



E-CONTENT

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Topic: Cultivation, Production & Uses of -LEGUMES

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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 agriculture and agroforestry. The commonly used legumes include alfalfa, chickpeas, cow peas, kidney, lentils, mung beans, peanuts, peas, pigeon peas, soya beans, and vetches.

Legumes are believed as the earliest human-domesticated plants. Lentils were also the component of cropping systems of ancient Egypt and Faba beans are mentioned in Bible. Carbonized seeds of pea, lentils and vetches have been found in fire places of Neolithic age (7000 to 8000 years B. C.) in Turkey. In China, farmers began cultivating soy bean between 2000 and 3000 B. C.

Legume seeds (pulses or grain legumes) are the major source of human food second one to cereals. 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, whereas 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.

LEGUMES are grown agriculturally, primarily for human consumption, for livestock forage and silage, and as soil-enhancing green manure.

Important Legumes cultivated and consumed in India are as follows:

1. Bengal Gram (Desi Chick Pea / Desi Chana);
2. Pigeon Pea (Arhar / Toor / Red Gram);
3. Green Beans (Moong Beans);
4. Chick Pea (Kabuli Chana);
5. Black Gram (Urd);
6. Red Kidney Beans (Rajma);
7. Black Eyed Pea (Lobiya);
8. Lentils (Masoor);
9. White Pea (Matar)

Some other Legumes are

10. *Arachis hypogea* (Peanut, Groundnut);
11. *Canavalia ensiformis* (Jack bean);
12. *Ceratonia siliqua* (Carob, Locust);
13. *Glycine max* (Soy bean);
14. *Pachyrhizus erosus* (Yam bean);
15. *Parkia javanica* (Petal);
16. *Phaseolus coccineus* (Scarlet runner bean);
17. *P. lunatus* (Lima bean, Butter bean);
18. *Psophocarpus tetragonolobos* (Winged bean);
19. *Vicia faba* (Broad bean / Faba bean);
20. *Vigna subterranean* (Bambara ground nut);
21. *Vigna umbellata* (Rice bean).

Legumes are the richest source of protein, starch, minerals, vitamins and are considered as the earliest domestic plants. They are versatile crops, having a huge potential to produce protein-rich grains, fix nitrogen biologically and enrich beneficial microbes in soil. Some legumes are capable to solubilize the unavailable phosphate by exudating organic acids from roots.

Gram and Pigeon pea which together account for 61% of the total pulse production, are the principal grain legumes; chickpeas are grown in the post-rainy season (Oct.-March) and pigeonpeas are planted in the rainy season (June-Oct.). Other legumes grown exclusively in the post rainy-season are lentil (*Lens culinaris* Medic), “khesari” or grass pea (*Lathrus sativus* L.) and peas (*Pisum sativum* L.). Mungbean or green gram (*Vigna radiata* (L.) R. Wilczek) “urd” or black gram (*Vigna mungo* (L.) Hepper) and cowpea (*Vigna unguiculata* (L.) Walp.) are grown in both seasons but the post-rainy season crop is possible only in the warmer parts of the country. Where irrigation is available these can

also be grown in the summer. Other grain legumes grown in the rainy season with limited regional importance are field beans (*Lablab purpureus* L.), Sweet mothbean (*Vigna acotifolia* (Jacq.) Marechal), cluster beans (*Cyamopsis tetragonoloba* (L.) Taub.) and soybean (*Glycine max*(L.) Merr.). Groundnut (*Arachis hypogea* L.) is the major oil seed legume grown in both seasons but in the post-rainy season the crop is mostly confined to the irrigated areas of peninsular India.

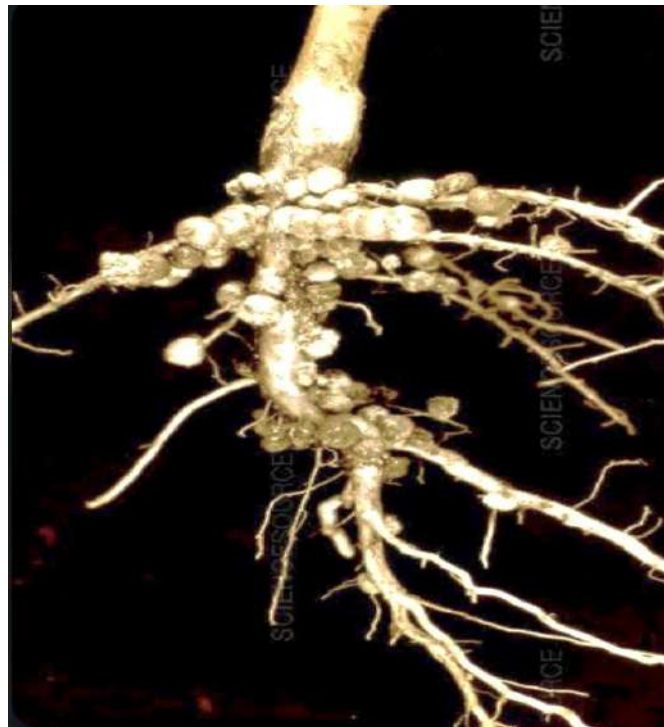
The major diseases of pigeon pea are **sterility mosaic, phytophthora blight and wilt** (*Fusarium udum*). Chickpea is affected by wilt (*Fusarium oxysporum*) and **root rot** (*Rhizoctonia sp.*). Seed treatment with 2-3 g/kg seeds of **Captan** or **Thiram** can protect the plant from wilt damage although this may not entirely eliminate the disease.

