Encapsulated Organic Wolffia Powder

Case Study
June - 2025



Powder Technical Center ASEAN Successfully developed **a high-quality, market-ready Encapsulated Organic Wolffia Powder** - offering food and nutraceutical companies **a new functional ingredient** that supports plant-based nutrition, sustainability, and innovative product development.

Background

Wolffia globosa — is recognized as the smallest flowering plant in the world, and an emerging **whole-plant superfood**. Rich in essential micronutrients, proteins, vitamins, minerals, polyphenols, and antioxidants, Wolffia offers exceptional potential as a functional food ingredient.

However, fresh Wolffia is highly perishable and difficult to process into stable products for mainstream food and nutraceutical markets.

Objective

To develop a spray-dried, encapsulated Wolffia powder with the following key attributes:

- Preserve the plant's complete nutritional profile
- Achieve high stability and long shelf-life powder
- Improve dispersibility and solubility
- Maintain natural color and mild flavor (Similar to green tea extract)
- Enable easy integration into a variety of food and health product formats

Approach & Process

The project was carried out at the **Powder Technical Center ASEAN** (Chonburi, Thailand) in partnership with regional organic Wolffia producers.

Advanced spray drying and encapsulation techniques (in collaboration with PRECI, Japan, spray drying technology) were applied to transform fresh organic Wolffia into a functional, high-quality powder. Formulation and process parameters were optimized through extensive R&D trials to ensure high product quality, good solubility, and long shelf life — meeting the specific needs of functional food manufacturers.

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Results

The resulting Spray-Dried, Encapsulated Organic Wolffia Powder offers:

Outstanding nutritional value:

- **High protein and essential amino acids**
- **Exceptionally high vitamin B12 content** — the only plant-based source of B12 vitamin
- **Calcium** levels surpassing leafy greens and dairy alternatives
- Rich in other **essential vitamins** (A, C, D, E, K, B-complex) and minerals (iron, zinc, phosphorus)

Superior functionality:

- **Excellent dispersibility and solubility in both liquid and dry applications**
- Mild, neutral flavor profile (similar to green tea)
- Longer shelf life

Production & packaging advantages:

- Stable, free-flowing powder suitable for large-scale manufacturing
- Compatible with standard automated filling, blending, and packaging processes
- Versatile for functional foods, beverages, and nutraceutical formats

Applications

- The powder is suitable for a wide range of products, including:
- Functional foods and beverages
- Nutritional supplements
- Protein and superfood blends
- Specialized medical and elderly nutrition

Conclusion

Through this project, Powder Technical Center ASEAN successfully developed a high-quality, market-ready Encapsulated Organic Wolffia Powder — offering food and nutraceutical companies a new functional ingredient that supports plant-based nutrition, sustainability, and innovative product development.

Source	Vitamin B12 (µg/100g)	Calcium (mg/100g)	Protein (g/100g)	Key advantages
Fresh Wolffia	~0.7–0.9	~150–200	~4–5	Perishable, limited storage
Spray dried Wolffia powder *Developed by Powder Technical Center*	**3.27**	**836.33**	**15.66**	**Natural B12, high calcium, high protein, shelf-stable, free-flowing, excellent solubility, vegan, sustainable**
Oven dried Wolffia	~1.5–2.0	~600–700	~12–14	Lower B12 retention, less solubility, dark color, limited applications
Milk (whole)	0.4–0.6	113	3.4	Dairy, allergen
Egg yolk	1.1–1.6	50	16	Animal origin, allergen
Chicken breast	0.3–0.5	11	27	Animal origin
Common plant foods (spinach, kale, etc.)	**0**	varies	varies	No B12

**Nutrient values from standard food databases, published literature, and internal R&D results.*

PRECI **Technology by PRECI Co., Ltd., Japan**

Specialist in spray drying, spray cooling and freeze granulation, with Powder Technical Centers in Japan. T.S.K. Engineering is PRECI's exclusive partner in Thailand, and PTC ASEAN in Chonburi runs trials with PRECI know-how.