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## **Botanical, chemical and pharmacological review of *Phaseolus vulgaris* L. (common bean): An ayurvedic medicinal plant**

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**Abstract**--Herbs that have curative properties have been used for a very long time in the practise of traditional medicine. The French bean, scientifically known as *Phaseolus vulgaris* Linn, is an excellent choice for a meal that's high in both carbohydrates and protein. This plant has a variety of different components, including sugars, proteins, saponins, tannins, and phenolic acid. *Phaseolus vulgaris* Linn. also has Anti-obesity and anti-urolithiatic properties. In this paper, the phytochemistry and pharmacological characteristics of *Phaseolus vulgaris* Linn. known as common bean, is summarised. The plant may also be explored further for its numerous pharmacological properties owing to the extensive range of chemical components it contains, the fact that it is a food crop, and the fact that it is used for natural medicinal purposes. In this work, an effort has been made to present available current status on pharmacology, photochemistry, and botany of the plant. The article also explains the environment in which the plant thrives. All of the data were discovered via searches conducted at the library as well as on Google scholar, PubMed, SciFinder, and Scirus.

**Keywords**---*Phaseolus vulgaris*, Botany, Medicinal uses, Photochemistry, Pharmacology, Food crop, Urolithiasis, Obesity.

## 1 Introduction

The plant *Phaseolus vulgaris* L. (*Papilionaceae*), which is native to the United States, is now grown in a wide variety of nations, including India and Pakistan. The other place is the origin of 47 of the 52 species of *Phaseolus* that are now known to science. This plant used to make up a significant portion in the diets many of people in developing countries. But with significant change in the lifestyle globally (in line with developed countries food habits), the consumption has declined. It has not received the recognition for its use that it deserves in northern Europe North America and other parts of globe. The incidence of rising number in the lifestyle related disorders viz. obesity, and heart disease is all on the rise in Mediterranean countries. There are increased cases of various cancers as well. With 17.7 million new cases being reported year, World Health Organization (WHO) cites death resulting from a non-transmissible disease (NTD) as the major cause of mortality globally. In the United States, there are a total of 8.8 million new instances of cancer, 3.9 million new cases of respiratory sickness, and 1.1 million new cases of diabetes (1.6 million cases). These four groups of diseases are responsible for the deaths of 81% of persons who have a non-communicable disease-related cause of death. A growing body of evidence from the scientific community shows that bioactive molecules, which are good for one's health, may assist in the avoidance of and treatment of sickness **(1)**.



Figure 1 Plant of *Phaseolus vulgaris* L.

According to a number of studies, common beans contain a significant amount of numerous essential nutrients, including protein, carbs, fibre, minerals, and vitamins. Flavonol glycosides, anthocyanins, and condensed tannins (Proanthocyanidins) are just a few examples of the bioactive compounds that may be found in these seeds. Not only these molecules are responsible for the seeds' brilliant colour, but they also play a role in the seeds' biological activity. Clinical studies have shown that consuming beans is supposed to provide the benefit as they possess lower glycemic index thereby leading to reduction in likelihood of developing type 2 diabetes. This is because beans have a high polyphenol content, which renders potent antioxidant effect. Beans have a high polyphenol content. Consumption of beans has been associated to a reduction in the risk of ischemic heart disease / other cardiovascular disorders, stomach and prostate cancer, obesity, stress reduction, anxiety and depression in the elderly, Beans have been an important part of the cuisine of Mexico for centuries. According to the study, Mesoamerica, namely the area to the west and south of Mexico, is the place where beans first grew and were domesticated. South America served as the species' last habitat before becoming extinct **(2)**.



Figure 2 Seeds of *Phaseolus vulgaris*.

Today, Mexico is home to a large array of bean types, some of which are cultivated and others of which are wild and have not yet been explored. In the north-central area of Mexico, the most prevalent bean varieties include "Pinto," "Bayo," "Flor de Mayo," "Garbancillo," and "Negro." The northeaster part of Mexico is home to a variety of beans known as "Peruano," "Azufrado," and "Mayocoba." The central area of Mexico has the largest availability of bean types such as "Flor de Mayo," "Flor de Junio," "Negro," and various kinds of "Criollo." Small-grain, black, and cloudy beans are the most important crops in regions of the tropics that experience high levels of humidity. However, the fact that just 5% of this food is produced on an industrial setting demonstrates that its level of industrialization is still relatively low and its health potential is least explored. A large number of research have been conducted to investigate the phytochemical make-up of different varieties of the common Mexican bean **(3)**.

