

ONION

- **Botanical Name:** *Allium cepa* L.
- **Family:** Amaryllidaceae
- **Chromosome No:** 16
- **Origin:** Central and South Western Asia

Uses:

- The green leaves, and immature and mature bulbs are eaten raw.
- It is used in preparation of sauces, soups and seasoning of food on accounts of its special characteristic pungency.
- Also used in processed form e.g. flakes, powder and pickles.
- Onions are diuretic, applied on bruises, boils and wounds.
- It relieves heat sensation.
- Bulb juice is used as smelling on hysterical fits in faintness.
- It is used to relieve insect bites and sour throat.
- Onions play a part in preventing heart diseases and other ailments.
- Onions are given in jaundice, spleen enlargement and dyspeptic after cooping in vinegar.
- Roasted onions mixed with cumin, sugar candy and butter oil are a demulcent of great benefit in piles.
- The essential oil contains a heart stimulant, increases pulse volume and frequency of systolic pressure and coronary flow and stimulates the intestinal smooth musculature and the uterus.
- It reduces blood sugar & has lipid lowering effect.
- **Pungency in onion** is due to allyl-propyl- disulphide.

Varieties: The onion varieties have been classified on the basis of size and skin colour. Further, onion has been classified as common and multiplier onion. There are 4 classes on the basis of colour of bulb: White, Yellow, Red and Brown. Red colour is due to anthocyanin pigment and yellow is due to **quercetin** pigment

- **Red Coloured:** Agrifound Dark Red, Agrifound Light Red, Arka Niketan, Arka Kalyan, Pusa Madhavi, Pusa Ratnar, Pusa Red, Pusa Riddhi, Udaipur 101, Udaipur 103, Bhima Raj, Bhima Red
- **Kharif Onion:** Arka Kalyan, Arka Pragati, N-53, Arka Niketan
- **White skinned varieties:** Pusa White Flat, Pusa White Round, Punjab-48, Udaipur-102
- **Yellow skinned varieties:** Brown Spanish (Long day variety, suitable for growing in hills), Early Grano (Good for salad, suitable for green onions).
- **Multiplier Onion:** Agrifound Red, CO-1, C-2 (resistant to purple blotch), CO-3 (resistant to thrips), CO-4 (moderately resistant to thrips), MDU-1.
- **Small Onion:** Agrifound Rose (pickling type, suitable for export), Arka Bindu

- **Rabi season varieties:** Palam Lohit, Patna Red, Agrifound Dark Red, Palam Lohit
- N-53 (Kharif onion variety),
- Brown Spanish (long day variety)

Soil: Soil should be friable, fertile, well drained and have an abundant supply of humus. A heavy soil is not desirable that bakes and crusts after irrigation. Sandy loam and silt loams are best suited to it. The soil pH should be in the range of 5.8-6.5. It is sensitive to high acidity and alkalinity.

Climate: It grows in mild climate without extremes of high and low temperature. The optimum temperature for seed germination should be 20-25°C. Low temperature and short photoperiods are required for vegetative growth, while relatively high temperature and long photoperiods are needed for bulb development. It requires 13-21°C temperature for vegetative growth before bulb initiation and 16-25°C for bulb development and 25-30°C for bulb maturation.

Sowing time

Season	Time of sowing	Time of transplanting	Harvesting time
Northern India			
Rainy(<i>Kharif</i>)	May- June (July)	July- Aug (Mid Aug)	Nov-Dec
Winter (<i>rabi</i>)	Oct-Nov (Nov)	Dec-Jan (Jan-early Feb)	May-June
Maharashtra and parts of Gujrat			
Rainy (<i>kharif</i>)	May-June	July Aug	Oct-Dec
Late rainy (<i>kharif</i>) or early winter (<i>rabi</i>)	Aug-Sept	Sept-Oct	Jan-March
Winter (<i>rabi</i>)	Nov-Dec	Dec-Jan	April-June
Tamilnadu, Karnataka & Andhra Pradesh			
Early rainy (<i>kharif</i>)	April-May	May-June	August
Rainy (<i>kharif</i>)	May-June	July-Aug	Oct-Nov
Winter (<i>rabi</i>)	Sept-Oct)	Nov-Dec	March-April

Seedlings become ready for transplanting in 8-10 weeks time. Seedlings must be about 15-20cm in length at the time of transplanting.

Seed Rate:8-10 kg/ha

Spacing: The onion seedlings are planted at a spacing of 15-20 cm between rows and 5-10 cm between plant-to-plant. Transplanting on ridges is ideal for *kharif* onion crop.

Soil preparation and transplanting: Onion should be planted in well-pulverized field by ploughing first with soil turning plough and afterwards with 4 to 5 ploughings with country plough. Leveling should follow ploughing. Onion is normally planted in flat beds however *kharif* onion is planted on ridges. Transplanting should be done during late afternoon

Manures and fertilizers: Apply well rotten farmyard manure @ 200-300 q/ha, nitrogen @ 60-150 kg, phosphorus @ 35-150 kg and potassium @ 25-120kg per hectare depending upon the soil test, cultivar and growing season. FYM is applied at the time of field preparation. Apply 50% nitrogen and entire quantity of phosphorus and potash at the time of transplanting or bulb sowing. Remaining half of the nitrogen is top dressed 5-6 weeks after transplanting.