LEGUMES: Legume is a broad term, which includes all the Lentils, Pulses, Beans and Peas found in the family Fabaceae / Leguminosae. e.g. Chick pea

PULSES: Pulses are the dried edible seeds of leguminous plants. e.g. Chickpea, Cow pea.

LENTILS: They are lens shaped dried seeds of legumes. e.g. Brown, Green, Yellow, Red lentils.

BEANS: Beans are large and oval or kidney-shaped leguminous seeds.



Rhizobium nodules of a Leguminous plant



BEANS & LEGUMES



split pea



roman bean



red bean



chickpea



green pea



mixed bean



pink pea



split mung



mung bean



black bean



kinney bean



soybean



lima bean

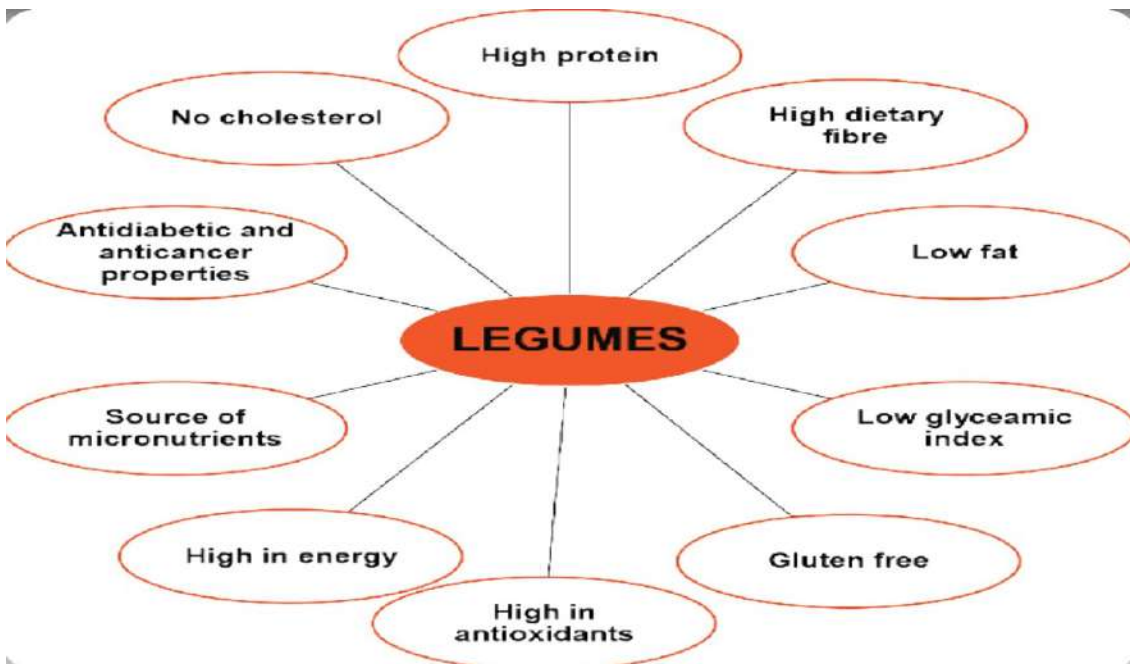
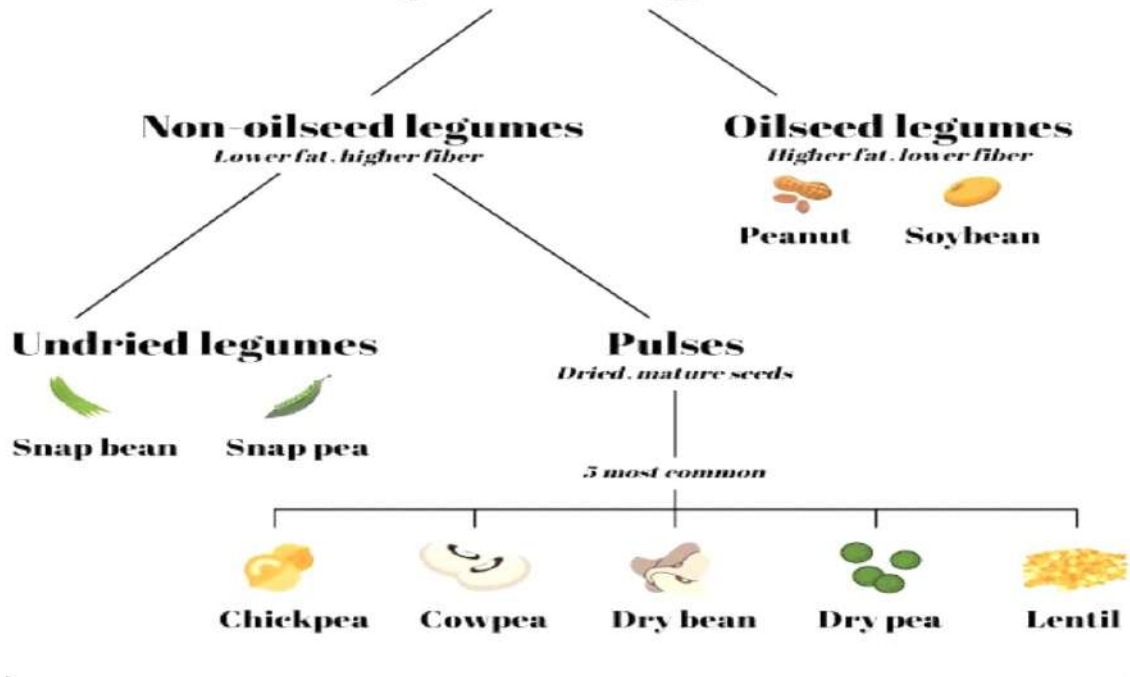