The most common types of bioactive chemicals that were identified and are of interest for medical fraternity can be total phenols, anthocyanins, tannins, flavonoids, lectins, phytic acid, and oligosaccharides. Other types of bioactive compounds were also identified. According to the findings of a research conducted

on Sprague-Dawley rats, consumption of many varieties of the common Mexican bean has shown to minimise the likelihood of the rats developing cancerous tumours. It may be possible to enhance further if more is known about genetics and the resources that are now accessible. Bean varieties that were brought to Europe from the Americas around 500 years ago have been the subject of research in a number of European countries, including Italy and Spain. It is worth to study and derive leverage out of genetic variation present in their cultivars as a tool to widen the basis for development programmes and as a tool to assist in efforts to increase bean consumption on an individual level while simultaneously lowering consumption of fast food. We want to learn what kinds of nutrients and bioactive compounds may be present in the bean types that are most common, as well as how these substances may influence human health **(4)**.

## 2 Taxonomy

The edible dry seeds or unripe fruit of the annual plant *Phaseolus vulgaris*, most often known as the common bean or the French bean, is the primary reason for the plant's widespread cultivation (both commonly called beans). The most common types of beans are dry beans, which are the seeds that are harvested after the plant has reached its full maturity, snap beans, which are harvested before the seed develops and have a crunchier pod and less fibre, and shell beans, which are the seeds that have been cooked and have had their shells removed (seeds harvested at physiological maturity). Many use it as a staple while sometimes it is used as a cattle feed as well. It is a member of the Fabaceae family, which contains other species of *Phaseolus* as well as legumes in general. The rhizobia, which are bacteria that fix nitrogen, are essential to the growth of common beans, just as they are to the growth of other plants in this family. The species known as common beans has been around for a very long period, yet throughout that time they might have likely undergone significant genetic changes. This kind of wild bean as a climber is seen in a number of different types. The types of beans depend on the habitat where it is grown. These beans are sometimes known as bush beans, dwarf beans, pole beans, or climbing beans. The kidney bean, wax bean, pinto bean, and navy bean are just few of the varieties that fall under this category. Additionally, broad beans (*Vigna radiate*) and runner beans (*Phaseolus coccineus*) are cultivated for the purpose of commercial production (*Vicia faba*). Every continent with the exception of Antarctica is capable of growing beans. In 2016, the global production of dried beans reached 27 million metric tonnes, while the production of green beans reached 24 million metric tonnes. In 2016, China was responsible for producing 79 percent of the world's green bean crop; whereas Myanmar was the country that produced the driest beans. Wild *P. vulgaris* is native to the Americas. It was previously believed that the domesticated bean had two different sets of genes due to the fact that it was domesticated separately in Mesoamerica and the southern Andes. Recent genetic studies suggest that it was first domesticated in Mesoamerica and then exported to the rest of the globe, most likely together with squash and maize. This conclusion is based on the findings of previous studies (corn). Known as the "Three Sisters," the following are the top three crops that Mesoamerican farmers in North America depended on the most: **(5-6)**.

- **Plant:** Annual, climber or sub erect, stem, pubescent to glabrescent.

- **Leaves:** Trifoliolate, petiolate 4-nine cm lengthy, leaflet 4.5-15cmlong.2.5-6.5cm huge ovate to ovaterhombic, acuminate, lateral leaflet oblique; petiolate 1.5-2.5mm lengthy, stipules 4mm lengthy
- **Inflorescence:** 1-three flowered, peduncle 0-5cm lengthy.
- **Bracts:** 3mm lengthy bracteolate 5-6mm lengthy.
- **Calyx:** Pubescent, tube 2-3mm lengthy, tooth 1mm lengthy, joined to shape an emarginated.
- **Corolla:** white, yellowish, purple/light pink.
- **Vexillum:** 1-1.9cam lengthy, Glabrous, 5-12 seeded.
- **Keel:** 2.2cm lengthy, spirally incurved.
- **Fruit:** 1-15cm lengthy, 1-1.3cm huge, linear, calceolate, pubescent or Glabrous, 5-12 seeded.
- **Seed:** Reni shape, darkish pink 0.nine-2.0×0.three-1.2cm.
- 

