays a pivotal role in determining food quality and serves as a crucial marketing tool, significantly influencing consumer shopping choices (Barska&Wyrwa, 2016). The global consumption of plastic has seen a remarkable surge annually (Siddique et al., 2008). Plastic packaging, which gained prominence in the consumer market during the 1930s and 1940s, has become ubiquitous in the 21st century due to its unparalleled properties such as transparency, durability, and resistance to various elements (Kosior & Crescenzi, 2020). Projections by the Ellen MacArthur Foundation (2016) suggest a doubling of plastic consumption in the next two decades and nearly quadrupling by 2050. Algeria's per capita plastic consumption stands at around 15 kg annually, relatively lower compared to industrialized nations where a significant portion of plastic waste ends up in nature, seas, and waterways (Chiheb, 2021). The country utilizes approximately seven billion plastic bags annually, positioning it as a major global consumer of plastic bags (Ait Sedik, 2021). The World Economic Forum (2020) has highlighted concerns that if current trends in plastic production and consumption persist, ocean plastic pollution could triple by 2040. Issues like non-biodegradability, recycling challenges, and the potential leaching of harmful substances into the environment raise serious health and environmental apprehensions (Savard, 2013). The COVID-19 pandemic has significantly impacted consumer shopping and dietary behaviors globally (Ammar et al., 2020; Sheth, 2020). The environmental impact of household products is increasingly influencing consumer choices (Lazzarini et al., 2016). Efforts to address the environmental hazards posed by plastic polymers have led to the exploration of bio-based polymers as sustainable alternatives to conventional plastic packaging (Kumar, 2020). However, concerns about product quality, environmental impact, and barrier properties arise when considering the elimination or substitution of plastic packaging with alternative materials (White & Lockyer, 2020; Koutsimanis et al., 2022). Bioplastics, derived mainly from renewable sources like plant materials, offer sustainability advantages including reduced greenhouse gas emissions during

production compared to fossil-based plastics (Herrmann et al., 2022). These materials are often biodegradable and have minimal environmental impact (Mannina et al., 2019). Predictions indicate a global bioplastic production of 7.8 million tons by 2026 (Surendren, 2022), underscoring the promising future of bioplastics (Schulze et al., 2017; Zoubir & Benchikh, 2020). Innovations in food packaging systems are geared towards meeting evolving market demands for healthier, high-quality food options while mitigating the adverse environmental effects of packaging (Han et al., 2022). In the context of this research, perception refers to how consumers sense, select, and interpret information (Cant et al., 2006). The objective of these studies is to compare consumer preferences between plastic and bioplastic packaging in Algeria and gauge their attitudes towards biodegradable packaging.

Material and methods Study

area

Descriptive research method was used to achieve the objective of this study. The study area was segmented into four areas, the four wilayas of Algeria; Oran, Algiers, Ouargla, and Constantine (Figure 1). This area was chosen because of its cosmopolitan and urbanized nature. Also, no previous study on this subject has been conducted in this area. The choice of these wilayas is also linked to the importance of the packaging sector, so they have a place in the economy at local and national level.

