

Cucurbits

Introduction:

- Cucurbits form an important group of vegetable crops cultivated extensively during **summer season (Largest group of warm season vegetables)**
- **Family-** Cucurbitaceae
- Botanically known as **Pepo**. Majority of vegetables are Monoecious/ **Andromonecious or diecious**. These group of vegetables **have trailing habits**.
- This group consist as of wide range of vegetables which are used either as salad, pickling (cucumber) or for cooking (all gourds) or candied or preserved (ash gourd) or as desert fruits (musk melon and water melon).
- The cultural requirements of all crops in this group are more or less similar.
- Pollination is by **Insects**
- Bitter principle is due to **Cucurbitacin**
- These crops requires **dry weather and high temperature at the time of maturity**.

Crop/botanical name	Origin	Varieties
Cucumber (<i>Cucumis sativus</i>) (2n = 14)	India	Japanese Long Green, Pusa Uday, Pusa Barkha, Pant Kheera-1, Pusa Sanyog (H1) Poinsette, Sheetal, Priya
Bottle Gourd (<i>Lagenaria siceraria</i>) (2n = 22)	Africa	Pusa Naveen, Pusa Samridhi, Pusa Sandesh, Pusa Santushti, Pusa Hybrid 3, Punjab Round, Punjab Komal, Punjab Long, Arka Bahar
Bitter Gourd (<i>Momordica charantia</i>) (2n = 22)	AFRICA	Arka Harit, Pusa Do Mausami, Pusa Vishesh, Pusa Hybrid-2, Coimbtore Long, Kalyanpur Baramasi, Solan Hara, Solan Safaid
Summer squash (<i>Cucurbita pepo</i>) (2n = 40)	Central America Mexican region	Pusa Alankar, Australian Green, Punjab Chappan Kaddu1, Early Yellow Prolific
Sponge Gourd (<i>Lufa cylindrica</i>) (2n = 26)	India	Pusa Sneha, Pusa Supriya, Pusa Chikni
Ridge Gourd (<i>L. acutangula</i>) (2n = 26)	India	Pusa Nutan, Pusa Nasdar, Arka Sumeet, Arka Sujat, Satputia (hermophrodite flower)
Ash Gourd (<i>Benincasa hispida</i>) (2n = 24)	Japan and Jawa	Pusa Ujjawal, Co-1, Co-2, S-1 (PAU), Karikumbala, Boodikumbala, APAU Shakti
Snake Gourd (<i>Trichosanthes anguina</i>) (2n = 24)	India	Co-1, Co-4, TA-19, Chichinda
Water melon (<i>Citrullus lunatus</i>) (2n = 22)	Africa	Arka Jyoti (F ₁), Arka Manik, Sugar Baby, Durgapur Meetha, Durgapur Kesar, Asahi Yamato
Musk melon (<i>Cucumis melo</i>) (2n = 24)	North west India and hot valleys of Iran	Pusa Madhuras, Pusa Sharbati, Hara Madhu, Punjab Rasila, Punjab Sunheri, Punjab Hybrid, Arka Jeet, Arka Rajhans, Hisar Madhu, Durgapur Madhu, Kashi Madhu

Climate: Cucurbits are warm season crops. They do not withstand even light frost and strong winds though cucumber tolerates a slightly cooler weather than melons. Seed does not germinate below 11°C, optimum germination occurs at 18°C and germination increases with rise in temperature till 30°C. Cucurbits grow best at a temperature range of 18-24°C. Proper sunshine and low humidity are ideal for the production of cucumber. Melons prefer tropical climate with high temperature during fruit development with day temperature of 35-40°C. Cool nights and warm days give better quality fruits in melons.

Soil: A well drained soil of loamy type is preferred for cucurbits. Lighter soils which warm quickly in spring are usually utilized for early yields while heavier soils are suitable for more vine growth and late maturity of the fruits. In sandy river beds, alluvial substrata and subterranean moisture of river streams support the cultivation of cucurbits. The soil should not crack in summer and should not be waterlogged in the rainy season. It is important that soil should be fertile and rich in organic matter. The most suitable pH range is between 6.0 and 7.0

Time of Sowing , Seed rate and Spacing

In northern plains, most of the cucurbits are sown during winter season *i.e.* in the month of November (in the riverbeds).In the garden soils, sowing is done in February. Melons are grown only when the weather is warm and dry during fruit development *i.e.* November to February.For rainy season, grow only those cucurbits which can tolerate rains. *e.g.* bitter gourd in June-July.In north-eastern states most of the cucurbits are sown from November to March when the weather is comparatively dry.In southern and central India, winters are not severe and long, therefore, these can be grown throughout the year. November sown crop is over by March-April.In Northern Indian hills, sowings start from April-May and the crop is over by August- September.In western India, sowings are done from September upto February.