Table 1 Taxonomy of *P. vulgaris*

Plant	Annual plant that may either climb or stand upright, with stems that range from pubescent to glabrescent.
Leaves	Trifoliolate, petiole length of 4-9 centimeters, leaflets of 4.5-15 centimeters long, 2.5-6.5 centimeters wide, oblong to ovate-rhombic in shape, acuminate, lateral leaflets oblique; petiolule length of 1.5-2.5 millimeters, and stipule length of 4 millimeters.
Inflorescence	1-3 flowers, peduncle length ranges from 0-5 cm.
Bracts	3mm long; bracteoles 5-6mm long.
Calyx	Pubescent, tube 2-3 millimeters in length, with teeth measuring 1 millimeter in length and the top two united to create an emarginated lip.
Corolla	White, yellowish purple or pale-pink.
Vexillum	1-1.9cm long, glabrous.
Keel	2.2cm long, spirally incurved.
Fruit	10-15 centimeters in length, 1-1.3 centimeters in width, linear or lanceolate in shape, pubescent or glabrous, and bearing 5-12 seeds.
Seeds	Reni form, dark red, 0.9-2.0x0.3-1.2cm.

Table 2 Taxonomic classification of *P. vulgaris*

Kingdom	Plantae
Family	Papilionaceae
Tribe	Phaseolae
Sub tribe	Phaseolinae
Genus	<i>Phaseolus</i>
Species	<i>Vulgaris</i>
Synonym	<i>Phaseolus aborigineus</i> Burkart.

### 3 Origin And Other Name

While reviewing the legume that are cultivated, it is evident that the term "bean" is referred to *P. vulgaris*. In India, it is also often referred by the names Bakla,

Rajmah, and Rajma, to mention just a few. The common bean is believed to have been one of the earliest crops to be produced in the Americas (*Phaseolus vulgaris* L.). The production of garbanzo beans is more than twice as high as that of chickpeas, which are the second most important grain legumes for human use. According to data compiled by FAOSTAT, a government body in the United States, the annual production of dry beans was around 26.8 million metric tonnes in 2016. China was responsible for producing 23.6 million tonnes, which was equivalent to 79 percent of the entire production worldwide. Myanmar, India, and Brazil were the nations that dominated the worldwide market. It is essential to have a solid understanding of the history of crop species and how it has been developed over the course of time in order to successfully conserve existing plant resources and get the most out of them. A recent research that used genetic markers from a wide variety of various locales has made it abundantly evident that the Andean gene pool experienced a bottleneck prior to being domesticated. In addition, the four genetic groups of Mesoamerican accessions, each with different affinities to wild accessions from the Andes and northern Peru–Ecuador, was a really intriguing conclusion-(8).

Table 3 Names of *Phaseolus vulgaris* in different languages

Languages	Names
Bengali	BarbatiBeej.
English	Kidneybean, Snap bean, Green bean, Drybean, Stringbean.
French	Haricotcommun.
German	Gartenbohne.
Hindi	Rajma.
Italian	Fagiolo, Faxoe, Faisoe (Liguria) ,Fasoel (Piemonte), Cornett(Lombardia),Fasioi,Fasoler(Veneto), Fasol,Fasulein(Emilia), Fasciolo(Umbria).
Latin	<i>Phaseolus vulgaris</i> .
Malyalam	Beans.
Portuguese	Feijão(dry),Feijão-vagem(green).
Spanish	Caraota(Venezuela),Chaucha(green -Argentina,Uruguay),Ejote
Tamil	SigappuKaaramani.
Telugu	Chikkuduginjalu.
Urdu	Lal lobia.

#### 4 Functional Food And Nutraceutical/Bioactive Compounds

*P. vulgaris* has been found to contain about 52 to 76 percent carbohydrates, 14 to 33 percent protein, and a variety of amino acids, including lysine (6.4-7.6 gramme per 100 grammes of protein), phenylalanine, and tyrosine. In addition to its nutritional value, it contains bioactive compounds, such as those that have anti-inflammatory, phenolic acid, flavonoids, flavan-3-ol, condensed tannins, and anthocyanin properties. These compounds also have antioxidant properties,

which are particularly effective at protecting the body from peroxy radicals, 2, 2-diphenyl-1-picrylhydrazyl (DPPH), and 3-ethylbenzothiazoline6-sulfonic acid (ABTS **(9-11)**).

