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RESEARCH ARTICLE

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DURABILITY EVALUATION OF BIKE BASKET MADE FROM ASEPTIC CARTON BOXES AFTER WEATHER EXPOSITION

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ABSTRACT

Aseptic carton boxes are domestic waste normally found in milk juice boxes. These materials are composed of paper layers, aluminum, and polyethylene that grant to the material, among other characteristics, good resistance and durability. However, this composition also makes harder the recycling process of these packages due to the labor of separating the materials that integrate these boxes. Therefore, this work aimed to evaluate the resistance to weather in bike baskets made from aseptic carton boxes. Some of the samples were placed outdoors and some indoors, both were analyzed periodically. The aesthetic, as well as the weight of some samples and some data, were acquired on an excel spreadsheet and analyzed. Thus, it was observed through data observation that samples that were painted with black paint had better resistance to climate change weather than those that did not have that procedure. Therefore, it was possible to conclude that painting plays an important role in the resistance of bike baskets made from aseptic carton boxes to the weather adversity, also it was possible to prove the viability of baskets made from milk boxes.

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INTRODUCTION

According to *Política Nacional de Resíduos Sólidos*, domestic solid residues can be defined as those coming from domestic activities in urban areas (Brasil, 2012). Among the different types of domestic solid residues, we can name aseptic carton boxes, which are commonly found in drink packages, such as milk. Thus, according to Cembranel *et al.* (2019), aseptic carton boxes are materials composed of six layers of three different materials, grouped as shown in figure 1, from inside out it follows: double polyethylene layer, one aluminum layer, one polyethylene layer, one layer of carton box and the last layer of polyethylene layer. Therefore, each layer grants the package a new feature. The carton box assures the resistance and stability of the package, whereas the polyethylene makes it waterproof and it is also responsible for adherence of the other layers and aluminum blocks the entrance of light and oxygen to the material interior, stopping them from having contact with the food or drink, which increase product's shelf life at room temperature (Marques *et al.*, 2018). This group of layers ensures that the aseptic packages will be kept in cabinets in consumers' residences and shelves in the Market for a long period without the necessity of refrigeration, as

long as the packages are sealed, which is favorable to the food sector. However, the package composition in layers that have different chemical characteristics and properties makes it harder its recycle. (Wuillda *et al.*, 2017). Therefore, the carton packages recycling tends to be done on an industrial scale, wherein a recycling industry their components are separated and each separate component will form a new product. For example, aluminum may form a can, carton paper may turn into recycled paper and low-density polyethylene (PEBD) can be transformed into roof tiles or pellets (Fensterseifer *et al.*, 2017). Due to the difficulty of recycling, handcrafted recycling emerges as a simpler way of classifying these materials. In this recycling method, the packages will be transformed into new products through a handcrafted process, without the necessity of material separation, in other words, the craftsman will cut, fold, glue, and paint the material according to the specified procedures depending on the product to be produced (Ferreira *et al.*, 2020). Handcrafted recycling can generate multiple types of products, such as baskets, wallets, comfort, blankets among others. An example of a product generated from aseptic carton packages is the thermal comfort/blankets produced by ONGs such as Irmão Girassol de Pernambuco (GI, 2021). This ONG retrieves milk boxes and juice to elaborate the thermal comfort that is distributed to the homeless people in Recife. This comfort, due to its

packaging properties, works as insulation agents, making these people's nights less cold. In this context, before using aseptic carton packs in a product, it is advisable to check if it has sufficient strength and durability for this function. The weather resistance test is an experiment that is applied to verify the variations that a material can suffer when it is submitted to climatic changes. By performing this test, it is possible to analyze the durability of the material (Guimarães *et al.*, 2020). The objective of this work was to analyze the durability of baskets made with aseptic carton packs when subjected to different climate changes in a weather resistance test. For this, a basket of aseptic carton packs and 7 samples were placed outdoors and 7 samples placed indoors were used, and their results were taken and periodically evaluated.