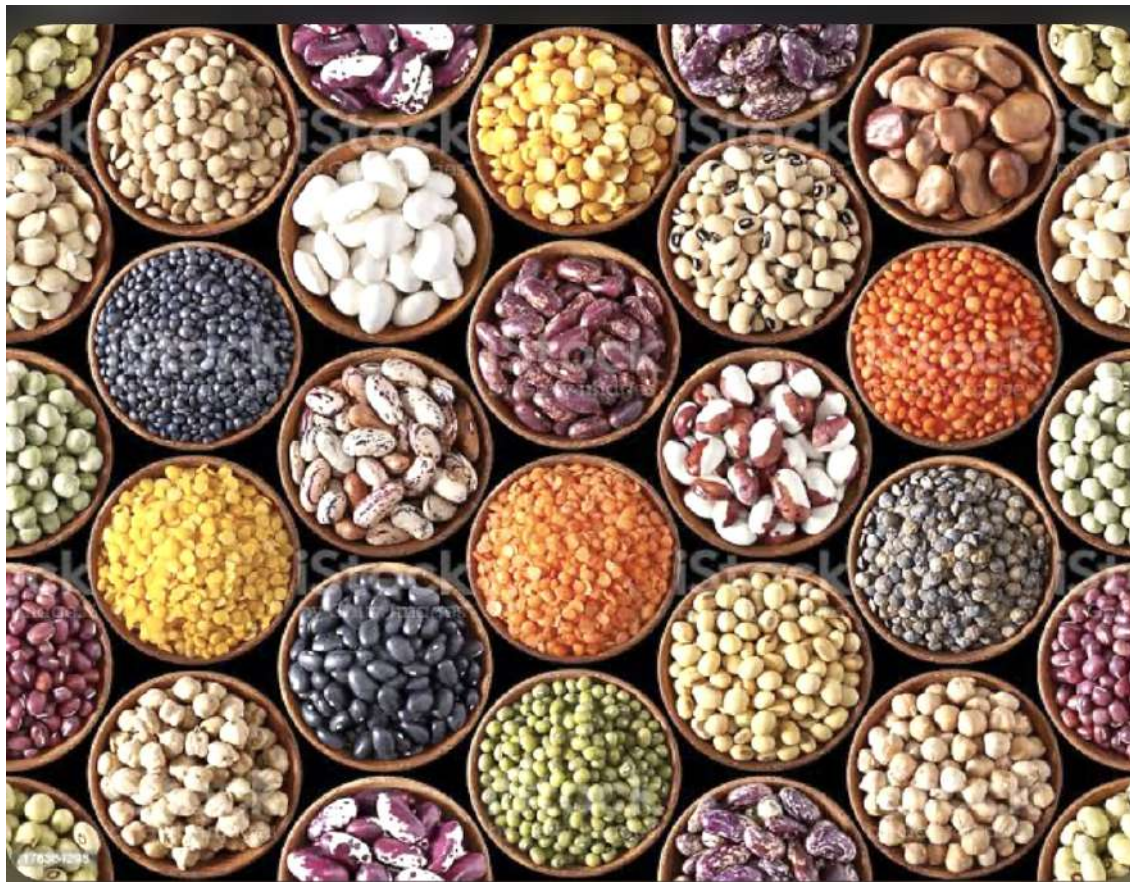
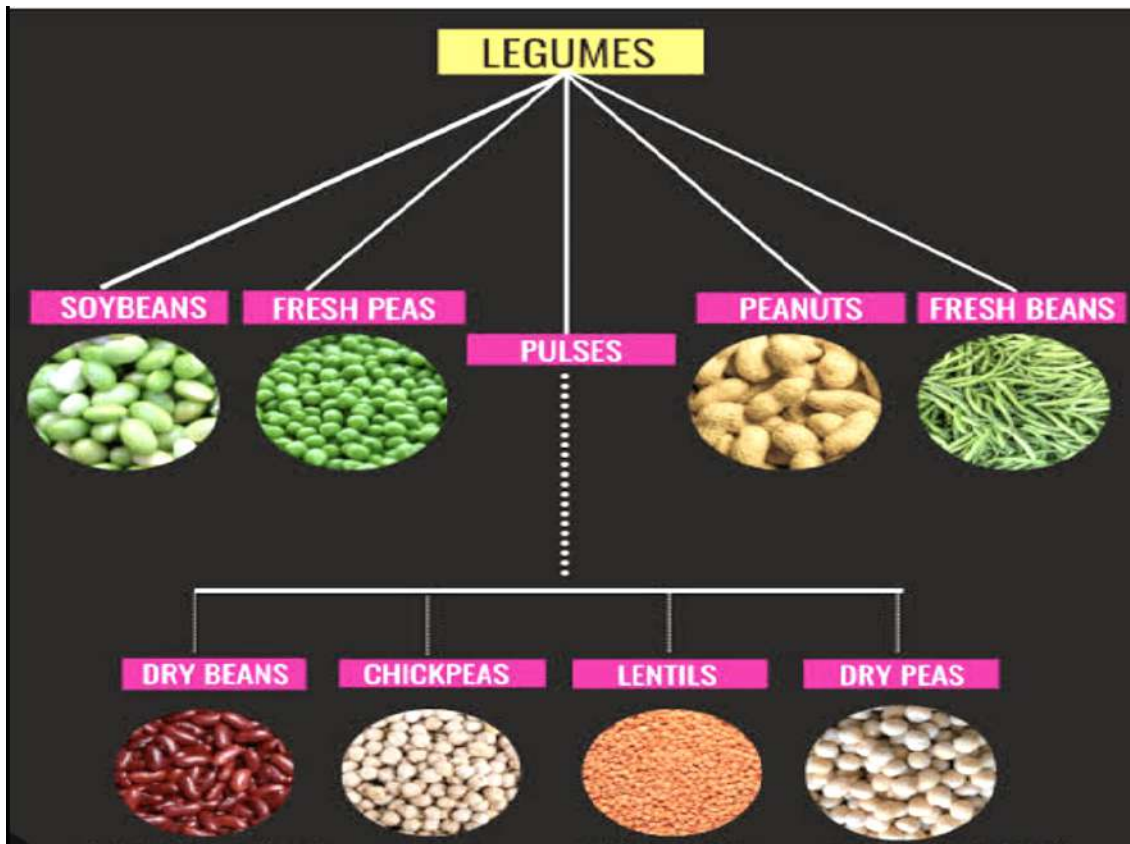
black eyed pea