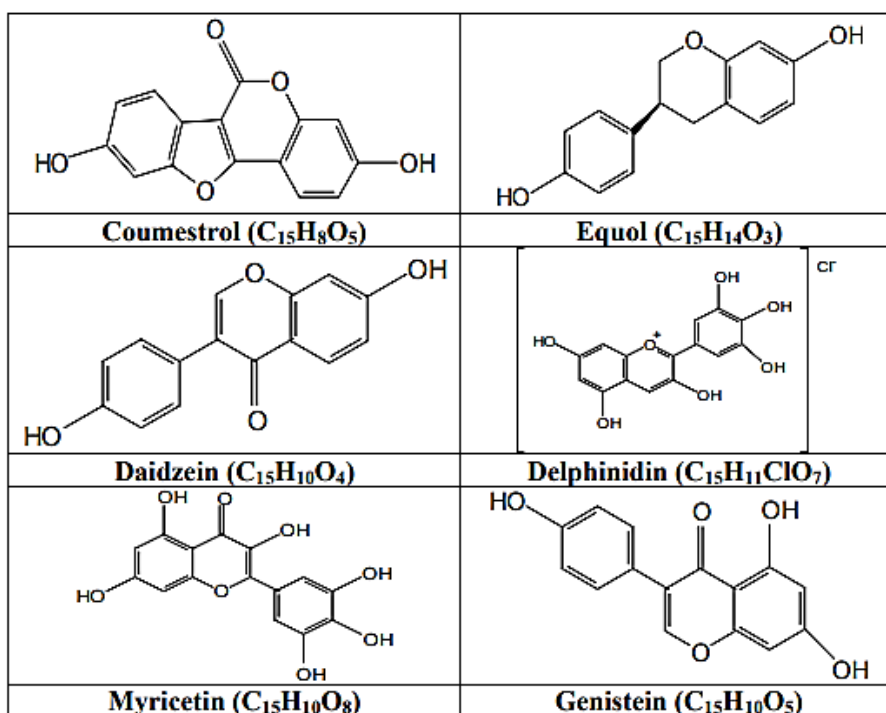


Figure 3 Chemical structures of some compounds isolated from *Phaseolus vulgaris*.

#### **a. Saponin:**

Common beans though contain Saponin, but it is present in a very low concentrations. These molecules have a structure that resembles either a steroidal aglycone or a triterpenoid, and they include one or more sugars in their composition. Saponins are classified as either type A, type B, or type E according to the structure of the aglycones.

#### **b. Non Flavonoids Phenolic Compound:**

The phenolic compounds that are not flavonoid, such as hydroxybenzoic acid and hydroxycinnamic acid, may be discovered in the cotyledons of the seed, while flavonoid compounds can be found on the seed coat.

#### **c. Flavonoids:**

Beans contain phenolic chemicals known as flavonoids. It has been shown that the presence of these phenolic chemicals may slow down the development of tumours and some forms of cancer. Flavonoids have the same structure, which consists of two aromatic rings joined together by a 3-carbon bond to form an oxygenated heterocyclic compound. Flavonoids are classified as organic compounds. These are divided into six different subclasses according to the heterocyclic flavones, flavones, isoflavones, anthocyanides, and flavonols that they contain (catechin & proanthocyanides). Some of the most significant flavonoids include catechin, kaempferol, quercetin, myricetin, and procyanidin.

**d. Tannins:**

Tannins are present most on seed coat, tannins are polymeric flavonoids that comprises a small part of widely diverse group of phenolic compound.

**e. Phenolic Acids:**

The most frequent place to find phenolic acids is in the common bean. These acids include Vanillic, Coumaric, sinapic, Ferulic, and Chlorogenic acids. Phenolic acids play an important role in plants because they are the precursors of other, more complex phenolic compounds.

