

# FINAL REPORT BH-25

## Evaluation of disintegration during composting at ambient temperature of **Wooden Pulp Paper fiber products** **Water-based barrier coated Paper Cup** **(thickness: 0.364 mm; grammage: 280 g/m<sup>2</sup>)**

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# 1 Identification of the test

## Project number

BH-25

## Conditions

The test was performed under screening conditions

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## Test item

Wooden Pulp Paper Fiber Waterbased Barrier Coated Cup (Figure 1)

- thickness: 0.36 mm
- grammage: 280 g/m<sup>2</sup>



Figure 1. Visual presentation of Wooden Pulp Paper Fiber Waterbased Barrier Coated Cup

## 2 Introduction

The purpose of this test is to evaluate the disintegration of a material at ambient temperature in home compost. During home composting the high temperatures (> 20°C), obtained during industrial composting processes, are mostly reached. Therefore a material must demonstrate sufficient disintegration at ambient temperature before it can be allowed in home composting. The test item is mixed with compost and incubated at 28°C in the dark. The maximum test duration during which disintegration should be demonstrated is 12 weeks. Regularly the moisture content is verified and adjusted when needed. At the same time the compost is manually stirred and the test item is visually monitored. The test set-up is based with some modifications, however, on the international standard ISO 20200 *Plastics — Determination of the degree of disintegration of plastic materials under simulated composting conditions in a laboratory-scale test* (2015).

## 3 Results

### 3.1 Thickness and grammage of the test item

The results of the thickness and grammage measurements on test item Wooden Pulp Paper Fiber Waterbased Barrier Coated Cup are given in Table 1. The high standard deviation, which is observed for both the thickness and the grammage of the test item, is caused by the fact that the bottom of the tray is characterized by some relief. The measured thickness and grammage of the test item are taken into account for the disintegration result obtained in this study.

Table 1. Thickness and grammage of the test item

Non-wood plant fiber products	Value (AVG ± SD)	Minimum value	Maximum value
Thickness (mm)*	0.3497 ± 0.207	0.341	0.371
Grammage (g/m <sup>2</sup> )**	280 ± 11	269	291

With AVG = average and SD = standard deviation.

\* ISO 534 Paper and board – Determination of thickness, density and specific volume (2011)

\*\* ISO 536 Paper and board – Determination of grammage (2012)

### 3.2 Test conditions and set-up

The disintegration of Wooden Pulp Paper Fiber Waterbased Barrier Coated (0.364 mm; 280 g/m<sup>2</sup>) was evaluated during 12 weeks of composting at ambient temperature. The test item was cut into 2.5 cm × 2.5 cm pieces, mixed with compost inoculum in a 1% concentration and incubated at 20°C ±2°C in the dark. The compost consisted of a 80/20 mixture of < 10 mm mature compost with an age of 12 weeks and fresh milled Vegetable, Garden and Fruit waste (VGF), respectively. The compost was regularly stirred and moistened if needed. At the same time the visual appearance of the test material was evaluated.

### 3.3 Visual perceptions

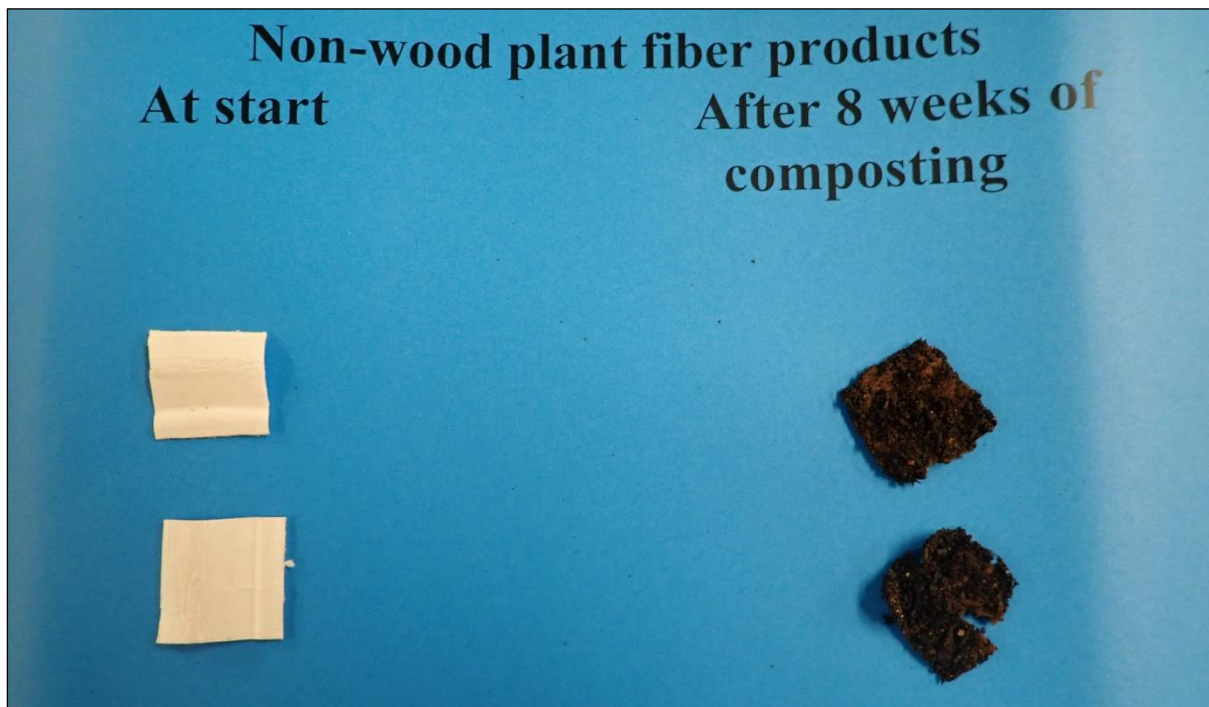
The disintegration of Non-wood plant fiber products (0.36 mm; 280 g/m<sup>2</sup>), cut into 2.5 cm × 2.5 cm pieces, has proceeded very swiftly. Figure 2 shows a visual comparison between wood plant fiber products, cut into 2.5 cm × 2.5 cm pieces, at start and after an incubation period of 4 weeks at ambient temperature. The shape of the test item pieces still remained completely intact, but it was noticed that the colour of the test item pieces had become light brown. During the following weeks the disintegration in replicate 1 proceeded somewhat faster when compared to replicate 2. All test item pieces in replicate 1 were already disappeared after 6 weeks of composting and no pieces could be retrieved from the composting reactor (Figure 3). The test item pieces in replicate 2 still remained rather intact after 6 weeks. Two weeks later tears were noticed in the 2.5 cm × 2.5 cm pieces of replicate 2 and it was noticed that the pieces had become very fragile (Figure 4). The disintegration proceeded and after 8 weeks of composting all pieces of the test material were also disappeared in replicate 2 (Figure 5). Because of this result and as complete disintegration was obtained for Non-wood plant fiber products, the test was stopped after 11 weeks of composting instead of the maximum duration of 12 weeks.



