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**Debasis Mahata**

Department of Agronomy, Uttar  
Banga Krishi Viswavidyalaya,  
Pundibari, Cooch Behar, West  
Bengal, India

## Importance of buckwheat (*Fagopyrum esculentum* Moench)

**Debasis Mahata****Abstract**

Buckwheat is one of the most important traditional pseudocereals and a multipurpose crop, belonging to genus *Fagopyrum* of the family Polygonaceae. Even though it is an underutilized crop, it remains important for food security in the temperate and hilly regions of countries in East Asia, East Europe and the Himalayan region. Excellent grain quality with high nutritive substances (63% carbohydrate, 11.7% protein, 2.4% fat, 9.9% fiber, 11% water and 2% minerals), well balanced amino acid composition, abundant vitamin P high in rutin, which reduces cholesterol content in the blood makes buckwheat an almost perfect food. The crop is not a cereal, but the seeds (strictly achenes) are usually classified among the cereal grains because of their similar usage. The seed is used in several culinary preparations during fast and religious festivals. Its starchy flour mixed with wheat, rice or maize flour is used to prepare biscuits, noodles, pancakes and for gluten free diets. The biological value of protein is superior to other food plants and is nearly equal to that of eggs. The flowers of buckwheat are rich source of dark coloured and strong flavoured honey. Besides food production, it is extremely useful as a cover crop in maintaining agro-ecosystem by storage of water and preventing soil erosion and also for livestock feed, fodder and green manure.

**Keywords:** protein, carbohydrate, noodles, honey and cover crop

**Introduction**

Buckwheat (*Fagopyrum esculentum* Moench) is an ancient Asian crop now widely grown around the world. Even though it is an underutilized crop, it remains important for food security in the temperate and hilly regions of countries in East Asia, East Europe and the Himalayan region (Arora 1995) <sup>[1]</sup>.

The crop is not a cereal, but the seeds (Strictly achenes) are usually classified among the cereal grains because of their similar usage. The grain is generally used as human food and as animal or poultry feed, with the dehulled groats being cooked as porridge and the flour used in the preparation of pancakes, biscuits, noodles, cereals, etc.

The protein of buckwheat is of excellent quality and is high in the essential amino acid lysine, unlike common cereals. This, coupled with the plant's ability to do well on poorer soils, probably accounts for its widespread usage. It is also a multipurpose crop.

**Uses of buckwheat**

The small leaves and shoots are used as leafy vegetables, the flowers and green leaves are used for rutin extraction for use in medicine. The crop produces honey of a very good quality. Buckwheat is grown throughout a large area of Asia and Southeast Asia as a crop that fits the farming system on marginal and fairly unproductive land.

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**Correspondence****Debasis Mahata**

Department of Agronomy, Uttar  
Banga Krishi Viswavidyalaya,  
Pundibari, Cooch Behar, West  
Bengal, India

Buckwheat grain is grown mainly for human consumption and as animal feed, although it can also be used as a vegetable, a green manure crop, as a smother crop to crowd out weeds and as a source of buckwheat honey.

Common buckwheat is consumed in many different preparations in different countries. In Japan it is mainly consumed as a noodle soba. In Europe and North America buckwheat flour is generally mixed with wheat flour to prepare pancakes, biscuits, noodles, cereals, and is used as a meat extender. In Russia and Poland the groats and flour are used to make porridge and soup. In Sweden it is used to stuff fish. In Southeast Asia buckwheat is a staple food in many hilly areas. Here the flour is used to make unleavened bread chapattis. It is also mixed with water and fried to produce a crisp pakora. The flour also can be mixed with potatoes to make parathas. It is also used for fasts and for religious celebrations. Buckwheat is used to make alcoholic drinks; the liquor prepared from tartary buckwheat being ascribed medicinal qualities. In China it has been reported that buckwheat is used for the production of vinegar.

Buckwheat is often raised as a leafy vegetable crop in many areas of the Indian subcontinent. The leafy tender shoots of the plants are harvested and dishes prepared from them. This often augments the supply of fresh vegetables that are available at this time of year. The crop is generally dual purpose as the remainder of the crop is harvested for grain and straw.

Common buckwheat has been used as a source of nectar for honey production in many countries. Buckwheat fills a special need for the beekeepers because honey production comes late in the season when other nectar sources are scarce. It is often possible to obtain a crop of buckwheat honey after an earlier flow has been harvested from another crop. Relatively pure buckwheat honey is dark-coloured and has a strong flavour that is relished by some people but is disliked by others. According to Morse (1969)<sup>[2]</sup> buckwheat was once a major source of nectar for beekeepers in New York State of the USA and the supply did not meet the demand. However, in many areas buckwheat production has declined and buckwheat honey is so uncommon that it demands a premium price.