METHODOLOGY AND METHODS

The methodology describes the chosen method to either solve or explain the problem that will be evaluated by the author. According to Gil (2017), the types of Methodology can be classified from their objectives and technical procedures. According to Miguel *et al.* (2012), the methodological importance of work can be justified by the need for an adequate scientific basis, by the search for the best approach to address the research questions. Also, according to these authors, the case study is one of the most frequently adopted approaches in Brazil, by production engineering and operations management field. The scientific method is characterized by choosing systematic procedures for the description and explanation of a given situation under study and its choice must be based on two basic criteria: the nature of the objective to which it is applied and the objective pursued in the study (Fachin, 2001). Regarding the objective, this research can be characterized as a descriptive one, as it described the characteristics of the aseptic carton pack basket when submitted to the weather resistance test. As per the technical procedures used, one can also classify this research as experimental research, as it aimed to test the feasibility and resistance of using milk cartons subjected to climate change (GIL, 2017). Regarding the test, first, the basket of aseptic carton packs was elaborated, so that it could be used as a sample for the weather resistance test. To make the basket, 6 empty milk carton packages were collected, opened, and sanitized with neutral soap and running water. Then, the packages were dried with a dry cloth or paper and they were placed stretched out in a closed and aired environment for approximately 24 hours. After the aforementioned period, the packages were cut and painted with black paint, which was the end product treatment for the product (finishing). After drying the paint, the basket was assembled and it was ready for analysis. Besides the basket, 14 samples of the material were also used: seven were painted in black and seven were used without finishing, it was just left with the label. These samples were also separated so that 7 samples were kept indoors and 7 samples were kept outdoors. To carry out the basket and samples, Molico and Ninho from Nestle brands of milk packages were used.

Table 1. Samples used in the essay to the resistance to the weather resistance test

Weather Resistance test Samples			
Outdoor samples	Samples without ink	A1	
		A2	
		A3	
		A4	
Painted samples		B1	
		B2	
		B3	
Indoor samples	Samples without ink	Basket	
		C1	
		C2	
		C3	
	Painted samples		C4
			D1
			D2
		D3	

Therefore, the samples were separated as follows, considering the availability of material found: 4 samples without black paint that were placed outdoors (A1, A2, A3, and A4), 3 painted samples that were placed outdoors (B1, B2, and B3), 4 unpainted samples were placed in a covered environment (C1, C2, C3, and C4) and 3 samples with black paint that were placed in a covered environment (D1, D2, and D3). Table 1 presents the sample glossary in a simplified way. Thus, all samples were weighed and periodically analyzed with photos and notes, and their results were compared with each other to assess the resistance of the material when subjected to different climate changes. The results were collected on the first day of analysis, then analyzes were performed after one week and then every 15 days until 8 fortnights were completed (10 analyzes performed in 4 months and 10 days of testing). At the end of each analysis, the results were recorded in a notebook and an Excel spreadsheet, taking into account data, such as day of acquisition, time of analysis, climate, temperature, maximum temperature, minimum temperature, rainfall, humidity, the weight of the basket and sample weight. A comparative table was also built showing the difference between the weights of the current day's analysis and the weights collected in the previous analysis, to confirm whether there was any change in the weight of each of the samples.

RESULTS AND DISCUSSION

First, a preliminary analysis was carried out, so that one could record the initial weights of each sample and the basket. These data and other important pieces of information mentioned above were organized in an Excel spreadsheet so that they could be analyzed later, as shown in Table 2.

Table 2. Initial data collected in the first experiment essay

Day 1					
Date	01/14/2021	Hour	11:06	Temperature	32°C
Weather	Sunny				
Rain Rate	7mm	Rain Rate %	90%		
Air humidity	44% a 71%	Maximum	33°C	Minimum	23°C
Basket Weight	111g				
Sample Weight					
Outdoor Samples			Indoor Samples		
Sample	Weight (g)	Sample	Weight (g)	Sample	Weight (g)
A1	2	C1	1		
A2	2	C2	1		
A3	1	C3	2		
A4	2	C4	1		
B1	2	D1	2		
B2	1	D2	1		
B3	1	D3	2		

The second trial analysis (Week 1) was performed one week after the first analysis (Day 1). Thus, it was observed the weights of the samples and the basket and their variations when compared to the previous week.

