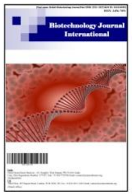

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Distribution, Importance and Diseases of Soybean and Common Bean: A Review

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Authors' contributions

This work was carried out in collaboration among all authors. Author GS designed the study, performed the literature searches and wrote the first draft of the manuscript. Author GD performed the literature searches and improved the first draft of the manuscript. Author AK designed and supervised the study, gave instructions to all the co-authors, contributed in adding recent references and finalized the manuscript. All authors read and approved the final manuscript

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ABSTRACT

The crops belonging to the family Leguminosae are the second to cereal crops of agricultural significance due to their high nutritional value. Soybean is native to East Asia and was originated in China while common bean is native to Central and Southern America originated in Peru. Both soybean and common bean are erect, bushy annual herbaceous plants growing up to 150 and 40 centimeters in height, respectively. They have enormous food and medicinal values. Soybean and common bean are important leguminous crops which are excellent source of high-quality proteins, minerals, vitamins, polyunsaturated fats, and other nutrients for both human and other animal feeds. Soybean is beneficial for weight loss, diabetics as dietary supplements, bone loss in women and minimizing cancer risks while common bean is useful for preventing constipation, lowering cholesterol levels and reducing the risk of heart diseases. Pests, pathogens and weeds cause harmful effect resulting in low production of both the legume crops. The present review focuses on the overview, different importance and diseases of soybean (*Glycine max*) and common bean (*Phaseolus vulgaris*). In addition, attention has been paid on various aspects of these two legumes namely taxonomy, morphological features, origin and distribution along with their pests and diseases.

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Keywords: Soybean; common bean; legumes; taxonomy; pests; plant diseases.

1. INTRODUCTION

The crop plants belonging to the family Leguminosae are the second to cereal crops of agricultural importance on the basis of the area harvested and total production. Grain legumes provide about one-third of all dietary protein nitrogen and one-third of processed vegetable oil for human consumption [1]. Grain legumes contain about 20 to 40% proteins. In many parts of the world, legumes also complement cereals or root crops which are the primary source of carbohydrates. The cereal seed proteins are deficient in lysine while leguminous seed proteins are deficient in sulfur-containing amino acids and tryptophan [2]. The legumes also provide essential minerals needed in the diet of humans and health- promoting secondary compounds that can protect the humans from cancer.

Traditionally, legume family has been divided into three subfamilies on the basis of morphology of flowers: Caesalpiniaceae*,* Mimosoideae*,* and Papilionoideae. The grain legumes are part of subfamily- Papilionoideae. There are four important clades namely Galegoid, Genistoid, Dalbergioid and Phaseoloid within the subfamily Papilionoideae, which are the most important food and feed legumes economically [3]. It is considered that many different known varieties of different legumes such as cool-season pulses like pea, lentil and chickpea, warm-season food legumes like peanut and common bean; and forage legumes like alfalfa and clover which are used as food, can be studied in a better way using the available genomic and biological knowledge of known varieties.

Legumes are important components of the diet worldwide, regardless of the Country/Province/Community. Legumes are consisted of beans, peanuts, peas, lentils and other pods, which are used as food. The cultivation of legumes has been going on for thousands of years [4]. Soybean (*Glycine max*) and common bean (*Phaseolus vulgaris*) are among the most important legumes cultivated in the world. The annual production and cultivated area of soybean in the world was about 336.47 million metric tons and 122.44 million hectares, respectively, and that of common bean was 28.90 million metric tons and 33.06 million hectares during the year 2019-2020 [5]. Soybean has high nutritional value as it is the source of protein and oil. It is also a valuable source of aquaculture and animal feed. Common beans are also enriched source of starch, dietary fiber and protein generally in developing countries [6]. Both of these legumes are grown all over the world but their production is affected by various pests and diseases. There are a number of pathogens, that attack legume crops and damage them, resulting decrease in yield and quality. Increased use of genetic resources through traditional breeding and/ or bioengineering may provide the solution for this problem.

