Journal of Applied Pharmacognosy and Phytochemistry
Volume 3, Issue 2, Year of Publication 2023, Page 09 – 18

Review Article

JOURNAL OF APPLIED PHARMACOGNOSY AND PHYTOCHEMISTRY | JOAPP
www.joapponline.com

STUDY OF PHARMACOLOGICAL AND NON PHARMACOLOGICAL ACTIVITY OF LEGUME POLYSACCHARIDE

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Article Information
Received: 2nd February 2023
Revised: 16th April 2023
Accepted: 19th May 2023
Published: 30th June 2023

Keywords
Legume, polysaccharides, pharmacological actions, non-pharmacological actions

ABSTRACT
Legumes, members of the Leguminosae family, including oil seeds like soy and peanuts, and their historical significance in societies worldwide. Only 20 out of approximately 1300 legume species are commonly consumed by humans, with chickpeas, lentils, and soybeans among them. Grain legumes, rich in protein and low in carbohydrates, are vital for nutrition in low-income populations. Processing enhances the nutritional and flavor quality of legumes, affecting starch and dietary fiber content. Despite their importance for human health, animal production, soil improvement, and greenhouse gas mitigation, legumes face challenges compared to major cereals. Genetic improvements and agricultural advancements are essential. The article also touches on polysaccharides, essential biopolymers with diverse biological activities, and highlights the importance of polysaccharides from legumes in various industries, including pharmaceuticals. The research on polysaccharides with anti-diabetic and antioxidant properties is emphasized.

INTRODUCTION

Legumes are members of the Leguminosae family and are made up of oil seeds such soy, peanuts, alfa, clover, mesquite, pea, chickberry, lens beans, pea, and lupinus. Ancient societies in Asia, the Middle East, South America, and North Africa produced and used legumes. They are grown, harvested, and marketed as the main ingredients of seeds all over the world. Oil seeds and legumes are the two types of grain legumes. Unlike beans, which are largely utilized for oils, legumes are different (1). Only 20 of the approximately 1300 species of legumes are typically ingested by humans (2). The chickpea (Cicerarietinum), pigeon pea (Cajanus cajan), lentil (Lens culinaris), mungbean (Vignaradiata), soybean (Glycine max), and winged beans stand out among the commonly consumed legumes (3). For low-income people in developing countries, grain legumes are important for human nutrition. It serves as a good source of slow-release energy, usually referred to as "poor man's meal." They are low in carbohydrates and abundant in protein. Legumes are often ingested after processing, which raises both the nutritional and flavour quality of the food. Nutrient bioavailability and food flavour are both enhanced. Trypsin and growth inhibitors are inactivated, allowing nutrients to be consumed hemagglutinins. The principal bio polymeric constituent of legumes, starch, is partially changed during

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processing into starch that is resistant (RS). The latter is a man who has been made useful. Dietary fibre is a one-of-a-kind substance that can help you lose weight. In addition to its impact on faecal volume, high-quality diets are important and butyrate production, both of which are thought to be indicators of Human colonic health is a topic that has received a lot of attention recently(4).There is increasing awareness of the importance of food legumes in improving the health of humans (5), production of farm animals (6) the soil in which legumes grow (7), and in mitigating greenhouse gases (8).Nevertheless, food legumes remain poor cousins to the major cereal crops (rice, wheat, maize) due to the ever increasing global demand for cereals from burgeoning human populations.

Priorities for cultivation and research in food legumes remain secondary to those for cereals in most cropping systems. Contributing to this is the relatively greater sensitivity of food legumes to various abiotic and biotic stresses than cereals, increasing their cultivation risk, and their lower grain yield potential compared with competing cereal crops. Genetic improvements are needed to address these issues, but agricultural improvements can be of great help in bridging yield gaps caused by various stresses (9).

Polysaccharides are ubiquitous in plants, microorganisms (such as fungi and bacteria), algae, and animals. Together with proteins and polynucleotides, they serve as indispensable biopolymers, playing a crucial role in various life activities, including cell-cell communication, cell adhesion, and molecular recognition within the immune system (10). In recent times, there has been considerable interest in bioactive polysaccharides isolated from natural sources, particularly within the realms of biochemistry and pharmacology. It Show different biological activities affected by different chemicals Construction. (11) A class of polysaccharides called gum and mucilageis used in large quantities in various industries. The composition of many galactomannans from different legume seeds is very similar, but their physical properties differ to some extent that individual gums may be more useful in thespecial system (12).