Table 3. Data collected in the first week of the weather resistance test

Week 1					
Date	01/22/2021	Hour	18:40	Temperature	28°C
Weather	Sunny				
Rain Rate	5mm	Rain Rate %	90%		
Air humidity	37% - 65%	Maximum	34°C	Minimum	20°C
Basket Weight	111g				
Sample Weight					
Outdoor Samples			Indoor Samples		
Sample	Weight (g)	Sample	Weight (g)	Sample	Weight (g)
A1	1	C1	2		
A2	1	C2	1		
A3	1	C3	1		
A4	1	C4	2		
B1	1	D1	1		
B2	1	D2	1		
B3	1	D3	1		

Therefore, it was identified that 7 out of 14 samples suffered a reduction in their weight (A1, A2, A4, B1, C3, D1, and D3), 5 samples maintained the average weight (A3, B2, B3, C2, and D2) and only 2 samples increased in weight (C1 and C4). Regarding the aseptic carton boxes basket, it did not vary in weight, maintaining the initial value. This procedure, performed at Week 1, was performed every 15 days and its results were always compared with the previous analysis. Most of the samples had a decrease in weight. This fact can be associated with the increase in temperature during the week in which the material was being tested, also to the low occurrence of rainfall. Table 3 presents the data from the second week of testing, while Table 4 indicates the variation between the data collected in the first two weeks:

Day 1		Week 1		Weight Difference (g)
Sample	Weight (g)	Sample	Weight (g)	
Basket	111	Basket	111	0
A1	2	A1	1	-1
A2	2	A2	1	-1
A3	1	A3	1	0
A4	2	A4	1	-1
B1	2	B1	1	-1
B2	1	B2	1	0
B3	1	B3	1	0
C1	1	C1	2	1
C2	1	C2	1	0
C3	2	C3	1	-1
C4	1	C4	2	1
D1	2	D1	1	-1
D2	1	D2	1	0
D3	2	D3	1	-1

Table 4. Differences from sample weights of day 1 to week 1 of the weather resistance test essay

The third analysis (Fortnight 1), which was performed 15 days after the previous analysis, identified that of the 14 samples: 7 maintained their weight (A3, B2, B3, C4, D1, D2, and D3), 6 gained weight (A1, A2, A4, B1, C2, and C3) and only one decreased weight (C1). The samples that are located in an open environment and without a paint finish (A1, A2, A3, A4) began to warp, showing a certain size (Figure 2), still due to the increase in temperature. The basket reduced its weight by 2g, concerning the previous analysis, and presented an expansion and span, modifying its shape a little. Tables 5 and 6 show the data for Fortnight 1 and the variations found between the results of Week 1 and Fortnight 1:

In Fortnight 2, of the 14 evaluated samples: 8 (B1, B2, B3, C2, C4, D1, D2, D3) had no significant increase or reduction in weight, 5 samples (A1, A2, A3, A4, and C1) increased in weight and only one decreased in weight (C3).



Figure 21. Frontal and back label A1 (outdoors without paint finishing) (AUTHOR, 2021)

This fact can be explained by the intense rains that occurred during the evaluated week, which resulted in compensating the high temperatures prevailing at this time of year. For this reason, some samples also showed changes such as peeling off the label, peeling off the ink, and increasing the span.

Table 5. Data collected in the Dados coletados na Quinzena 1 de ensaio de resistência a intempéries

Fortnight 1					
Date	02/04/2021	Hour	16:04	Temperature	36°C
Weather	Sun with clouds				
Rain Rate	5mm	Rain Rate %	90%		
Air humidity	34% - 64%	Maximum	40°C	Minimum	24°C
Basket Weight	109g				
Sample Weight					
Outdoor Samples			Indoor Samples		
Sample	Weight (g)	Sample	Weight (g)		
A1	2	C1	1		
A2	2	C2	2		
A3	1	C3	2		
A4	2	C4	2		
B1	2	D1	1		
B2	1	D2	1		
B3	1	D3	1		

Table 6. Differences in weight of samples of week 1 to fortnight 1 of the weather resistance test

Week 1		Fortnight 1		Weight Difference (g)
Sample	Weight (g)	Sample	Weight (g)	
Basket	111	Basket	109	-2
A1	1	A1	2	1
A2	1	A2	2	1
A3	1	A3	1	0
A4	1	A4	2	1
B1	1	B1	2	1
B2	1	B2	1	0
B3	1	B3	1	0
C1	2	C1	1	-1
C2	1	C2	2	1
C3	1	C3	2	1
C4	2	C4	2	0
D1	1	D1	1	0
D2	1	D2	1	0
D3	1	D3	1	0

The basket also underwent alterations, it was dismantled in some points, increased by 13g in weight, and presented a more oval shape (Figure 3).