In the present review, emphasis has been placed on the overview, relevance and diseases of soybean and common bean. Particular attention has been paid to various aspects such as taxonomy, morphological features, origin, distribution, food, medicinal and economic importance along with their pests and diseases of these two legumes.

2. OVERVIEW OF SOYBEAN (*Glycine max*)

Soybean is an important crop worldwide due to its high protein and oil contents [7]. Various food products are made from soybean seeds and considerable efforts have been made to increase the soybean yield in order to meet the needs of the larger population in the world [8,9]. However, limitation of genetic diversity has been realized when only available regional varieties were considered during domestication [10,11]. There are reports that 50 percent of the genetic diversity and 81 percent of the rare alleles were lost during domestication and 60 percent of the genes showed significant changes in allele frequency due to soybean domestication [12]. Although many mapping traits related to soybean domestication have been studied with a variety of domesticated and wild type soybean germplasms, only the soybean gene responsible for growth habit has been identified at the genome level [13,14]. Variants of *Glycine soja* namely Sieb and Zucc have been reported when wild type was undomesticated, and these are very similar to domesticated soybean [15].

2.1 Taxonomy

Soybean is one of the major vegetable crops grown in areas with cold to subtropical temperatures [16,17]. There are evidences that domesticated soybeans have been used as food for a long time. It has been claimed that, for the first time, the population of Northeast China used soybean as a food crop around 1700 to 1100 B.C. [18].

Linnaeus coined the word '*Glycine*' for soybean for the first time in 1737. The name '*Glycine'* has been taken from the Greek word 'glykys' whose meaning is sweet. Later, Linnaeus listed eight different species under the genera, *Glycine*. These various species were *Glycine apios*, *Glycine frutescens*, *Glycine abrus*, *Glycine tomentosa*, *Glycine comosa*, *Glycine javanica*, *Glycine bracteata* and *Glycine bituminosa*. With time however, almost all these species were found more suitable than other different genera [19].

Over the time, scientists have made a lot of changes in the classification of soybean. Ultimately, it was put under the family, Fabaceae. Some people also call the family Fabaceae as the pea family. This family has over 240 different genera. However, *Glycine* is the well-known and it has five different species and out of these, *Glycine max* is more popular among them [20]. Soybean has currently been botanically placed in the following Sub-Kingdom, Class, Sub-class, Order, family of Plant Kingdom (ITIS)

Kingdom	:	Plantae
Sub-kingdom	:	Viridiplantae
Infra-kingdom	:	Streptophyta
Super-division	:	Embryophyta
Division	:	Tracheophyta
Sub-division	:	Spermatophytina
Class	:	Magnoliopsida
Super-order	:	Rosanae
Order	:	Fabales
Family	:	Fabaceae
Genus	:	*Glycine*
Species	:	*max*

Local soybean names are more popular in many countries, such as 'Sojabean' in Africa and 'Soijapaper' in Finland. It is called 'Soja' in France and Russia, while it is known as 'Daizu' in Japan. It is called 'Kong' in Korea. It's called 'Daunanh' in Vietnam, while it is called 'Sojabona' in Sweden. It is called 'Maodou' in China [21].

2.2 Morphological Features of *Glycine max*

Soybean is an erect, bushy annual herbaceous plant that grows up to 1.5 meters in height. Its stem has thick brown hairs. The primary leaves are opposite, ovate and unifoliate, while the secondary leaves are trifoliate and alternate. Sometimes, compound leaves with four or more leaflets are also present. The roots are taproots with lateral roots and they contain nodules. The flower has a tube-shaped calyx with five sepals, five petals inside the corolla, one pistil and nine joined stamens with one separate stamen at the back. A ring is formed from the stamens at the bottom of stigma and is elongated before pollination which ultimately forms a ring around stigma from the raised anthers. The colors of the flowers are white and purple. The fruit is like a hairy pod and grows almost seven centimeters in length with 3 to 5 clusters. Each pod contains two to four seeds. The shape of the seed is usually oval, but may vary depending on the cultivar from spherical to elongated and flattened.