red lentils bean

9 Major Legumes







Lablab purpureus



Cajanus cajan



Cicer arietinum



Lensculinaris



Lathyrus sativus *Pisum sativum*



Vigna radiata

Vigna mungo



Vigna unguiculata *Cyamopsis tetragonoloba*



Glycine max

Arachis hypogea



Vigna acontifolia

PIGEON PEA [Arhar, Tuar, Congo Pea, Red gram]

Botanical name: *Cajanus cajan* (L.) Millsp. (Family: Fabaceae)

It is native to Africa and cultivated in Egypt before 2200 BC. According to De Candolle pigeon pea is more probably a native of tropical Africa, and introduced perhaps 3000 years ago into India. It is grown in all the tropical countries viz. USA, Africa, India, Australia and West Indies etc. In India it is commonly cultivated in states of Uttar Pradesh, AP, Tamil Nadu, Bihar, MP etc.

BOTANY

A profusely branched annual / Perennial shrub, height 0.5 to 3.0m. Leaves trifoliate and inflorescence axillary corymb. The flowers are yellow / purple in colour. Fruit is POD, constricted obliquely between the seeds. Seeds are light red/brown-green and cotyledons are light or dark yellow.

CULTIVATION & PRODUCTION

Sandy or Clayey loam soil best for the growth and cultivation of the crop, however it may grow in wide variety of soil.

It is a drought resistant crop and can tolerate dry areas, requires less than 65 cm annual rainfall.

Pigeon pea is a Kharif crop which is sown in June-July and harvested between January-March. It is a pure or mixed crop with Sorghum, Millets, Sesame, Cotton, Maize, Groundnut etc.

The crop matures in 6-10 months. Pods harvesting is done manually in which plants are cut and finally pods are collected for threshing. Threshing is done on specially constructed floor by trampling pods under the cattle feet. After this seeds and chaff are separated by winnowing.

There are two main varieties of Pigeon pea grown in India:

a. *Cajanus cajan* var. *bicolour* DC. (Arhar)

b. *C. cajan* var. *flavus* DC. (Tur).

ARHAR comprises of late-maturing, large, bushy plants, bearing purple streaked, yellow flowers and dark coloured pods, each having 4-5 seeds.

TUR on the other hand comprises early maturing and smaller plants having yellow flowers and plain pods, each containing 2-3 seeds.

ARHAR is commonly cultivated in north-eastern India and Tur in peninsular India.

For preparation of pulse from seeds two methods are applied.

A. Dry Method: In this method seeds are first sun-dried for 3-4 days after that subjected to milling for splitting. Milling process is repeated in fractions for 3 to 4 times till all the seeds are split into halves. If unsplit seeds are present they are separated out and treated with oil and sun-dried and milled again.

The total yield of 30 kg per 45 kg of seeds is obtained by this method.