Figure 3. Carton boxes basket in egg shape, the result of the second-fortnight analysis (AUTHOR, 2021)

Table 7 presents data for Fortnight 2 while Table 8 presents the difference between the result for Fortnight 1 and Fortnight 2. In the fifth analysis of the essay (Fortnight 3), it was observed that 7 samples increased in weight (B1, B2, B3, C2, C3, C4, and D2), 5 remained with the same weight (A1, A4, C1, D1, and D3) and 2 decreased in weight (A2 and A3). In addition, the basket increased by 2 g in weight, possibly due to the rains that occurred during the week. Therefore, some samples kept outdoors started a decomposition process, that is, the layers that form the material started to separate naturally (Figure 4). Tables 9 and 10 present the results of this analysis:

Table 7. Data collected in the second fortnight of the essay on Weather

Fortnight 2					
Date	02/20/2021	Hour	20:42	Temperature	25°C
Weather	Rain showers				
Rain Rate	8mm	Rain Rate %	90%		
Air humidity	49% - 79%	Maximum	32°C	Minimum	22°C
Basket Weight	122				
Sample Weight					
Outdoor Samples			Indoor Samples		
Sample	Weight (g)	Sample	Weight (g)	Sample	Weight (g)
A1	3	C1	2		
A2	3	C2	2		
A3	3	C3	1		
A4	3	C4	2		
B1	2	D1	1		
B2	1	D2	1		
B3	1	D3	1		

Table 8. Difference of weights of fortnight 2 to fortnight 1 from the weather resistance test

Fortnight 1		Fortnight 2		Weight Difference (g)
Sample	Weight (g)	Sample	Weight (g)	
Basket	109	Basket	122	13
A1	2	A1	3	1
A2	2	A2	3	1
A3	1	A3	3	2
A4	2	A4	3	1
B1	2	B1	2	0
B2	1	B2	1	0
B3	1	B3	1	0
C1	1	C1	2	1
C2	2	C2	2	0
C3	2	C3	1	-1
C4	2	C4	2	0
D1	1	D1	1	0
D2	1	D2	1	0
D3	1	D3	1	0

Table 9. Collected data in fortnight 3 of the weather resistance test

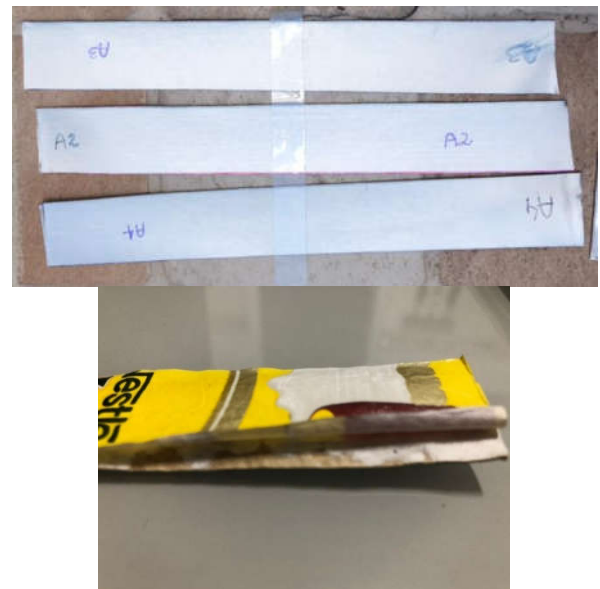
Fortnight 3					
Date	03/06/2021	Hour	16:05	Temperature	29°C
Weather	Cloudy with rain showers				
Rain Rate	30mm	Rain Rate %	67%		
Air humidity	54%	Maximum	32°C	Minimum	25°C
Basket Weight	124g				
Sample Weight					
Outdoor Samples			Indoor Samples		
Sample	Weight (g)	Sample	Weight (g)	Sample	Weight (g)
A1	3	C1	2		
A2	2	C2	3		
A3	2	C3	2		
A4	3	C4	3		
B1	3	D1	1		
B2	2	D2	2		
B3	2	D3	1		

