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Legumes: An Overview

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ABSTRACT

Legumes are the richest source of protein, starch, minerals, vitamins and are considered as the earliest domestic plants. Legumes belong to leguminosae family, which is one of the largest and most important families of flowering plants. The present review describes the history, consumption, nutritional aspects, traditional medicinal uses pharmacology and commercial aspects of legumes.

Keywords: Legumes, nutrition, medicine, commerce.

INTRODUCTION

Leguminosae is one of the largest and most important family of flowering plants constituting 650 to 750 genera, 18,000 to 19,000 species of herbs, climbers, shrubs and trees. This family broadly defined by the podded fruits (legumes). It is divided into four sub families as caesalpinoideae (2,800 species), mimosoideae (2,900), papilionoideae (14,000) and swartzioideae (80). Legumes are useful as human and animal food and soil-improving components of



agricultural and agroforestry. The commonly used legumes include alfalfa, chick peas, clovers, cow peas, kidney, lentils, mung beans, peanuts, peas, pigeon peas, soy beans, and vetches [1,2].

History of legume consumption

Legumes are believed as the earliest human-domesticated plants. Lentils were also the component of the cropping systems of ancient Egypt and faba beans are mentioned in Bible. Carbonised seeds of pea, lentils and vetches have been found in fire places of Neolithic age (7000 to 8000 years B. C.) in Turkey. In Switzerland, the lake dwellers who lived between 4000 and 5000 B. C. cultivated peas (*Pisum* species) and a dwarf field bean. In China, farmers began cultivating soy bean between 2000 and 3000 B. C. Beans, soy bean and staple crops were domesticated in America and Asia respectively more than 3,000 years ago. Romans used legumes in pastures and for soil improvement dating 37 B. C [2,3].

Nutritional aspects of legumes

Legumes are the richest source of nutrients (protein,

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starch, minerals and vitamins) and important health protective compounds (phenolics, inositol phosphates and oligo-saccharides). Legume proteins are composed of several thousand specific proteins. About 70 to 80% of the crude protein in legumes seeds is storage protein. Legume seeds accumulate large amount of proteins during their development. The main protein fractions are albumin and globulin. The albumin fraction has a well-balance amino acid profiles and is relatively rich in sulfur containing amino acid (methionine and cysteine), where as, the globulin fraction differ in their amino acid composition, molecular weight of protein sub units and physico-chemical properties. Proteins are present in pea and beans upto 20% and upto 40 % in soybean and lupin. The protein is rich in lysine, and is therefore complementary to cereals in lysine balance [3,4].

Legumes contain 390 – 510 g/kg starch content as an important energy source. This legume starch is characterized by high amylopectin content. The oil content of legumes (except soy and lupin) is about 1 – 2% which is mainly composed of poly unsaturated fatty acids. The great nutritional value of legume seeds not only allow them to use as meat replacers but also provide component of rational nourishment and food for vegetarians. The isolated proteins, starch and fibers from legume seeds have good physico-chemical and health protecting properties [3].

Legumes as human food

Legume seeds (pulses or grain legumes) are the major source of human food second only to cereals (Poaceae). Nutritionally these are more rich in protein content than cereal grains. When legumes and cereals are eaten together, they provide complete protein requirement. In Latin America kidney beans are a major source of food, where as lentils, pigeon peas and chick peas are important in South Asia. Similarly faba beans, lentils and chick peas are important protein food in Middle East and North Africa. Common food products made from legumes include peanut butter and soymilk [2].

Leguminous plants used as food [2]

Arachishypogaea (peanut, groundnut)
Cajanuscajan (pigeon pea)
Canavaliaensiformis (jack bean)
Ceratoniasiliqua (carob, locust)
Cicerarietinum(chickpea, gram, garbanzo)
Glycine max (soybean)
Lens culinaris (lentil, masur dhal)
Pachyrhizuserosus (Yam bean)
Parkiajavanica (Petal)
Phaseoluscoccineus (scarlet runner bean)
Phaseoluslunatus (lima bean, butter bean)
Phaseolus vulgaris (bean, common bean)
Pisumsativum (common or garden pea)
Psophocarpustetragonolobus (winged bean)
Viciafaba (broadbean, faba bean)
Vignamungo (urdbean, black gram)
Vignaradiata (gram, mungbean)
Vignasubterranea (bambara groundnut)
Vignaumbellata (rice bean)
Vignaungiculata (kacang, cowpea)

Legumes as animal feed

Legumes are also used as animal fodder in which soy beans are most commonly used. Forage legumes which are generally used are grass-legumes mixtures, the clovers, medics, trefoils and vetches are important in temperate regions. Stylosanthes, Pueraria, Lablab, Desmodium and other tropical pasture crops are important in tropical and sub tropical regions as live stock fodder [2].

Leguminous plants used as fodder [2]

Acacia albida
Acacia farnesiana
Acacia koa
Acacia lutea
Acacia nilotica
Acacia seyal
Albiziaamara
Albizialebbek
Archidendronjiringa
Archidendropsisbasaltica
Astragaluscicer
Bauhinia spp.

Cyamopsistetragonoloba

Dalbergiasissoo

Desmodium spp.

Erythrina spp.

Lotus spp.

Lupinus spp.

Macroptilium spp.

Macrotylomauniflorum

Medicago spp.

Melilotus spp.

Pithecellobiumdulce

Prosopisspp.

Puerariaphaseoloides

Stylosanthes spp.

