

Peanut

Plant selection

3 weeks before seedling

Peanut crop varieties

Here is a list of popular varieties:

- AK-159 is a high yielding Spanish bunch type with medium maturity (105-115 days).
- AK-303 is a bold seeded variety recommended for Kharif season.
- Ak-265 is a semi spreading variety reaching maturity in 120 days with medium seeds and is resistant to rust and late leaf spot diseases.
- JL-220 is a variety that is erect, extra early (90-95 days), with medium seed and suitable for Kharif.
- JL-286 is a variety that is erect, extra early (93-95 days), with small seeds and suitable for Rabi and summer seasons.
- JL-501 is a variety that is erect, early (102 days), with medium seed and suitable for Kharif.
- Kadiri Harithandra (K-1319) is resistant to multiple diseases and insect pests, possesses fresh seed dormancy up to 20 days and is recommended for the rabi-summer season.
- Kopargaon-1 is a medium-size pod variety.
- Ratneshwer (LGN 1) is an erect, early maturity (105 days), small seeds variety suitable for Kharif and is tolerant to stem rot.
- TAG-24 is an erect semi-dwarf variety suitable for rabi reaching maturity in 95-105 days with small seeds.
- TLG-45 is a high pod-yielding variety and a semi-dwarf plant.

Planting

Chemical seed treatments

Many of the seeds acquired by farmers have been previously treated to avoid a series of diseases. If this is not the case, peanut seeds can be treated or "coated" with the following chemical products to protect them from diseases and pests. Here are some recommendations:

- Against fungal diseases such as collar rot, solutions containing thiram (3 g/ kg of seed), carbendazim (2g/ kg of seed) or mancozeb (2 g/ kg of seed) can be applied and will confer protection for up to 3 weeks.

- After the treatment, seeds should be left to dry in the shade for about 30 minutes to an hour.

Rhizobium seed treatment

In a Nutshell

If you are cultivating a leguminous crop for the first time, treat seeds with Rhizobium bacteria to improve the absorption of nitrogen during the season and increase yields at harvest. The application of Rhizobium may save you 20 to 25% of the required nitrogen during the season. Check the expiration date on the packet when acquiring powders (short validity) and make sure to carry out the procedure explained below for successful inoculation of your seeds.

6 steps

Step 1

Prepare a 10% sugary solution to stick the Rhizobium bacteria to the seed surface. This solution is made by mixing 50 g sugar or gur to 500 ml of water.

Step 2

Dissolve the sugary solution by warming for about 15 minutes and then make sure to cool it down to room temperature.

Step 3

Empty and dissolve the ready-made Rhizobium culture into the cooled sugar solution (200 - 400 g of powder/ acre). Mix thoroughly so as to obtain uniform slurry.

Step 4

Pour slurry over the seeds in a container and make sure to mix thoroughly while doing so. Keep on mixing till all seeds are evenly covered.

Step 5

Spread the treated seeds over gunny bag/paper cloth or even cement/solid surface for drying in the shade (important). Do not expose the inoculated seeds to high temperature, dry wind and hot sun.

Step 6

After the seeds are dry, collect them in bags and prepare for sowing. If inoculated seed can not be sown on the same day of inoculation, repeat treatment again before sowing.

Week 1

Method of planting

Seed rate and spacing will vary depending on the type of variety:

- For bunch type varieties, use a seed rate of 40-50 kg per acre and a spacing of 30 cm between rows and 10-15 cm between plants.
- For semi-spreading varieties, use a seed rate of 38-40 kg per acre and a spacing of 30 cm between rows and 15-20 cm between plants.

- When sowing on a broad bed- and furrow system, peanuts seeds are sown in 4 rows per bed with 30cm between rows and 10cm between plants.
- Planting depth is around 5-8 cm deep.
- Use a dibbler or seed drill for planting.

Monitoring

Week 10

Monitor fields frequently

Monitor the growth of your crop often. Walk through your field in a random manner or zigzag and check for signs of diseases, pests, or deficiencies. Deficiencies are characterized by the discoloration of leaves and the poor vigor of the plants. Diseases are often visible as discoloration and spots or streaks on leaves. Finally, remember that most of the insects present in the field are beneficial for your crop. Those that attack your crop will leave behind damage on leaves and buds in the form of holes. Make sure to talk to your neighbors and exchange information about current diseases with your local community. Also, seek support with public extension services in your area.