At fortnight 4 it was identified that 6 samples decreased (A1, A4, B1, B2, C2, and C4), 6 maintained (B3, C1, C3, D1, D2, and D3) and only two increased in weight (A2 and A3). The carton pack basket was reduced by 14g in weight and showed small tears, in addition to the

paint standing out in some points. In addition, another important variation was related to the label of unpainted samples outdoors, which became wrinkled after the last changes in the weather (Figure 5). This fact can be explained by the increase in temperature present in the days before the analysis. Tables 11 and 12 present the research results.

Quadro 10. Weight differences from fortnight 3 samples to fortnight 2 from weather resistance test

Sample	Fortnight 2		Fortnight 3		Weight Difference (g)
	Weight (g)	Sample	Weight (g)	Sample	
Basket	122	Basket	124		2
A1	3	A1	3		0
A2	3	A2	2		-1
A3	3	A3	2		-1
A4	3	A4	3		0
B1	2	B1	3		1
B2	1	B2	2		1
B3	1	B3	2		1
C1	2	C1	2		0
C2	2	C2	3		1
C3	1	C3	2		1
C4	2	C4	3		1
D1	1	D1	1		0
D2	1	D2	2		1
D3	1	D3	1		0



Sample at the first day of analysis Samplefortnight 3

Figure 4. Comparison between the sample kept outdoors without finishing in black paint at the initial stage and the decomposing sample (AUTHOR, 2021)

Table 11. Data collected in fortnight 4 from the weather resistance test

Fortnight 4					
Date	03/20/2021	Hour	15:37	Temperature	31°C
Weather	Sunny				
Rain Rate	0	Rain Rate %	0%		
Air humidity	52%	Maximum	33°C	Minimum	21°C
Basket Weight	110g				
Sample Weight					
Outdoor Samples			Indoor Samples		
Sample	Weight (g)	Sample	Weight (g)	Sample	Weight (g)
A1	2	C1	2		
A2	3	C2	2		
A3	3	C3	2		
A4	2	C4	2		
B1	1	D1	1		
B2	1	D2	2		
B3	2	D3	1		

Fortnight 5 showed more results regarding the aesthetics of the samples, as the labels of outdoor samples peeled off and wrinkled more. Furthermore, the weights of the samples in a covered environment were kept the same, as well as the weight of A1. In addition, samples A2, A3, A4, and B3 decreased in weight, while samples B1 and B2 swelled even more. Tables 13 and 14 present the research results.

Table 12. Difference from weights of fortnight 4 to fortnight 3 from the weather resistance test

Fortnight 3		Fortnight 4		Weight Difference (g)
Sample	Weight (g)	Sample	Weight (g)	
Basket	124	Basket	110	-14
A1	3	A1	2	-1
A2	2	A2	3	1
A3	2	A3	3	1
A4	3	A4	2	-1
B1	3	B1	1	-2
B2	2	B2	1	-1
B3	2	B3	2	0
C1	2	C1	2	0
C2	3	C2	2	-1
C3	2	C3	2	0
C4	3	C4	2	-1
D1	1	D1	1	0
D2	2	D2	2	0
D3	1	D3	1	0



Figure 5. Samples kept outdoors without using finishing black paint in decomposing and wrinkled (AUTHOR, 2021)

Table 13. Data collected at fortnight 5 from the weather resistance test

Fortnight 5					
Date	04/02/2021	Hour	16:27	Temperature	28°C
Weather	Cloudy				
Rain Rate	5mm	Rain Rate %	90%		
Air humidity	58%	Maximum	30°C	Minimum	20°C
Basket Weight	120				
Sample Weight					
Outdoor Samples			Indoor Samples		
Sample	Weight (g)	Sample	Weight (g)	Sample	Weight (g)
A1	2	C1	2		
A2	2	C2	2		
A3	2	C3	2		
A4	1	C4	2		
B1	2	D1	1		
B2	2	D2	2		
B3	1	D3	1		

Table 14. Difference from weights of fortnight 5 to fortnight 4 from the weather resistance test