**5 Nutritional Value**

The classification of Nutraceuticals takes into account where they come from, how they function, the chemical components that they include, and the positive effects that they have on a person's health. No matter whether they are classified as macronutrients, micronutrients, or phytochemicals, all of these components have a place in a diet that is balanced and nutritious. As a result of this, Nutraceuticals may be separated into a wide number of categories according to their source. Some examples of these categories include foods high in fibre, polyunsaturated fatty acids (PUFA), probiotics, prebiotics, antioxidants, vitamins, polyphenols, and spices. According to a research that was conducted by Nasri and colleagues, the word "Nutraceuticals" refers to dietary supplements (nutrients) that are produced from herbs as well as foods and drinks (such as juice) like cereal and soup. It is possible to use these in order to improve one's health, delay the ageing process, protect against chronic diseases, increase one's life expectancy, or support the structure and function of the body. These molecules are especially exciting at the moment since they have the potential to treat a variety of disorders, can be consumed without risk, and show a lot of promise for usage as food additives in the near future. According to a number of different estimations, by the end of 2018, global sales of these products are anticipated to be more than \$20 billion. The seed of the *Phaseolus vulgaris* plant is associated with a number of positive health effects, including the following: **(12).**

Table 4 Nutritional value of *Phaseolus vulgaris*

Basic composition (mg/g)		Fatty acids (mg/g)	
Total lipid	10.60	Total saturated	1.54
Protein	225.30	Total mono unsaturated	0.82
Carbohydrate	612.90	Total poly unsaturated	5.86
Essential minerals (mg/g)		Vitamins (mg/g)	
Macro-minerals		Alpha-Tocopherol (E)	0.0021
Calcium	0.83	Ascorbic acid (C)	0.045
Magnesium	1.38	Folate	3.94 µg/g
Phosphorus	4.06	Niacin (B3)	0.0211
Potassium	13.59	Phylloquinone (K1)	0.056 µg/g
Sodium	0.12	Pyridoxine (B6)	0.00397
Micro-minerals		Retinol (A1)	---
Iron	0.0669	Riboflavin (B2)	0.00215
Zinc	0.0279	Thiamin (B1)	0.00608
Total dietary fiber	0.1520	Caloric value	3.37 kcal/g

## 6 Pharmacological Activity

In order to investigate how synthetic substances affect the body, albino rats and mice were utilised as test subjects. Both short-term and long-term actions on rats aimed at reducing inflammation were performed on rats. Mice were used in an experiment using an analgesic. The animal ethics committee of the university gave its approval to all of the experiments that were performed on animals. All of the animals were made used to the environment of the laboratory before the beginning of the studies **(13)**.

### **a. Acute Toxicity**

The acute toxicity test was carried out in accordance with the standards provided by the Organization for Economic Cooperation and Development (OECD) (OECD/OCDC, 2000). The purpose of this test was to determine the optimal dosage of all of the compounds that were synthesised and extracted.

### **b. Anti-Inflammatory Activity**

As was noted before, the anti-inflammatory effect was studied by using the well-known Carageenan model in groups of six mice each. In the right hind paw of each rat, an injection of a newly generated aqueous suspension of carrageenan at a concentration of one percent by weight was administered. Two different groups of rats were given the test extract one hour before the Carageenan treatment at a dose of two hundred milligramme per kilogramme of the rat's body weight each. This served as the control. A digital plethysmometer was used to determine the volume both thirty minutes before and after the Carageenan therapy was administered. Rats were given diclofenac in an amount equal to 200 milligramme per kilogramme of their body weight. The glacial acetic acid test and the carrageenan-induced rat edoema test were used, respectively, to investigate the analgesic and anti-inflammatory activities of seed extracts from the *Phaseolus vulgaris* (Linn) plant. The usage of conventional painkillers such as aspirin and diclofenac served as a control in this study to determine the extent to which extracts were able to reduce inflammation and relieve pain. Extract of petroleum ether has been shown to have a number of anti-inflammatory and anti-pain effects. It's possible that pain and inflammation might be treated using extracts of petroleum ether **(14)**.

### **c. Analgesic Activity**

A large number of mice weighing 20-25 gm. each were administered 0.6 percent glacial acetic acid intraperitoneally (i.p.) 24 hours before to the actual experiments. The dosage was 10 ml/kg. The animals were observed to determine whether or not they were writhing. Only those who had some form of writhing were allowed to take the exam the next day (called "positive responders"). Respondents were administered compounds on the day of the test, half an hour before being challenged with glacial acetic acid. They were administered extracts orally at a rate of 200 milligramme per kilogramme of body weight. The typical dose of aspirin given was 30 milligramme per kilogramme of the mice's body weight **(15)**.