Trifolium spp.

Econom ic / com m ercial in portance of legum es

Legumes are not only used as human food and animal

feed but also consume as green manures for crops

Econom ic and com m ercial Legum inous plants [2]

Plants	Main Uses
Acacia albida	Shade
Acacia auriculiformis	Shade, ornamental, fuel
Acacia farnesiana	Perfume, tannin, wood
Acacia glauca	Green manure
Acacia koa	Lumber
Acacia mangium	Lumber, fuelwood
Acacia mearnsii	Fuelwood, lumber, tannin
Acacia pennatula	Shade coffee, fuel
Acacia senegal	Gum Arabic
Acacia seyal	Lumber
Albiziafalcataria	Shade
Albizialebbek	Shade
Albiziasumatrana	Shade, green manure
Astragaluscicer	Erosion control
Bauhinia spp.	Ornamental
Calliandracalothyrsus	Fuel, green manure, land reclamation
Calopogoniummucunoides	Erosion control, soil improvement
Cassia alata	Medicine, tannin
Cassia senna	Cosmetic
Crotalaria juncea	Fiber, green manure
Cyamopsistetragonoloba	Gum, green manure, cover crop
Dalbergiasissoo	Lumber
Erythrina spp.	Shade, green manure, ornamental
Gliricidiasepium	Shade, green manure
Inga edulis	Shade for coffee
Leucaenaleucocephala	Green manure, land reclamation, paper pulp
Lupinus spp.	Green manure, soil improvement
Pithecellobiumdulce	Shade
Prosopisspp.	Shade, lumber
Puerariaphaseoloides	Erosion control
Sennaoccidentalis	Medicine

such as *Sesbaniastrata* in rice cropping and *Gliricidia sepium*, *Leucaena leucocephala* in alley cropping. Legumes also used as forages like *Lupinus* (lupin), *Medicago* (alfalfa) and *Trifolium* (clover). They can be milled into flour, used to make bread, doughnuts, tortillas, chips, spreads and extruded snacks or used in liquid form to produce milk, yogurt and infant formula. Peas, lentils and soybean provide novel uses for specific

legumes. Legumes have been industrially used to prepare biodegradable plastic, oil, gums, dyes and inks [2,3].

Legumes in traditional system of medicine

Many legumes have been used in folk medicine in different parts of the world. Abuki bean is reported as lactagogue and diuretic. It tonifies the kidney-adrenal functions and detoxify the body. It is very effective in leucorrhoea, jaundice, ascites, mumps, boils and diarrhoea. Black bean acts as analgesic specially in lower backache and knee pain. It is reported as tonic, haemitenic and diuretic. Mung bean is useful in diarrhoea, dysentery, conjunctivitis, oedema of lower extremities, high blood pressure, intestinal ulcers, painful urination, burns, mumps and poisoning from food, lead and pesticide. Peas are diuretic and mild laxative. These are used in vomiting, hiccups, belching, constipation and cough and a very good tonic for spleen, pancreas and stomach. Peas reduce the chances of skin eruptions (carbuncles and boils) and hastens their healing. Soy bean is an excellent remedy for childhood malnourishment. It is used to treat spasms, arthritis, food stagnation, skin eruptions, constipation, oedema and toxemia during pregnancy. It acts as tonic for spleen, pancreas and kidneys. Kidney bean acts as diuretic and used effectively in treating oedema and swelling. Lentil stimulates the adrenal system and increases the vitality of the kidneys. Lima bean is reported as tonic for liver and lungs and beautifies the skin. String bean strengthens the spleen, pancreas and kidneys. It is used in diabetes, diarrhoea and leucorrhoea [5].

Pharmacological activity of legumes

Proteins present in legumes are the source of constructive and energetic compounds. They also play a bio-active role as the precursor of biologically active peptides with various physiological and pharmacological functions for example lasein-derived peptides, which possess immuno-modulating, anti-hypertensive and anti-thrombotic activities. Isoflavones from soy beans and other legumes are reported to decrease the serum cholesterol level and the risk of cancer. Soybean and soyfood phytoestrogens are suggested as possible alternative to hormone replacement therapy for menopausal women. Rotenone from various *Lonchocarpus* and *Derris* species is one of the example of insecticide and molluscicide drug [1].

The high fiber content, low glycaemic index and the presence of minor components such as of legumes phytosterols, saponins, oligosaccharides etc., are considered the main responsible agents in controlling lipid and consequently decrease the risk of cardiovascular diseases. Similarly the low glycaemic index and the high content of undigestible fibers of dry legumes are claimed to help glycaemic control in diabetics. Legumes are assumed to play an important role in the accelerated transit of digested food in the intestinal tract. This accelerated transit and its final excretion play an important role in decreasing re-absorption of cholesterol, incomplete starch digestion and lowering fermentation processes [4].

Pharmacological activity of legumes [4]

Plant	Peptide / protein	Pharmacological activity
Soybean	7S globulin α' chain	LDL-receptors up-regulation
Faba bean, lupin and others	Undefined storage Proteins	Reduce plasma cholesterol and triglyceride
Pea, soybean and others	BB serine-protease Inhibitor	Against cancer, inflammation and obesity
Various sources	α -amylase inhibitor	Control body weight and diabetes
Lupin	Conglutiny	Hypoglycaemic, hypocholesterolaemic
Various sources	Lectins	Anti-cancer, immunomodulation
Soy bean	ACE inhibitor peptides	Hypotensive

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