

PACKAGE OF PRACTICES OF CHICK PEA CULTIVATION

(Gram, Bengal Gram)



1. INTRODUCTION

Role of pulses in Indian agriculture needs hardly any emphasis; India is a premier pulse growing country. The pulses are the integral part of the cropping systems of the farmers all over the country because these crops fit in well in the crop rotation and crop mixtures followed by them. Pulses are important constituents of the Indian diet and supply major part of the protein requirements. Pulse crops, besides being rich in protein and some of the essential amino acids, enrich the soil through symbiotic nitrogen fixation from atmosphere.

Gram commonly known as 'chick pea' or Bengal gram is the most important pulse crop in India. Chick pea occupies about 38 per cent of area under pulses and contributes about 50 per cent of the total pulse production of India. It is used for human consumption as well as for feeding to animals. It is eaten both whole fried or boiled and salted or more generally in the form of split pulse which is cooked and eaten. Both husks and bits of the 'dal' are valuable cattle feed.

2. CLASSIFICATION

The Indian grams have been classified into two broader groups:

1. **Desi or Brown Gram** (*Cicer arietinum L.*): In this group the color of the seed ranges from yellow to dark brown. Seed size is usually small. It is the most widely grown group. Plants are small with good branching ability.
2. **Kabuli or White Gram** (*Cicer kabulium*): In this group the color of the seed is usually white. Grains are bold and attractive. Yield potential of this group is poor as compared to desi or brown gram. Plants are generally taller than the desi gram and stand more or less erect.

3. CLIMATIC AND SOIL

Chick pea is a winter season crop but severe cold and frost are injurious to it. Frost at the time of flowering results in the failure of the flowers to develop seeds or in the killing of the seeds inside the pod. It is generally grown under rainfed conditions but gives good returns in irrigated conditions as well. Excessive rains soon after sowing or at flowering and fruiting or hailstorms at ripening cause heavy loss. It is best suited to areas having moderate rainfall of 60-90 centimeters per annum.

Chick pea is grown on a wide range of soils in India. In the north, gram is generally grown on moderately heavy soils. In Maharashtra and on the Deccan plateau, black cotton soils are used. Light soils, mostly sandy loams are preferred in Punjab, Uttar Pradesh, Haryana and Rajasthan. Though gram is grown on all kinds of soils, sandy loam to clay loam is considered to be most suitable. The best type of soil for chick pea is one that is well drained and not too heavy. On dry

and light soils, the plants remain short while on heavy soils having high water retention capacity, the vegetative growth is abundant, light becomes limiting and fruiting is retarded. The soil chosen for its cultivation should be free from excessive soluble salts and near neutral in reaction. However, it is not suited to soils having a pH higher than 8.5.

3. VARIETIES:

Unlike cereals high yielding photo-insensitive cultivars are not available in pulses and this appears to be the most important reasons for low productivity of pulse crops in the country. However, several improved varieties of chick pea have been evolved in different chick pea growing state. Below mentioned varieties are recommended for Rajasthan states:

Rajasthan: GNG-416, GNG-469, GNG-663, PBG-1, L-550, Pusa-256, RSG-44, Pusa-1053, PDG 84-1

A. **Desi or Small Seeded Varieties**

Pusa-256: It matures in 145-150 days. Grains are bold and brown in color. This variety is equally suitable for timely and late planting. It is resistant to Ascochyta blight. Yield potential is 22-25 quintals per hectare.

B. **Kabuli Gram Varieties**

Pusa-1053: It matures in 130-140 days. This variety is suitable for timely planting in irrigated conditions. Seeds are extra bold. It is essential to wilt disease. Yield potential is 25 quintals per hectare.

4.CROPPING SYSTEM

Chick pea is sown after the harvest of kharif crops. Chick pea in rotation with cereal crops help in controlling soil borne diseases. The most common cropping systems are as below:

1. **Kharif fallow-chick pea (in barani areas)**
2. **Rice-Chick pea**
3. **Pearl millet-Chick pea**
4. **Sorghum-Chick pea**
5. **Maize-Chick pea**

Chick pea is grown mixed with wheat, barley, linseed, rapeseed and mustard crops. It is grown mixed with toria in *Tarai* region.