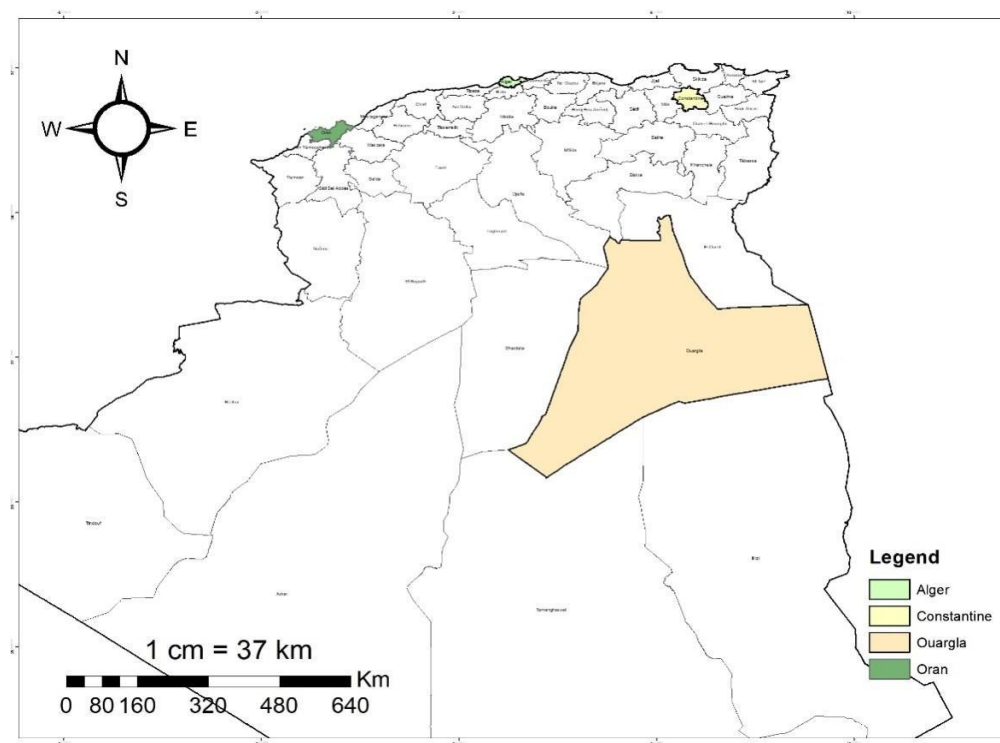


Figure 1: Geographical map showing the distribution of the wilayas surveyed

(The study area)

Sample selection

The study population comprised packaging traders and consumers within the designated area. Participants were required to meet specific inclusion criteria, which entailed being regular users of packaged food, aged 18 or above, and the primary purchasers of food items. This selection criterion was based on the premise that individuals fitting this profile encounter food packaging most frequently during their food selection and purchasing processes (Venter et al., 2006). A deliberate selection process targeted popular markets specializing in food products and vegetables. Daily packaging activities were observed across all sampled marketplaces, with seven prominent supermarkets chosen for the study: Ritaj Mall, Magic House, City Center, Senia, Souk Dubai, Commercial Center of Bab Ezzouar, and Medina Jdida market. The sample size for the study comprised 2000 participants.

Data Collection Instrument

A self-administered preliminary questionnaire was utilized for data collection. The questionnaire, created in French using Google Forms, was disseminated online over a two-month period from December 2022 to January 2023. Conducting the preliminary survey was deemed essential to identify the target population for investigation, understand their characteristics, and determine which wilayas exhibit significant usage of packaging. Subsequently, the final survey, which was pre-tested, pre-coded, and well-structured, was administered face-to-face and required approximately three to five minutes for completion after a brief explanation of its purpose. To ensure respondent anonymity, questionnaires were identified by a 4-digit code rather than the respondent's name. The focus was on supermarkets to capture individuals with diverse educational backgrounds. For participants who were unable to read or write, questions were verbally presented, and responses were duly recorded on the questionnaire. Data collection for the survey took place from January to April 2023. The survey was divided into two sections, comprising 11 questions that included both multiple-choice closed-ended and open-ended queries, allowing respondents to select specific answers or freely express their opinions. The collected questionnaire data was structured by coding the questions to facilitate data compilation. The first part of the survey gathered socioeconomic information such as gender and age, while the second part focused on recording patterns of packaging use, perceptions, and preferences.

Statistical analysis

The statistical data analysis methods employed in this study included: (i) Univariate analysis: This involved utilizing basic statistics and frequency distributions to describe the data. Descriptive statistics were utilized to provide an overview of the data, offering insights into its distributions and the frequencies of responses. (ii) Bivariate analysis: Specifically, cross tabulations and factor analysis were conducted. Chi-square contingency tests were utilized to assess the impact of

sociodemographic characteristics on the data. (iii) Hierarchical cluster analysis (HCA): HCA was performed using IBM SPSS V 22 to explore the relationship between consumer characteristics. Grouping was employed to investigate community structure and identify patterns within clusters, revealing the hierarchical organization of groups based on decreasing similarities between clusters. (iv) Principal components analysis (PCA): PCA was conducted using IBM SPSS V 22 to establish relationships among multiple primary variables and identify common factors among them. This analysis helped in understanding the underlying structure and patterns within the data.

Results and discussion

Sociodemographic profile of consumers

The sociodemographic profile of consumers data is given in (Table 1). The survey revealed that the majority 1204 (60.2%) of respondents are men with compared to 796 female respondents (39.8%). Moreover, the predominance of males in our sample resembles the Algerian reality, which has 49.4% women and 50.6% men (ONS, 2012), our results confirm that in our study area men are responsible for the purchases. Data analyses showed that 45.6% of consumers were aged between 25-35 years with mean age of 33 years. This implies that they were active and physically capable and responsible for their purchases, our results showed that majority of the consumers inside the markets are youths. A large percentage 60.6% of participants had university level. 24.9 % of population were educated at secondary school or baccalaureate, while 9.3% had postgraduate degrees, and 4.8% were educated at primary school or vocational training school, and only 0.4% of the sample had no studies. In terms of marital status 58.6% of participants were married, while 40% were single. Concerning employment status, most respondents are employed (39.3%), while almost the same percentage for those who are not employed (34.25 %), housewife (21.55%). There are also a few students (4.9%). In 83.8% of cases, packaging consumers are not satisfied about their monthly income. The Cronbach's Alpha was 0.985 which makes our results very reliable.