Site selection

3 weeks before seeding

Optimal growing conditions for peanut

- Groundnuts are the third most important oilseed in the world.
- It is an important source of protein grown mostly under rain-fed conditions.
- The favourable temperature range for growing peanut is 21-27°C during the crop growth period.
- Temperatures below 18°C and higher than 35°C will reduce germination and flower initiation.
- Peanut plants thrive with rainfall ranging from 700 to 1000mm.
- Optimal soils for production are well-drained, light-textured, loose and friable soil, with reasonably high calcium levels, moderate organic matter, and a pH range of 5.5 to 7.0.
- Heavy and soils high in clay content are unsuitable for cultivation as the pods cannot properly develop in these soils.

Week 17

Rotate crops properly

Crop rotation is the practice of growing different crops in the same field in sequential seasons. This helps to increase soil health and fertility, and also avoids the carry-over of some diseases. The simplest rule of thumb is to grow an above-ground crop and then a below-ground crop, but avoid crops of the same families.

Here are some groups of crops with recommended rotations:

- Nightshades: tomatoes, potatoes, peppers, capsicums, chilies, and eggplants
- Cole crops: cabbage, cauliflower, broccoli, brussels sprouts, and kale
- Root crops: beetroot, carrots, parsnips, salsify, and turnips
- Legumes: beans, peanuts, grams, and peas (highly recommended to replenish nitrogen levels)
- Cucurbits: cucumbers, pumpkins, squashes and marrows, and various melons
- Other crops: Swiss chard, spinach, leek, celery, lettuce, endive, and artichokes can be included anywhere, unless they make a bad companion.

Strict crop rotation is obligatory after having grown peas, potato, cucumber, cabbage, carrots, parsley, and onions.

Field preparation

2 weeks before seedling

Prepare fields well in advance of sowing date

The major difference between rainfed fields and irrigated fields is that the latter needs more work in terms of field preparation, for example, the formation of ridges and furrows to facilitate irrigation. When preparing the fields, make sure to follow the recommendations listed below:

- Carry out a good plowing with a tine attachment or rotavator at a depth of 35 cm to incorporate the remaining plant debris and weeds into the soil.
- Collect small stones and crop stubbles from the field to facilitate good seed-soil contact at sowing.
- Later on, harrow the field 3-5 times to reduce clod size and compaction, and obtain a fine and loose tilth.
- Add farmyard manure during the last plow (5-10 tons/ acre). Make sure to mix it well with the soil.
- Level and drain the field properly to avoid flooding problems.
- For irrigated land, prepare ridges and furrows separated by the appropriate distance.
- Divide the field into smaller plots at your convenience to facilitate the irrigation.

Planting systems for peanut

There are several ways to sow peanuts: sowing on a flat surface or using a ridge-and-furrow system, or a broad bed-and-furrow system. The broad bed-and-furrow system has multiple benefits over the other two systems:

- Better control of soil moisture and good drainage of excess water
- Better control of weeds through intercultural operations
- Less compaction of soil facilitates rooting
- Adapted for plastic mulching
- Easier mechanical harvesting

How to prepare a broad bed and furrow system:

- Prepare beds of 1.2m wide and 15-20cm high.
- Beds should be spaced 30cm apart
- In the Kharif season, beds should be formed in the same direction as the slope (parallel).
- In the Rabi season, beds should be formed in the opposite direction of the slope (perpendicular).

1 week before seedling

Using mulch in peanut production

Both polythene mulching and organic mulching in groundnut have been proven to improve production.

- Polythene mulching has been found to be effective in increasing the yield, seed oil content, protein content, and the level of eight other compounds in the seed.
- When grown under polythene mulch system, groundnut is sown approximately 10 days earlier and it matures about 10 days earlier than under non-mulched condition.
- Polythene mulching increases the soil temperature and therefore shortens the crop period
- During the hot season, it also protects the soil from direct sunlight.
- It also helps by retaining soil moisture, improving soil texture and in controlling weeds.
- A polythene film of a thickness of 0.007 mm is optimum and more economical.
- Additionally, rice straw applied as mulch was also found to be effective for improving the productivity groundnut.