Three types of growth habits can be found amongst soybean cultivars namely determinate, semi-determinate and indeterminate cultivars [22]. The determinate growth is characterized by the cessation of vegetative activity of the terminal bud when it becomes an inflorescence at both axillary and terminal racemes. The determinate genotypes are primarily grown in the southern parts of United States of America (USA). The semi-determinate type cultivars have indeterminate stems that terminate vegetative growth abruptly after the flowering period. On the other hand, indeterminate cultivars continue vegetative activity throughout the flowering period and are grown primarily in central and northern regions of North America [5,23,24].

2.3 Origin and Distribution

Soybean is native to East Asia. Other members of the *Glycine* genus are native to the Western Pacific coasts from Australia to Siberia. The main oriental soybean products used as food are tofu, soy sauce, miso, tempeh, natto, yuba, kinako and soybean sprouts. Soybean acreage is extensive in the Mississippi valley of the central USA, all the way from Central Minnesota (45°N) to the Gulf of Mexico (30°N). However, its acreage in tropical areas is very limited, except for the islands of Java in Indonesia [16]. In recent years, soybean production in USA and Brazil has exceeded to that of China, while India has become the fifth largest producer of soybean [25].

Soybean was domesticated in China nearly 4,000 years ago [26]. The North China Plain or

Huang-Huai Hai (HHH) plain has been suggested to be the area of origination of soybean based upon a comparative study of seed protein contents of cultivated soybean (*G. max*) and its wild relative (*G. soja*; Sieb. and Zucc.) types varieties from different latitudes in China [27].

Various investigations on the origin and evolution of soybean germplasm have been actively undertaken using various molecular markers. For improvement of soybean production and increasing food security, various researches have been done in the field of breeding in order to get better soybean germplasm [28]. The genetic structure of the Asian soybean population by analysing allelic profiles of soybean by Simple Sequence Repeat (SSR) markers has been investigated [29]. Genetic diversity of European commercial soybean germplasm has also been revealed by SSR markers [30]. Investigation on genetic relationships between Chinese and US soybean germplasms has been revealed by high density Single Nucleotide Polymorphism (SNP) markers [31].

2.4 Food and Medicinal Importance

Soybean is considered to be one of the most important crops in the whole world. Soybean seeds are enriched in protein and vegetable oils [32,33]. That's why, soybean meal and oil are processed from soybean all over the world [34]. It has been a major source of protein for the people of China, Korea, Japan and Indonesia for thousands of years. It has been estimated that almost 2% of the total soybean produced is directly consumed as food by humans which is estimated to be almost three million metric tons [35]. The percentage of oil and protein in soybean seeds has been found to be almost 18% and 38%, respectively [36]. As estimated, almost 40% of the edible vegetable oil consumed worldwide is produced from soybean. The contents per 90 g edible portion of soybean are: 14.3 percent protein, 7.7 percent fat, 0.9 g dietary fiber, 25 µg riboflavin, 47 µg folate, 138 mg calcium, 0.99 mg zinc and 4.42 mg iron [4].

Soybean seeds consist of three lipoxygenase isozymes (LOX, L-1, L-2, L-3) that catalyze the oxidation of polyunsaturated fatty acids (PUFA) into fatty acid hydroperoxides and is associated with the formation of volatile compounds causing unpleasant flavor of soybean [37]. The major reason for this flavor is various medium chain ketones, aldehydes and their alcoholic counterparts which are accumulated as a result of a lipoxygenase catalyzed oxidation reaction. Soybean breeders can decrease oil stability issues by creating varieties without seed lipoxygenases or with low PUFA contents. The tofu produced using normal and LOX-deficient soybean formed different volatile flavor compounds [38]. Various varieties of soybean which were LOX free have been released in Japan [39]. These varieties revealed no pleiotropic influence on prime agronomic traits. LOX-deficient soybean is a beneficial raw material for the soymilk production, tofu and other soybean fresh products. The problems in post-harvest production of LOX free varieties are the contamination between normal and LOX-deficient soybean seeds [40].