Dietary polysaccharides are plays an essential role in our everyday lives. These polysaccharides are commonly present in medicinal plants, grains, fruits, vegetables, and edible mushrooms. Researchers are increasingly focusing on medicinal foods due to their low toxicity and potent pharmacological activity (12,13). They are composed of monosaccharide units and are linked by glycosidic bonds. Evaluating the effects of polysaccharides with anti-diabetic and antioxidant properties has become an important area of research (14,15,16). Polysaccharide from legumes are also used as an excipients in pharmaceutical industry (17, 18).

VARIOUS PHARMACOLOGICAL ACTIONS OF LEGUME POLYSACCHARIDE

The pharmacological action of yellow lupin polysaccharide are antioxidant, immunomodulatory and prebiotic activities. Tambiraj SR *et al.* isolated Yellow Lupine polysaccharides (YLP1, YLP2 and YLP3) from the seeds of *Lupinus luteus L*. Their antioxidant activity was assessed by ABTS+ and hydroxyl radical scavenging & Fe2+ chelation assays.

Immunostimulatory activity was measured by their ability to activate macrophages and produce TNFα and NO. Four strains of probiotic bacteria were used to measure prebiotic activity. YLP2 with the highest -galactose content showed the highest activity of the three isolated polysaccharides. NMR and FTIR spectroscopy show that YLP contains galactan and galactomannan bound by glycosidic- β bonds in the backbone. The Galp unit of thegalactomannanside chain is bound to the Manpbackbone by an α bond. The results shown in the study conducted by Tambiraj SR *et al.* show that YLP has important antioxidant, immunostimulatory, and prebiotic activities and therefore has great potential as a dietary supplement and a functional agent. (19)

Red kidney bean polysaccharides are reported to have anti-diabetic and prebiotic properties. Red kidney beans (Phaseolus vulgaris) stand out as an excellent source of proteins, complex carbohydrates, fermentable fibers, antioxidants, vitamins, and minerals, offering a multitude of health benefits. In a study conducted by Jaya Nanohar J et al., the in vitro assessment of the prebiotic potential, fecal fermentation, and antibiofilm activity of water-extractable polysaccharides (RKBWEP) from red kidney beans was conducted. RKBWEP exhibited lower digestibility when subjected to simulated human gastric juice (1.58%), α23 amylase (4.68%), and intestinal fluid (4.03%) hydrolysis compared to the standard fructooligosaccharide, which showed 2.04%, 5.6%, and 7.13%, respectively. RKBWEP significantly promoted the growth of standard probiotic bacteria, namely Lactobacillus plantarum and L. fermentum. In an in vitro batch fecal fermentation, RKBWEP stimulated the growth of beneficial gut microbiota, particularly Bifidobacterium spp. and Lactobacillus spp., after 24 hours. The concentration of short-chain fatty acids (SCFAs), such as acetic acid, propionic acid, and butyric acid, increased during RKBWEP fermentation, reaching maximum values of 47.92, 10.32, and 6.91 mM after 48 hours. Furthermore, RKBWEP (40μg) effectively inhibited Escherichia coli biofilm formation by 79%. The potential prebiotics and biofilm inhibitory properties of the bean polysaccharide can be considered as a novel food additive aimed at developing symbiotics. (20) The study conducted by Bai Z*et al.* on anti diabetic activity of red kidney bean polysaccharide was done on Male Kunming mice and the dose introduced was 500 mg/kg and they were studied for four weeks, and it was found that it reduces TG, TC and LDLs. (28)