Table 1: Sociodemographic profile of packaging consumers (N=2000).

		Frequency	(%)
Gender	Female	796	39.8
	Male	1204	60.2
Age	18-25	188	9.4
	25-35	912	45.6
	35-50	646	32.3
	50-69	254	12.7
Level of education	Noformal education	8	0.4
	Primary	96	4.8
	Secondary	498	24.9
	University	1212	60.6
	Higher	186	9.3
Occupation	Unemployed	685	34.25
	Housewife	431	21.55
	Employee	786	39.3
	Student	98	4.9
Marital status	Single	800	40
	Married	1172	58.6
	Divorced	22	1.1
	Widower	6	0.3
Monthly income	Enough	234	11.7

	Not enough	1676	83.8
	Enough and more	90	4.5
Theself- assessment	Excellent	876	43.8
	Very good	765	38.25
	Good	312	15.6
	Bad	47	2.35
Wilaya	Algiers	460	23
	Oran	453	22.65
	Constantine	600	30
	Ouargla	487	24.35

Biodegradable packaging use frequency according to sociodemographic variables

Table 2 shows the cross tabulations for biodegradable packaging use frequency and socioeconomic characteristics with statistically significant coefficients. According to the table, the major part of our survey represented (36.78%) always consume biodegradable packaging, while the others (29.91%) often use biodegradable packaging, (18.56%) of participants use this type rarely and (14.73%) never use it. It seems that biodegradable packaging is not really used by the population in this research. The same statement was observed when analyzing the socioeconomic characteristics with the use of biodegradable packaging (Table 2). Chi-square test confirmed that all the characteristics presented significant differences ($P < 0.05$). Due to these, other analyses HCA and PCA were used to verify the results and confirm the relation between the socioeconomic parameters and use.

Table 2: Cross tabulations of biodegradable packaging use frequency and reasons of consumption according to socioeconomic characteristics.

Variable	Packaging Use Frequency	χ^2	P-value
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		Always	Often	Rarely	Never		
Sexe	Female	127	395	190	84	629.348a	.000 ***
	Male	249	565	267	123		
Age	18-25	20	31	46	91	90.428a	.000 ***
	25-35	45	356	275	236		
	35-50	214	222	82	128		
	50-69	91	54	56	53		
Level of education	No formal education	2	1	1	4	181.740a	.000 ***
	Primary	30	13	21	32		
	Secondary	195	198	36	69		
	university	412	269	383	148		
	Higher	85	34	18	49		
Occupation	Unemployed	258	194	97	136	143.572a	.000 ***
	Housewife	30	210	145	46		
	Employed	333	108	223	122		
	Student	59	29	6	4		
Marital status	Single	85	369	45	301	330.700a	.000***
	Married	572	325	144	86		
	Divorced	4	10	6	2		
	widower	0	4	2	0		
Monthly income	Enough	34	61	43	96	410.620a	.000 ***
	Not enough	793	478	249	156		
	Enough and more	26	3	32	29		
The self-assessment	Excellent	546	200	72	58	924.388a	.000 ***
	Very good	335	170	152	108		
	Good	167	115	24	6		
	Bad	9	1	27	10		
Wilaya	Algiers	276	105	61	18	1025.652	.000***

	Oran	190	218	41	4	a	
	Constantine	300	246	11	43		
	Ouargla	187	209	72	19		

***:High level of signification

Principal Component Analysis (PCA) and Hierarchical cluster analysis (HCA)

The Principal Component Analysis PCA results (figure 2) show that the figure quality is very good, with the F1 and F2 axes representing 91.20% and 2.82% of the variation, respectively. We can observe from the PCA plot (figure 2 a) that all of the characteristics studied were classified into three groups. From the PCA we can observe that wilaya and sex, wilaya and age form an angle indicating that they are independent of each other, as well as for self-assessment and marital status. Level of education and occupation are very close, this indicates that they are well correlated and represented by axis 1 same thing for monthly income and self-assessment. Age and sex are correlated too. The Hierarchical cluster analysis HCA classification as shown (figure 2 b), an average group-linking method based on Pearson's correlation was used to create a hierarchical agglomerative dendrogram. The clustering dendrogram demonstrated that the characteristics were grouped into three main groups clusters, confirming the PCA results. In the first cluster sex and marital status were grouped together, when the second cluster contains age, occupation, wilaya and the self-assessment, then the third one contains only the level of education and monthly income in the last cluster. The results of PCA and HCA clarified the separation of the parameters into discriminate clusters.

