Cowpea Flour Product Information Sheet

Plant Physiology

Cowpea has high resistance to drought, and high temperatures and has the potential to fixate the nitrogen, which allows for growth in soil with a low nitrogen content.

Nutritional Content

Below is the nutrient profiling of Cowpea which includes all the proximate composition, elemental nutrients, vitamins, and all the essential amino acids.

Proximate Composition	
Energy (kcal)	336
Protein %	24.09
Carbohydrate %	57.02
Fat %	1.70
Crude fiber %	3.94
Ash %	2.81
Moisture content %	13.00

Vitamins (mg/100g)	
Thiamin [Vitamin B1]	0.9
Riboflavin [Vitamin B2]	0.2
Niacin [Vitamin B3]	2.0
Pyridoxin [Vitamin B6]	0.4
Folacin [Vitamin B9]	0.6
Pantothenic acid [Vitamin B5]	1.5
Ascorbic acid [Vitamin C]	1.5
Minerals (g/100g)	
Zinc	0.2
Calcium	9.3
Sodium	0.1
Magnesium	0.1
Iron	1.1
Potassium	129.2
Phosphorus	49.8

Amino Acid	**Range (mg/100g)**
Arginine	433-572
Histidine	169-236
Isoleucine	305-333
Leucine	434-543
Lysine	467-497
Methionine	74-82
Cystine	26-38
Phenylalanine	251-290
Tyrosine	113-137
Threonine	242-281
Tryptophan	58-82
Valine	252-368

Physicochemical properties

Gelatinization and retrogradation:
Cowpea starch has a low gelatinization point which indicates that less heat could thicken it and swell. After this process, the high retrogradation ability of cowpea starch would form a cohesive structural matrix upon cooling, and this replaces gluten's role.
Applications: Gluten-free pasta and noodles, bakery and pastry products, and dairy products (yogurt and puddings).

*Cowpea N:P conversion factor (5.45), Iseki, K., Olaleye, O., & Ishikawa, H. (2019). Intra-plant variation in seed weight and seed protein content of cowpea. Plant Production Science, 23(1), 103–113. https://doi.org/10.1080/1343943X.2019.1677161

Water-holding capacity: The hydrophilic nature of cowpea proteins holds a significant amount of water which improves moisture retention and texture. *Applications: bakery goods, gluten-free products, and meat analogues.*

Fibre content: The high fiber content in cowpeas increases the viscosity of the flour which improves the overall texture, specific volume, and sensory qualities. *Applications: Bread (improves crumb structure and volume), gluten-free pasta (provides elasticity and texture), baked goods, and baby foods.*

Cowpea-based milk. 2022

Meat analogues: Wet-extracted cowpea proteins can form fibrous structures that could mimic the texture of meat muscle fibers. *Application: Chewiness to the plant-based meat substitutes.*

Oil absorption capacity: The oil absorption capacity enhances flavour retention and richness. *Applications: ground meat formulations, meat replacers, doughnuts, pancakes, baked and other fried products*

Cowpea-based bread. 2022

Water solubility and pH

Cowpea exhibits high water solubility, making cowpea flour ideal for liquid-based formulations like plant-based milk alternatives with a stable range of 6-7 pH, which mimics the pH of cow's milk and inhibits microbial growth extending the shelf life. However, it is known that flour it is not necessarily highly soluble, due to presence of large starch particles. The water solubility improves the smoothness and mouthfeel of cowpea-derived products. *Applications: Plant-based milk alternatives, dairy alternatives like yogurt and pudding, soups, and sauces (smooth texture and stability).*

Gelation: Cowpea exhibits strong gelation properties which form stable gels under heat, and gelation is largely attributed to the globulin fraction of cowpea proteins. *Applications: sauces, soups, puddings and protein-rich beverages.*

Foaming, emulsifying, and rheological behaviour: The cowpea protein isolates possess good foaming and emulsifying properties, and the rheological behaviour includes viscosity and elasticity. *Applications: protein-fortified beverages and emulsified food products, aeration of mousses and protein drinks, baked goods (viscosity and elasticity), sauces, etc.*

Binding properties: Starch and proteins in cowpeas act as effective binders which improve the consistency, stability, and thick and smooth texture. *Applications: soups, sauces, gravies, yogurt and pudding.*

Protein fortification: Cowpea proteins are valuable in protein-enhanced food products due to their high solubility, foaming, and emulsifying properties. *Applications: Protein-fortified beverages, protein bars, and protein powders*.

Summary of Cowpea applications

1. Gluten-free products [Noodles and pasta, Bread, Cake and Muffins, pizza crusts and crackers]
2. Bakery and pastry [Bread, cakes and pastries, doughnuts and pancakes, cookies and biscuits, muffins and brownies]
3. Plant-based dairy alternatives [Cowpea milk, Cowpea-based Yogurt, pudding]
4. Protein-fortified products [Protein-fortified beverages, shakes, smoothies, bars, and cookies]
5. Meat analogues and extenders [Plant-based meat substitutes like burgers, sausages, and meatballs]
6. Soups and sauces
7. Snacks and ready-to-eat foods [Crackers, chips, snack bars, baked snacks]
8. Baby food products [porridges, purees]
9. Oil-rich and fried products [Fritters, savoury pancakes, meat substitutes]
10. Breakfast foods [Cowpea-Based pancakes and waffles, cereals, and porridges