The nectar flow in buckwheat is most favourable under adequate moisture conditions. Under these conditions, a hectare could support up to 2.5 hives and produce up to 175 kg of honey in a season. It is not uncommon for a strong colony to glean 5 kg/day while foraging for buckwheat (Marshall and Pomeranz 1982)<sup>[3]</sup>. Although buckwheat is a dependable and high-yielding honey plant, it normally yields nectar only during the morning and bees are unable to complete a full day of nectar collection. As honey bees prefer to work the same crop plant all day, they become agitated and hard to work with. They therefore prefer to work other plants and need to be forced to work the buckwheat plants for maximum honey production.

Buckwheat is useful as a green manure crop for renovation of low-productivity land because it grows well on such land and produces a green manure crop in a short time (Marshall and Pomeranz 1982)<sup>[3]</sup>. As many as 7 t/ha of dry matter have been obtained at an age of 6-8 weeks under conditions in Pennsylvania, USA. When ploughed under, the plant material decays rapidly, making nitrogen and mineral constituents available for the succeeding crop. The resulting humus improves the physical condition and moisture-holding

capacity of the soil. When a crop is harvested early in a year a second crop of buckwheat often can be grown and ploughed down as green manure.

Buckwheat has been used as a smother crop, owing to the lack of good herbicides for broad-leaved weed control. Buckwheat is generally a very good competitor as it germinates rapidly and the dense canopy that it produces soon shades the soil. Often growers will increase the seeding rate in areas where they expect more weed competition so that the canopy is developed more quickly. This rapidly smothers out most weeds, especially broadleaved ones. If the weed growth gets above the buckwheat canopy, buckwheat becomes a poor competitor. Buckwheat has been cited as being a useful crop for the control of many weeds including quack grass, Canada thistle, sowthistle, creeping jenny, leafy spurge, Russian knapweed and perennial pepper grass (Jensen and Helgeson 1957)<sup>[4]</sup>.

Sportsmen have long known that buckwheat is useful as a food and cover crop for wildlife. Deer eat buckwheat and will begin foraging as soon as a few seeds have developed. The grain is also eaten by wild turkeys, pheasant, grouse, waterfowl and other birds. The crop is generally planted and not harvested so that the standing plants provide both food and cover for wildlife.

Few ethno botanical reports exist for common buckwheat. It is popular in Japan as a healthy food because of its rutin content. This is reported to aid in increasing the elasticity of the blood vessels and therefore prevent hardening of the arteries. Tartary buckwheat, on the other hand, is reported to be used as a medicinal plant. According to Hu *et al.* (1992)<sup>[5]</sup> the leaf of Tartary buckwheat is a drug used in traditional Chinese medicine. They state that according to the *Chinese Materia Medicine Dictionary* the therapeutic function of the leaf and stem includes treating choking, ulcer, haemostasis and for bathing wounds. They also report that the book *Classified Materia Medica for Emergency* indicates that the leaf can be used as food and may improve the functions of sight and hearing, and keep adverse energy down. The plant is also used to treat hypertension, which is believed to be related to the fact that in rural areas, where the incidence is lower, the leaf of Tartary buckwheat is used as a food. In Nepal the consumption of Tartary buckwheat is reported to aid in stomach disorders. In some areas *jang*, a local beer made from Tartary buckwheat, demands a higher price because of its medicinal effects.

Clinical observations carried out on 75 diabetic patients treated with Tartary buckwheat biscuits showed a decrease in the blood sugar level (Wang *et al.* 1992)<sup>[6]</sup>. Other reports from China indicate that Tartary buckwheat shows a hypoglycaemic effect. Tartary buckwheat noodles can be obtained at the present time as a treatment for diabetes.

Tartary buckwheat has been reported to treat peridontitis and gum bleeding. Patients who brushed their teeth and gargled every morning and evening with Tartary buckwheat flour showed a 62% recovery (Song and Zhou 1992)<sup>[7]</sup>. This effect was believed to be due to Tartary buckwheat containing many microelements, vitamins and vitamin B, and being especially rich in quercetin and rutin. They report that these special compositions have the effects of maintaining resistance of blood capillaries, decreasing its fragility and permeability, protecting and recovering its elasticity and diminishing inflammation.