#### **d. Antimicrobial Activity**

On a collection of bacterial and fungal isolates, the antimicrobial properties of *Cajanus Cajan*, *Phaseolus vulgaris*, and *Vigna unguiculata* were evaluated for their potential to eradicate the pathogens. The plant seeds are first extracted using ethanol, then the seeds are allowed to air-dry at ambient temperature, and finally they are placed in a clean test tube. The agar well diffusion technique was used for the purpose of conducting the antimicrobial susceptibility test on four different isolates: two bacterial isolates (*Listeria ivanovii* and *Escherichia coli*), and two fungus isolates (*Aspergillus fumigatus* and *Candida albicans*). According to the findings of this research, out of the three different extracts that were examined, the one with the highest antibacterial potential was the one containing *P. vulgaris*. *Vigna unguiculata* was the test isolate that demonstrated the weakest antibacterial activity in comparison to the other isolates. The findings of the MIC test reveal that the growth of every strain that was tested was inhibited by *C. Cajan* at the doses that were shown. *V. unguiculata* was only successful in stopping fifty percent of the strains, but *P. vulgaris* was successful in stopping seventy-five percent of the isolates. This activity was slowed down due to the quantity of extract used. Plants contain antibacterial action that is effective against a wide variety of microorganisms because they may inhibit the growth of bacteria and fungus. Our findings, despite the fact that more investigation is required to validate them, are quite intriguing. This is due to the fact that this plant is consumed on a regular basis and may be added to the list of plant components and plant products that can be used in the treatment of infectious disorders (17-19).

#### **e. Antidiabetic Activity**

After a night of abstaining from food, mice were given varied quantities of *Phaseolus vulgaris* seeds the next morning. Some of the mice had normal blood sugar levels, whereas others had excessive blood sugar levels. It is believed that seeds contain a wide variety of bioactive compounds, such as anthocyanins, anthocyanin alkaloids, and flavonoids, in addition to a wide variety of other compounds, such as tannins, flavonoids, fibres, and proteins. This is because of the fact that seeds also contain a wide variety of other compounds. The levels of glucose in the patients' blood were tested at 0, 1, 2, 3, 4, 5, and 6 hours after therapy. Both the seeds on their own (300, 200, and 100 g/kg BW) and in combination with glibenclamide (0.2, 0.1, and 0.05 g/kg BW) were investigated for their ability to lower blood sugar levels in animals with hyperglycemia. The biggest reduction in blood sugar was seen in diabetic rats three hours after ingesting 300 g/kg BW of *P. vulgaris* seeds. The effect that eating *P. vulgaris* seeds had on one's blood sugar was weighed against that of taking the oral hypoglycemic medicine glibenclamide. Normal rats did not have dangerously low blood sugar levels even when given the highest dosages of seeds (300 mg/kg BW) and glibenclamide (0.20 g/kg BW) because the seeds and glibenclamide worked synergistically to raise blood sugar levels (20).

One of the most common chickpea varieties used in traditional medicine to treat diabetes problems is called *Phaseolus vulgaris*. The most recent study results are compared to the available historical information. The findings of recent investigations contradict the findings of publications from the early part of the 20th century. The use of *Phaseolus* preparations does not seem to be the most

effective method for either treating diabetes or doing significant structural study. In order for the extract to have any kind of an impact, it has to be given in very high quantities. It's possible that chickpeas are superior to other foods when it comes to preventing or treating type 2 diabetes. This is due to the fact that chickpeas contain a considerable quantity of fibre and block the activity of  $\alpha$ -amylase.

Research has to be done on the antioxidant properties of *Phaseolus vulgaris* to see whether or if the plant has the potential to be utilised as a treatment for diabetic issues, which are often related to high levels of oxidative stress. According to the most recent research, you may take an extract of *P. vulgaris* beans orally for an extended period of time at a dose of 200 milligramme per kilogramme of body weight. When diabetic rats are given STZ, which has the well-known effect of lowering blood sugar, there is an improvement in both the indications of liver function and the function of the kidneys. The extraction of this extract also stimulated the production of antioxidant enzymes in the liver and kidneys of STZ-induced diabetic mice, which resulted in a decrease in the amount of reactive oxygen species (ROS) being produced. Because of this, the antioxidant qualities of the *P. vulgaris* bean extract were discovered throughout the course of this inquiry, leading researchers to hypothesise that the extract might be beneficial in the management of diabetes. It has been shown that the presence of certain bioactive compounds in red kidney beans (*Phaseolus vulgaris* L.) may prevent diabetes by suppressing the activity of the enzyme  $\alpha$ -glucosidase. On the other hand, there is no information available on the anti-diabetic effects of the nonpolar components **(21-22)**.