B. Wet Method: In this process seeds are first soaked in water for 6-10 hours then sun dried for 2-3 days and with sieved red earth.

After drying, red earth is separated by winnowing and seeds are split in hand mill.

The total yield of 36 kg per 45 kg seeds is obtained by this method (yield is more as compared to dry method).

IMPROVED VARIETIES

Kudrat 3 (Perennial), Chamatkar (Annual), Karishma (Annual), Amar, Azad, Asha (IPCL – 87119), Maruti, C-11, JKM – 7, BSMR – 853 & BSMR -736.

IMPORTANT PATHOGENS: *Phytophthora cajani* and *Fusarium* wilt.

USES

Ripe and immature seeds, both are used for human food as a good source of protein.

-Used as pulse crop.

- Seeds contain about 22% protein and important amino acids Methionine, Lysin, and Tryptophan and Vit. B₁, B₂, B₃, B₆ folate and minerals.
- Green leaves used as fodder, green manure, for rearing silkworm (in Medagascar) and has medicinal property.
- Dried stalks used in making baskets and fuel.
- The enzyme UREASE, obtained from it, is required for estimation of Urea in blood, urine etc.
- It contains two globulins: **Cajanin** and **Concajanin**.
- Husk makes useful fodder.





Helicoverpa larvae damaging arhar pod Plume moth on Pigeon pea pod

CHICK PEA [Gram, Bengal gram, Chana]

Botanical name: *Cicer arietinum* L.(Family: Fabaceae)

HISTORY and CULTIVATION

In ancient times the gram was known to the Greeks, under the name *Erebinthos*, and to the Romans as *Cicer*; and the existence of other widely different names show that it was early known and perhaps indigenous to the south-east of Europe. It is thought that the gram has been cultivated in Egypt from the earliest times. Its introduction into India is of more early date, for there is a Sanskrit name (gram-*Chanaka*) and several other names in modern Indian languages. It believed that the Western Aryans carried Chickpea into India.

Chickpea is native of South Europe. At present it is commonly grown in Uttar Pradesh, Punjab, Maharashtra, Rajasthan, Bihar and MP. India is the largest chickpea producer as well as consumer in the world. It is the world's third most important food legume. It contains 25% proteins, *which is the maximum provided by any pulse* and 61.1% carbohydrates. Among several insect pests attacking chickpea, *Helicoverpa armigera* appear in great number during vegetative growth and at pod formation stage. A single larvae may destroy several pods before reaching to maturity and this pest is reported to cause damage to the extent of 5 to 40% on pods of chickpea.

Chickpeas are classified into two distinct types based on seed characteristics. Desi chickpeas have a thick, coloured seed coat and the surface of the seed is rough and angular whereas the Kabuli types have white or beige seeds with a smooth surface. Kabuli chickpeas are best grown in temperate areas whereas Desi chickpeas are best suited to semi-arid areas of the tropics.

CLIMATE and TEMPERATURE

Chickpeas are cultivated in both irrigated and rainfed areas. Chickpeas are cool-season legumes which are best grown as a winter crop in the tropics or as a spring or summer crop in temperate regions. It requires optimum daily temperature between 18-29⁰C. In India, gram is sown as *rabi* crop at the end of the rainy season during months of September-November, and harvesting between February and April. It grows well under good moisture conditions with ideal temperature between 24⁰C to 30⁰C.

SOIL

Chickpeas grow well in well drained moderately heavy soil, black cotton soil and sandy loam soil. Sandy loam to clay loam with pH ranging between 6.0-8.0 are best suitable for chickpeas farming.

PLANTING

Chickpeas are propagated directly from seeds with timing of planting, depending on the variety being grown and geographic location. Spring crops should be planted when the soil has warmed to at least 5⁰C. Chickpeas are leguminous and when planting in a site which has not previously been used for chickpea cultivation, seed should be inoculated with an appropriate type of *Rhizobacteria* prior to planting. Seeds are usually spread by broadcasting or by drilling in rows. Desi types require a seed rate of 30-40 kg/ha whereas Kabuli types require 80-100 kg/ha. The seed should be planted 2-12 cm deep and when planting in rows, seed should be spaced 10 cm apart allowing 25 to 60 cm between rows.

PEST and DISEASE CONTROL

Chickpea is mostly affected by **cutworms** and **gram pod borers** pests. They may be controlled by THIAMETHAXAM 70 WP @ 3g/kg seed applying LINDANE @ 20-30 kg/ha mixed in the soil and ENDOSULFON 35 EC @ 1.30 litres mixed in 1000 litre of water/ha, respectively.

Some other diseases are WILT, GREY MOLD, SCLEROTINA BLIGHT and RUST. Fungus *Fusarium oxysporum f.sp.* causes severe damage to chickpea due to wilt.

Ascochyta Blight is the number one disease impacting chickpeas upto 90%.

HARVESTING

Harvesting of chickpea crop is done when leaves turn reddish-brown, start shedding and seeds are hard and rattle with 15% moisture. Plants are plucked with hands or sickle and are allowed to dry in sun for 4-6 days. Threshing is carried out by beating the plants with sticks or bullock drawn thresher, followed by winnowing.