5.FIELD PREPARATION

Chick pea is highly sensitive to soil aeration. This imposes a restriction for its cultivation on heavy soils and calls for special care in seedbed preparation. A rough seedbed is required for

chick pea. In case the chick pea crop is taken after a kharif fellow, it would be desirable to go for a deep ploughing during the monsoon as the same would help in larger conservation of rain water in the soil profile for subsequent use by this crop. Very fine and compact seedbed is not good for chick pea. It requires a loose and well aerated seedbed.

6. SEED AND SOWING

Date of sowing has been recognized as single non-monetary input affecting most the yield of chick pea in all chick pea growing areas. Experiments conducted under the **All India Co-ordinated Pulse Improvement Project** at different Centers over last several years have amply demonstrated that second fortnight of October is the optimum time for sowing chick pea in most of the chick pea growing areas of northern India. For peninsular India, first fortnight of October is the best time for chick pea sowing. Delay beyond this period results in conspicuous reduction in yield. Under humid sub-tropical conditions of *Tarai*, which are characterized by shallow water table and relatively more winter rainfall, first fortnight of November is most suitable. Early sowing of chick pea results in excessive vegetative growth and poor setting of pods. The early sown crop suffers more from wilt owing to high temperature at that time.

The crop may be sown by seed drill or local plough at a row spacing of 30-40 centimeters. A seed rate of 75-100 kg per hectare depending upon seed size may be sufficient for one hectare. The seed should be placed 8-10 centimeters deep because the shallow be treated with 0.25 per cent. Thiram or Carbendazim (Bavistin) before sowing.

7. MIX AND INTERCROPPING PRACTICE

Mixed or intercropping is the growing of two or more plant species in the same field in the same year and, at least in part, at the same time. Mixed species cropping permits an intensification of the farm system, which results in increased overall productivity and biodiversity in cropped fields. Mixed species cropping has been seen as a promising technique to develop sustainable farming systems because it often has multifunctional roles and can potentially provide a number of eco-services within the farm system. Examples may include the addition and recycling of organic material, water management, protection of soil from erosion and pest or disease suppression. This functional diversity contributes to ecological processes to promote the sustainability of the whole farm system.



Inter cropping of chick pea and linseed

8. MANURES AND FERTILIZERS

Chick pea being a leguminous crop fulfills the major part of its nitrogen requirement (about 75%) through the process of symbiotic nitrogen fixation which works effectively from three to four weeks after sowing. However, soils with low organic matter and poor nitrogen supply may require 20-25 kg per hectare of nitrogen as starter dose which can meet plant requirement before the formation of nodules. Besides nitrogen, pulses respond very favorably to phosphorous application if the soils are deficient in phosphorous supply. If both nitrogen and phosphorous are required to be supplied then diammonium phosphate (18-46-0) at the rate of 100 to 150 kg per hectare should be applied uniformly before the last disc ploughing. Responses to potassium application have been inconsistent. It is better if all the fertilizers are drilled in furrows at a depth of 7-10 centimeters.

9. WATER MANAGEMENT

Chick pea is mostly sown as a rainfed crop. However, where irrigation facilities are available, give a pre-sowing irrigation. It will ensure proper germination and smooth crop growth. If winter rains fail then give one irrigation at pre-flowering stage and one at pod development stage. In no case first irrigation should be given at flowering time of gram crop. A light irrigation should be given because heavy irrigation is always harmful to gram crop. Excess of irrigation enhances vegetative growth and depresses chick pea yield.

10. WEED CONTROL

Chick pea being a stature crop suffers severely by infestation of weeds. One hand weeding or inter culture with hand hoe or wheel hoe after 25-30 days and second if needed after 60 days

of sowing may take care of weeds. Fluchloralin (Basalin) 1 kg per hectare in 800-1000 liters of water as pre-planting spray may be used as an effective herbicide. It should be well incorporated in the soil before sowing. In case Basalin is not available use Metribuzin or Prometrynen at the rate of 1.0-1.5 kg active ingredient in 800-1000 liters of water per hectare as pre-emergence spray. Hand weeding or inter culture with the help of hoe is always better than herbicides because inter culture operations improve aeration in the soil.