#### **f. Hypocholesterolemic Activity**

There is a correlation between the cholesterol-lowering properties of green beans (*Phaseolus vulgaris*) and the presence of resistant starch and fibre in these beans. This product is effective in a variety of ways, including preventing the absorption of fat, preventing the accumulation of bile acids, increasing the amounts of cholesterol found in the faeces, and maybe even enhancing the clearance of lipoproteins by acting on low-density lipoprotein receptors. The fermentation of green bean fibre and resistant starch results in the production of short-chain fatty acids and phytohemagglutinin, both of which have the potential to assist in the regulation of hunger and feelings of fullness. Because it has the ability to activate hormone receptors in the intestines, it could have an effect on ghrelin and perhaps on other orexigenic neuropeptides as well. It is possible that it will enhance the function of neuropeptides that cause hunger, such as glucagon-like peptide-1, tyrosine-tyrosine peptides, and cholecystokinin. Other plant substances, such as phytosteroids and saponins, bind bile acids, break up cholesterol micelles, and limit the action of lipogenic proteins by means of the liver X receptor pathway. This prevents fat from being absorbed in the stomach, where it would otherwise be consumed **(23-25)**.

#### **g. Antioxidant Activity**

If an extract of green beans proved to be effective as an antioxidant, then the study was a complete and resounding success. The DPPH assay and UV-Vis spectroscopy were used, respectively, to evaluate the antioxidant activity and absorbance of the sample. The use of phytochemicals as a screening tool for

secondary metabolites is a possibility. The IC<sub>50</sub> was calculated to be 1268, 2512, 1698.18, and 4442.75 g/mL when the sample was held for less than one, one, two, or three months, respectively, while the IC<sub>50</sub> for BHT, which served as a control, was calculated to be 1,744. It has been shown that the pea powder sample extract had a modest amount of antioxidant activity. The level of antioxidant activity may change depending on the storage conditions. In the phytochemical analysis, there were discovered to be flavonoids, phenols, saponins, steroids, and terpenoids; however, there were not any tannins **(26, 28)**.

## **7 Biological Uses**

Important antioxidants like kaempferol and quercetin are included in the category of flavonoids. It has been shown that the anti-inflammatory and antioxidant effects of the carotenoids present in beans may help to lower the risk of having a stroke. Triterpenoids Saponins have properties that are antiviral, antifungal, and antibacterial, and they have the potential to prevent the transmission of viruses. Its function as an anti-inflammatory causes inflammatory mediators like histamine and serotonin to be rendered incapable of performing their functions. Quercetin and catechin are two types of flavonoids that support liver health and preservation. The risk of developing tumours is decreased when quercetin, an anti-cancer substance, is consumed. Flavonoids have the ability to suppress not just bacteria but also viruses (antiviral and antibacterial). Free radicals may be stopped from causing damage to cells by phenolic acid (antioxidant) In addition to its use in the treatment of heart disease and allergies, gallic acid is now the subject of research into its potential ability to thwart the development of cancer. People from all around the world eat the mature, dried seeds of the common bean as a kind of pulse, while the immature pods and seeds are cooked and eaten as a vegetable. The most widely produced bean in tropical Africa is used for culinary and nutritional purposes as a pulse. The common bean is essential not only due to the fact that it is beneficial to one's health, but also due to the fact that it adds flavour and variety to meals that are high in carbs, such as those that are cooked with maize or bananas. Rwanda, Burundi, and Kenya all rely heavily on it as a primary source of protein. Common beans are referred to as the "meat of the poor" on occasion, despite the fact that its appeal extends to people who have far greater financial resources. In the tropical African area, beans are often prepared in the kitchen with various spices and oil. You may puree it, mash it, or create soup out of it, depending on your preference. In many parts of the world, the dried seeds of the common bean are often preserved in tomato sauce before being canned. The leaves of the common bean are often consumed as a vegetable by some populations, particularly during the "hunger months," which are times when there is a scarcity of food options. Only a handful of the cultivars produce plants with leaves that are tender enough to be consumed. Feed for animals often include remnants of agricultural production. A powder made from charred seeds is often used in the treatment of wounds in Mali. The green, immature pods of *Phaseolus vulgaris*, sometimes known as French beans, are typically grown in temperate countries for the purpose of canning, freezing, or eating fresh. Young pods make up the vast bulk of commercially important crops in tropical Africa, such as maize **(29-31)**.

