

HEALTH BENEFITS OF PULSES

Pulse grain

Pulse grain is the edible seed from the pod of a legume crop that is grown for human consumption. Pulses include chickpeas, lentils, peas, faba beans, mung beans and other legume crops. Pulses contain a wide range of nutrients, including carbohydrate (sugars and starches), dietary fibre, protein, unsaturated fat, vitamins and minerals, as well as non-nutrients, such as antioxidants and phytoestrogens.

Health benefits of pulse grains

- Pulses are high in dietary fibre - important for healthy bowel function.
- Pulses contain soluble fibre - lowers blood cholesterol.
- Pulses have a low glycaemic index or GI (<55) - lowers glucose and insulin levels.
- Low GI foods are recommended to avoid hyperglycemia and/or increases in blood insulin levels - risk factors for cardiovascular disease, mortality, and type 2 diabetes.
- Pulses contain antioxidants - vitamin E, selenium, phenolic acids, phytic acids, copper, zinc and manganese.
- Pulses have Phytoestrogens - may help in the prevention of hormone-related cancers, such as breast and prostate cancer.
- Pulses are good sources of folate - useful in the prevention of diseases, such as heart disease, cancer. The B vitamin folic acid significantly also reduce the risk of neural tube defects (NTDs) like spina bifida in newborn babies.
- Chickpeas, faba beans, lentils contain saponins - lower blood cholesterol
- Pulses are gluten-free - they offer a great variety for those on a gluten-free diet (eg for Celiac disease, a gastro-intestinal disorder).
- Pulses suit a vegetarian diet when combined with other foods – need a Vitamin C source for iron absorption; grains, nuts or rice to balance the essential amino acids (methionine and lysine).

Dietary guidelines

To benefit from the different nutrient contents and nutritional attributes of different grains and pulses, eat a wide range of grain-based and pulse-based foods. Note that processing can slightly alter the nutritional attributes of a food product.

Pulses (legumes) in Australia feature in both the "meat" and "vegetable" food groups and are eaten as an accompaniment. Dietary guidelines are to "Eat plenty of vegetables (including legumes) and fruits", as well as "Eat plenty of cereals (including breads, rice, pasta, noodles), preferably wholegrain."

Pulses in Asia are represented in the "meat" food group and are an important source of protein.

Children require 2 'serves' of pulses daily, adults 4 'serves'. A 'serve' of pulses (as part of vegetable group) is 75g (½ cup) cooked dried beans, peas or lentils. A 'serve' of pulses (as part of meat group) is 80g (½ cup) cooked (dried) beans, lentils, chickpeas, split peas or canned beans.

Start by consuming lower amounts of pulses and build up to a consistently high level. This helps to avoid the dreaded flatulence associated with beans and other pulses, and gives your gut time to adjust to the increased fibre and other components.

Pulses in a vegetarian diet

- Pulses are an excellent vegetarian source of iron (but it is 'nonheme' iron, as in plant foods, and so not as easily absorbed as 'heme' iron in meat). Include a source of Vitamin C to increase the absorption of iron from pulses and other plant foods.
- Combine pulses with another food to make a complete protein - because pulses are low in methionine and high in lysine, essential amino acids. For example: pulses and cereals/grains; pulses and nuts or seeds; pulses and rice.

Pulses and Diabetes

- In treating diabetes through diet therapy, the main goal is to maintain a near-normal blood glucose level
- Pulses are beneficial for people with diabetes because they have a low glycemic index (GI).
- Their low GI value (<55) results in a slower release of glucose following a meal, leading to minimal fluctuations in blood glucose levels and a more stable insulin response.
- It is the complex carbohydrates including dietary fibre and starch in pulses that is resistant to digestion. This contributes to a reduced rate of digestion and low GI for pulses compared to other carbohydrate-containing foods
- Pulses are also low in fat and an excellent source of protein for diabetics
- Pulses have been shown to improve blood lipid levels as well as overall metabolic control.

Nutrient Content and Health benefits of pulse grains

Energy

Pulses contain from 1040 to 1430kJ per 100 g (similar to cereal grains) - provided mostly by carbohydrate rather than fat.

Carbohydrate

All pulses are a good source of carbohydrate, with a low glycaemic index, hence their carbohydrate is slowly digested. About half of their energy is supplied by carbohydrate (sugars and starches).

Dietary fibre

Pulses eaten with the seed coat (eg green lentils, kabuli chickpeas), are much higher in dietary fibre than those that are dehulled before consumption (e.g. split peas, red lentils).

- **Insoluble fibre** - is important for bowel health.
- **Soluble fibre** - soluble fibre in pulses lowers blood cholesterol.
- **Resistant starch** - pulses generally have high amylose content.
- **Oligosaccharides** - sugars such as raffinose (3-5%), stachyose and pentosans cause abdominal discomfort and flatulence because they escape digestion in the gut and are fermented in the large bowel. Soaking in water overnight and changing the water helps reduce content of these sugars.

Protein

Pulses provide between 20 and 30 g of protein per 100 g, twice as much protein as grains and similar in protein content to meat. Pulses are low in essential amino acids, methionine and cysteine, but they are rich in lysine. When combined with grains, pulses provide all of the essential amino acids required for human growth and development.

Pulses are suitable for people requiring a gluten-free diet. They are high in fibre and the B vitamins thiamin and niacin, all which may be lacking in a gluten-free diet. Pulse flours are an alternative to gluten-free flour, and provide valuable protein and fibre to gluten-free baked goods.

Fat

Pulses are low in fat, containing 2-6% fat, most of which is provided by polyunsaturated and monounsaturated fatty acids.