The pharmacological activities of blue lupin polysaccharide is it act as antioxidant. *Lupinus Angustifolius* is rich in Australia and is mainly used as animal feed. However, these species have excellent nutritional values of high protein, high fiberfibers and low fat Content that may be valuable. The study conducted by Thambiraj SR*et al*. Blue lupin polysaccharides was isolated and examined their biological activity. Six polysaccharide fractions named BLP1, BLP2, BLP3, BLP4 were obtained by hot water extraction and sidelinechromatography. BLP5 and BLP6.Mono sugar compositions using gas chromatography were determined.These fractions,galactose, fucose, lamb north, glucose, mannose, ribose Xilose. Antioxidant activity of all fractions was analysed usingABTS+ scavengerActivity and iron chelating activity. The immunostimulatory activity of these fractions was measured and it was found that they have potential to act as a antioxidant activity. (21)

The pharmacological activity of mung bean polysaccharide encompasses immunoregulatory, hypoglycemic, antioxidant, and antibacterial effects. In a study conducted by Yao Y et al., the average molecular weights (Mws) of MAP1 and MAP2 were determined to be 94.2 kDa and 60.4 kDa, respectively. Analysis of monosaccharide components revealed that MAP1 consisted of Rha, Ara, Glu, Gal, and Gal and on the other hand, MAP2 included Xyl, Rha, Gal, Glu, GalA. Both MAP1 and MAP2 exhibited significant dose-dependent antioxidant activity in vitro, studies also include MAP1 And MAP2 were both able to stimulate the production of secretory molecules mouse macrophages in a concentration-dependent manner. The findings from these surveys indicate that the isolated polysaccharides in our study possess immunomodulatory effects on macrophages, suggesting their potential use as beneficial health food (22). The study conducted by Wu GJ*et al*. on mugh bean polysaccharide shows that they have anti diabetic activity. They isolated Mugh bean polysaccharide and administered in STZ-induced diabetic male Kunming mice and the dose was 400mg/kg and it was studied for 28 days and the result shows that it reduces FBG.(27) Jiang et al. extracted two water-soluble polysaccharides from mung bean (Vigna radiata) skin, utilizing cellulose enzyme-assisted extraction (MBP-1) and hot-water extraction (MBP-2), respectively.

The physicochemical properties, antioxidant, and antibacterial activities of MBP-1 and MBP-2 were investigated and compared. The results revealed distinct sugar, protein, and uronic acid contents for MBP-1 and MBP-2. MBP-1 consisted of rhamnose (Rha), arabinose (Ara), galactose (Gal), glucose (Glc), xylose (Xyl), mannose (Man), and galacturonic acid (GalA). On the other hand, MBP-2 was primarily composed of Rha, Ara, Gal, Glc, Xyl, fructose (Fru), and GalA, with molecular weights (Mws) of 139 and 208 kDa, respectively. Thermal gravimetric analysis (TGA) indicated that MBP-2 exhibited a more robust structure than MBP-1. Antioxidant assays demonstrated strong scavenging abilities for DPPH, OH, and ABTSþ radicals in both MBP-1 and MBP-2. Additionally, MBP-1 and MBP-2 exhibited mild antibacterial activities against both Gram-positive (Gþ) and Gram-negative (G) bacteria. (30) Mugh bean polysaccride aslo have non pharmacological action such as solubility and dissolution enhancer. (45)

The pharmacological activity of common bean polysaccharide is Chemopreventive effect. Common bean (*P. vulgaris L.*) cv. Negroid 8025 can be a reliable source of polysaccharides and phenols Link. Feregrino- perez AA *et al.* checked the total phenolic compounds and total flavonoids Determined by the reduction method. The recovery rate was> 70%, Verification of the usefulness of this method. PE contains large amounts of undigested carbohydrates that ferment in the colon to produce SCFAs.Mainly butyrate associated with a decrease in ACF Involved in the induction of gene expression Proliferation, cell arrest and apoptosis (bcatenin, p53, p21, rb, bax, caspase 3). (23) The pharmacological activity of fenugreek seed polysaccride Antioxidant activity. Ktari et al. conducted an assessment of the antioxidant activity of fenugreek water-extractable polysaccharide (FWEP) through a variety of in vivo and in vitro assays. The findings indicated that FWEP displayed potent antioxidant properties without inducing haemolysis in bovine erythrocytes. Application of FWEP hydrogel to wounds in a rat model significantly enhanced the healing process, leading to faster closure of wounds within 14 days of induction. Histological examination showed complete re-epithelialization and epidermal regeneration. These results collectively suggest that FWEP has promising potential for wound healing, likely due to its antioxidant characteristics. This study is the first to document the wound healing effectiveness and antioxidant activity of fenugreek-derived water-extractable polysaccharide (FWEP). According to the study, the topical use of FWEP hydrogel appears to expedite wound closure and reepithelialization in Wistar rat models with full-thickness resections. Furthermore, FWEP demonstrates robust antioxidant activity in various in vitro and in vivo systems. (24) The fenugreek seeds polysaccharide is also used as non-pharmacological action. They are used as mucilage-based matrix tablet and novel drug delivery system. (42) (43)