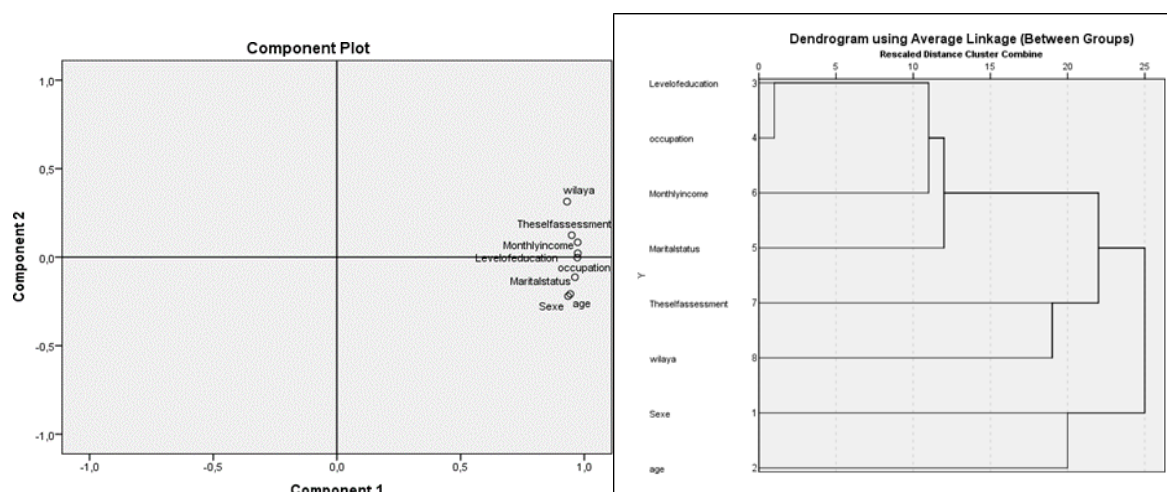


Figure 2: Correlation between socio demographic characteristics:(a) PCA, (b) HCA.

Frequency of consumption of different types of packaging

In Table 3 the proportion of packaging consumption, plastic was the packaging most frequently used 68.3 %, the majority of population said that plastic is the most used compared to other packaging. Fourteen per cent of consumers prefer glass packaging and even paper, additional metal packaging was used by a 2.5% of population. In the same context Peters-Teixeira and Badrie (2005) find also that Plastic was the best choice of packaging material (39%) compared with glass (19.5%), box (12.2%), paper (4.9%) foil (2.4%) and metal (2.5%).

Table 3: Frequency of use of different types of packaging(N=2000).

Packaging consumed	Frequency	Proportion%
Plastic	1367	68.35
Paper	292	14.6
Glass	292	14.6
Metal	49	2.45

As per Roosens (2019), consumers exhibit a preference for plastic due to its flexibility, ease of shaping, transparency, and the lower production temperatures required compared to glass. Plastic

materials are noted for their specific solidity. Conversely, Venter et al. (2011) observed that glass packaging is often associated with high-quality food products, while some participants linked carton boxes and plastic to lower quality items due to the perception that plastic packaging, being cost-effective, may contain less durable and cheaper products than those in glass containers. Various packaging statistics (e.g., Ingham, 2002; Business Insights, 2003; Future Innovation Today, 2006) indicate that plastic and carton are widely favored packaging materials. Van der Merwe (2013) highlighted a preference for plastic bottles over carton boxes. However, Draskovic et al. (2009) found that participants generally view glass as aesthetically pleasing and associated with higher quality products. Glass offers several advantages in food packaging as it provides protection by being impermeable to gases and vapors, as well as odors and flavors, thereby preserving the organoleptic properties of the food (Marsh and Bugusu, 2007). While consumers may express rational opinions about packaging choices, convenience in daily life often emerges as a primary factor influencing their decisions. Consumers may prioritize ease of use when selecting packaging materials, indicating a potential gap between preferences and actual behavior in packaging choices.