Week 17

Start preparing field again soon after harvest

During the summer months, just after your previous harvest, think about plowing the soil deep to dig plant residues and thus break the cycle of many insects, diseases and weeds. Field sanitation is also important.

The roguing and destroying of weeds and volunteer plants will prevent the carry-over of major diseases to the next season.

Weeding

Week 1

Pre emergence herbicides

- To prevent the germination of weed seeds in your field, you can use pre-emergence herbicides.
- You may choose to apply Pendimethalin 30% EC at the recommended rate of 800 ml per acre mixed in 100-200l of water.
- Spray within 2 days after sowing.
- Use a hand-operated sprayer fitted with a deflecting or fan-type nozzle.
- Target the bottom of the furrows and avoid ridges.
- Make sure that sufficient moisture is present in the soil at the time of herbicide application.
- Make sure that the product is well incorporated in the soil.
- Follow up with a mechanical weeding at 40-50 days after sowing to effectively control weeds in your field.
- Ask your extension officer or cooperative about the best product for your specific case.

Week 3

Managing weeds for peanut crop

- Control of weeds within 2-3 weeks of sowing not only prevents exhausting the nutrients from the soil but also conserves moisture and helps with the quick growth of leguminous crops.
- One hoeing and earthing up is recommended at 25 days after sowing, followed by a hand weeding at 35 days after sowing.
- If applying pre-emergence herbicides, follow up with one mechanical weeding at 40-50 days after sowing to effectively control weeds.

Irrigation

Week 1

Make an irrigation plan for your leguminous crops

Water supply is particularly important during three stages of crop growth: germination, flowering stage and pod/seeds development. Here are some recommendations on how to prepare an irrigation plan so that your plants are vigorous and healthy. Remember that the exact quantity applied will depend on the type of soil, variety and the weather.

- The initial irrigation after sowing must be substantial in order to favor seed-soil contact and the moisture of the seeds.

- Another irrigation can be planned 3-5 days after that, depending on soil moisture and water availability.
- If there is no rain, fields should be irrigated regularly (every 7-15 days) during the vegetative stage.
- After this, the plants should be irrigated at the beginning of the flowering stage.
- The last irrigation event should be during pod development to secure yields.
- Under no circumstances should you overwater, as leguminous crops are very sensitive to flooding.
- Note that when 80% of pods are dry, plants should be left to dry for about 20-25 days before harvesting.

Week 6

Irrigation during critical growth phase

- Flowering, peg penetration, and early pod formation are the moisture-sensitive phases of groundnut growth.
- The pegs cannot enter the soil if the soil surface is hard due to prolonged dry-spell.
- The early phase of pod setting is especially sensitive to water deficit.
- Provide some irrigation to your crop to avoid reduction of pod yield, in case of drought.

Fertilization chemical

Week 9

How to add micronutrients to your plants

Secondary nutrients and micronutrients are usually added after a soil test or after the detection of a deficiency in your crop. Boron, iron, zinc, manganese, and calcium are the most common compliments. The addition can be done as a side dressing (mixed with sand) at the base of the plant, or as a foliar spray. This will depend on the nutrient itself, the weather conditions, and the severity of the deficiency. Here are some more recommendations on the products that you can use:

- Calcium can be added in the form of calcium nitrate or calcium chloride solutions (3 g/l).
- Magnesium is sprayed in the form of magnesium sulphate solutions (3 g/l).
- Iron is sprayed as ferrous sulphate solutions (2 g/l).
- Boron is usually applied to soils before seed sowing in the form of borax (800g/acre), mixed with sand.
- Zinc is usually sprayed as zinc sulphate solutions (2 g/l).
- Molybdenum is usually sprayed as sodium or ammonium molybdate solutions (2 g/l).

- Ask your extension officer or local retailer which micronutrient mixture is best-suited for your purposes.