It has been estimated that almost 95% of the total soybean oil is used as edible oil and the remaining is used in industrial production of hygiene products, cosmetics, paint removers and plastics etc. [41]. The 98 percent of soybean meal is used in aquaculture feeds and livestock due to protein enrichment [42]. As estimated, in Asia, soybean is consumed as a primary protein source in the form of common foods such as soymilk, natto, green vegetable soybean, tempeh, tofu, sprouts and many others [26]. People with dairy allergies or preferring vegetarian diets generally prefer soybean based dairy analogs as substitutes. In meat analogues, the primary constituent is soy protein and it is consumed by people who wish to have animal-free food or saturated fat-deficient food.

Soybean has also been reported as having medicinal value [43]. Soybean is used as a preventive medicine in primeval China. In China, soybean is considered to be important for proper functioning of many organs. Black soybean and fresh green soybean have a number of medicinal properties. Black soybean is widely used by Chinese physicians to maintain health.

Various health benefits of soybean such as weight loss, use in diabetics as dietary supplements, helpful in women's bone loss, minimize cancer risks, decrease in cholesterol and increase in blood iron content, have been reported [7,44-50]. The Food and Drug Administration, USA (FDA) has certified that daily intake of nearly 25 g soy protein (low in cholesterol and saturated fat) reduces the risk of heart diseases. This FDA certification has increased consumers interest in the production of soybean products and has boosted the production of more soybean food products.

Table 1. Major diseases and pathogens of *Glycine max*

Sl. No.	Disease Name	Pathogen Name	Distribution
Bacterial Diseases			
1.	Bacterial blight	*Pseudomonas amygdali* pv. Glycinea	Worldwide
2.	Bacterial pustules	*Xanthomonas compestris* pv. Glycines	Worldwide
3.	Bacterial tan spot	*Corynebacterium flaccumfaciens* pv. Flaccumfaciens	Brazil, Russia, Canada and USA
4.	Bacterial wilt	*Pseudomonas solanacearum*	Central USA and other countries
Viral Diseases			
1.	Alfa alfa mosaic	Alfalfa mosaic virus	Worldwide
2.	Bean pod mottle	Bean pod mottle virus (BPMV)	USA
3.	Bean yellow mosaic	Bean yellow mosaic virus (BYMV)	Worldwide
4.	Brazilian bud blight	Tobacco streak virus (TSV)	South America
5.	Peanut stripe	Peanut stripe virus (PSV)	Africa, Asia and North America
6.	Soybean crinkle leaf	Soybean crinkle leaf virus (SCLV)	Tropical regions
7.	Soybean dwarf	Soybean dwarf virus	Asia, Africa, Europe and North America
8.	Soybean mosaic	Soybean mosaic virus	Worldwide
Fungal Diseases			
1.	Downey mildew	*Peronospora manshurica*	Worldwide
2.	Fusarium root rot	*Fusarium* sp.	Asia, USA
3.	Powdery mildew	*Microsphaera diffusa*	USA, South America
4.	Brown spot	*Septoria glycines*	Southern USA
5.	Frog eye leaf spot	*Cercospora sojina*	Tropical region and Southern USA
6.	Purple seed stain	*Cercospora kikuchii*	USA
7.	Target spot	*Corynespora cassiicola*	In all soybean growing countries
8.	Anthracnose	*Colletotrichum truncatum*	Worldwide
9.	Pod and stem blight	*Phomopsis longicolla*	USA
10.	Charcoal rot	*Macrophomina phaseolina*	Africa, South America, Asia
11.	Sclerotinia stem rot	*Sclerotinia minor, S. sclerotiorum*	South America, North America and Africa
12.	Sclerotium blight	*Sclerotium rolfsii*	Africa, USA
13.	Red crown rot	*Cylindrocladium parasiticum*	Southern USA
14.	Red leaf blotch	*Phoma glycinicola*	Africa
Nematode Diseases			
1.	Soybean cyst	*Heterodera glycines*	Most soybean growing regions
2.	Lance nematode	*Hoplolaimus galeatus*	Asia, Africa
3.	Lesion nematode	*Pratylenchus* sp.	Africa, Southern USA, Brazil
4.	Root knot	*Meloidogyne arenaria*	Worldwide
5.	Spiral nematode	*Helicotylenchus* sp.	Worldwide