Fortnight 4		Fortnight 5		Weight Difference (g)
Sample	Weight (g)	Sample	Weight (g)	
Basket	110	Basket	120	10
A1	2	A1	2	0
A2	3	A2	2	-1
A3	3	A3	2	-1
A4	2	A4	1	-1
B1	1	B1	2	1
B2	1	B2	2	1
B3	2	B3	1	-1
C1	2	C1	2	0
C2	2	C2	2	0
C3	2	C3	2	0
C4	2	C4	2	0
D1	1	D1	1	0
D2	2	D2	2	0
D3	1	D3	1	0

In fortnight 6 it was observed that 8 samples had no significant change in their weight (B1, B2, C1, C2, C3, C4, D2, and D3) and 6 increased in weight (A1, A2, A3, A4, B3 and D1), of which three increased by approximately 2g (A1, A2 and A4). In this analysis, none of the samples decreased in weight. Regarding the weight of the basket, it also increased by about 17g (Tables 15 and 16). Furthermore, it is important to emphasize that these data were obtained from an analysis carried out on a rainy day, in which the samples located outdoors were wet due to the rain, which increased the weight of the samples by swelling them. In addition, the label of samples outdoors and without the paint finishes more unstuck from the packaging, probably due to the high exposure to rainwater.

Table 15. Data collected at fortnight 6 from the weather resistance test

Fortnight 6					
Date	04/19/2021	Hour	15:45	Temperature	26°C
Weather	Rain showers with wind				
Rain Rate	25mm	Rain Rate %	90%		
Air humidity	61%	Maximum	27°C	Minimum	21°C
Basket Weight	137				
Sample Weight					
Outdoor Samples			Indoor Samples		
Sample	Weight (g)	Sample	Weight (g)	Sample	Weight (g)
A1	4	C1	2		
A2	4	C2	2		
A3	3	C3	2		
A4	3	C4	2		
B1	2	D1	2		
B2	2	D2	2		
B3	2	D3	1		

Table 16. Difference from weights of fortnight 6 to fortnight 5 from the weather resistance test

Fortnight 5		Fortnight 6		Weight Difference (g)
Sample	Weight (g)	Sample	Weight (g)	
Basket	120	Basket	137	17
A1	2	A1	4	2
A2	2	A2	4	2
A3	2	A3	3	1
A4	1	A4	3	2
B1	2	B1	2	0
B2	2	B2	2	0
B3	1	B3	2	1
C1	2	C1	2	0
C2	2	C2	2	0
C3	2	C3	2	0
C4	2	C4	2	0
D1	1	D1	2	1
D2	2	D2	2	0
D3	1	D3	1	0

In fortnight 7, the samples either decreased in weight or maintained the weight they had in the previous week. This fact can be explained by a possible loss of water that had been accumulated from the rains of the previous fortnight. Therefore, the samples returned to their normal state, as they were before the rains. Thus, 8 samples decreased in weight (A1, A2, A3, A4, B2, B3, D1, and D2) and 6 samples kept the same weight (B1, C1, C2, C3, C4, and D3), while the basket decreased 17g of your weight when compared to the previous fortnight. Regarding Fortnight 8, which was the last analysis to be addressed in this work, not many differences were found when compared to fortnight 7. Thus, 10 samples had no weight variation (A1, A2, A3, A4, B1, B2, C1, C2, C3, and C4), while only 4 samples increased in weight (B3, D1, D2, and D3). In addition, the basket had a weight reduction of 6g in this last analysis.

Table 17. Data collected at fortnight 7 from the weather resistance test

Fortnight 7					
Date	05/11/2021	Hour	15:30	Temperature	30°C
Weather	Rain showers with wind				
Rain Rate	0mm	Rain Rate %		0%	
Air humidity	43%	Maximum	30°C	Minimum	16°C
Basket Weight	120				
Sample Weight					
Outdoor Samples			Indoor Samples		
Sample	Weight (g)	Sample	Weight (g)	Sample	Weight (g)
A1	2	C1	2		
A2	2	C2	2		
A3	2	C3	2		
A4	2	C4	2		
B1	2	D1	1		
B2	1	D2	1		
B3	1	D3	1		

Table 18. Difference from weights of fortnight 7 to fortnight 6 from the weather resistance test

