

# *Faba Bean: A Nutritional Powerhouse and Unveiling Health Benefits*

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## **ABSTRACT**

Faba beans (*Vicia faba L.*) are suitable for tropical to temperate climates. They are more tolerant of acidic soils. The optimal pH level for growing faba beans is between neutral and alkaline (pH 6.5 to 8.0). Flowers are usually pollinated by insects such as honey bees, bumblebees, and solitary bees. Faba beans are one of the most important edible legumes. These beans are very nutritious due to their high content of proteins, minerals, vitamins, and numerous bioactive compounds such as polyphenols and carotenoids. It is a good source of lysine-rich protein and a good source of levodopa (1-3,4-dihydroxyphenylalanine), a dopamine precursor that has potential as a drug to treat Parkinson's disease. These beans are high in non-nutritive secondary metabolites and high in fiber, both of which are good for human health.

## **INTRODUCTION**

**F**aba bean (*Vicia faba L.*) chromosome number  $2n = 12, 14$  is an annual crop. Its common name is, broad bean, and horse bean and kalamatar in India (Kumar *et al.* 2023) Legume crops are widely cultivated throughout the world and having a sustainable

source of protein-rich food. Among all those legume crops, one of the oldest crops in the world is the faba bean, which is primarily grown in the Mediterranean region, including Ethiopia, Egypt, China, Afghanistan, India, Northern Europe, and Northern Africa. (Dhull

*et al.* 2021) It is considered as an important crop from its ecological, nutritional, and economical aspects. (Xiao *et al.*, 2021). Faba bean (*Vicia faba* L.) is suitable for tropical to temperate regions. It is a grain legume vegetable which is commercially grown for green pod and dried seeds (Raiger *et al.* 2021).

Faba Bean is the rich source of protein, namely Lysine, and it contains (20-30%) of it, depending upon the cultivation practices and the agro-climatic condition of the place where it's being cultivated. Levadopa (l-3,4-dihydroxyphenylalanine), a precursor of dopamine that is used to treat Parkinson's disease, is abundant in faba bean. The body's ability to synthesis dopamine molecules, which control motor cells, is compromised in an individual with Parkinson's disease (Singh *et al.* 2012). Among the majority of pulses, peas, chickpeas, lentils, and other beans, the fava bean has a high protein level. It is low in fat and a great source of vitamins and minerals. Additionally, it has anti-nutritional elements such lectins, phytic acid, tannins, and digestive enzyme inhibitors that can have harmful effects in the body by reducing the body's absorption and bioavailability of proteins and minerals during digestion. (Martineau *et al.* 2022)

In the year 2020-21, the area dedicated to Faba beans production in India totalled 8.11 lakhs hectares, resulting in a production of 1.26 million tonnes (Source: DES, Ministry of Agriculture & Farmers Welfare, Government of India, 2021-22). Faba bean, is a traditional legume crop of Bihar, and being cultivated on the largest areas of the state. Moreover, it's been also cultivated in significant areas of Madhya Pradesh, Odisha, and Uttar Pradesh, primarily in its eastern regions of India (Koli *et al.* 2022).

### **Cultivation**

As compared to other legume crops faba bean are more tolerant to acidic soil. (Singh *et al.*

2013) While the identity of the extinct ancestor of the faba bean is still unclear, other closely related species of the bean have small seeds, and faba beans with small seeds are the most widely grown in the area. The faba bean is a widely distributed plant that grows well in both subtropical and temperate regions of the world, as well as at higher elevations in the tropics, such as South America and Mexico. It is extensively distributed over the northern states of India throughout the plains' winter season and the hilly or mountainous areas' rainy season. (Singh *et al.* 2010)

*Vicia faba* is a rabi season crops in India that can tolerate wide range of climatic diversity, soil type and pH, but it requires well drained fertile loamy soil with one or two irrigations to cultivate in its full bloom (Singh *et al.* 2012). The optimal pH for growing faba beans is between neutral and alkaline (pH 6.5 - 8.0). The growing season requires little or no heat to produce the optimal temperature of 18-27°C (Mishra *et al.*, 2023).

### **Morphology**

Faba bean is a yearly plant characterized by its robust and erect stems, reaching a height of 0.3-2 m. The stems are unbranched and may have one or multiple hollow sections starting from the base. Its leaves are arranged alternately and are pinnate, composed of 2-6 leaflets, each measuring up to 8 cm in length. Unlike many other plants in the same Genus, *Vicia faba* lacks tendrils or only possesses under developed ones (Muehlbauer *et al.*, 1997).