Interculture and weed control: Onion is a closely planted and a shallow rooted crop and thus, hand weeding is difficult to be performed which may damage the crop. Therefore, use of chemical weedicides at initial growth stage followed by 1-2 hand weeding is beneficial. The critical period of crop-weed competition is between 4-8 weeks. Application of Alachlor (Lasso) @ 2 litres/ha or Pendimetalin (Stomp) @ 3 litres/ha in 750 liters of water before transplanting is beneficial for controlling weeds. Three hand weedings are sufficient to harvest economic crop if done at 30, 50 and 75 days after transplanting.

Irrigation: Onion needs very careful and frequent irrigation as it is a shallow rooted crop. Water requirement of the crop at the initial growth period is less and increases during later growth stages. Irrigation should be applied at an interval of 10-15 days in cool weather and at a weekly interval during hot weather. Bulb formation and bulb enlargement stages (70-100 days after transplanting) are critical for water requirement. Insufficient moisture tends to slow down bulb growth while over supply causes rotting. Generally, 10-12 irrigations are given in *rabi* season. Stop irrigation when the tops mature and start falling down.

Harvesting: Onions are ready for dry bulb harvesting when the tops get dried (or at neck fall stage) and bulbs are mature. Harvesting at this stage results in higher yield, longer storage life of bulbs and less neck rot. The green onions can be harvested when they reach pencil size until bulbing begins. It is desirable to leave 1.5-2.0 cm of the tops attached to the bulb as it helps to close neck and reduce storage losses.

Curing: Onion bulbs should be adequately cured because curing or drying of bulbs is an important process to remove the excess moisture from the outer skin and neck of onion bulb. Curing helps to reduce the chances of disease infection, minimizes shrinkage due to loss of moisture from the interiors and helps to develop good skin colour. Bulbs are either cured in field or in open shades before storage. Onions are considered cured when neck is tight and the outer scales are dried until they rustle. Bulbs are cured in field for 3-5 days in wind row method. Then bulbs are placed in shade and cured for 7-10 days to remove field heat. This shade curing improves bulb colour and reduces losses during storage.

Yield: *Rabi* crop: 250-300q/ha, *Kharif* crop: 200-250q/ha

Curing:

- Curing or drying of bulbs is an important process to remove the excess moisture from the outer skin and neck of onion.
- This helps in reducing the infection of diseases and minimizes shrinkage due to removal of moisture from the interiors. This is, further, an additional measure for the development of skin colour.
- Bulbs are either cured in field or in open shades before storage. Onions are considered cured when neck is tight and the outer scales are dried until they rustle. Bulbs are cured in field for 3-5 days in wind row method. Then bulbs are placed in shade and cured for 7-10 days to remove field heat. This shade curing improves bulb colour and reduces losses during storage.

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Storage: Onion bulbs have a rest period for about 2 months. Proper storage is important as higher temperature induces sprouting. Thorough ventilation, uniform comparatively low temperature, low humidity, proper maturity, optimum application of fertilizer (s), freedom from diseases and insect-pests is essential for successful storage.

Growing *kharif* onions by sets:

- Onion sets are small bulbs (around 0.25-1.0 inch in diameter) grown in the previous year.
- These sets are used as the propagating material for the production of dry bulbs and bunching onions.
- Varieties recommended for this crop are N-53, Arka Kalyan, Arka Niketan *etc.*
- 5-7.5 kg seed is enough to raise sufficient number of sets to plant one hectare area.
- Sowing of seed is done during end of January or beginning of February (left plants at same place till April).
- In April, plants form small sets due to close spacing. The plants are uprooted and tops are removed.
- The sets having 1.5-2.0 cm in diameter and disease free are selected and stored till July.
- About 10q sets are enough to plant one-hectare area.
- Sets are planted at 10cm apart in rows on both sides of ridges spaced 35-45 cm.
- Sets are normally planted by July-August to get an early crop by early November.
- These are commercially used to produce early green onions but also used for dry bulb production.

Physiological disorders

1. **Bolting:** It means emergence of seed stalk prior to time of bulb formation and adversely affects the formation and development of bulbs.

Reasons:

- Transplanting of aged seedlings
- Early sowing of seeds in the nursery beds, which result in the formation of small sets.
- Late transplanting of seedlings
- Low temperature (10-12°C) for prolonged period.

Management: Time of planting should be adjusted in such a way that the crop may expose to moderate temperature at bulbing. Sow nursery at proper time.

2. **Sprouting:** An important disorder in storage of onion and results in huge losses. It is associated with excessive moisture at maturity and supply of nitrogen.

Management: Adjust time of planting in such a way that harvesting can be done in dry period. Stop irrigation as soon as bulbs reach maturity. Spray iron sulphate or borax @ 500- 1000 ppm 2-3 weeks prior to harvesting.