### **a. *Phaseolus Vulgaris* In Kidney Stone Treatment**

Kidney stones are a problem that have grown more prevalent in recent years, and as a result, a rising number of people all over the globe are afflicted with them. The increase in obesity rates in the United States has been related to a number of reasons, the most prominent of which include poor diet, heredity, and a lack of regular physical activity. In the vast majority of cases, kidney stones are composed of magnesium ammonium phosphate, uric acid, or cysteine, although in very trace amounts. Around 80 percent of the stones are composed of calcium oxalate (which accounts for 50 percent) and calcium phosphate, which accounts for 1 percent; however, a mixture of the two is also present (45 percent). Other types of kidney stones include struvite (which accounts for 10 percent), uric acid (which accounts for 9 percent), and cysteine (1 percent). It is possible for a person to have a range of difficulties, one of which is the creation of stones, when their metabolism is off kilter. These consequences include gout, hypocalcemia, hyperuricosuria, hypercalciuria, and low urine volume. Other issues include hyperxaluria, low urine volume, and a change in urine pH. The seeds of *Phaseolus vulgaris* Linn. Which are rich in potassium, magnesium, and phytic acid, may be beneficial in lowering the risk of developing kidney stones. This is because of the seeds' high concentrations of these nutrients. Citrate is easier to flush out of the body when it is combined with potassium, which reduces the likelihood that crystals will form in the citrate. The dissolution of magnesium complexes with oxalates is easier than the dissolution of calcium oxalates. In the presence of calcium, the synthesis of calcium oxalate is hampered by the presence of phytic acid (32-34).

### **b. Obesity Treatment**

The medical diseases known as overweight and obesity are characterised by an abnormal accumulation of fat in the body on a local, regional, or global scale. Because of this, the health of the general population is in peril. As we will see in the next section, different populations have a variety of body weights and fat distributions, both of which contribute to the development of co-morbid diseases. As a result, determining the point at which there is an increased danger to one's health is of the utmost importance. People who consume *Phaseolus vulgaris* L., which contains the unique alpha-amylase inhibitor, are more likely to experience weight loss and a reduction in fat mass. In clinical trials, the use of *Phaseolus vulgaris* L. as a placebo has shown that the claimed weight loss is real. Investigations was out in vitro using aqueous and methanolic extracts of *Phaseolus vulgaris* Linn. In addition to possessing lipolytic characteristics, it is also useful for combating adaptogenic herbs (35-37).

## **8 Conclusion**

The common bean is considered to be a functional food due to the presence of various bioactive components within its structure that are advantageous to the human body. Mexico is home to a large number of different genotypes, each of which has its own distinct collection of chemical and physical traits. According to the findings of the study, the bioactive compounds that can be found in this grain provide a variety of advantages to one's health. Dark-colored or black beans stand out because to the increased amounts of polyphenols, anthocyanins, condensed tannins, and flavonoids like quercetin that they contain. Alkaloids, anthocyanins,

carbohydrate-rich compounds including catechins and fibre; flavonoid compounds like quercetin, phytic acid, quercetin, terpenoids, and steroids; and tryptophan inhibitors are all components of the *Phaseolus vulgaris* L. (Chickpea) plant. Because of this, green beans offer a number of health benefits, some of which are mentioned above, such as being hypocholesterolemic and analgesic, as well as anti-inflammatory, antibacterial, and anti-diabetic. It has also been shown that chickpeas (*Phaseolus vulgaris*) has significant anti-diabetic properties and that these properties might be used in the creation of innovative diabetes treatments. Natural medication may be used to treat health problems without causing any harmful effects, This review demonstrates that *Phaseolus vulgaris* Linn has a significant quantity of phytoconstituents. The pharmacological effects of a specific drug may sometimes be seen at an extremely low concentration of its chemical components. Because *Phaseolus vulgaris* Linn has a significant amount of pharmacological activity, this area will serve as a starting place for scientists and researchers to explore more from the said plant spp. Despite the fact that beans have historically been a staple in the diet, there is still a significant amount of research that needs to be conducted in order to determine what types of bioactive chemicals the various genotypes of beans contain and how these chemicals affect the health of the consumer.

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