

Buckwheat's Extraordinary Array of Plant Nutrients

This study reveals the surprisingly diverse spectrum of macro-, micro-, and phytonutrients present in buckwheat. It also details differences between the nutrient contents of several buckwheat species, including common buckwheat (*Fagopyrum esculentum*), Tartary Buckwheat (*F. tataricum*), and others.

Amid a modern backdrop of common lifestyle-related illnesses, dietary quality has emerged as both a risk and an opportunity for health. Research increasingly focuses upon the importance of nutrient density, intakes of phytonutrients often lacking in modern diets, and in the functionality of foods' macronutrient profiles. To definitively address immunometabolic imbalances that result in disease for many individuals, there is heightened interest in ancient species of plant foods that provide exceptional nutritional value.

As a gluten-free cereal that thrives under challenging environmental circumstances, buckwheat presents a uniquely attractive proposition: a healthy food that is ecologically beneficial. Research on the phytochemical components of buckwheat shows that they possess desirable mechanisms of action, including immunomodulation, chemoprotection, cell life-and-death cycle modification, and other salutary influences.

This review summarizes findings from dozens of detailed chemical analyses of buckwheat flour, seed, sprouts, leaves, hulls, and other plant structures. Nutrients and phytonutrients assayed include flavonoids, stilbenes, lignans, isoflavones, minerals, tocopherols, sterols, B vitamins, and many others.



Buckwheat has long been cultivated as a nourishing food and as a dependable crop that adapts to difficult growing conditions.

Buckwheat's success as a survivor makes it especially valuable for human health: its capacity for overcoming environmental adversity is genetically encoded into its nutritional profile. Buckwheat is hormetically programmed to generate protective phytochemicals that support healthy biological aging processes in humans.

Research Summary

In their review of analytical studies on the nutritional composition of buckwheat, the authors noted the following:

- In Asia, buckwheat is revered as a food that aids healthy glucose and insulin metabolism.
- Tartary Buckwheat shows overall flavonoid contents of ~40 mg/g—around four-fold that of common buckwheat.
- Major phytonutrients identified in buckwheat include the valuable stilbene resveratrol (in both -trans and -cis forms), antioxidant phenolic acids such as gallic, caffeic, chlorogenic, and ferulic acids, phytosterols (like sitosterols, ergosterol, and daucosterol), and immunomodulating triterpenes like ursolic acid.
- Rutin comprises up to 90% of the total phenolic species in buckwheat, in which it serves as a crucial protective agent against UV radiation, cold stress, drought, and insect predation.
- The overall dietary fiber contents of buckwheat consist mainly of insoluble fiber, whereas whole buckwheat flour contains more soluble than insoluble fiber.
- Compared to wheat, maize, or rice, buckwheat provides more crude protein, total dietary fiber, magnesium, calcium, potassium, phosphorus, manganese, niacin, thiamin, riboflavin, choline, vitamin E tocopherols (mainly gamma-, but also alpha- and delta-tocopherols), and the essential amino acids lysine, methionine, and tryptophan.
- Both common and Tartary Buckwheat contain resistant starch, comprising 20-30% amylose and 70-80% amylopectin.
- Tartary Buckwheat's fatty acid profile includes polyunsaturated and monounsaturated fats, including linoleic, linolenic, oleic, and other fatty acids.
- Flavonoid subtypes seen in buckwheat include flavonols (e.g., rutin and quercetin), flavanols (including catechins and epicatechins), flavonones (such as hesperidin, naringenin, and derivatives), flavones (like orientin), anthocyanins, proanthocyanidins, isoflavones, and flavonolignans.
- The study identifies threonine and methionine as the two main limiting amino acids in buckwheat protein.

This study names buckwheat as the most abundant source of D-chiro-inositol, which beneficially modulates insulin signaling pathways. Buckwheat also contains D-fagomine, which acts as a



glycosidase inhibitor and may thus help limit dysregulation of the glycemic and insulinemic responses.

CONCLUSION

Buckwheat is remarkably well-rounded for a cereal food, providing healthy carbohydrates, fats, and dietary fiber, along with gluten- and gliadin-free protein. It is additionally generous in its mineral and B vitamin contents, and provides choline and multiple tocopherols. Yet perhaps most distinctive of all is its wealth of flavonoids, resveratrol, and other constituents having immunomodulatory influence.

