TURNIP

BOTANICAL NAME : *Brassica rapa Linn Syn.Brassica campestris var. rapa*
FAMILY : Cruciferae
CHROMOSOME NUMBER : 2n=20
ORIGIN : Mediterranean area of European types and Eastern Afganistan and adjoining area of Pakistan is another primary centre
COMMON NAME : Salgam, Shalgam, Shaljam

INTRODUCTION

- Turnip is quick growing root vegetable.
- It is a herbaceous biennial for seed production and an annual for use as a vegetable.
- Both roots and leaves are edible.
- Turnip produces napiform types of roots.

USES:

- It is grown for elongated roots as well as for its foliage.
- Fresh roots are consumed in salads or cooked as a vegetable or used in pickles.
- The turnip greens are rich in vitamin A and C and contain appreciable amount of vitamin B, and also good source of Ca, P and Fe.
- The greens are mostly fed to animals and seldom used as green vegetables.

CLIMATE

- Turnip is a cool season crop and can tolerate frost and mild freezing temperatures.
- Hot weather and inadequate supply of water results in deterioration of root quality, roots become woody, tough and bitter in taste.
- Temperatures below 10oC induces flowering.
- The most favourable weather for the development of root is 10-13oC air-temperature and 18-23oC soil- temperature.
- High light intensity favours ascorbic acid content.

SOIL

- Soil should be deep friable, and field should be well-drained.
- Turnip is moderately tolerant to acid soils having pH 5.5 to 6.8.
- The land should be deep ploughed and harrowing should be done till good tilth.

VARIETIES

Asiatic/tropical/subtropical type	European/Temperate Type
More pungent & better for pickles, earlier & more heat tolerant	Sweeter and more palatable
Pusa Kanchan, Pusa Sweti, Punjab Safed 4	Purple Top White Globe, Golden Ball, Snow Ball, Early Milan Red Top, Pusa Chandrima, Pusa Swarnima.

Turnip cultivars can be put under different groups on the basis of morphological characters of their root and top.

1. White Fleshed
a) Purple-topped
Flat type: Purple Top Milan
Globe type: Purple Top White Globe
b) Green topped
Globe type: Green Top White, Green Globe
Long type: Cowhorn
c) White topped
Flat type: White Milan, White Flat Dutch

Globe type: White Stone, Quick Silver
Half long type: White Egg, White Gem
Long type: Lily White
2. Yellow Fleshed
Purple-topped globe-type: Aberdeen Purple Top
Bronze or green-td, globe type: Aberdeen Green Top, Amber Globe
Yellow-topped, globe type: Yellow Globe, Golden Ball, All Seasons
3. Foliage Cultivars
Flat Japan, Shogoin, Seven Top
Turnip varieties can be put into two distant groups viz.
Temperate Type (European Type):

- They are biennial because they require two seasons for seed production.
- They produce seed only in the hills of India.
- They are quick growing, early and low yielding but excellent in quality.
- They require temperate climate for seed production.
- Purple Top White Globe (PTWG), Snow ball, Golden ball, Pusa swarnima, Pusa chandrima, Early Milan Ted Top and Early White Milan are some important varieties.

Tropical Type (Asian Type):

- They are high yielding but poor in quality.
- They are slow growing and remain edible for a long period.
- They can produce seed both in temperate and sub tropical climate but it is not economical to produce their seeds in hills due to slow growing nature in the temperate climate and thus require more time, land occupation period and labour.
- Pusa Kanchan (A cross between European and Desi type), Pusa swati and Punjab Safed are some of the cultivars.

A few important cultivars grown under both the types i.e. temperate and tropical are given below:
European or Temperate Types:
Purple Top White Globe:

- It is large rooted and heavy yielding variety developed at IARI.
- Roots nearly round, large, smooth, skin purplish red on upper portion which extends above soil surface, lower portion creamy coloured.
- Flesh white, firm and crisp.
- Best for dehydration, matures in 60-65days after sowing.
- Average yield 250-300q/ha.

Golden Ball:

- It was bred at IARI Regional Station, Katrain, Kullu Valley, HP.
- It gives globe shaped, smooth, yellow roots with sweet and yellow flesh.
- Yield varies between 200-250q/ha.

Snow Ball:

- It is an early variety.
- Roots are medium sized, round, smooth and white.
- Flesh is white, fine grained, and tender with sweet taste.

Early Milan Red Top:

- It is an extra early maturing variety and ready for harvesting within 45 days after sowing.
- Very high yielding variety with deep flat roots having purplish red tops and white underneath.
- It has pure white, crisp and mildly pungent flesh.