Crop	Season	Seed rate (kg/ha)	Spacing (m)	Fruit yield (q/ha)
Cucumber	Summer/rainy	2.5-3.5	1.5 × 0.60-0.90	250-300
Bottle gourd	Summer	4-5	2-3 × 1-1.5	300-400
Bitter gourd	Summer/Rainy	4-6	1.5-2.5 × 0.60-1.20	150-200
Summer squash (dwarf)	Summer/rainy	8-10	0.60-0.75 × 0.45-0.60	250-300
Sponge gourd	Summer/rainy	2.5-3.0	2.50-3.00 × 0.60-1.20	150-200
Ridge gourd	Summer/rainy	3-3.5	2.50-3.00 × 0.60-1.20	150-200
Snake gourd	Summer/rainy	4-6	1.5-2.5 × 0.60-1.20	200-250
Ash gourd	Summer/Rainy	5-7	1.5- 3 × 0.6-1.2	100-150
Water melon	Summer	3-4	2.5-3.5 × 0.90-1.20	300-500
Musk melon	Summer	1.5-2.0	1.50-2.0 × 0.60-0.90	150-200

Chow –Chow (*Sechium edule*) is a perennial crops propagated by viviparous single seed fruits.

Vivipary: Seed germinates inside the fruit while still attached to the parent tree and nourished by it

Methods of planting: Mostly in cucurbits, *in situ* method of sowing is followed. But in certain areas of Northern India and hills where the main objective is to get early fruit harvest, the seedlings are raised in polythene tubes and plantation is done in the field when the conditions are favourable without disturbing the soil ball. Transplanting is done at 2 true leaves stage.

Furrow method: Furrows are made at 1 to 1.5 m in case of cucumber and bitter gourd. The sowing is usually done on the top of the sides of furrows and the vines are allowed to trail on the ground especially in summer season.

Bed method: In some regions, bed system is in fashion where the seeds are sown on the periphery of beds. The width of the bed is almost double to the row to row spacing.

Hill method or raised beds or raised point: The hills are spaced at a distance of 0.5- 0.75m and 2-3 seeds are sown per hill, after germination retain only one or two plants per hill. This method facilitates proper drainage especially in heavy rainfall regions.

Pit Method: Generally, it is followed in southern India. The pit is lower than the normal bed surface. Training is done by Pargolla or Pandal system.

Manures and fertilizers:

Farmyard manure (q/ha)	Nitrogen (N)	Phosphorus (P ₂ O ₅)	Potassium (K ₂ O)
	(Kg/ha)		
200-250	60-100	50-75	50-85

Full dose of farmyard manure, phosphorus and half of potassium and N should be applied at the time of sowing. Remaining part of N should be top dressed in two equal parts after one month and at flowering stage while half of K is applied when good growth takes place.

Interculture and weed management: Thinning of plants should be done 10-15 days after sowing retaining not more than 2 healthy seedlings per hill. The beds or ridges are required to be kept weed free in the early stages before vine growth start. Weeding and earthing up are done at the time of top dressing of split application of nitrogenous fertilizers. Apply Fluchloralin or Trifluralin @ 0.75-1.0 kg/ha or Bensulide @ 5-8 kg/ha as preplant soil incorporation at 2 weeks before sowing. Butachlor @ 1 kg/ha or chloramban @ 2-3 kg/ha as pre emergence & Naptalam @ 2-4 kg/ha as post emergence after first weeding efficiently helps in controlling the weeds in cucurbitaceous crops. In general, vertical training is more helpful in increasing the yield of cucumber.

