Stability and safety of wastes-based packaging materials
(EcoBioCAP-WP 4)
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To cite this version:
Helene Angellier-Coussy. Stability and safety of wastes-based packaging materials (EcoBioCAP-WP 4). EcobioCap Final Meeting, Feb 2015, Montpellier, France. hal-02798806

HAL Id: hal-02798806
https://hal.inrae.fr/hal-02798806
Submitted on 5 Jun 2020

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Stability and safety of wastes-based packaging materials (EcoBioCAP - WP 4)

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To investigate the suitability of packaging materials developed in EcoBioCap as food contact materials (INRA, FRAUNHOFER, CSIC, UNIROMA)

Objective

MATERIAL STABILITY
Structural, physico-chemical & microbiological

FOOD SAFETY
Related to raw materials and final packagings

Under food contact conditions
Study case: PHBV / Wheat straw fibres biocomposites

Matrix = PHBV

Filler = Wheat straw fibres
Overall migration in Liquid Food simulants

PHBV (Tianan)

Liquid Food Simulants*


Overall migration (mg/dm²)

- Water
- Acetic acid 3% (w/v)
- Ethanol 20% (v/v)
- Ethanol 95% (v/v)
- Isooctane
- Olive oil

10 days, 40°C

OML
Overall migration in Liquid Food simulants
PHBV (Tianan) + 20 wt% wheat straw fibers ($d_{50} = 150 \, \mu m$)

**10 days, 40°C**

- Water: 35.94 mg/dm²
- Acetic acid 3% (w/v): 37.87 mg/dm²
- Ethanol 20% (v/v): 42.01 mg/dm²
- Ethanol 95% (v/v): 42.12 mg/dm²
- Isooctane: 0.80 mg/dm²
- Olive oil: 2.27 mg/dm²

OML ✔ ✔ ✗ ✗

**PHBV**

**PHBV/20WSF**
Challenge tests & specific migration using surrogates

**Surrogates** = *molecules representative of migratable substances*

**STEP 1:** Enriching with surrogates

**STEP 2:** Extraction of surrogates (at each step of the process in the case of challenge tests)

**STEP 3:** Analysis
Toxicological risks of wheat straw fibres?

- **Epoxiconazole : the most used fungicide**
  - Acceptable Daily Intake (ADI) = 0.008 mg/kg body weight and per day, i.e. 0.56 mg/day for a human of 70 kg
  - Median residue in wheat straw : 2.71 mg/kg of wheat straw (EFSA, 2008)

- **Worse case of migration for PHBV/wheat straw fibres trays**
  - Trays (30g, 140x130x35 mm³, i.e. 3.7 dm²) in full contact with food
  - 20 wt% of wheat straw fibres
  - Maximal quantity of migratable epoxiconazole = 0.026 mg/kg of food
  - This would mean that a daily ingestion of more than 21 kg of food in contact with this kind of packaging... to reach the value of 0.56 mg/day

- **Taking into account the decontamination efficiency (≈80%)**
  - This would mean that a daily ingestion of more than 88 kg of food in contact with this kind of packaging... to reach the value of 0.56 mg/day
Conclusions

- **Wheat straw fibres = no safety concern** : Up to 80% of decontamination of surrogates + if the remaining quantity migrated integrally from the packaging towards the food, it did not represent any danger for human health (<ADI)

- **Inertness of PHBV**s : Can be used as food contact materials for all types of food.

- **Stability negatively affected by the addition of wheat straw fibres** : Can be used as food contact materials only for low or intermediate water activity products and/or fat products.