Figure 2. Visual comparison between wood plant fiber products (0.36 mm; 280 g/m<sup>2</sup>), cut into 2.5 cm × 2.5 cm pieces, at start and after 4 weeks of composting at ambient temperature



*Figure 3. Visual presentation of the contents of composting reactor 1 with Non-wood plant fiber products (0.3 mm; 280 g/m<sup>2</sup>), cut into 2.5 cm x 2.5 cm pieces, after 6 weeks of composting at ambient temperature*



*Figure 4. Visual comparison between wood plant fiber products (0.36 mm; 280g/m<sup>2</sup>), cut into 2.5 cm x 2.5 cm pieces, at start and after 8 weeks of composting at ambient temperature (replicate 2)*



*Figure 5. Visual presentation of the contents of composting reactor 2 with Non-wood plant fiber products (0.36 mm; 280 g/m<sup>2</sup>), cut into 2.5 cm × 2.5 cm pieces, after 11 weeks of composting at ambient temperature*

## 4 Conclusion

The disintegration of test material wood plant fiber products (thickness: 0.36 mm; grammage: 280 g/m<sup>2</sup>) was evaluated during 11 weeks of composting at ambient temperature. The test item was cut into 2.5 cm x 2.5 cm pieces, mixed with compost in a 1% concentration and incubated at 20°C ± 2°C in the dark. At the end of the composting test, the disintegration was evaluated.

The disintegration of test item Non-wood plant fiber products (thickness: 0.36 mm; grammage : 280 g/m<sup>2</sup>) has proceeded very swiftly. Already after 11 weeks of composting the test material had completely disappeared, which is much less than the maximum prescribed test duration of 12 weeks.

The French standard specification NF T51-800 *Plastics – Specifications for plastics suitable for home composting* (2015) and the OK compost HOME certification scheme of TÜV AUSTRIA Belgium stipulate that, when a material has passed the 90% disintegration requirement in a quantitative test according to ISO 16929 *Plastics – Determination of the Degree of Disintegration of Plastic Materials under Defined Composting Conditions in a Pilot-Scale Test* (2013), it is enough to demonstrate sufficient disintegration for home composting in a qualitative test, based on ISO 20200, at ambient temperature (20°C – 30°C). According to the Australian standard specification AS 5810 *Biodegradable plastics – Biodegradable plastics suitable for home composting* (2010) the criterion for evaluation of disintegration is that no more than 10% w/w (dry weight) of the original dry weight of the test material fails to pass through a 2 mm fraction sieve. Any remaining residue shall not be distinguishable from the other material in the compost at 500 mm as observed by the naked eye.

Based on these results and as the 90% disintegration requirement of EN 13432 *Requirements for packaging recoverable through composting and biodegradation - Test scheme and evaluation criteria for the final acceptance of packaging* (2000) is fulfilled for Non-wood plant fibre products in a thickness of 0.36 mm and a grammage of 280 g/m<sup>2</sup> (see report BH-12/3), it can be concluded that test material wood plant fiber products, in our opinion, for the requirement of disintegration, eligible for OK compost HOME certification and complies with NF T51-800 (2015) and AS 5810 (2010).

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