Preventive measure

Week 2

Prevent leaf miners in your plants

When leaf miners are present, white or grey serpentine leaf tunnels are visible on leaves, between the two epidermises. A thin, dark streak or dotted dark line is sometimes visible inside the tunnels, more conspicuous from the underside. Leaves may be deformed, twisted, or curled, but remain green. To prevent leaf miners, make sure to:

- Monitor the field regularly for signs of leaf miner infestation.
- Remove infected plants and plant parts and destroy them by burning.
- Apply mulch around plants to prevent the insects from breeding in the soil.
- Use yellow sticky traps or yellow basins filled with water to drown them. They are attracted to the color yellow.
- Practice thorough weed control in and around the field during the season.
- Do not use broad-spectrum insecticide that could affect natural enemies.
- Plow deep after harvest to expose the miners to natural enemies.
- Burn infected plant parts and destroy possible hosts such as old crop debris.
- Plan a crop rotation with non-susceptible crops.

Prevent termites in your fields

Symptoms of termites include wilting of young or older plants and often lodging and presence of termites and tunnels around and in the roots. Roots and the base of the stem are also hollowed out. To prevent termites in wheat, be sure to:

- Inspect plants regularly, early in the morning or late in the afternoon.
- Remove and destroy affected plants or part plants.
- Promote conditions for healthy plant growth, for example, balanced fertilization.
- Avoid water stress and unnecessary injury to the plants.
- Harvest early if possible, as termites often attack the crops left over in the field after maturity.
- Remove plant residues and other debris after harvest.
- Plow fields to destroy termites' nests and tunnels and to expose them to predators, such as ants, birds, chickens.
- Practice crop rotations or grow in fields with intercrops.

Week 4

Prevent aphids in your plants

Low to moderate numbers are usually not harmful to crops. Severe infestation can cause damage on leaves and shoots and stunted plant growth. Honeydew secreted by the aphids also leads to additional infections and worsening of symptoms. To prevent aphids in your plants, make sure to:

- Monitor fields regularly for signs of aphid infestation.
- Hand-pick and remove infected plant parts.
- Not over-water or over-fertilize your crop.
- Control insecticide use in order to not affect beneficial insects.
- Control ant populations that protect aphids with sticky bands.
- Hold weeds in check, in and around the fields.
- Plow the field immediately after harvest to prevent their spread.
- Plan a rotation with resistant crops.

Week 5

Prevent thrips in your plants

Attacks by thrips are characterized by small silver patches on the upper side of leaves ("silvering") and marks on the fruit surface. Minute yellow or black insects 1-2 mm in length are visible on the underside of the leaves. To prevent thrips in your plants, make sure to:

- Remove the infected plant and any plant debris and destroy it.
- Control weeds in and around the field.
- Use sticky traps over a large area for monitoring of the infestation level.
- Keep plants well-irrigated and avoid excessive applications of nitrogen fertilizer.
- Plow and remove all plant waste after harvest.

Week 6

Prevent leafhoppers and jassids in your crops

Symptoms of leafhoppers and jassids begin with dead areas on leaf blades around the feeding points, followed by yellowing at the edges of leaves, and sometimes curled leaves. To prevent leafhoppers and jassids in your crops, be sure to:

- Monitor by searching for empty larval skins on leaf undersides.
- Hand-pick and remove eggs or infected plant parts.
- Alternatively, use yellow sticky traps that are very attractive to green leafhoppers.
- Try to promote a good environment for beneficial insects such as ladybugs and lacewings.

Week 7

Prevent white grubs in your fields

Both adults and larvae damage the plants. Grubs feed on fine rootlets and nodules. Adults attack flower structures and pods. Affected plants are yellowish and wilted and die in patches. In annuals, sudden wilting is the earliest symptom. Plants that are attacked by adult beetles defoliate. To prevent white grubs in your plants, make sure to:

- Monitor fields for signs of the pest.
- Remove infested flowers, pods or plant parts by hand.
- Install light traps at the onset of rains and monitor the number of beetles per day.
- Collect and destroy white grub around the field, preferably in the morning.
- Use green manure such as Italian ryegrass or legumes to conserve natural enemies.
- Apply potassium as a base fertilizer to strengthen root systems and increase tolerance to grub damage.
- Plow deep in late autumn and in spring before planting.
- Fallow the fields for two years. Rotate crops with non-host plants (paddy rice).