The pharmacological activity attributed to green gram polysaccharide is its immunomodulatory effect. Green gram, recognized for its high dietary fiber content, is acknowledged for enhancing immune system functionality. Despite this, information regarding the immunomodulatory potential of its non-starch polysaccharide (NSP) remains limited. Therefore, KethaK et al. conducted an extraction of five different NSPs, which were sequentially obtained using water (WSP), hot water (55°C, HWSP), EDTA (0.5%, pectin), and alkali (10%, hemicellulose A and B). The study explored parameters such as galactose ratio, sugar, protein, uronic acid content, molecular weight distribution, and immunomodulatory activity.

Among the various NSPs, hemicellulose B stood out as particularly rich in carbohydrates (~95%) & exhibited robust immunomodulatory activity. Further fractionation of hemicellulose B into six fractions was achieved using a DEAE cellulose column, with sequential elution employing water, ammonium carbonate (0.1, 0.2, 0.3 M AC), and sodium hydroxide (0.1 and 0.2 M NaOH). The 0.1 M AC-eluted fraction emerged as the major fraction, demonstrating a recovery rate of approximately 50%, and exhibited significant activity ($p < 0.001$) when compared to the remaining DEAE-eluted fraction. This activity was observed through enhanced splenocyte proliferation and macrophage activation. (25)

The health benefits of Soya Bean polysaccharide are Prebiotic Potential, Anti-Inflammatory Activity and anti diabetic function. The study done by Le B *et al.*they have evaluated the extraction of soluble low molecular weight substances. Polysaccharides from soybean by-products using microwave-assisted enzyme technology (MESP). They have proposed the chemical structure of MESP using Fourier transform infrared spectroscopy.Gas chromatography and analysis of 1H and 13C nuclear magnetic resonance spectra. Result MESP proposed that it is mainly composed of arabinose, rhamnose, glucuronic acid and (1 → 4). Glycosidic bonds in the backbone. MESP was found to be selectively stimulating compared to inulin Lactobacillus probiotics growth.

In addition, the results of in vitro fermentation showed this MESP significantly increased both acetate and butyrate levels ($p <0.05$). MESP is treated with lipopolysaccharide (LPS) - stimulated RAW264.7 cells to measure anti-inflammatory activityEffect in vitro. MESP is nitric oxide, tumor necrosis factor (TNF) α, Production of interleukin (IL) 1β, IL6 and IL10. In addition, the results of Western blotting We found that MESP significantly weakened the down regulation of LPS-induced yanus phosphorylation levels. Kinase 2 (JAK2) and signal converters and transcriptional activators 3 (STAT3) in macrophages. The underlying mechanism may be accompanied by inhibition of the expression of inflammatory cytokines.Probably via the JAK2 / STAT3 route. Overall, the results of their research are:Manufacture of prebiotics and MESPs that may be used as a dietary supplement ingredient in prebiotics Anti-inflammatory agent from soybean residue. (26)

For Anti diabetic activity *Bai Z et al.* extracted the soyabean polysaccharide and was introduced in a high-fat diet and streptozotocin-induced type II diabetic male Kunming mice and the dose was 400mg/kg and it was observed for 4 weeks and the results were that it reduces LDLs. (34) The polysaccride of soya bean also have some non- pharmacological action such as super disintregant. (49) The pharmacological activity of azuki bean polysaccharide is hypoglycaemic effects. For the study of hypoglycaemic effect Wu GJ *et al.* isolated the polysaccharide from azuki bean and was introduced orally in STZ-induced diabetic Male Kunming mice. The dose was 400 mg and the mice was examined for 28 days the result was found that it reduces FBG, controlling the levels of glycogen content, TC and LDL-C in STZ-induced diabetic mice. (27)