Pusa Swarnima:

- This variety has been developed at IARI Regional Station, Katrain by hybridization between Japanese White (Asiatic type) x Golden Ball (European type).
- Roots are flattish round, 6-7cm in length and 7-8 cm in diameter, light creamy, yellow skin with pale amber colour flesh, fine texture and flavour.

Pusa Chandrima:

- It is an early maturing variety developed by hybridization between Japanese White (Asiatic type) x Snow Ball (European type) at IARI Regional Station, Katrain, Kullu Valley, HP.
- Roots medium to large in size, flattish round, 8-9cm long and 9-10cm in diameter, smooth, white skin, flesh white, fine grained, sweet and tender.

Asiatic or Tropical Types:

Pusa Kanchan:

- It is selection from the cross between Asiatic Red x Golden Ball developed at IARI, New Delhi.
- Roots round, medium sized, skin red and flesh light yellow.
- It is excellent in taste and flavour.
- Roots do not develop pithiness even if harvesting is delayed.

Pusa Swati:

- It was developed at IARI, New Delhi.
- Roots are flattish round, white and attractive.
- Flesh is white, soft and crisp.
- Ready in 40-45 days after sowing.

Punjab Safed:

- It is an early variety developed at PAU, Ludhiana.
- Its roots are white, round, medium sized and mature in about 60days.

SEED RATE

- 3-4 kg/ha

TIME OF SOWING

- In plains of India:

Asiatic Type: From July to September
European Type: From October to December

- In hills: March to May.

SPACING

- 30-45 x 10-15 cm and 1-1.5 cm deep on ridges.

METHODS OF SOWING

- The seeds are sown directly in the main field.
- When the plants are 10-15 days old, thinning is done to keep them at 10-15 cm in rows.
- Sowing is also done in ridges by opening shallow furrows.
- In normal cases, seeds germinate after 4-6 days of sowing.

NUTRIENT MANAGEMENT

- Apply FYM @ 150-200quintals/hectare during field preparation.
- Besides this apply 60-80kg N, 40-50kg of both P and K.
- Half N, and full quantity of P and k should be applied at the time of field preparation and the remaining N should be top dressed along with earthing up at the time of root initiation.

IRRIGATION

- There should be adequate moisture in soil at the time of sowing.
- Usually rainy season crop does not require any irrigation except during long dry spells.
- On the other hand, summer season crop requires irrigation at 5-6 days interval.

- Light irrigation should be given before harvesting to facilitate lifting

EARTHING UP

- Earthing up is usually done 20-25days after sowing to provide good condition for root development.
- Earthing up and top dressing of Nitrogen is done simultaneously at the time of root initiation.

HARVESTING

- Early varieties become ready for harvesting in 60-80 days after sowing whereas late varieties take 90-120 days.
- Fully developed roots are harvested either by pulling the roots or lifting the roots with the help of khurpi or shovel.
- Timely harvesting is quiet important for quality roots.
- Harvesting roots of 5-7.5 cm diameter would be ideal and larger roots are often coarse in texture and bitter in taste.
- The roots are cleaned, tops are cut and roots are graded according to size.

YIELD

- The yield of turnip varies from 200-300q/ha depending upon the variety, climate, type of soil and management practices.

POST HARVEST HANDLING

- Keeping quality of turnip is very poor.
- Roots may be washed to improve the appearance, quality and reduce the decay.
- Dipping the roots in hot paraffin will help reduce shrinkage and improve the appearance.

DISEASES & PESTS

Powdery Mildew: (*Erysiphe cruciferarum*)

- Affected plants show powdery patches of varying size on leaves.
- Dry atmosphere is favourable for development of this disease.

Control measures:

- Irrigate the crop regularly.
- Remove leaves as soon as disease appears and destroy them.
- Before observing symptoms, spray dinocap (0.05%) or wettable sulphur (0.2%) at 10-15days interval.

Downy Mildew: (*Peronospora parasitica*)

- Affected leaves show grayish white patches on under surface of leaves.
- Leaves turn yellow and later die.

Control measures:

- Remove affected leaves and destroy them.
- Spray Zineb @ 0.2 per cent.

Soft Rot: (*Erwinia carotovora*)

- Affected roots become soft from inside while outer skin remains hard and firm.

Control measures:

- Uproot affected plants along with roots and destroy.

Dry Rot:

- Affected roots show drying symptoms, and brown, sunken canker like areas develop on the roots.

Control measures:

- Avoid the attack of slugs and snails.
- These cause wounds on turnip which facilitate bacterial entry.
- Affected plants can be uprooted and destroyed.

