

Innovative circular economy using agrifood byproduct for developing biodegradable blister packaging



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Introduction

Agri-food industry produces biobased wastes that are often discarded while still containing valuable biomolecules. Dust from air suction in the locust bean gum (LBGd) processing industry is a good example of it. On the other hand, the ecological footprint of non-biodegradable packages, particularly the single-use ones, demands the development of more sustainable materials.

Objectives

In this work, the feasibility of using LBGd-derived for developing biobased blister packaging is being studied. This objective arises from the need to implement a circular economy and to find new sources of raw materials, also based on the European green deal.

Methods

LBG dust characterization



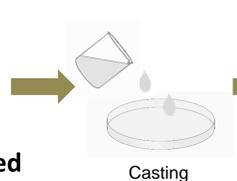
LBG dust

Particle size;
Carbohydrate's content;
Elemental analysis;
Phenolic content;
Lipophilic content;
Ashes.

LBG dust-derived films production



LBG dust-based suspension



Casting



Solvent evaporation

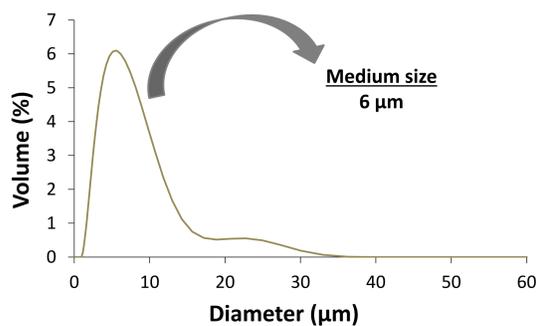
Solvent Casting

Wettability
Mechanical properties

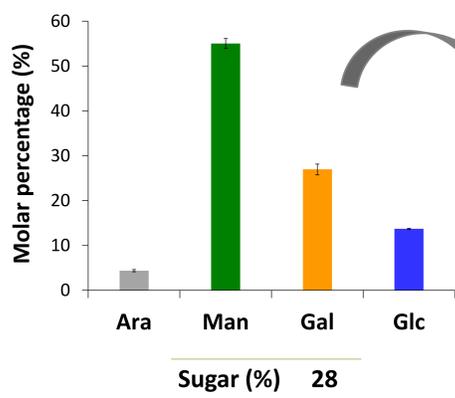
Results

Characterization of LBG dust

❖ Coulter measurements



❖ Sugar content and glycosidic linkages



Main linkages:

- (1→4)-Man;
- (1→4,6)-Man;
- t-Gal;

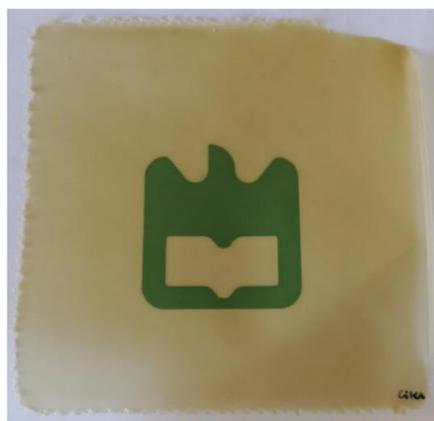
Galactomannans

❖ Chemical composition

Phenolic compounds (%)	Lipophilic compounds (%)	Ashes (%)	Protein (%)
12	6	2	56

Rich in protein

LBG dust-derived films



✓ Yellowish transparent films

✓ Stretchable materials

(90% elongation at break)

✓ Moderated water tolerance

(60-90° water contact angle)

❖ Biodegradability in soil

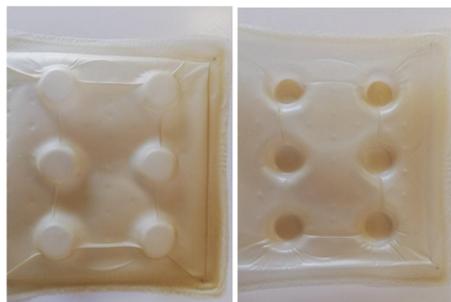


Initial LBG-dust plastic



Degradation of LBG-dust plastic in 17 weeks

❖ Thermoforming capacity



Blister packaging

Conclusion

□ Protein-rich locust bean gum dust revealed to be a suitable raw material for developing flexible and water-tolerant biobased plastics, opening an opportunity for their valorization through a circular economy as source of natural compounds for biodegradable blisters.