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1 Abstract

Eco-friendly packaging has become one of the most important and urgent trends in the industry, which is on the look for new solutions to this issue. A sensory profile of two packaging materials (PET and PLA) was created in order to compare them in terms of sensory properties in the categories odour, appearance and touch. The two cups show a significant difference in all examined attributes except of one. In addition, consumer preference is also investigated. The PLA cup is being preferred, mainly because of its better stability. The results can be used as a guide for further investigations.

2 Introduction

Sustainable packaging is a big consumer trend. There are a lot of new materials of packaging on the market and it is essential to know how different materials are described and how it is perceived by the consumer. Therefore, sensory profiles of a new (PLA = Polyactic acid) and a conventional (PET = polyethylene terephthalate) material are done. PLA is one of the most used biodegradable plastic alternatives to plastic like PET. Furthermore, a consumer preference test has been performed. The goal is to find out which material is better perceived by consumers and performs better in sensory terms. It is also important to provide valuable data of the sensory profile for the successful development of sustainable packaging.

3 Material and Methods

Material:

Cup 1
Polyethylene terephthalate (PET)
250 ml
height: 10,8 cm
diameter bottom: 5 cm
diameter opening: 7,8 cm
Lid: arched/curved



[1]

Cup 2
Polyactic acid (PLA)
200 ml
height: 6,3 cm
diameter bottom: 6 cm
diameter opening: 9,5 cm
Lid: flat



[2]

Software: Biosystèmes Fizz

References: Wine glass (IKEA SVALKKA), Cling film (K-Classic), RAL scale (color 1016), Glass full of water (IKEA 365+, 200 ml), White, plastic festival cup 200 ml from Kaufland (producer: TEDECO-GIZEH), Paper cups from Kaufland, 200 ml (producer: SWS-Schüler), Lid of yoghurt cup from Lidl MILBONA, White plastic garbage bag 20 l (K-Classic)

Methods:

Sensory profile: quantitative descriptive profile (DIN EN ISO 13299) [1*]

To create a conventional profile, the collection of descriptive terms with the whole panel (n=11) is required first -> simple descriptive test (DIN 10964 [2*]). It is important to identify and select non-overlapping, unique, objective, and referenced attributes that allow for a complete descriptive analysis of the samples. To measure the intensity an unstructured line scale of 10 cm is used. Samples were marked with a three digit-blinding code and presented with a Latin Square presentation design. The panel get trained before testing.

6 Conclusion and Outlook

Many significant differences for sensory attributes were found between the two cups. The consumer test shows that the PLA cup is preferred by consumers mainly because of its better stability.

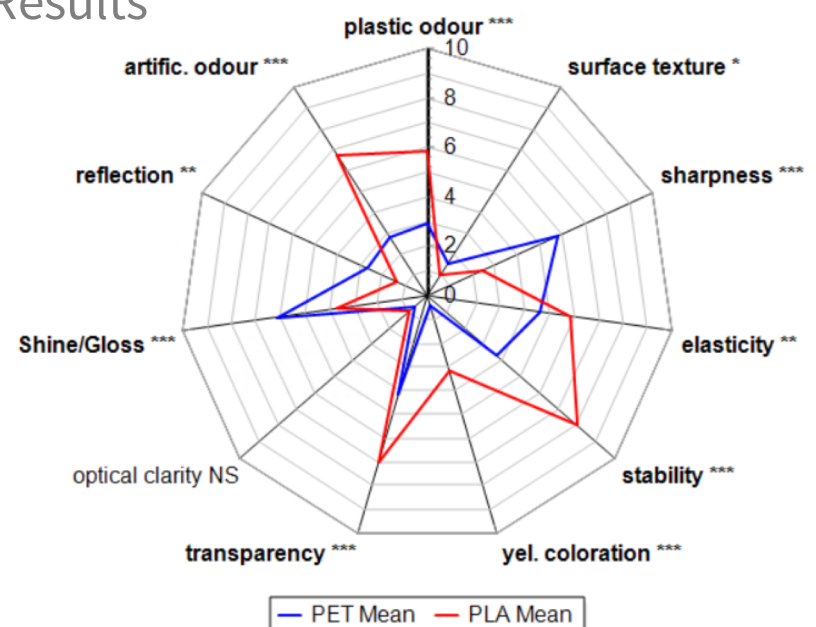
In the future, PLA material can be used as a substitute for PET. The tests have shown that PLA also has undesirable properties (artificial and plastic odour, yellow coloration), but these are not decisive for the choice of material. Further development of the PLA cup in terms of a more colourless and odourless property is recommended. A stable cup is very well received by the consumers of these test. Further developments should also pay attention to which shapes and sizes are preferred by consumers. After all, a desired shape of the cup is also decisive in addition to the material. To validate the results, another evaluation of these two cups could be done by more trained panel, because the test was performed by an untrained panel that had only been trained once before. For the consumer preference test, a bigger consumer panel (n=50-100) should be surveyed in order to obtain decisive results. Due to the Corona pandemic, only 11 consumers could be interviewed for this test. Nevertheless, consumers demand packaging that produces less waste, is made of recycled materials and is recyclable when empty. For most consumers, plastic represents an inferior product that is associated with negative perceptions and feelings. [6*]

The cups are received closed with their lids and then first the odour, then the appearance and at least the touch is evaluated. Statistical analysis was carried out using FIZZ Web [3*]. Significant differences were determined at p=0.05 by one-way analysis of variance (ANOVA) followed by Student's t-test.

Consumer preference test

In order to find out which material is preferred, a paired preference test is conducted with 11 consumers (5 female, 6 male; age group: 20-58) according to DIN EN ISO 11136 [4*]. The pairwise comparison test according to DIN EN ISO 5495 [5*] is applied. Consumer have to choose between two samples: "Forced Choice Test".

4 Results



NS : Not significant at 5% * : 5% ** : 1% *** : 0,1%

[3] Comparison of the mean of PET and PLA cups in the categories appearance, odour and touch

The results of the ANOVA show that there are significant differences in the ratings of the two cups at a significance level of 0,05. The t-test showed significant differences for all attributes except of one, the "optical clarity". The PLA cup is more stable, transparency and yellow and has a higher artificial and plastic odour in comparison to the PET cup. The consumer preference test shows that 91% of consumers prefer the PLA cup. The consumer said they preferred the PLA cup because it fits better in the hand due to its stability. The results of the consumer preference test are independent of age and gender.

5 Discussion

The results show that the artificial plastic odour and the yellow coloration is more noticeable at the PLA cup than at the PET cup. Nevertheless, it does not have a negative impact on the preference of the cups, which suggests that the other significant characteristics are decisive. Although these other significant differences are present, stability is the decisive criterion according to consumers. A direct comparison of the two cups was sometimes difficult, because the cups also have differences in shape, size and thickness of the material.

References

- [1*] DIN EN ISO 13299: Sensorische Analyse – Prüfverfahren – Allgemeiner Leitfadens zur Erstellung eines sensorischen Profils, Beuth-Verlag, Berlin 2016
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- [3*] Biosystèmes Fizz
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- [5*] DIN EN ISO 5495: Sensorische Analyse – Prüfverfahren – Paarweise Vergleichsprüfung, Beuth-Verlag, Berlin 2016
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