Soybean is also enriched in nutraceuticals such as lecithin, oligosaccharides, saponin, flavonoids, phytosterols, tocopherols etc. Isoflavones belong to an important group of flavonoids that have beneficial effects on human health [8,51]. Soybean is exclusive to legumes as it is an important source of isoflavones with low estrogenic properties and it also influences signal transduction. Isoflavones and soy foods have received a great deal of attention for their role in prevention and treatment of osteoporosis and cancer [4,52].

2.5 Economic Importance

Soybean is an important commercial crop worldwide and therefore its production is increasing year after year [53]. It provides vegetable proteins and ingredients for a number of chemical products. The symbiotic bacterium, *Rhizobium japonicum* is capable of fixing the atmospheric nitrogen used by the soybean as a host and therefore, there is little demand for externally added nitrogen fertilizers in soybean farms, and it helps in reducing the costs of production and energy costs compared to other crops requiring external nitrogen fertilizers [16,54].

2.6 Pests and Diseases in Soybean

Pests, pathogens and weeds cause harmful effects resulting in low production of soybean crops, and weeds are the main harmful factors [55]. Microorganisms such as fungi, viruses, bacteria, oomycetes and nematodes contribute to economic damage each year. Soybean pests include aphids, beetles, mites and stinkbugs that attack the whole plant [56,57]. Due to pathogen attack, there is also a decrease in the yield and quality of soybean crop. List of major diseases in soybean caused by various pests and pathogens has been given in Table 1. Among these, most important diseases are soybean rust, bacterial blight and soybean mosaic which affect most crop production [18].

3. OVERVIEW OF COMMON BEAN

Common bean is the world's major grain legume. This bean is the primary source of highly essential plant proteins and micronutrients [58-61]. Botanically, this bean has been classified as follows [62]:

Kingdom	:	Plantae
Sub-kingdom	:	Viridiplantae
Infra-kingdom	:	Streptophyta
Super-division	:	Embryophyta
Division	:	Tracheophyta
Sub-division	:	Spermatophytina
Class	:	Magnoliopsida
Super-order	:	Rosanae
Order	:	Fabales
Family	:	Fabaceae
Genus	:	*Phaseolus*
Species	:	*vulgaris*

The most popular common name for this bean is 'common bean'. However, other common names are also there. It is called 'Kidney bean' in the United Kingdom, 'Frijol' in Spain and 'Haricot' in France. In Germany it is called 'Bohne' while in Italy, it is called 'Fagiolo commune'. It is called 'Gardbona' in Sweden and 'Stokboon' in Netherlands. 'Feijao' is the common term used in Portugal. In Bolivia, Ecuador, Peru and Chile, it is commonly referred as 'Vainita' [63].

3.1 Morphological Features of *Phaseolus vulgaris*

The common bean is a highly polymorphic warm seasoned annual herbaceous plant. It is of two types, erect herbaceous bush growing up to 20 to 60 centimeters in height and twinning with climbing vines growing up to 2 to 5 meters. It is a terrestrial plant and consists of a tap root with various adventitious roots [63-66]. The stems of bushy types in common bean are slender, pubescent and branched, while in twinning types, the stems are prostrate for most of their length, rising towards the end. The leaves are compound, green colored and made up of two or more distinct leaflets. The arrangement of the leaf is alternate with one leaf per node along the stem. The leaflets are 6 to 15 cm long and 3 to 11 cm wide. The inflorescences are axillary or terminal with 15 to 35 cm long racemes. The flowers are bilaterally symmetrical, white to purple in color and basically papillonaceous [64,67,68]. There are five petals, sepals or tepals in the flower, and each flower after pollination produces one pod which is green, yellow, purple or black in color [67]. There are 10 stamens in the number. The fruit is dry, but does not split open when ripened. The length of the fruit is 80 to 200 millimeters (mm) [68]. The pods are edible before ripening (as green beans) or left to ripen and after ripening, the dry seeds are obtained from dry edible beans [69].