Pulses contain no cholesterol, but they do contain plant sterols which are known for their cholesterol-lowering effect.

Vitamins

- B vitamins - pulses contain thiamin, riboflavin, niacin, folate, vitamin B6 (pyridoxine) and pantothenic acid. Pulses contain more folate than grains.
- Vitamin E - the embryo of pulses contains vitamin E, a known antioxidant.
- Vitamin A
- Vitamin C - dried pulses contain vitamin C, but pulse sprouts are good sources of vitamin C (1 cup of bean sprouts contains 11 mg of vitamin C).

Minerals

- Potassium - Contain more potassium than sodium which is important for the management of hypertension.
- Contain iron, zinc, magnesium and phosphorus.
- Contain more calcium than cereal grains.
- Contain selenium (but varies with source).
- Some manganese and copper are also found in pulses. Magnesium, calcium and zinc bind to phytate which may reduce their absorption.

Phytochemicals

- **Lignans** and **isoflavones** have anticarcinogenic, weak oestrogenic, and antioxidant properties.
- **Phenolic acids** have antioxidant activity.

Antinutrients

- **Lectins or haemagglutinins** in some pulses are toxic when taken orally. They can cause vomiting, diarrhoea, nausea and bloating in humans. Heat can reduce the toxicity of lectins, but low temperatures and slow cooking may not be enough to completely eliminate their toxicity.
- **Phytic Acid** has antioxidant activity.
- **Phenolic compounds**, including tannins are found mainly in the seed coat.
- **Protease inhibitors** found in chickpeas have been shown to have a role in preventing the initiation of cancer.
- **Saponins** are common in chickpeas, lentils and faba beans. They are poorly absorbed and may affect nutrient absorption.
- Broad beans can result in **favism**, a haemolytic anaemia, in genetically susceptible individuals of Mediterranean descent.
- The **lathyrus** toxin in certain drought-resistant chickpeas can cause lathyrism, a neurological disorder, when consumed in large amounts.
- Phytic acid, saponins, tannins and protease inhibitors have been shown to lower glucose response after a meal.

Table 1: Nutrient content of pulses (dried weight)

Per 100 g	Lupin (Albus)	Chickpea	Field pea	Faba bean	Mungbean	Lentil	Navy bean
Energy (kJ)	1552	1523	1427	1427	1452	1414	1402
Protein (g)	36	19	25	26	24	28	22
Fat (g)	9.7	6.0	1.2	1.5	1.2	1.0	1.3
Carbohydrate (g)	40	61	60	58	63	57	61
Fibre (g)	35	17	26	25	16	31	24
Thiamin (mg)	0.6	0.5	0.7	0.6	0.6	0.5	0.7
Riboflavin (mg)	0.2	0.2	0.2	0.3	0.2	0.3	0.2
Niacin (mg)	2.2	1.5	2.9	2.8	2.3	2.6	2.1
Pantothenic acid (mg)	0.8	1.6	1.8	1.0	1.9	1.9	0.7
Vitamin B6 (mg)	0.4	0.5	0.2	0.4	0.4	0.5	0.4
Folate (μ g)	355	557	274	423	625	433	370
Vitamin A (IU)	23	67	149	53	114	39	4
Vitamin C (mg)	4.8	4.0	1.8	1.4	4.8	6.2	3.0
Vitamin E (mg)	-	0.8	0.3	0.1	0.5	0.3	0.4
Calcium (mg)	176	105	55	103	132	51	155
Iron (mg)	4.4	6.2	4.4	6.7	6.7	9.0	6.4
Magnesium (mg)	198	115	115	192	189	107	173
Phosphorus (mg)	440	366	366	421	367	454	443
Potassium (mg)	1013	875	981	1062	1246	905	1140
Sodium (mg)	15	24	15	13	15	10	14
Zinc (mg)	4.8	3.4	3.0	3.1	2.7	3.6	2.5
Copper (mg)	1.0	0.9	0.9	0.8	0.9	0.9	0.9
Manganese (mg)	2.4	2.2	1.4	1.6	1.0	1.4	1.3
Selenium (μ g)	8.2	8.2	1.6	8.2	8.2	8.2	11.0

US Department of Agriculture, Agricultural Research Service, Nutrient Database for Standard Reference (2001)

The Glycemic Index (GI) of Some Common Foods

High GI Foods		Low GI Foods	
Food	Glycemic Index*	Food	Glycemic Index*
White rice, boiled	45 - 104	Baked beans	40 - 56
Boiled potato	54 - 101	Lentils (boiled)	18 - 52
White bread	67 - 87	Chickpeas (dried, boiled)	10-42
		Peas	22-47
Corn flakes TM	72 - 92	Mungbeans	25-42
		Multigrain wheat flour bread	43
		Apple (raw)	28 - 44
Jelly beans	76 - 80	Yoghurt	14 - 36
Porridge (from whole rolled oats)	42 - 75	Hommos	6

* Values from www.glycemicindex.com

References and Acknowledgements

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- **Go Grains** (www.gograins.com.au), the leading independent nutrition advisor for grain foods in human health in Australia. Go Grains Health & Nutrition Limited is a membership-based organisation that links the Australian grains industry value chain from grain growers to food manufacturers.
- **Pulse Australia** (www.pulseaus.com.au) the peak industry body for pulses in Australia.
- **CLIMA** "Passion for Pulses"(www.passionforpulses.com). CLIMA is the Centre for legumes in Mediterranean Agriculture (<http://www.clima.uwa.edu.au>).
- **Pulse Canada**. The Canadian equivalent to Pulse Australia (www.pulsecanada.com).

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