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AGRIMA

Development of facial nourishing serum with bamboo leaves extract

Summer Camp | July 7 – 11, 2025 | Marseille, France

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Agri-food Waste Management for Sustainable bio-economy through Higher Education curricula and upskilling

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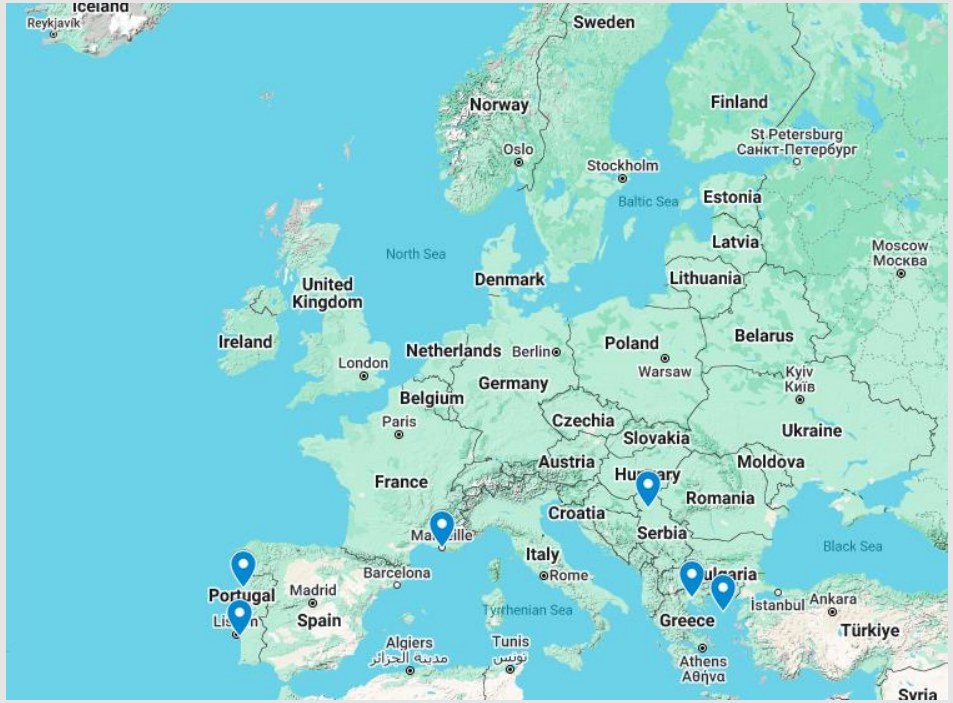
Goals

AGRIMA aims to foster universities' **capacity building** for the **green transition** through **innovative practices and higher education curricula updating in agri-food waste management** for the **circular bioeconomy**.

AGRIMA addresses:

1. **Advancing pedagogical methods** for industrial agri-food waste valorisation **based on business-academia synergies**.
2. **Integrating citizen science** in bio-economy-enhanced waste valorisation as a means of **civic engagement and environmental advocacy**.

Partners



Aix*Marseille université
Socialement engagée

AVIPE
Associação de Viticultores do Concelho de Palmela

P.PORTO

UNIVERSITY OF THE AEGEAN

UNIVERSITAS STUDIORUM NEOPLANTENSIS
UNIVERSITY OF NOVI SAD

Web2Learn
Open, social learning

Bamboo as a Source of Silicon and Its Applications

- Bamboo accumulates large quantities of silicon in the form of amorphous silica ($SiO_2 \cdot nH_2O$).
- Silicon plays a beneficial role in the synthesis of elastin and collagen, both through topical application and oral intake, enhancing skin hydration, elasticity, and texture.
- It also aids in building strong bones (through mineralization by incorporating calcium) and supports the function of connective tissue, tendons, and ligaments.
- Silicon is also considered to have **anti-atherogenic** and **anti-inflammatory** effects, particularly in ligaments.