The pharmacological activity of pea polysaccharide is hypoglycaemic effects. For the study of hypoglycaemic effect Wu GJ *et al.* isolated the polysaccharide from the pea and the polysaccharide was introduced orally in aSTZ-induced diabetic Male Kunming mice. The dose was 400 mg/kg and the mice was examined for 28 days the result was found that it Reduce FBG in STZ-induced diabetic mice. (27)

The pharmacological activity associated with cowpea polysaccharide is its hypoglycemic effect. In a study conducted by Wu GJ et al., the polysaccharide was isolated from cowpeas and administered orally to male Kunming mice with streptozotocin (STZ)-induced diabetes. The dosage used was 400 mg/kg, and the mice were observed for a period of 28 days. The results demonstrated a reduction in fasting blood glucose (FBG) levels, along with the regulation of glycogen content, total cholesterol (TC), and low-density lipoprotein cholesterol (LDL-C) in STZ-induced diabetic mice. (27)

The pharmacological activity of white kidney bean polysaccharide is anti-diabetic action. For the study of anti-diabetic activity Bai Z *et al.* isolated the polysaccharide from white kidney bean polysaccharide and was introduced in a high-fat diet and streptozotocin-induced type II diabetic Male Kunming mice. The dose of the pollysaccaride was 500 g/kg and the mice was examined for 4 week and it was found that it reduces TG. (28) The pharmacological activity of white kidney bean polysaccharide is anti-diabetic action. For the study of anti-diabetic activity Bai Z *et al.* isolated the polysaccharide from white kidney bean polysaccharide and was introduced in a high-fat diet and streptozotocin-induced type II diabetic Male Kunming mice. The dose of the polysaccharide was 500 g/kg and the mice was examined for 4 week and it was found that it reduces TG. (28)

The pharmacological activity of lentil polysaccharide is anti-diabetic action. For the study of anti-diabetic activity Bai Z *et al.* isolated the polysaccharide from the lentil polysaccharide was introduced in a high-fat diet and streptozotocin-induced type II diabetic Male Kunming mice. The dose of the polysaccharide was 500 g/kg and the mice was examined for 4 week and it was found that it Reduce TG AND LDLs. (28)

The pharmacological activity attributed to pinto bean pod polysaccharide (PBPP) includes antioxidative and α-amylase inhibitory potentials. Kamarudin F et al. successfully extracted PBPP with a yield of 38.5 g/100 g. The total carbohydrate and uronic acid contents of PBPP were determined to be 286.2 mg maltose equivalent/g and 374.3 mg Gal/g, respectively. PBPP, with a molecular weight (Mw) of 270.6 kDa and intrinsic viscosity of 0.262 dm3/g, was composed of mannose (2.5%), galacturonic acid (15.0%), rhamnose (4.0%), glucose (9.0%), galactose (62.2%), xylose (2.9%), and arabinose (4.3%), with trace amounts of ribose and fucose.

The structural analysis suggested a spherical conformation with a highly branched structure. Fourier Transform Infrared analysis revealed that PBPP shares a similar structure with commercial pectin, with an esterification degree of 59.9%. Scanning electron microscopy showed that the crude polysaccharide formed a thin layer of film consisting of multiple micro-strands of fiber. PBPP exhibited significant free radical scavenging activity (7.7%), metal-reducing capability (2.04 mmol/dm3), and α-amylase inhibitory activity (97.6%) at a total amount of 1 mg. Additionally, PBPP demonstrated high water and oil retention capacity (3.6 g/g and 2.8 g/g, respectively). At low concentrations, PBSP exhibited 39.6% emulsifying activity and 38.6% stability. Moreover, PBSP displayed thickening capacity at low concentrations (0.005 kg/dm3) (29).

The pharmacological activity of Milkvtech are Inhibitory effect (and IL-1βαLipopolysaccharide-Induced TNF- Production in THP-1 Cells). Astragalus polysaccharide (APS), one of the major bioactive components of Astragalus membranaceus Bunge, has been reported to have anti-inflammatory effects, but the molecular mechanism behind this effect is largely unknown. The purpose He X *et al.* study is to investigate the expression of inflammatory cytokines induced by lipopolysaccharide (LPS) and the MAPK / NFκB pathway in human THP1 macrophages. The results showed that levels of TNFα and IL1β released from LPS-stimulated THP1 cells were significantly increased compared to controls ($p < 0.01$).