### **Buckwheat nutrition facts**

#### **One cup of cooked buckwheat groats contains the following**

- 155 calories
- 6 grams of protein
- 1 gram of fat
- 33 grams of carbohydrates
- 5 grams fiber
- Only 1.5 grams of sugar
- 86 milligrams manganese (34%)
- 86 milligrams magnesium (21%)
- 118 milligrams phosphorus (12%)
- 6 milligrams niacin (8%)
- 1 milligrams zinc (7%)
- 34 milligrams iron (7%)
- 0.13 milligrams vitamin B6 (6%)
- 24 milligrams folate (6%)
- 0.6 milligrams pantothenic acid (6%)

### **Buckwheat Benefits**

#### **Improves Heart Health by Lowering Cholesterol and Blood Pressure Levels**

In clinical studies, findings suggest that buckwheat can help lower inflammation and unhealthy cholesterol levels while helping to prevent heart disease. Buckwheat nutrition intake is associated with lower serum total cholesterol levels, plus it decreases levels of LDL “bad cholesterol” while increasing HDL “good” cholesterol.

Rutin, a phytonutrient found in buckwheat, is an important antioxidant for cardiovascular health. This phytonutrient supports the circulatory system and helps fight blood pressure and high cholesterol, as does the high fiber content of buckwheat.

#### **Contains disease-fighting antioxidants**

Buckwheat nutrition contains protective phenolic compounds and antioxidants that can help fight cancer or heart disease formation, in addition to supporting brain, liver and digestive health. Antioxidants including flavonoids like *Oligomeric proanthocyanidins* are found within buckwheat’s hulls and seeds, plus they are present in ground buckwheat flour.

Buckwheat’s polyphenolic antioxidants act as therapeutic agents against free-radical damage, also called reactive oxygen species or “oxidative stress.” Antioxidants support cellular function by protecting DNA from damage and preventing inflammation or cancerous cell formation.

#### **Provides highly digestible protein**

Buckwheat nutrition is a great source of plant-based protein and contains twelve amino acids — the “building blocks of protein” that support energy, growth and muscle synthesis. In fact, buckwheat has more protein than any form of rice, wheat, millet or corn. Buckwheat grains contains roughly 11-14 grams of protein for every 100 grams, which isn’t as high as quinoa or beans and legumes, but is higher than most whole grains. If you’re a vegetarian or vegan, buckwheat is a great food to regularly include in your diet because it provides two types of essential amino acids — types you cannot make on your own and must get from the foods you eat. Buckwheat nutrition contains essential amino acids called lysine and arginine. What’s important about this? These specific amino acids aren’t found in many other common cereal or whole grains, so getting them from buckwheat ensures you cover the full range of essential proteins your body needs.

### **High fiber content helps improve digestion**

Buckwheat nutrition supplies about six grams of dietary fiber in every one cup serving, which helps to fill you up and hastens the transit of food through the digestive tract (important for regulating bowel movements). Buckwheat can even protect the digestive organs from cancer, infection and other negative symptoms by preventing oxidative stress within the digestive tract. When researchers from the Department of Food and Nutrition at Bucheon University in Korea tested the effects of buckwheat in animal studies, they observed higher antioxidant activities in the liver, colon and rectum of animals consuming buckwheat. Protective glutathione peroxidase and glutathione S-transferase antioxidants were all found in the digestive systems of the animals receiving buckwheat. When buckwheat is fermented to create alcoholic drinks or certain types of sourdough bread, it can also supply valuable probiotics that nourish the digestive tract by transporting healthy bacteria into the gut flora. Studies show that consuming fermented buckwheat products can improve the body’s pH level, or the balance between acidity and alkalinity that keeps harmful bacteria and disease from forming.

#### **Can help prevent diabetes**

Compared to many other carbohydrates and whole grains, buckwheat is low on the glycemic index. The complex carbohydrates found in buckwheat nutrition are absorbed into the bloodstream slowly, which help you to feel full for longer and support sustainable energy. This helps fight imbalances in blood sugar levels that can lead to inflammation, fatigue and even diabetes or metabolic syndrome. Studies found that when diabetic patients consumed buckwheat over a two-month period, they experienced improvements in blood sugar control and reduced insulin resistance without any form of medication.

#### **Doesn’t contain gluten and is non-allergenic**

Buckwheat is very similar in taste, appearance, size and texture to barley but buckwheat nutrition has the advantage of containing zero gluten. Buckwheat is safe for anyone with celiac disease or a gluten sensitivity and can stand in place of gluten-containing grains like wheat, wheat berries, barley, rye and oats that are contaminated with gluten, spelt and kamut. Remember, buckwheat isn’t even a grain, it’s actually a seed! Buckwheat and wheat are from completely different botanical families but can be used in many of the same ways. Avoiding gluten-containing grains and swapping in buckwheat instead can help prevent digestive disturbances like bloating, constipation, diarrhea and even leaky gut syndrome.