11. DISEASES AND PEST MANAGEMENT

Successful disease management requires planning well in advance. This disease is most effectively managed with the integration of several different strategies. Since only chickpeas are susceptible to *A. rabiei*, several cultural practices such as rotation with non-host crops, not growing chickpeas more frequently than every 3–4 years, and not planting new crops near previous blighted fields, the use of disease free seeds and destruction of plant diseased debris, will all help to reduce inoculum level and inhibit severe epidemics. It has been demonstrated that some cultural practices, such as planting date proved to be very effective in reducing fungal attack to plants, but they are insufficient under high disease pressure, especially when weather conditions are particularly conducive to disease development. The use of resistant cultivars appears to be the most practical and economically efficient measure for management of root diseases of chickpea and is also a key component in Integrated Disease Management programs.

DISEASES

The important diseases of chick pea are wilt, sclerotinia blight, grey mold, rust and Ascochyta blight. Symptoms of these diseases and their suitable control measures are given below:

Wilt: The main cause of this disease is a fungus; *Fusarium orthoceras* through other fungi are also associated with this disease. This disease causes considerable loss in most of the gram growing regions. The symptoms of the disease may be seen in the seedling stage as well as in an advanced stage of plant growth. The leaves start yellowing and afterwards drying. The plants too become yellowish and finally dry out. Roots turn black and ultimately decompose.

CONTROL MEASURES

1. Treat the seed with Benlate T or a mixture of Benlate of Thiram (1:1) at the rate of 2.5 g per kg of seed.
2. Grow the resistant varieties like C-214, Avrodhi, Uday, BG-244; Pusa-362, JG-315, Phule G-5 etc.
3. In fields having heavy incidence of gram wilt, the cultivation of chick pea should be avoided for three to four years.

4. As far as possible sowing of chick pea should not be done before third week of October.
5. Deep planting of chick pea about 8-10 centimeters deep in the light soils reduces the gram wilt incidence.

Sclerotinia Blight : It is caused by a fungus *Sclerotinia sclerotiorum*. This disease causes losses in Punjab, Haryana and Western Uttar Pradesh. The disease affects all the plants except the roots. The infection in the initial stage is visible on the stem near the ground. The affected plants first become yellow, then brown and ultimately dry out. On close observation, brown colored spots may be seen on affected stem which later girdle it. White cottony growth of the fungus with hard, black colored sclerotia may be seen on these spots on the stem.



Attack of Sclerotinia Blight

CONTROL MEASURES

1. Use only healthy seeds free from sclerotia.
2. Grow disease resistant varieties like G-543, Gaurav, Pusa-261 etc.
3. After harvest, the diseased plants should not be allowed to stand in the field but should be destroyed by burning.
4. Treat the soil with a mixture of fungicides like Brassicol and Captan at the rate of 10 kg per hectare.

Grey Mold: This disease is caused by a fungus *Botrytis cinerea* survives in the soil. This disease causes considerable damage in tarai area of Uttar Pradesh. Brown necrotic spots appear on twigs, petioles, leaves and flowers of the plant on attaining full vegetative growth. The branches and the stem also get affected parts. The affected stem finally breaks and the plant dies.

CONTROL MEASURES

1. Plant the crop late i.e. first fortnight of November.
2. Spray the crop with 0.2% carbendazim (Bavistin).

Rust : This disease is caused by a fungus *Uromyces ciceris arietini*. The disease is more severe in Punjab and Uttar Pradesh. The symptoms are visible in early February. Small, round to oval, light or dark brown pustules are formed on the under surface of the leaves. The pustules later turn black. Afterwards, these pustules appear on upper surface of leaves, petioles, twigs and pods. The affected leaves pre-maturely fall and therefore the yield is considerably reduced.

CONTROL MEASURES

1. With the appearance of first symptoms, spray the crop with 0.2% Mancozeb 75 WP followed by two more sprays at 10 days interval.
2. Plant only resistant varieties like Gaurav.

Ascochyta Blight: This disease is caused by *Ascochyta rabi*, a fungus which survives on plant trash left in the soil. This is an important disease prevalent in Punjab and parts of Himachal Pradesh. All the plant part except the root is affected. Small round, yellowish-brown spots are seen on the leaves in the months of January and February. The spots also spread to petioles and branches where they are elongated and become dark brown in color. The affected plants finally dry up.

