



## Amaranth: A Pseudocereal



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### Short Communication

Pseudocereals are plants that produce fruits or seeds which are used and consumed as grains, though botanically pseudocereals are neither grasses nor true cereal grains. Pseudocereals are typically high in protein and other nutrients, gluten free and are considered whole grains. Many so-called "ancient grains" are pseudocereals. These pseudocereals include amaranthus, buckwheat and quinoa mainly. The family Amaranthaceae is generally considered as the "Amaranth family." The word Amaranthus is basically derived from the Greek word "Anthos" (Flower) which means everlasting or unwilting.

The genus amaranth is mainly comprised of about 400 species and the division of species is based on their utilization method into grain (*A.caudatus*, *A.cruentus* and *A.hypochondriacus*) and vegetable amaranthus (*A.dubius*, *A.tricolor* and *A.cruentus*). Grain Amaranth species are of new world origin, *A. caudatus* from Andean Peru and Ecuador, *A. cruentus* and *A. hypochondriacus* from Mexico and Central America. Nowadays, the grain amaranths are cultivated from

the temperate to tropical zone. It has a great amount of genetic diversity, phenotypic plasticity, and is extremely adaptable to adverse growing conditions, resists heat and drought, has no major disease problem, and is among the easiest of plants to grow in agriculturally marginal lands.

The crop is known for its excellent nutritional value and therapeutic nature [1]. Compared with other crops, this pseudocereal is rich in protein (17–19% of dry weight) with double the amount of essential amino acids than wheat grain protein [2,3]. Amaranth has nearly optimal proportion of essential amino acids and is rich in lysine. The amino acid composition revealed that amaranthus is a rich source of important amino acids namely alanine, valine, leucine, arginine, phenylalanine, tryptophan, isoleucine serine etc. The protein of amaranth does not contain gluten therefore it can be used in the diet of patients suffering from celiac diseases.

Table 1 A comparative table for amaranthus grain with other grains (per 100gms) (USDA and National Research Council)

**Table 1:** A comparative table for amaranthus grain with other grains (per 100gms) (USDA and National Research Council).

Grain type	Amaranth	Corn	Rye	Buckwheat	Rice	Milk (Human)
Protein %	14.5%	9%	13%	12%	7%	3.5%
Lysine %	0.85%	0.25%	0.40%	0.58%	0.35%	0.49%
Carbohydrate	63g	74g	73g	72g	71g	5g
Calcium	162mg	20mg	38mg	33mg	41mg	118mg
Iron	10.0mg	1.8mg	2.6mg	2.8mg	3.3mg	Traces
Phosphorus	455mg	256mg	376mg	282mg	372mg	93mg

**Source:** Anu Rastogi and Sudhir Shukla [4].

High amounts of calcium, magnesium, iron, potassium and zinc are also found in amaranth. The calcium/phosphorus ratio (Ca:P), which should be around 1 to 1.5, shows a good value of 1 to 1.9-2.7 in this pseudocereal [5]. It is a good source of riboflavin, vitamin C and in particular of folic acid and vitamin E [6]. Folic acid has been found in amounts of 102µg/100g in

amaranth i.e. 2.5 times higher than in wheat (40µg/100g). The vitamins B2 and B6 are also present in amaranth seeds [7]. Starch content is low, with a limited amount of amylose (about 10% of starch, while 90% is amylopectin). Amaranth is a good source of tocotrienols and flavonoids. Moreover, the lipid content in amaranth seeds is significant, containing 6–7% of

squalene, a compound related to the reduction of cancer risk, anti-aging effects on skin, regulation of lipid metabolism, and a positive effect on the human immune system.

Table 2, Minerals and vitamins in grain amaranth and wheat (per 100gm)

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Mineral	Grain Amaranth	Wheat	Vitamins	Wheat	Vitamins
Phosphorus	455mg	158mg	Ascorbic acid	4.20mg	Infinite
Potassium	290mg	101mg	Riboflavin	0.23mg	181mg
Calcium	175mg	528mg	Folacin	49mcg	129mcg
Magnesium	266mg	266mg	Niacin	1.45mg	
Iron	17.4mg	238mg			
Zinc	3.7mg	120mg			
Copper	0.77mg				

Source: Anu Rastogi and Sudhir Shukla [4].

Fibre is also a naturally occurring constituent in amaranth seed which is slightly lower than wheat and is present in bran instead of perisperm layer. It ranged from 33-44% in *A. caudatus*. Anti nutritional factor i.e. phytic acid ranges from 0.3 to 0.6% and it is equally distributed in the seeds. This anti nutritional factor has a property to lower the cholesterol level in human system. These compounds can easily be removed by boiling of seeds or leaves for 5 minutes before using it for edible purposes.

Amaranth seeds contain rather low amounts of saponins (0.09%), and this low concentration of saponins in amaranth seeds produces low toxicity as compared to other cereals. Saponins are only absorbed in small amounts, and they have detrimental effect to the intestinal tract. These compounds can form complexes with zinc and iron, and therefore limit their bioavailability [8]. Saponins are anti-carcinogenic, anti-microbial, cholesterol decreasing, immune modulating, as well as anti-inflammatory. Therefore amaranth-derived products create no significant hazard to the consumer.

Amaranthus is an important alternative for cereals due to its high nutritive values and interesting functional properties. Amaranth, an underutilized crop and a cheap source of proteins, minerals, vitamin A and C, seems to be a future crop which can substantiate this demand due to its tremendous yield potential and nutritional qualities, also recently gained

worldwide attention. However intensive research is still required to develop global food products along with the popularization of this grain among masses.

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