#### **Supplies important vitamins and minerals**

Buckwheat groats and flours are a great source of energy-boosting B vitamins, plus minerals including manganese, magnesium, zinc, iron and folate. Buckwheat’s supply of magnesium can further help improve digestion, aid in muscle growth and recovery, and defend against stress’s negative impacts on the body. B vitamins, manganese, phosphorus and zinc all help with healthy circulation and blood vessel function, plus they’re needed for neurotransmitter signaling in the brain that fights depression, anxiety and headaches.

#### **Health benefits of buckwheat**

Buckwheat is a powerhouse of nutrients. Being gluten free, it can be an excellent substitute for wheat, rye, barley and oats.

It is thus considered suitable for those who are allergic to wheat and celiac patients. It has a high content of fiber and protein, and significant amounts of iron and magnesium. Besides, it contains all the eight essential amino acids. Buckwheat is also packed with phyto nutrients which are amazing disease fighting organic components. The several health benefits of buckwheat can be attributed to its amazing nutritional profile.

#### **Aids in weight loss**

Whole grain buckwheat can be very helpful in weight loss. Buckwheat has fewer calories in comparison to wheat or barley. It is free of saturated fat and cholesterol and rich in dietary fiber and protein. This combination plays an important role in suppressing appetite, controlling blood sugar, facilitating proper digestion and building lean muscle mass.

#### **Diabetic friendly**

Being low in calories and fat free, buckwheat is an ideal food for diabetic patients. Buckwheat contains a medicinal chemical which strengthens capillary walls and reduces haemorrhage, thus lowering the risk of fatal strokes and heart attacks in people with high blood pressure and diabetes. It improves micro vascular integrity and circulation in diabetics, thus preventing the damage of nerves and muscle cells and loss of kidney function. D-chiro-inositol is a compound that is deficient in type II diabetic patients. This compound is required for proper conduction of insulin for controlling and treating type II diabetes. Buckwheat also contains D-chiro-inositol.

#### **Reduces blood pressure**

Buckwheat is a good source of magnesium which is instrumental in improving blood pressure by relaxing the blood vessels. This reduces blood pressure naturally without the use of harmful chemicals.

#### **Cardiovascular health**

Being rich in B vitamins, particularly niacin, folate and vitamin B6, buckwheat is highly beneficial for the cardiovascular health. These vitamins reduce the concentration of cholesterol in the blood. Niacin causes an increase in high density lipoproteins (HDL) which further enhance the blood vessel strength and cholesterol removal. The minerals like iron, magnesium, phosphorus, copper and manganese help in reducing blood pressure and improving blood oxygenation. Buckwheat contains high quality proteins which remove the plaque forming triglycerides and low density lipoproteins (LDL). Thus buckwheat is highly beneficial for people with weak heart functions and other cardiovascular problems.

#### **Protection against breast cancer**

Research has proved that eating a diet rich in fiber from whole grains such as buckwheat reduces the risk of breast cancer. In fact, pre-menopausal women eating wholegrain fiber are at a lower risk of developing breast cancer. The antioxidant properties of buckwheat are often used as an antidote for x-ray irradiators. The antioxidants, lignans play an important role in estrogen reception and hence are beneficial for women during or after their menopause. The plant lignans are converted into mammalian lignans in the intestines. One of these called enterolactone is believed to protect against breast cancer and other forms of cancer related to hormones.

#### **Protection against childhood asthma**

As per research, consumption of whole grains such as buckwheat can reduce the risk of childhood asthma by around 50 percent. Due to its high content of magnesium and vitamin E, buckwheat can help in reducing the incidence of childhood asthma.

#### **Prevents gallstones**

Being high in insoluble fiber, buckwheat can help in preventing gallstones. Insoluble fiber speeds up the movement of food through the intestines, increases insulin sensitivity but lowers the secretion of bile acids and blood sugar.

#### **Health benefits of buckwheat protein**

Buckwheat contains proteins of a very high quality which offers several health benefits. This protein in combination with amino acids helps in lowering cholesterol levels besides being a key factor in preventing diabetes and obesity. In addition, buckwheat proteins reduce hypertension by reducing the activity of angiotensin converting enzyme.

#### **Healthy bone structure**

Manganese present in buckwheat ensures healthy bone structure by forming essential enzymes for building bones and acting as a co-enzyme for assisting metabolic progression in the human body. It is also actively involved in the formation of connective tissues, absorption of calcium and metabolism of fat and sugar. Magnesium is also beneficial for bone and dental health. It trans-misses nerve impulses and helps in the production of energy. It facilitates the absorption of calcium by the body and prevents the development of osteoporosis. Thus, buckwheat has a lot to contribute to a healthy bone structure.

