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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)
Study case: PHBV / Wheat straw fibres biocomposites

MATRIX = PHBV

FILLER = Wheat straw fibres

100 microns
Overall migration in Liquid Food simulants
PHBV (Tianan)


Overall migration (mg/dm²)

10 days, 40°C
Overall migration in Liquid Food simulants

PHBV (Tianan) + 20 wt% wheat straw fibers ($d_{50} = 150 \mu m$)

10 days, 40°C

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