
From Almond Waste to Sustainable Materials – Preliminary Research and Future Potential

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Background & Significance

Why Almond Waste? An Untapped Australian Resource

- **Australia's Almond Kernel Production:** Australia produces over 150,000 tonnes of almonds annually, with forecasts suggesting continued growth.
- The kernel represents only ~25–35% of the fruit mass.



Image Source: Internet

Background & Significance

Why Almond Waste? An Untapped Australian Resource

- **Current Use:** Primarily low-value applications such as stockfeed, with limited processing into higher-value products.
- **Sustainability Advantage:** Almond trees are perennial carbon sinks with a ~25-year lifespan, storing carbon both above and below ground. Unlike annual crops, trees are not destroyed during harvest.
- **Untapped Potential:** Valorising this biomass could reduce agricultural waste, replace synthetic materials, and create new circular economy pathways in textiles and biodegradable materials.



Image Source: Handy Farms

Research Objectives

- Exploring High-Value Opportunities for Almond Biomass.
- Explore textile fibre and material potential.
- Investigate value-added uses of biomass components.
- Assess potential as a soil health enhancer.



Initial Investigations at RMIT

Early work explored multiple pathways to valorise almond hulls and shells, confirming presence of useful natural components (cellulose, lignin, potassium) with potential for applications in textiles, agriculture, and industrial products.



Image Source: RIDLEY

Initial Investigations at RMIT

We started by looking at the different components of almond waste – hulls and shells – and explored their potential separately. Each part has unique properties that could be valuable for different applications.



Initial Investigations at RMIT

- Through some simple lab explorations, we confirmed that the material can be refined and treated into more uniform forms, showing potential for further development.



Initial Investigations at RMIT

- We trialled converting almond shells into pulp, highlighting possibilities for sustainable paper or packaging applications.



- We also produced filaments through wet spinning

Exploring Agricultural Potential

- Interestingly, almond waste contains useful minerals such as potassium, which could be repurposed for soil enhancers and fertilisers — supporting agriculture and biodiversity.

Uses of Potassium in Agriculture

Potassium is an essential macronutrient for plants and plays a vital role in:

- ✓ Improving plant health and disease resistance
- ✓ Enhancing root development and water uptake
- ✓ Increasing crop yield and quality
- ✓ Strengthening cell walls, making plants more drought-resistant

Key Findings to Date

- Confirmed useful natural components with potential value.
- Presence of cellulose, lignin, and potassium indicates strong opportunities in textiles, coatings, and soil enhancers.



Potential Applications

- 1. Textile Innovations:** Developing fire-resistant coatings for natural fabrics like wool and nonwoven hemp, which address the growing market demand for eco-friendly, flame-retardant textiles. Additionally, exploring the extraction of cellulose from almond waste for fibre production, creating high-quality, biodegradable fibres for textile applications.
- 2. Sustainability in Agriculture:** Extracting potassium, creating biodegradable mulches and eco-friendly soil enhancers that improve soil health, support biodiversity, and contribute to climate resilience by sequestering carbon and reducing the reliance on synthetic fertilisers.

Potential Applications

3. Industrial Materials: Using almond hulls and shells to develop sustainable particleboards, compostable cardboard, garden pods, eco-friendly cement additives, and biodegradable packaging materials. These innovations address environmental challenges in the construction and consumer goods sectors, offering scalable, sustainable alternatives to traditional materials.

4. Circular Economy Model: Providing scalable, zero-waste solutions that reduce reliance on non-renewable resources and landfills, aligning with global sustainability goals and industry profitability.

Next Steps & Collaboration Opportunities

Scaling and Application Testing

- Refine sustainable product concepts.
- Develop prototypes with industry partners.
- Explore circular economy integration with the almond industry.



Thank you

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