PRODUCTION

Globally, India ranked first in area and production of chickpea followed by Australia, Myanmar, Pakistan, Turkey, Ethiopia, Russia, Iran and USA.

Brown chickpea (desi chana) is mostly grown in India, Myanmar, Pakistan, parts of South Asia, Ethiopia, Mexico and Iran. White gram (Kabuli chana) is mainly grown in Mediterranean, Southern Europe, Northern Africa, South America and South Asia.

HIGH YIELDING VARIETIES OF CHICKPEA IN INDIA

1. **Black chickpea varieties:** Gourav, Pant G-186, Phule G-95311, Kranti, UdayPusa-256, H-355 etc.
2. **White chickpea varieties:** ICVV-2, Haryana Kabuli, Pant Kabuli, Pusa-1003, Sadabahar etc.

USES

The gram is consumed in several ways.

- Chickpeas are nutrient-rich food providing about 17-30% protein, dietary fibres, folate and dietary minerals (Ca, Fe, Mg and K), Vit. B₆, Zn etc. and rich in amino acids – lysine, tryptophan, isoleucine.
- *Dal* is prepared by splitting the whole grain into two and removing the husk.
- The flour of the daalis known as *Besan*.
- The whole grain is eaten raw, roasted, parched or boiled.
- Gram is also used as cattle feed. It makes a nutritious feed for horses.
- Germinated gram is used as a prophylactic against deficiency diseases, scurvy in particular.
- Used also in textile sizing and adhesives.





Wilt Disease



Cut Worm



BLACK GRAM [Urd]

Botanical name: *Vigna mungo*(L.) Hepper [Syn.*Phaseolus mungo* Roxb.]
(Family: Fabaceae)

ORIGIN & DISTRIBUTION

Black gram is originated in Central Asia and India. In later stage spread to other countries like Pakistan, Sri Lanka, Myanmar, Madagascar, East Asia, Africa and America.

BOTANY

Black gram is a short and erect, fast growing annual crop, reaching 30-100 cm height. Stem profusely branched. The leaves are trifoliate with ovate leaflets. Inflorescence axillary racemose. Pods are erect, short and brown-black in colour with 6-10 seeds / pod.

CULTIVATION

It is a tropical crop and can tolerate temperature upto 42⁰C. The optimum required temperature is 25⁰C to 35⁰C.

Easily grown in wide variety of soil but loamy or clay loam soils with neutral pH are best suited for its cultivation. It is also cultivated in summer. A short day cultivar is sown in June-July and harvested in October-November, while a day neutral cultivar is sown in January and harvested in March.

For the pure crop in Kharif season, the land is ploughed once or twice, then crop can be sown dry in furrows followed by irrigation. As it is a kharif crop so much irrigation is not required. The critical stage for irrigation is flowering and pod filling. Organic and inorganic fertilizers should be applied at the time of sowing.

DISEASES

Powdery midew (*Erysiphe polygoni*), **Anthracnose** (*Colletotrichum lindemuthianum*), **Leaf spot** (*Cercospora canescens*), **Rust** (*Uromyces phaseolitypica*), **Dry root rot** (*Rhizoctonia bataticola*), **Mungbean Yellow mosaic disease** (*MYMV*), **Leaf crinkle disease** (Urdbean leaf crinkle virus (*ULCV*)).

IMPROVED VARIETIES

Pant U-8, Pant U-9, Pant U-31, Pant U-35, T-9, T-27, T-77, Pusa-1, H-10 etc.

HARVESTING

Harvesting of vigna seeds can be done by picking the pods or by uprooting or cutting the whole plant (with a sickle). The pods are dried on the threshing floor for 7 – 10 days and threshed by beating with sticks. The seeds are then separated and are winnowed. Seeds are stored at 8-10% moisture.

USES

Seeds of Black gram are highly nutritious and good source of protein for vegetarians. The seeds are used in the form of *dal*(splitted seeds). It is largely used by south Indians to make *vada idili, dosa, etc.*

This pulse is good source of phosphorus. It is the chief constituent of wafer-biscuits (Papad). Fried and salted seeds are eaten as a snack. Pulse is used in rheumatism and nervous and hepatic diseases. Also used in dropsy cephalagia as a diuretic, and used for aching bones. It is used as green manure.



Mature Plant **Mature Fruits**



Seeds



Powdery Mildew

Yellow Mosaic Virus



Leaf Blight



Aphids



Spotted Pod Borer

PESTS



Pod Bug

PEST

GROUNDNUT[MUNGFALI]

Botanical name: *Arachis hypogea* L. (Family: Fabaceae)

The name *Arachis hypogea* is derived from two Greek words “*Arachis*” meaning to Legume and “*hypogea*” meaning below ground, referring to the formation of pods in the soil.

ORIGIN

Recent botanical survey has indicated that Brazil in South America is the most likely centre of the origin of this plant. In India, it was introduced by Jesuit Father (Missionaries) in first half of the 16th century. Shri Padmabhai Patel introduced this Legume to Gujarat in 1910 from Tamil Nadu.

It is also known as **peanut, earthnut, monkey nut, manilla nut, pinda, goober** and **kingpin**.