3.2 Origin and Distribution

The common bean is native to Central and South America. However, it was domesticated almost 6000 BC in Peru, and cultivated about 5000 BC in Mexico [70,71]. This bean was spread to another world by the Portuguese and the Spanish. It is an important food crop that is currently being cultivated in many parts of the world. It is widespread in subtropical, temperate and tropical regions of Europe, Africa, America and Asia [67]. A Mesoamerican origin of the *P. vulgaris* has been reported by studying the nucleotide diversity at different gene fragments of wild common bean that is representative of its geographical distribution [72]. Genetic diversity and origin of common bean germplasm has been revealed by Amplified Fragment Length Polymorphism (AFLP) markers and phaseolin analysis [73]. Investigation of African common bean germplasm has been reported by utilizing a SNP fingerprinting platform [74]. It has been revealed that increase in the crop improvement rate can be attained by taking benefit of various genomic technologies that are effective on the management of gene banks and on the way of collections of germplasm [75].

The common bean is a legume that grows in warm season. It is therefore best done in a temperate and subtropical environment. It may be sown in tropical areas but does not grow well under much wet conditions resulting in flower drops and fungal attacks [64]. Common bean grows in the regions with an annual rainfall between 300 mm to 4300 mm, and an optimum temperature between 15°C to 23°C. However, it may also grow in regions with temperatures as high as 35°C, but under the conditions, there will be hampering of seeds production. It may tolerate a small amount of frost, but it will stop growing below 10°C, and frost reduces yield at different growth phases [67,76]. During the ripening phase, dry weather is useful for the preservation of seeds. Common bean grows well on a wide variety of soils ranging from pH 4 to 9. Although, it grows better on well drained, silt loam, sandy loam or clay loam soils that are enriched with organic components. Usually, waterlogging cannot be sustained even though few cultivars grow well in standing water [64,77].

It is much laborious to collect global statistics on common beans since *Phaseolus* and *Vigna* species are usually clustered together. According to the Food and Agricultural Organization (FAO), yields of common beans (*Phaseolus* species only) amounted to around 23 million tons in 2012, which were cultivated in 29 million hectares of area. Brazil, India, China, USA, Myanmar, Tanzania and Mexico account for two-thirds of the world's common bean production. According to a report of FAO, China is the leading producer of fresh beans (*Phaseolus* and *Vigna* species) with 19 million tons of production in 2017 which is more than 80% of the world's total production. India is the world's third largest producer of common bean [25]. Little information is available on the production of forage and byproducts related to common bean crop. Common bean by-products are seasonal and are available for the processing plant environment [63].

3.3 Food and Medicinal Importance

Common bean is a valuable source of minerals (zinc and iron), proteins and vitamins for countless populations [78,79]. Pods are eaten fresh before maturation and can be preserved by freezing, dehydrating or canning. Beans are edible and boiled, fried, baked or ground into flour. Residues of crops such as stems, dried pods and other by-products are used as fodder [63,67].

The composition of 100 g of edible portion of common bean has been reported as follows: protein 21 g, carbohydrates 63 g, fat 1.2 g, vegetable fiber 16 g, potassium 1393 mg, iron 5 mg, magnesium 37 mg, sodium 8 mg, vitamin C 0.9 mg, folate 115 µg, and flavonoids 2.5 mg [80].

The protein contents of common bean vary among varieties. The fiber contents present in common bean are useful for avoiding constipation and lowering cholesterol levels. It also contains sufficient amounts of niacin (vitamin B3), folate and pantothenic acid. Folic acid deficiency causes anemia and therefore, folate contents of this bean are useful for anemic patients. This bean may also be useful as supplement in pregnant women to prevent neural tube defects.