#### **Mental health**

Buckwheat also contributes to mental health. It contains tryptophan which influences the mood in a positive manner, thus making happy and preventing depression.

#### **Other benefits**

Being rich in minerals such as phosphorus, magnesium, iron, copper, zinc and manganese and having high flavonoids content, buckwheat is very effective in curing low hemoglobin and frequent colds and flu. Due to its high content of vitamin B complex, buckwheat is often recommended to people suffering from liver disorders and illnesses which require them to restrict their consumption of sugary substances.

#### **Skin benefits of buckwheat**

Skin problems are a major cause of concern in the present scenario. Proper supply of nutrients to the body is essential for healthy and radiant skin. The quality of skin largely depends upon genetic factors, but it is also influenced by environmental factors to a significant extent such as exposure to pollution, level of stress, lifestyle etc. Being a powerhouse of nutrients, buckwheat has an important role to play in skin health.

#### **Natural suntan**

Buckwheat helps greatly in skincare. It contains large amounts of rutin which is beneficial in protecting against skin damage caused by the sun. Hence, it can be regarded as a natural suntan lotion as it provides protection against the harmful rays of the sun

**Prevents ageing**

The powerful antioxidants and flavonoids present in buckwheat prevent premature skin ageing.

**Makes skin glow**

Magnesium contained in buckwheat has a relaxing effect on the blood vessels, thus improving blood circulation. This results in a glowing and youthful looking skin.

**Hair benefits of buckwheat**

Healthy hair greatly enhances the appearance of an individual and is often a source of admiration. But in the present scenario, there are several hair problems ranging from hair loss, split ends, dandruff, hair thinning and alopecia. Just like skin, proper supply of essential nutrients is extremely important for strengthening the hair follicles and maintaining healthy and damage free hair. Buckwheat contains some of the essential nutrients that are beneficial for hair health.

**Helps hair growth**

Buckwheat contains 75% of complex carbohydrates. Whole grain-carbohydrates are good for proper growth of hair. Buckwheat is rich in vitamin A, B-complex vitamins and zinc, making it highly conducive for hair growth.

**Improves hair health**

Vitamin B6 or pyridoxine is vital for hair growth and health. Being soluble in water, this vitamin cannot be stored in the body. It has to be replenished from some food source or supplement. Buckwheat is a great source of vitamin B6.

**Nutrition Facts: Buckwheat, raw - 100 grams**

Ingredient	Amount
Calories	343kcl
Water	10 %
Protein	13.3 g
Carbohydrates	71.5 g
Sugar	~
Fiber	10 g
Fat	3.4 g
Saturated	0.74 g
Monounsaturated	1.04 g
Polyunsaturated	1.04 g
Omega-3	0.08 g
Omega-6	0.96 g
Trans fat	~

**Buckwheat nutritional value**

Buckwheat is a powerhouse of nutrients. It contains a range of nutrients comprising of carbohydrates, vitamins, minerals, sugar, soluble and insoluble fiber, sodium and amino acids. It contains minerals like manganese, magnesium and copper. Moreover, it has two health-promoting flavonoids-rutin and quercetin and all the eight essential amino-acids. Buckwheat is also a great source of an essential fatty acid called Alpha-Linolenic acid which is important for overall health. Its nutritional profile is explained below.

- **Vitamins:** Buckwheat provides 8% of daily value (DV) of niacin which aids in the release of energy from carbohydrates, protein and fat during metabolism. They provide 6% of daily requirement of vitamin B-6, folate and choline and small amounts of vitamin K, riboflavin and thiamine.
- **Minerals:** One cup serving of buckwheat grains provides 21% DV of magnesium and 12% DV of phosphorus and

copper. Thus, they are an important source of these minerals.

- **Calories:** One cup of cooked and roasted buckwheat provides around 155 calories. Carbohydrate is the primary energy source. Around 33 grams of carbohydrates are available in the form of starch. It contains just 1.5 grams of sugar.
- **Dietary Fiber:** Buckwheat grains contain 4.5 grams or 18% of the daily value (DV) of total fiber. Fiber aids in weight loss by lowering cholesterol and glucose levels and promoting proper digestion.
- **Proteins:** One serving of buckwheat grains contains about 6 grams of protein. Protein is vital for building and repairing body tissue.
- **Fat:** Calories in Buckwheat grains are low. They contain just 1 gram of total fat and less than ½ gram of saturated fat.

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