PRODUCTION

The important groundnut growing countries in the world are India, China, USA, West Africa, Sudan and Nigeria. In India the production of Groundnut is about 33% of the world's production.

Among oilseed crops, groundnut accounts for >40-50 %in area and 60 to 70%in production in the country. Among oilseed crops, groundnut has first place in the country. Its cultivation in India is mainly confined to the States of Gujrat, Andhra Pradesh, Tamil Nadu, Karnataka, Maharashtra, Madhya Pradesh, Uttar Pradesh, Rajasthan, Punjab and Orissa. About 80% of the total area and 84 % of the total production in the country are confined to first five States. The highest productivity of groundnut (1604 kg/ha) is in State of Tamil Nadu, while in Gujarat the productivity is about 1190 kg/ha.

Table shows the position of the States with respect to area, production and productivity

Area	Production	Productivity
Gujarat	Gujarat	Tamil Nadu
Andhra Pradesh	Tamil Nadu	Gujarat
Karnataka	Andhra Pradesh	Punjab
Maharashtra	Karnataka	Andhra Pradesh
Tamil Nadu	Maharashtra	Uttar Pradesh

Saurashtra state is the heart of the Gujarat and India for groundnut production.



Groundnut crop



Harvested Groundnut crop



Groundnut plant at flowering stage



Groundnut pods and Seeds

BOTANY

Groundnut is a herbaceous annual crop with a more or less upright central stem with numerous branches that vary from prostrate to almost erect depending upon the variety. It has a taproot; stem is cylindrical, hairy and become more or less angular with age. The leaves of groundnut are pinnate with two pairs of leaflets borne on a cylindrical and grooved petiole. The flowers are yellow, complete, papilionate and sessile. Usually flowering takes place between 24-30 days after sowing, which is little earlier in bunch type than spreading. The gynophore is commonly referred to as **peg**. The peg carrying the ovary pushes itself into the soil. It is only after entering the soil that ovary begins to develop and takes up horizontal position. At the same time, the pod begins to enlarge. The fruit is a indehiscent pod containing 1-5 seeds. The nut is composed of 2 cotyledons, which contain oil and other food materials.

CLIMATE

Groundnut is a tropical plant requires a long and warm growing season. It grows well in areas receiving 50 to 125 cm of well-distributed rainfall during growing season, abundance of sunshine and relatively warm temperature. Soil temperature is an important factor and its effects are critical on seed germination, emergence of seedlings, early plant growth, rate of flowering, and pod development. When soil temperature goes below 19 °C, emergence of seedling is low. The optimum temperature for vegetative growth of groundnut is ranging in between 26 to 30 °C depending on the cultivar. Reproduction growth is maximum at 24-27 °C. Light influences both photosynthesis and respiration in groundnut. The opening of flowers and number of flowers both depend on light.

In India, groundnut is generally sown in four seasons.

Kharif: About 85 %of the total groundnut in India is sown in the kharif season under rainfed conditions.

Rabi:

Grown in a very limited area during rabi season where winter is not very severe, in rice fallow fields and utilizes the residual moisture with minimal irrigation.

Summer:

Summer season crop mainly taken in the states of Tamil Nadu, Andhra Pradesh, Karnataka, Gujarat, and Maharashtra.

Spring:

Spring cultivation of groundnut is taken in the states of Uttar Pradesh, Punjab and West Bengal.

SOIL

Groundnut does well in the well drained, light textured, loose, friable and sandy and sandy loam soils which helps in easy penetration of pegs and their development and also harvesting. Clay and heavy soils are not suitable for groundnut crop as they interfere in penetration of pegs and make harvesting quite difficult.

pH range 6.0 to 7.5 found much suitable for the crop well supplied with calcium and a moderate amount of organic matter.

FIELD PREPARATION

Although groundnut is deep rooted crop, due to its under ground pod forming habit, deep ploughing should be avoided, because it encourages development of pods in deeper layers of soil which makes harvesting difficult. Adequate moisture is necessary at sowing for proper germination and good plant growth and proper development of pod. One ploughing with soil turning plough followed by two harrowing would be sufficient to achieve a good surface tilth up to 12 – 18 cm depth.

VARIETIES

CG 8 (ICGV-SM 08501), CG 9 (ICGV-SM 08503), CG 10 (ICGV-SM 01724) and CG 11 (ICGV-SM 01731).

The Hyderabad base International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and Bangladesh Agricultural Research Institute (BARI) have released BARI Chinabadam-12 (ICGV 07219).

Other varieties are Kadiri-2, Kadiri-3, bg-1, bg-2. Kuber, GAUG-1, GAUG-10. PG-1, T-28, T-64, Chandra, Chitra, Kaushal, Prakash, Amber etc.

SEEDS TREATMENT

For control of seed borne diseases, treatment of groundnut seeds with THIRAM (3 g/kg of seeds), MANCOZEB (3 g/kg of seeds) or CARBENDAZIM (2 g/kg of seeds) is recommended. Thereafter, seeds should be inoculated with proper strain of Rhizobium culture particularly in those fields where groundnut is to be grown first time. Seeds are treated with QUINALPHOS 25 EC @ 25 ml or CHLORPHYRIPHOS 20 EC @ 25 ml/kg of kernels for control of white grubs.