Disease Management

Purple blotch (*Alternaria porri*): Small white sunken spots develop on leaves. The lesions enlarge and turn purple under moist condition. The bulb tissue becomes papery.

Management: Three summer ploughings reduce the disease severity. Spray Mancozeb or copper oxychloride (2g/liter) at 10 days interval, if required.

Downy Mildew (*Peronospora destructor*): There is violet growth of fungus on the surface of leaves and flower stalks which later become pale-green yellow and finally collapse.

Management: Follow crop rotation with a 4 year break in onion cultivation.

Maintain field hygiene and sanitation. Remove primary infected onion plants. Spray Zineb @ 0.2%

Onion Smut (*Urocystis cepulae*): It is a soil borne disease and infects cotyledon and seedlings which result in heavy mortality. **Management:** Treat nursery soil with Thiram or Captan (0.2%) along with Methocal sticker. Treat the seed before sowing with Thiram or Captan (3 g/kg of seed).

Insect- pests

Onion thrips: It is the major pest of onion and garlic. Onion plants infested with thrips develops spotted appearance on the leaves which turn into pale white blotches due to drainage of sap. The adults hibernate in soil, on grass and other plants in the onion field.

Management: Application of malathion (0.05%) or cypermethrin (0.01%) is effective.

Onion maggot: Maggots enter the bulbs through roots and attack the tender portion. Infested plants turn yellowish brown and finally dry. The affected bulbs rot in storage as infestation leads to secondary infection by pathogenic organisms.

Management: Crop rotation should be followed. Application of phorate @ 10 kg/ha

Mites: They suck sap and plants turn yellow with sickly appearance.

Management: Infested bulbs should be exposed to sun for 2 days. Dusting of sulphur in the onion fields @ 22 kg/ha can be helpful.

Garlic (*Allium sativum* L)

Botanical name : *Allium sativum* L

Family: Amaryllidaceae

Origin: Central Asia

Chromosome No(2n): 20

Pungency in garlic is due to the compound diallyl-disulphide.

Cultivars: GHC-1, Agrifound Parvati, Large Segmented, Solan Selection, Selection 1

Soil: Soil should be friable, fertile, well drained and have an abundant supply of humus. A heavy soil is not desirable that bakes and crusts after irrigation. Loam soils are best suited to it. The soil pH should be in the range of 6-7. It is sensitive to high acidity and alkalinity.

Climate: It is a winter season crop requiring cool and moist atmosphere (12-18°C) during growth and relatively dry weather (20-25°C) during bulbing and 25-30°C at bulb maturity. It is a frost hardy plant. Low temperature and short days are congenial for proper bulb formation and hence the pre-requisites for higher yield. Adequate vegetative growth promotes bulb formation

Sowing time

Region	Sowing time
North India	September- November
Mah., Karnataka, AP	August-November
WB, Orrisa, Gujarat	October-November

Planting material: Vegetatively propagated by cloves. Healthy cloves should be selected and **500-700 kg/ha** of bulbs are required. For large cloved varieties like GHC-1, the seed rate is 15-20q/ha. Bulbs are separated into single segment i.e. cloves at planting time.

Soil preparation and transplanting: same as onion

Spacing: 15-20cm between rows and 10 cm between plants to plant. Sowing depth is 2-4 cm.

Planting methods:

- 1. Dibbling:** Cloves are dibbled 5-7.5 cm deep keeping their growing ends upwards.
- 2. Furrow planting:** Cloves are dropped in the furrows by hand and covered lightly by loose soil.

Manures and fertilizers, Interculture and weed control: same as onion

Irrigation: In general, irrigation at an interval of 8-10 days during vegetative growth and 10- 15 days during bulb formation and development. Critical stages are bulb formation and bulb enlargement.

Harvesting: Crop is ready for harvesting when the tops turn yellow or brownish and shows signs of drying up and begins to fall over. Bulbs are taken out alongwith tops manually.

Bulbs are cured in field for one week. The bulbs are covered alongwith the tops of each other to avoid damage from the sun. Then, these bulbs are cured in shade for 7-8days either with tops or after cutting tops, leaving 2.5cm of the stalk. Roots are also trimmed leaving 1cm of root.

Yield: 100-150q/ha.

Curing: Curing or drying of bulbs is an important process to remove the excess moisture from the outer skin and neck of Garlic. This helps in reducing the infection of diseases and minimizes shrinkage due to removal of moisture from the interiors. This is, further, an additional measure for the development of skin colour. Bulbs are either cured in field

or in open shades before storage. Garlic are considered cured when neck is tight and the outer scales are dried until they rustle. Bulbs are cured in field for 3-5 days in wind row method. Then bulbs are placed in shade and cured for 7-10 days to remove field heat. This shade curing improves bulb colour and reduces losses during storage.

Storage: Thoroughly cured bulbs keep fairly well in ordinary ventilated room. Cold storage at 0-2.2°C and 60-70% RH is congenial. The storage life is prolonged and loss in weight is reduced by spraying maleic hydrazide @ 2000-3000 ppm, 2-3 weeks before harvesting.

Diseases: Purple blotch, Downy mildew

Insect-pests: Mites, Aphids, Thrips.