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


10 days, 40°C

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

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

- 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

10 days, 40°C

OML ✔ ✔ ✗ ✗ ☑ ☑
Challenge tests & specific migration using surrogates

*Surrogates = molecules representative of migratable substances*

**Challenge tests**

**Specific migration tests**

**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

PESTICIDES

PACKAGING ADDITIVES
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**: 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.
QUESTIONS ?