Turnip Yellow Mosaic Virus:

- Affected plants do not grow properly, root development slows down and the quality deteriorates.

- The disease is transmitted by flea beetle.

Control measures:

- Remove affected plants, control flea beetle population and remove cabbage plants as they serve as collateral host of mosaic virus.

PESTS

Flea Beetle: (*Phyllotreta* sp.)

- They make small holes in the leaves. Besides, they transmit Turnip Yellow Mosaic Virus.

Control measures:

- Hoeing may reduce population of this pest.
- Also spray carbaryl (0.1%) as soon as the attack is noticed.

Wire Worms:

- They bore roots and make tunnels.

Control measures:

- Regular cultivation will reduce the incidence.

Mustard Saw Fly: (*Athalia promixa*)

- It feeds on leaves and pods, and damages the seed.
- The affected leaves and fruits show holes.

Control measures:

- Mix follidol M (2%) or malathion dust (5%) @ 20-25 kg/ha in the soil at the time of soil preparation.
- Spray malathion (0.05%) or dichlorvos (0.04%) as soon as the attack is noticed.

PHYSIOLOGICAL DISORDERS

Brown Heart

- It is caused due to the deficiency of boron.
- The disorder is prevalent in very acidic soil where boron is deficient.
- The symptoms are characterized by the appearance of grey or brown colour in the inner portion of the affected roots.
- The roots become unfit for consumption.

Correction:

- Avoid the sowing in too acidic soils.
- Maintain adequate soil moisture to prevent drought condition.
- Incorporate borax @10-15kg /ha in the soil before sowing
- Spray the crop with boric acid (0.2%), 2-3 times at vegetative stage.

SEED PRODUCTION

- Turnip bears hermaphrodite flowers even though it is highly cross-pollinated crop.
- Honey bees are main pollinators.
- Therefore, maintain 1600m and 1000m isolation distance for foundation and certified seeds, respectively between two different varieties and between the crops like rape, mustard, chinese cabbage and rutabaga.
- Raise seed crop either by seed to seed method or root to seed method.
- Seed crop is sown at wider distance of 45 cm apart on ridges.
- Sow seeds in the month of August to September.
- Apply 100 quintal of Farm Yard Manure during field preparation, 40kg of P at the time of transplanting the roots and 25kg of K before flowering per hectare.
- Application of 25kg of N in pre-bolting stage is beneficial.
- In the month of November, roots are uprooted, selected and foliage as well as top of roots are clipped (preferably 2/3rd tops and ½ of the roots) and are replanted at a distance of 45 x 45cm.
- Light irrigation is done just after replanting of roots.
- Rogue out all off-types and diseased plants.

- First roguing is done 20-30days after sowing, second when roots are lifted and replanted and third during flowering and pod formation stage.
- In higher hills, roots are uprooted by the end of October and replanting is done in the month of March-April. Initiation of seed stalks and flowering starts by the end of April depending upon variety, time of planting, area where seed production is being done.
- Harvesting is done in May end depending on the altitude of the seed production site preferably when 60-70per cent pods turn yellow brown.
- Delay in harvesting results in shattering of seeds.
- Harvesting, threshing and curing operations are like other cole crops.
- Thresh and winnow seeds and dry in sun and store in cloth bags under cool, dry and well ventilated place.
- Turnip seeds remain viable for about 3-4 years under good storage conditions.

Seed Yield:

- 600-800kg/ha depending upon environmental factors and the varieties used.

SEED CERTIFICATION STANDARDS

A. Fields Standards

a. General requirements

Isolation

Seed fields should be isolated from the contaminants as shown in the table given below:

Contaminants	**Minimum distance (m)**	
	Foundation	**Certified**
Fields of the other varieties	1600	1000
Fields of the same variety not conforming to varietal purity	1600	1000

b. Specific Requirements

Factor	**Maximum permitted (%)**	
	Foundation	**Certified**
Off-type	0.10	0.20
Other crop plants		
Objectionable weed plants		
Diseased plants	0.10	0.50

B. Seed Standards

Factor	**Standards fo**	
	Foundation	**Certified**
Pure seed (minimum) %	98.0	98.0
Inert matter (maximum) %	2.0	2.0
Other crop seeds (maximum) Number/ kg	0.05	0.10
Total weed seeds (maximum) Number/ kg	0.10	0.20
Objectionable weed seeds (maximum) Number/ kg	-	-
Germination (minimum) %	70	70
Moisture (maximum) %	6.0	8.0