After treatment with APS, TNFα and IL1β the values were significantly lower than those in the LPS group ($p < 0.05$). Expression of TNFα and IL1β mRNA was also inhibited. Mechanical studies have shown that APS strongly suppresses NFκB activation and down regulates phosphorylation of ERK and JNK. These are important signaling pathways involved in the production of TNFα and IL1β, indicating that APS can suppress the production of TNFα and IL1β by LPS inhibits NFκB activation and ERK and JNK phosphorylation. (31)

The pharmacological activity of Milletia herb polysaccaride are Anti-Fatigue and Antioxidant Activity. Millettiaespeciosae Champ. Leguminosae (MSC) is a famous Chinese herb. Traditionally used as a food ingredient or medicine to boost physical fitness. He X *et al.* Studies have shown that the herbal aqueous extract (MSE) has an anti-fatigue effect with this On paper, MSE was further separated into total polysaccharides (MSP) and supernatant (MSS).He X *et al* .investigated which fraction was active due to alcohol precipitation and its anti-fatigue effect mouse MSP or MSS was orally administered at doses of 200, 400, 800 mg / kg for 20 days.

The anti-fatigue effect was assessed by thorough swimming exercise (ESE). Biochemistry parameters related to post-ESE fatigue and in vitro antioxidant activity of the active fraction absolutely. He X *et al.*studies show that MSP, not MSS, significantly extended swimming. Time to exhaustion ($p < 0.05$), indicating that MSP is responsible for the anti-fatigue effect MSE. In addition, MSP treatment increased glucose (Glu) and muscle glycogen levels,On the other hand, it reduced the accumulation of blood urea nitrogen (BUN) and lactic acid (Lac). In addition, ESE is creatine phosphokinase (CK), lactate dehydrogenase (LDH), and malondialdehyde (MDA), but reduced superoxide dismutase (SOD) and glutathione (GSH) In plasma. In contrast, MSP suppressed all of the above changes associated with fatigue. In addition, In vitro antioxidant studies revealed that MSP removed ¨OH and DPPH-free in a dose-dependent manner radical. In summary, these results strongly suggest that MSP was able to reduce physical discomfort. Fatigue by increasing energy resources and reducing the accumulation of harmful metabolites. Antioxidant activity can significantly contribute to the observed anti-fatigue effect of MSP. (32) The pharmacological activity associated with chickpea polysaccharide is its antioxidant activity. Ye Z et al. optimized the extraction conditions, achieving a yield of 5.37 ± 0.15% for extracting polysaccharides from Cicer arietinum L. (CHPS). The optimal extraction parameters included a temperature of 99°C, extraction time of 2.8 hours, and a water-to-crude material ratio of 24 ml/g.

From the crude CHPS, three fractions (CHPS1, CHPS2, and CHPS3) were obtained through DEAE FastFlow and Sephadex G100 chromatography, with average molecular weights of 3.1 × 10^6 Da, 1.5 × 10^6 Da, and 7.8 × 10^5 Da, respectively. The composition analysis revealed that CHPS1 consists of mannose, rhamnose, galactose, galacturonic acid, glucose, and arabinose; CHPS2 is composed of mannose, rhamnose, galacturonic acid, galactose, xylose, and arabinose; and CHPS3 is composed of galacturonic acid, galactose, and arabinose. Among the fractions, CHPS3 exhibited the most potent reducing and protective effects against H_2O_2-induced oxidative damage in PC12 cells, as well as the highest scavenging activity against DPPH and ABTS radicals. CHPS2 demonstrated the best activity against superoxide anion radicals. (33)

The pharmacological activity of small black soya bean polysaccride is anti-diabetic activity for the study of anti-diabetic activity Bai Z *et al*. extracted polysaccride from the small black soya bean and the polysaccharide was introduced in a high-fat diet and streptozotocin -induced type II diabetic Male Kunming mice. The dose of the polysaccride was 500 g/kg and the mice were examined for 4 week and it was found that it reduces TG. (28)