Fortnight 6		Fortnight 7		Weight Difference (g)
Sample	Weight (g)	Sample	Weight (g)	
Basket	137	Basket	120	-17
A1	4	A1	2	-2
A2	4	A2	2	-2
A3	3	A3	2	-1
A4	3	A4	2	-1
B1	2	B1	2	0
B2	2	B2	1	-1
B3	2	B3	1	-1
C1	2	C1	2	0
C2	2	C2	2	0
C3	2	C3	2	0
C4	2	C4	2	0
D1	2	D1	1	-1
D2	2	D2	1	-1
D3	1	D3	1	0

Table 19. Data collected at fortnight 8 from the weather resistance test

Fortnight 8					
Date	05/24/2021	Hour	19:16	Temperature	17°C
Weather	Cloudy				
Rain Rate	0mm	Rain Rate %		0%	
Air humidity	50%	Maximum	26°C	Minimum	16°C
Basket Weight	114g				
Sample Weight					
Outdoor Samples			Indoor Samples		
Sample	Weight (g)	Sample	Weight (g)	Sample	Weight (g)
A1	2	C1	2		
A2	2	C2	2		
A3	2	C3	2		
A4	2	C4	2		
B1	2	D1	2		
B2	1	D2	2		
B3	2	D3	2		

This result can be explained by the low rainfall and predominantly cloudy weather during the last days of this analysis, which may have contributed to the absence of significant changes in the samples. Tables 17, 18, 19, and 20 present data from the last two weeks of the trial and their respective comparisons with previous analyses.

Table 20. Difference from weights of fortnight 8 to fortnight 7 from the weather resistance test

Fortnight 7		Fortnight 8		Weight Difference (g)
Sample	Weight (g)	Sample	Weight (g)	
Basket	120	Basket	114	-6
A1	2	A1	2	0
A2	2	A2	2	0
A3	2	A3	2	0
A4	2	A4	2	0
B1	2	B1	2	0
B2	1	B2	1	0
B3	1	B3	2	1
C1	2	C1	2	0
C2	2	C2	2	0
C3	2	C3	2	0
C4	2	C4	2	0
D1	1	D1	2	1
D2	1	D2	2	1
D3	1	D3	2	1

Through the results of this test, it was possible to observe that the samples with the black paint finish were more resistant to bad weather than the samples that did not have the same finish, especially when compared to the samples outdoors with and without the paint. These samples suffered more with the action of time and with rainwater, having their label detached from the material, undergoing a greater change in weight and swelling. Therefore, it can be concluded that the paint finish positively influences the resistance of the material to time, protecting it from bad weather and reducing its wear. In addition, it was also possible to notice that the samples suffered swelling and increased in weight when subjected to the action of rain and storms, due to the rainwater held in the structure. Regarding the carton pack basket, it did not suffer significant tears. This one only warped and had small tears and highlighted the paint in some points, but there was no significant loss in the material, that is, the basket continued to maintain its functionality, only from the minor damage suffered, proving that the material, together with the action of the ink, guarantees the resistance of the product.

CONCLUSION

According to this research, it was possible to evaluate the feasibility of using aseptic carton pack baskets for use on bicycles. Thus, it was analyzed whether they are weather-resistant, enabling the basket to be used in the most diverse types of climate change that it may face during its use. According to the tests carried out, it was possible to observe that, in periods of rain and storms, the samples suffered swelling, increasing in weight. It was also identified that the black paint finish reduces material wear due to weather changes, increasing its resistance and protecting the material from bad weather. The samples that were outdoors, which consequently suffered more over time, showed greater resistance when painted with black paint. On the other hand, the samples that did not have the finishing had a greater decomposition, showing their label peeled off and/or undergoing changes in their shapes. Regarding the milk cartons basket, it did not undergo many changes in its structure, despite having varied a lot in weight throughout the research. The product has undergone small changes, such as bending, having its finish slightly highlighted, and small tears on its edge, but the label on the packaging that was the walls of the product did not peel off, showing a lot of resistance. Therefore, despite the variations in the material samples during this work, we can state that the aseptic carton pack basket presented

sufficient strength to enable its use on bicycles. It showed satisfactory results, especially when finished with a black ink finish, as the ink increased the product's shelf life.

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FAPERJ

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