Place of bioplastic in consumer's choice

In order to achieve the objective of the study consumers were asked about their preference of plastic or bioplastic. 85% of respondents demonstrated a strong awareness of plastic's environmental impact, aligning with findings by Li et al. (2020) indicating higher acceptance of innovative food packaging compared to traditional options. Otto et al. (2021) highlighted consumer preferences for packaging that minimizes waste, integrates recycled materials, and is recyclable post-use. Kitz et al. (2021) reported that respondents were motivated to reduce plastic food packaging usage due to its environmental consequences. Participants justified their responses based on the detrimental effects of plastic on the environment and human health, including environmental pollution, ecosystem imbalance, water and soil contamination, and harm to marine and animal life. They expressed concerns about plastic's contribution to marine pollution, climate

change through microplastic breakdown, and the release of carcinogenic particles during production. Migration of harmful substances from plastic into food was also cited as a health risk, emphasizing the long-term impact on human health and the environment. Consumers, as per Li et al. (2020), are increasingly seeking higher quality and improved taste, often emphasizing concepts like "clean label." The promotion of compostable bioplastic food packaging as a sustainable alternative to conventional plastics is gaining traction in the food industry. Organizations are integrating these products into circular economy and sustainability strategies, recognizing their renewable sourcing, biodegradability in natural environments like soil or compost, and overall environmental benefits (Springle et al., 2022).

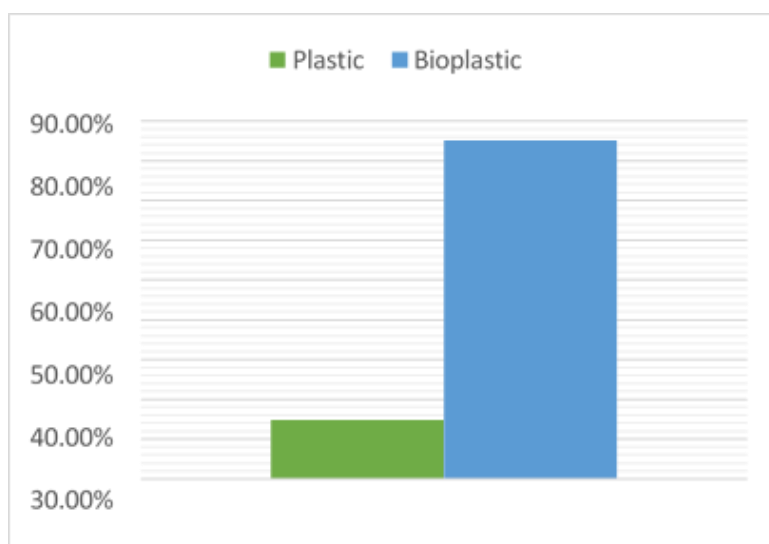


Figure 3: Place of bioplastic in consumers choice

Purchase value and willingness to pay

The analysis revealed that most consumers 54% are willing to pay more for a bioplastic, in a similar vein, Klein et al. (2019) observed that over 56% of the German population expressed interest in bioplastic items, while Scherer et al. (2018) reported a figure of 60%. Furthermore, Notaro et al. (2022) highlighted that Italian consumers exhibit a willingness to pay more for bioplastic jackets and disposable cups compared to conventional alternatives. A global study demonstrated a rapid shift in consumer attitudes, with 73% of individuals across 11 countries showing a readiness to

invest in eco-friendly packaging (Popovic et al., 2020). Consumer preferences for bioplastic products are influenced by various factors such as consumer intentions, green values, attitudes towards bioplastics, altruism, subjective norms, and innovation as identified by Rumm (2016), Scherer et al. (2017), and Klein et al. (2019). Additionally, socio-demographic characteristics including age, gender, education, and income play a role in shaping consumer decisions regarding bioplastic purchases as highlighted by Yue et al. (2010), Rumm (2016), and Scherer et al. (2018).

Conclusion

By examining Algerian consumers perceptions of biodegradable packaging, this study provides that Algerians want to introduce ecological packaging in their daily lives, to preserve the environment. Plastic causes several harmful effects on health and the environment and especially the marine flora, this which has been induced by the change in the attitudes of Algerians vis-à-vis plastic packaging and its replacement by bio-plastic; which is the ecological alternative to plastic, and finally our survey has allowed us to understand that Algerians are ready to pay more for ecological packaging and why not biodegradable plastic. We hope that our results will stimulate further research and discussion on this subject, leading to positive change in the packaging industry and a more sustainable future for Algeria.

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