CONTROL MEASURES

1. Plant only healthy seed. Before planting treat the seed with fungicides like Thiram or Carbendazim (Bavistin) at the rate of 2.5 g/kg of seed.
2. Follow three year crop rotation.
3. Plant resistant varieties/tolerant varieties like Pusa-256, Gaurav, GNG-146, PBG-1 etc.

INSECT PESTS

Some of the important insect pests of chick pea with their control measures are given below:

Cutworm: Gram cutworm is a serious pest in low lying areas where fields are cloddy. The larvae of this insect remain hidden under these clods during the day time and cause damage during the night. The caterpillars cut the plants at ground level. The pest is sporadic in nature and can be controlled by the application of Lindane 6% granules at the rate of 20-25 kg per hectare mixed in the soil.

Gram Pod Borer: This is the most serious pest of chick pea and causes damage up to 75 per cent reduction in yield. The caterpillar not only defoliates the tender leaves but also makes holes in the pods and feed upon the developing grains. While feeding on the developing seeds the anterior body portion of the caterpillar remains inside the pod and rest half or so hanging outside. When seeds of one pod are finished, it moves to the next. Unless the pest is controlled

in the initial stages of infestation it takes the heavy toll of the crop. As a matter of fact this pest is the most limiting factor in gram production.



Infestation of Pod borer



Attack of Bruchids during storage

CONTROL MEASURES

1. Spray Monocrotophos (Nuvacron) 36 EC at the time of pod formation at the rate of 1 millilitre mixed in 1 liter of water. The amount of solution may vary from 600-800 liters per hectare. The spray should be repeated, if needed after 15 days.
2. Alternatively, spray Endisulfan 35 EC at the rate of 1.25 liters mixed in 1000 liters of water per hectare.

Crop becomes ready for harvest when leaves turn reddish-brown and start shedding. Plants are either plucked out by hand or cut with sickle. The crop is allowed to dry in sun on threshing floor for about five to six days. Thereafter, threshing is done either by beating the plants with sticks or by trampling under the feet of bullocks.

12. INTEGRATED PEST MANAGEMENT (IPM)

Integrated Pest Management (IPM) is the deployment of a variety of methods of pest control designed to complement, reduce or replace the application of synthetic pesticides. IPM incorporates the simultaneous management and integration of tactics, the regular monitoring of pests and natural enemies, the use of thresholds for decisions, and spans methods from pesticide product management/substitution to whole agroecosystem redesign.

Under an ecologically balanced situation, a species considered as a “pest” normally has one or more natural enemies preying on it. As mentioned earlier, pest outbreaks can be induced by application of chemicals more injurious to the natural enemies than the pest. Thus a major consideration in any IPM endeavor is how to enhance activity of natural enemies so as to

restrict pest damage below or near economic threshold levels, and certainly to avoid any action that would jeopardize the activity of natural enemies.

Effective enhancement of natural enemies requires a thorough understanding of their biology and interaction with the target pest organism. Plant extracts have shown insecticidal properties and can be used effectively on field crops. The most well-known and commonly used is azadirachtin isolated from the seed, wood, bark, leaves and fruits of the Neem tree (*Azadirachta indica*).

Increasing native predatory birds in agricultural areas can help control insect pests that damage crops, potentially reducing costly pesticide use. For declining bird species, these efforts can increase the birds' reproductive success while producing fruit crops attractive to consumers."

13. HARVESTING

Following care should be taken during harvest:

- Avoid of use of pesticides prior to harvest,
- Avoid over maturity of crops,
- Harvesting before the crop matures usually means a lower yield and also a higher proportion of immature seeds,
- Timely harvest ensures optimum grain quality and consumer acceptance,
- Keep harvested crops for drying in the field,
- Tag the bundles properly and keep at proper place,
- Avoid harvesting during adverse weather condition,
- Drying results in optimum moisture content in safe storage of produce over a longer period of time.

14. YIELD:

A well managed crop yields about 20-25 quintals of grain per hectare which is about three to four times higher than the national average.

POST-HARVEST MANAGEMENT

The following measures should be taken to avoid post-harvest losses:

- Use of proper methods of harvesting,
- Adopt modern mechanical methods of threshing and winnowing,
- Use of improved techniques of processing,
- Cleaning and grading of produce,
- Use of efficient and good packaging for storage as well as for transportation,

- Use of proper techniques in storage,
- Proper care in handling of packages,
- Avoid use of hooks during handling.



Threshing and grading