SEEDS & SOWING

Bold and filled pods should be selected and shelled by hand or by power operated decorticator just before sowing. From the shelled seeds, small, shrivelled, damaged and broken seeds should be removed and only bold ones should be used for sowing.

Usually groundnut sowing is undertaken with the onset of monsoon. But where irrigation facilities are available, pre-monsoon sowing should be done in the last week of May or in the first week of June with pre-sowing irrigation. Early sowing helps in best utilization of monsoon by the crop. The summer crop is sown in the

last week of January. The spring crop is sown from the second fortnight to February to first week of March.

SOWING METHOD

Seeds should be sown about 5 cm deep with the help of country seed drill or they are sown behind the country plough. Dibbling of seeds by keeping 60 cm distance in row to row and 10 cm distance in plant to plant for spreading type and 45 cm x 10 cm in bunch type helps in saving the seed requirement and also increase the yield.

FERTILIZERS

N kg/ha	P ₂ O ₅ kg/ha	K ₂ O kg/ha	Stage of application
12.5	25	0	As basal application

The pod formation and development of groundnut is greatly influenced by fertilizer application. Lime application accusses better nodulation.

The entire quantity of phosphorous should be applied about 4-5 cm in the side of the seed and 4-5 cm below the seed level before sowing. N may be applied preferably in the form of ammonium sulphate as it contains sulphur, which is directly involved in biosynthesis of oil. Phosphorous fertilizer is very much important as it promotes root growth and development of rhizobium and helps the crop to tide over moisture stress. Single super phosphate is the best source of phosphorous as it contains 16 % phosphorous besides 19.5 % calcium and 12.5 % sulphur. Gypsum is the cheapest source of calcium (24%) and sulphur (18.6 %). P is a constituent of enzymes, phospholipids and protein, while S is a constituent of S containing amino acids and helps in fatty acid synthesis. Calcium is another important mineral for groundnut production. Groundnut has unique characteristic of absorbing about 75 % of S and Ca through gynophore and developing pods.

DISEASES

In groundnut, fungi cause seed rots and seedling diseases such as TIKKA, ROOT ROT, STEM ROT, WILTS, BLIGHT, POD ROT; and foliar diseases such as RUST and EARLY and LATE LEAF SPOTS.

Tikka and rust can be controlled spraying CARBENDAZIM 0.05 % + MANCOZEB 0.2 % (0.5 g/l + 2 g/l, respectively) at 2-3 week interval, 2 to 3 times, starting from 4-5 weeks after sowing.

LEAF HOPPER is the major pest of groundnut. [Under severe infestation necrotic in a typical V shape, giving the crop a scorched appearance known as ‘hopper burn’.]

Other common pests causing yield losses in groundnut are APHIDS, JASSIDS, THRIPS, WHITE FLIES, LEAF MINOR, WHITE GRUB. ARMY WARM and HELIOTHIS etc.

The major sucking pests like aphids, jassids, thrips, and white flies can effectively control by spraying of PHOSPHAMIDON 0.03 % or DIMETHIOATE 0.03 % or METHYL-O-DEMETON 0.025 % at an interval of 10 days.

Light traps attracts moths of leaf minor, which are collected and then destroyed.



Early leaf spot
(*Cercospora arachidicola*)



Late leaf spot
(*Phaeoisariopsis personatum*)



Rust: *Puccinia arachidis*



Stem rot: *Sclerotia rolfsii*



Bud necrosis: Peanut bud necrosis virus (PBNV)

Alternaria leaf disease: (Alternaria arachidis & A. tenuissima)

HARVESTING

The prominent symptoms of maturity are yellowing of foliage, spotting of leaves and dropping of old leaves. The pod is mature when it becomes hard and tough and when there is dark tint on the inner side of the cells.

In case of bunch type of groundnut, the plants are harvested by pulling. Harvesting of spreading type of groundnut is done by local plough or with the help of blade harrow. Harvested crop left in the field in small heaps for two to three days for curing and drying. After drying, pods are plucked from collected crop either by hand or by using pucker or thresher. The dried fodder, which is also known as haulm, is used in cattle feed.

ECONOMIC IMPORTANCE

Groundnuts are a popular source of food throughout the world. The kernels are consumed either roasted or fried and salted. Groundnut kernel contains about **47-49%** oil and **20%** protein. Its kernel as a whole is highly digestible. The kernel are eaten as either roasted or fried and salted. In many countries groundnuts are consumed as peanut butter or crushed and used for the groundnut oil. Protein is among the highest of the vegetable protein and equals that of casein. Groundnut oil is famous for use as human diet. Groundnut oil is primarily used in the manufacturing of vegetable ghee. Groundnut oil is a good source of all B vitamins

except B₁₂. They are rich source of thiamine, riboflavin, nicotinic acid and vitamin E.

The oil cake is used as valuable organic manure and animal feed. It contains **7-8 % N, 1.5 % P₂O₅ and 1.5 % K₂O**. Shell is used for fuel, thus it is fourfold crop i.e. **food, fodder, feed and bio-fertilizer**.

Declaration

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