Common bean is also beneficial in reducing the risk of heart diseases due to its richness in flavonoids. Various studies have shown that beans contribute to the reduction of the risk of different types of cancers, as they are enriched with compounds such phenols, flavonoids, tannins and other antioxidants. High-levels of intake of common bean reduces colorectal cancer [81,82]. It helps to control post-meal insulin and blood glucose levels and is therefore responsible for regulating diabetes. Common bean is also an enriched source of polyphenolic compounds and therefore has various health promoting properties [83].

3.4 Pests and Diseases in Common bean

Pathogens causing diseases in *P. vulgaris* are diverse which include bacteria, fungi, viruses and nematodes [82,84]. A list of major diseases of common bean and pathogens responsible has been provided in Table 2.

Table 2. Major diseases and pathogens of common bean

Sl. No.	Disease name	Pathogen	Distribution
Bacterial Diseases			
1.	Bacterial wilt	*Cornybacterium flaccumfaciens*	Central USA and other countries
2.	Common blight	*Xanthomonas campestris* pv. Phaseoli	Most of the common bean producing areas
3.	Halo blight	*Pseudomonas syringae* pv. Phaseolicola	Worldwide
Fungal Diseases			
1.	Alternarialeaf spot	*Alternaria alternata*	USA, Latin America and UK
2.	Angular leaf	*Isariopsis griseola*	Worldwide
3.	Anthracnose	*Colletotrichum lindemuthianum*	In many areas of world especially in USA
4.	Powdery mildew	*Erysiphe polygoni*	Worldwide
5.	Rust	*Uromyces phaseoli*	Worldwide
6.	White mold	*Sclerotinia sclerotiorum*	In temperate areas
7.	Ashy stem blight	*Macrophomina phaseoli*	Warm bean growing areas
8.	Fusarium root rot	*Fusarium solani*	America and Europe
9.	Pythium root rot	*Pythium* spp.	USA
10.	Rhizoctonia root rot	*Thanatephorus cucumeris*	USA, Brazil and Philippines
Nematode Diseases			
1.	Rootknot nematode	*Meloidogyne* spp.	South, central and north America
Viral Diseases			
1.	Common mosaic curly top	Bean common mosaic virus	Western USA, British Columbia, Canada
2.	Golden mosaic	Bean golden mosaic virus	Brazil, Jamaica, Guatemala, central and south America, Nigeria
3.	Yellow mosaic	Bean yellow mosaic virus	Worldwide

4. CONCLUSION

Legumes consumed directly or indirectly, play a key role in our continued quest to feed people. Soybeans are widely grown, heavily traded and have an exceptional nutritional and functional food profile. As estimated, only almost 2% of the annual production is used directly for human food. However, the crop is probably the most important source of plant protein in the world. In this review, efforts are done to provide a comprehensive overview of current knowledge of the two economically important crops of legume species. Soybean and common bean are two of the promising crops as a source of essential ingredients for the pharmaceutical industry, necessary for the maintenance of human health, with nutritional and economic benefits as well. Both legumes are currently grown in different regions of India. Soybean crop is profitable, as it has a high purchase price and is used successfully in crop rotation. Further research is needed to extract biologically valuable components from soybean and common bean varieties.

More research is needed to increase the production of soybean and common bean in order to meet the increased demand. The soybean crops have an enormous potential to improve the dietary quality of people around the world either as a vegetable crop or through soy-based or soy-enhanced food products. Although common beans are not only able to fix atmospheric nitrogen in the soil but are also a good source of minerals, fiber and protein contents. Therefore, it has been suggested that both these legumes are key sources of various nutrients for a healthy food supply and food security. Nutrition experts should develop collaborative efforts to encourage people to increase more soy food and common bean consumption in their diet. Increased use of genetic resources, both through traditional breeding and bioengineering may provide the solutions needed to address future pests/ diseases and food related problems.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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