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Preparation of Bamboo Plant Material

- The bamboo leaves and stalk were dried in air at room temperature, away from direct sunlight. The dried material was ground into uniform particle sizes, using sieving for size control.

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Extraction of Bamboo Leaf Using Subcritical Water

- **Solvent ratio**: 1:20
- **Pressure**: 20 bar N_2
- **Temperature**: 130°C
- **Time**: 30 min

	mg/l extract	mg/100 g raw	mg/g dry extract
Total phenols (GAE)	117.10 ± 2.37	234.19 ± 4.74	12.01 ± 0.24
Total flavonoids (RE)	52.68 ± 0.83	105.35 ± 1.66	5.40 ± 0.09
Antioxidant activity (AAE)	712.50 ± 24.75	1425 ± 49.5	73.08 ± 2.54
DPPH (AAE)	14.63 ± 0.87	29.27 ± 1.75	1.50 ±0.09
Total sugars (GE)	3.03 ± 0.01 g/l	6.06 ± 0.04 g/100 g	0.31 ± 0.00 g/g
ABTS	IC_{50} = 16.32 mg dry extract/ml		
Extraction yield (%)	19.50 ± 0.71		

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Extraction of Bamboo Stalk Using Subcritical Water

- **Solvent ratio**: 1:20
- **Pressure**: 20 bar N_2
- **Temperature**: 130°C
- **Time**: 30 min

	mg/l extract	mg/100 g raw	mg/g dry extract
Total phenols (GAE)	302.57 ±0.79	605.14 ± 1.58	17.80 ± 0.05
Total flavonoids (RE)	149.04 ± 5.44	298.08 ± 10.88	8.77 ± 0.32
Antioxidant activity (AAE)	1554.17 ± 7.22	3108.33 ± 14.43	91.42 ± 0.42
DPPH (AAE)	130.84 ± 0.47	261.67 ± 0.94	7.70 ± 0.03
Total sugars (GE)	7.39 ± 0.53 g/l	14.77 ± 1.06 g/100 g	0.44 ± 0.04 g/g
ABTS	IC_{50} = 36.50 mg dry extract/ml		
Extraction yield (%)	34.00 ± 1.41		

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Phytochemical screening

Compound class	Bamboo stem	Bamboo leaf
Free flavonoids	+	+
Anthocyanins	-	-
Total tannins	+	-
Gallic tannins	+	+
Reducing sugars	-	-
Glycosides	-	-
Alkaloids	+	-
Coumarins	+	+
Saponosides	-	-
O-heterosides	++	+
C-heterosides	+++	++

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Determination of Total Phenols and Flavonoids

The extracts contain **significantly more phenols and flavonoids in the bamboo stalk** than in the leaf. This suggests stronger antioxidant potential in the stalk.

Antioxidant and Antiradical Activity

Bamboo stalk extract showed **higher antioxidant activity overall**, while **leaf extract demonstrated a lower IC_{50} value in the ABTS test**, meaning **stronger efficiency at lower concentrations**.

Determination of Reducing Sugars

The **stalk extract contained more total sugars** (0.44 g/g) than the leaf (0.31 g/g), confirming **greater hydrolysis of cellulose and hemicellulose**, which are more prevalent in the bamboo stalk. Lignin breakdown was not expected under these conditions.

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Bamboo Leaf-Based Skin Serum

This serum combined:

•**Bamboo leaf extract** (strong antioxidant and collagen/elastin booster)

•**Hyaluronic acid** (various molecular weights) for **deep and lasting hydration** and **fine line reduction**

Bamboo Leaf-Based Face Cream

The final formulation can be customized based on product goals (e.g., day vs. night use, added active ingredients, SPF, etc.). The bamboo extract provides **skin-rejuvenating and protective properties**.

•The formulation included 0.3% of the leaf extract.

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Bamboo Leaf-Based Face Cream

- Tested by users
- Extract concentration: 0.3%

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Bamboo Leaf-Based Skin Serum

- Tested by users
- Extract concentration: 0.3%

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THANK YOU
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