It boasts striking, oversized white blossoms adorned with deep violet markings, arranged in axillary racemes featuring compact clusters of 1-5 flowers each. Typically, there are about 1-4 pods per cluster, and its growth pattern can be variable. Within the broad bean community, roughly 30% of plants undergo cross-

fertilization. Revered since antiquity, this plant is cherished for its green pods and dried seeds. Thriving in warm temperate and subtropical regions, the faba bean emerges as a staple winter crop (Mishra *et al.*, 2023).

Insects like honey bees (*Apis mellifera*), bumble bees (*Bombus* sp.), and solitary bees are often responsible for pollinating the flowers (Stoddard and Bond, 1987). Two subspecies of the faba bean were identified based on seed size: Faba and Paucijuga. Based on the size of the seeds, the Faba subspecies was further separated into three varieties: minor (little, rounded seeds, 1 cm long), equina (medium-sized seeds, 1.5 cm long), and major (big, broad, flat seeds, 2.5 cm long) (Muehlbauer *et al.*, 1997).

### Nutritional Value of Faba bean

The protein content of faba beans (24–33%) is higher than that of many other food legume crops. It is mostly composed of 79% globulins, 7% albumins, and 6% glutelins, as well as starch (45%), cellulose (3%), sugar (3%), oligosaccharides (6.5%), and minerals. (Dewangan *et al.*, 2022, Sahu *et al.*, 2023)

Faba beans are having a high nutritious value because it contains high amount protein, they are also a good source of mineral nutrients, vitamins, and numerous bioactive compounds such as polyphenols, carotenoids (Karkanis *et al.*, 2018).

**Table 1. Nutritive value of fava bean per 100 gm.** (Source: USDA National Nutrient data base)

Principle	Nutrient Value
Energy	341 Kcal
Carbohydrates	58.3 g
Protein	26.1 g
Total Fat	1.53 g
Dietary Fiber	25 g
<b>Vitamins</b>	
Folates	423 µg
Vitamin -B3	2.83 mg
Vitamin -B5	0.976 mg

Vitamin -B6	0.366 mg
Vitamin -B2	0.333 mg
Thiamin	0.555 mg
Vitamin A	53 IU
Vitamin C	1.4 mg
Vitamin K	9 µg
<b>Electrolytes</b>	
Sodium	13 mg
Potassium	1062 mg
<b>Minerals</b>	
Ca	103 mg
Cu	0.824 µg
Fe	6.70 mg
Mg	192 mg
Mn	1.626 mg
P	421 mg
Se	8.2 µg
Zn	3.14g

### Health Benefits of Faba Bean

The Faba Bean are rich in dietary fiber, which very good for the better the bowel function of the stomach, anti-obesity, and risk of coronary heart disease, type 2 diabetes, and also helps to reduce the gastrointestinal disorders (Poonia *et al.*, 2022).

However, adding more plant-based proteins to diets has a highly positive impact on people's health. These beans are a great source of fiber and secondary metabolites that are good for human health but do not contain any nutrients (Moorthi *et al.*, 2015)

**Table 2. Health benefits of faba bean**

Medical Advantages	Components
Anti- cancer activity	Phenolic compounds inhibit metalloproteinase activity (Lima <i>et al.</i> , 2016)
Weight maintenance	Total dietary fiber and inhibition of lipase (Millar <i>et al.</i> , 2019)
Prevents Parkinson's disease	L-DOPA (1-3,4-dihydroxyphenylalanine) (Prabhu <i>et al.</i> , 2018)
Blood pressure regulation	Angiotensin-converting enzyme (ACE) disruption brought on by the proanthocyanidin enzyme complex's synthesis (Millar <i>et al.</i> , 2019)

## CONCLUSION:

Faba bean is also known as a nutrient powerhouse. Their protein content blotting out many other legumes, making them a valuable source of essential amino acids which are beneficial for human health. Apart from protein content, faba beans are also rich in dietary fiber, vitamins, and minerals, all contributing to a well-balanced diet for humans. These properties of Faba Bean making it of having potential health benefits. The high fiber content promotes gut health, anti-obesity, and may even reduce the risk of chronic diseases like cardiac problems and diabetes. Moreover, Faba Beans contain L-DOPA, a precursor to dopamine, which has shown a promising effect in managing Parkinson's disease. Overall, faba beans became a versatile and nutritious crop with potential properties to significantly improve human health.

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