Legume polysaccharide showing pharmacological action-

SNo	Source	Scientific name	Pharmacological action	Part	Ref
1	Yellow lupin	*Lupinus luteus L.*	Antioxidant, immunomodulatory and prebiotic activities	Seed	19
2	Red kidney bean	*Phaseolus vulgaris L*	Prebiotic activity and antidiabetic action	Seed	20, 28
3	Blue lupin	*Lupinus angustifolius*	Antioxidant activity	Seed	21
4	Mung bean	*Vigna radiate L*	Immunoregulatory, hypoglycemic effect, antioxidant and antibacterial effect	Seed and skin	22,27, 30

SNo	Source	Scientific name	Pharmacological action	Part	Ref
5	Common bean	*Phaseolus vulgaris L.*	Chemopreventive effect	Seed	23
6	Fenugreek seed	*Trigonellafoenum-graecum*	Antioxidant and wound healing	Seed	24
7	Green gram	*Vignaradiate*	Immunomodulatory activity	Seed	25
8	Soya bean	*Glycine max*	Prebiotic Potential, Anti-Inflammatory Activity and antidiabetic function	Soy residue	26, 34
9	Azuki Bean	*Vignaangularis*	Hypoglycaemic effects	Seed	27,45
10	Pea	*Pisum sativum*	Hypoglycemic effects	Seed	27
11	cowpea	*Vigna unguiculata*	Hypoglycemic effects	Seed	27
12	White kidney Bean	*Phaseolus vulgaris*	Antidiabetic action	Seed	38,46
13	Small black soyabean	*Glycine max*	Antidiabetic action	Seed	28
14	Field Bean	*Viciafaba*	Antidiabetic action	Seed	28
15	Lentil	*Lens culinaris*	Antidiabetic action	Seed	28
16	Pinto Bean	*Phaseolus vulgaris*	antioxidative and -amylase inhibitory potentials	Pod	29
17	Milkvetch	*Astragalus*	Inhibitory effect (and IL-1βαLipopolysaccharide-Induced TNF-Production in THP-1 Cells)	Seed	31
18	Millettia	*Milletiaspeciosa*	Anti-Fatigue and Antioxidant Activity	Herb	32
19	Chickpea	*Cicerarietinum*	Antioxidant activity	Seed	33

<u>Legume polysaccharide showing non pharmacological action-:</u>

SNo	Source	Scientific name	Non- pharmacological action	Part	Ref
1	Tamarind	*Tamrindusindica*	Matrix-former, release-retardant and binder	seed	34
2	Royal poinciana	*Delonixregia*	Sustained release antipsychotic tablet	seed	35
3	Fenugreek seed	*Trigonellafoenum graceum*	Mucilage based matrix tablet and novel drug delivery	seed	36,37
4	Red cassia	*Cassia roxburghii*	binder	Seed gum	38
5	Mung bean	*VignaRadiata*	solubility and dissolution enhancer	seed	39
6	Guar	*Cyamopsis tetragonoloba*	Colon specific drug delivery	Seed gum	40
7	Black gram	*Vignamugno*	Suspending agent and tablet binder	seed	41
8	Mucuna	*Velvet bean*	Emulsifying and suspending properties	Seed gum	42
9	Soy beans	*Glycine max*	Super disintegrant	seed	43
10	Locust bean (carob seed)	*Ceratonia siliqua*	versatile biopolymer in different ndds formulation	seed	44

CONCLUSION

Legumes are functional food which are one of the important source of nutrition for human. The article underscores the global significance of legumes, emphasizing their historical importance, nutritional value, and role in addressing nutritional challenges in low-income populations. Despite their crucial contributions to human health, animal production, soil enhancement, and greenhouse gas mitigation, legumes face challenges compared to major cereals, partly due to their greater sensitivity to various stresses and lower grain yield potential.

The need for genetic improvements and agricultural advancements is highlighted to bridge the yield gaps. Additionally, the article touches upon the importance of polysaccharides from legumes in various industries, particularly in pharmaceuticals, and the growing research interest in their anti-diabetic and antioxidant properties.

FINANCIAL ASSISTANCE

Nil

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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