Week 8

Prevent helicoverpa caterpillars in your fields

Symptoms include feeding damage on flowers and fruits/ears/pods during maturity stages. Damaged tissues may rot, worsening the symptoms. The larvae are often hidden within plant organs, making it difficult to treat with chemical products. To prevent *Helicoverpa* caterpillar in your crops, be sure to:

- Monitor fields for signs of the pest (egg masses, damage).
- Hand-pick larvae and leaves or plants with eggs.
- Provide plants with balanced fertilization.
- Use light or pheromone traps to monitor or mass-catch the moths.
- Remove weeds in and around the field.
- Plow deep after harvesting to expose the insect for natural predators.
- Avoid monocultures and implement intercropping with beneficial plants.

Harvesting

Week 14

Time to harvesting

It is very important to harvest groundnuts at optimum maturity to reduce the post-harvest losses and to maintain the quality of the product under long-term storage conditions.

- The easiest and most practical method to determine pod maturity is to look at the internal hull colour.
- Darkening of the internal surface of the hull is directly related to seed maturity.

- When 75-80% pods show internal hull darkening, it means the crop is at the optimum maturity.
- Both early, as well as late harvesting, can result in substantial loss.
- Due to its indeterminate growth habit, pod maturity is not uniform in groundnut.
- If one waits for all the pods of a plant to mature, the seeds in early-formed pods, in some cases, start sprouting due to lack of seed dormancy, or pod walls start disintegrating due to attacks of fungi and other pathogens.

Drying and threshing pods

At harvesting, groundnut pods generally contain about 35% moisture, which must be brought below 7% to provide optimal storage conditions. The harvested plants are well shaken to dislodge the soil from pods and are left in the field for 2-3 days for initial drying before stripping. In the post-rainy season, when higher temperatures (40-45°C) prevail at the time of harvesting, the pods must be stripped immediately and dried under shade. Both mechanical and manual threshing is common. In the case of small yield, the harvested plants are taken home for pod stripping and drying. It is important to remove all damaged (physical, insect and nematode), rotted and sprouted pods from the harvested produce as they reduce the quality and are a source of contamination of diseases and insect pests in the storage area.

Post harvest

Week 16

Storing your peanut crops

The pods should be stripped off, cleaned and spread on the floor for drying under mild sunshine. After drying, the pods are ready for sale and should be stored in polythene bags. After proper drying, the kernel will split into two cotyledons if pressed with the thumb and index fingers and the pods should be kept in polythene lined gunny bags.

Where to store legume seeds to avoid losses

Seed moisture and the temperature of the storage room will determine how long seeds can be stored without losing their viability. However, there are other factors that may cause losses, such as diseases, pests (for example bruchids), bad storage facilities, wrong practices, etc. Here are some recommendations to prevent losses during the storage of your black gram seeds.

- Make sure to store seed bags in an enclosed room with no access for insects or rodents.
- If necessary, consider the option of improving your storage facilities.
- In general, rudimentary storage structures, made up of rice straw, bamboo splits and mud bricks are not optimal.
- "Pusa bins" are improved storage structures and need popularization.

- Consult organizations/public institutions around you for improved storage facilities.

Standardization of your leguminous seeds

In the market, your leguminous seeds are going to be classified according to variety, size, and quality following a series of norms and standards. The advantage of having clean and uniform produce, free of foreign objects and weeds is that:

- The producer gets a good and standard price for the product.
- The consumers are satisfied with the quality of the product they get.
- Products of similar grade can be stored in big quantities at one place and for a longer time.
- Good storage increases the longevity of the seeds and the opportunity to fetch a good price.

Make sure you know where to sell your harvest

A long series of possibilities are available for marketing and selling your produce. Make sure to know who you should contact (merchant, commission agent, shipper, middleman, retailer) and what the possible expenses for market or fair fees, storage and transport could be. Here are some places where you could sell your harvest:

- Local markets in surrounding villages.
- Local fairs organized regularly.
- Agricultural markets (mainly in cities and urban areas).
- Cooperative societies (membership).
- Governmental purchase through agencies.
- Retailers of agricultural goods.