Irrigation: In spring-summer crop, frequency of irrigation is very important, while in rainy season crop, well distributed rainfall between July to September reduces the frequency of irrigations. Ridges or hills or beds are to be irrigated a day or two prior to sowing of seeds and then light irrigation is to be given 4 or 5 days after sowing. Flooding of hills is to be avoided and crust formation of the top soil should be prevented. Irrigation once in 5 or 6 days is necessary depending upon soil, location, temperature etc. Irrigation water should not wet the vines or vegetative parts, especially when flowering, fruit set and fruit developments are in progress. Wetting will promote diseases and rotting of fruits, so it is essential to keep beds or inter row spaces dry as far as possible so that developing fruits are not damaged. In rainy season, therefore, these crops are trailed over supports to prevent rotting of fruits

Sex expression and sex ratio

Cucurbits are cross pollinated vegetable crops. There are nine types of sex forms found in these crops, of which monoecious type is the most common. "Satputia" variety of ridge gourd bears hermaphrodite (bisexual) flowers. Gynoecious lines (Bears only female flowers) are used for hybrid seed production in cucumber and bitter melon. It is of great significance in most of the cucurbitaceous crops which have monoecious plants that mean they bear male and female flowers separately on the same plant. In the beginning, monoecious plants bear only male flowers and female flowers appear late. The female to male ratio goes on increasing with the age of the plant. Though sex expression and sex ratio are varietal characteristics but they are influenced by environmental conditions. Low fertility, high temperature, and long light periods induce maleness. Gibberellic acid (GA) at higher concentration induces maleness but at lower concentration of 10-25 ppm increases the number of female flowers. Two sprays, first at 2-leaf stage and again at 4-leaf stage with 100 ppm of NAA, 200 ppm of ethep, 3 ppm of Boron or 3 ppm of Molybdenum can suppress the number of male flowers and increases the number of female flowers, fruit set & ultimate yield. Silver nitrate sprays induces male flowers.

Harvesting:

Harvesting of crop at right time is very important in cucurbits as in most cases, seed development is undesirable. Harvest cucumber, bottle gourd, bitter melon, snake melon, ridge melon and sponge melon when they are still young, tender and have soft seeds inside. Harvest before fruit colour changes from green to yellow.

Musk melon: It is a climacteric fruit which ripens during transportation and storage. Hence, it should be harvested before it attains fully ripe stage.

Full slip stage i.e. a crack develops around the peduncle at the base of the fruit and when fully ripe the fruit slips easily from the stem.

Half slip stage: Only a portion of the disc is removed when the fruit is pulled out. The scar on the fruit is smaller than the full slip stage.

Water melon: It is harvested at fully ripe stage. Maturity signs are withering of tendril, change in belly color or ground spot to yellow and the thumping test produce dull sound on maturity and metallic sound in unripe fruits.

River bed cultivation

It is kind of vegetable forcing being used in India where cucurbits are sown during winter season in the river beds.

- Pits or trenches are made during October-November.
- They are of convenient length, 30 cm wide and 60 cm deep or to a depth at which the sand is moist.
- A distance of nearly 2-3 m is kept between the trenches.
- Normally, 3-4 pre-germinated seeds are planted/hill in pits or trenches.
- Before sowing, the trenches are manured with FYM.
- Sprouted seeds are carefully sown. Spot watering during the initial stages is essential.
- Protection from low temperature/chilling winds during Dec-Jan (1-2 °C) is provided probably from *Saccharum* spp. on north side of the pit.

It serves following purposes:

- Checks the sand drifting on dug up trenches.
- Provide protection against chilly winds.
- This grass spread over the sand later on & vines spread over this

- grass. Sand does not blow off in hot months.
- Fruits from river bed are available 30-50 days before then the normal field sown crop.
 - Cucurbits have following salient features which make them fit for river bed cultivation:
 - ✓ Long tap root system which makes use of subterranean moisture.
 - ✓ These are more space planted crops, less no. of plants per unit area are to be managed.
 - ✓ Hot & dry weather with maximum sunshine prevails right from March-June/July which is an essential requirement for melons.

Problems: Leaching of nutrients, Risk if floods due to winter rains, Occurrence of diseases & Fruits having undesirable quality due to inbreeding depression.

Disease management:

Powdery mildew (*Erysiphe cichoracearum/Sphaerotheca fuliginea*) Powdery mildew is often serious in dry weather and is the main cause of early dying of plants. White or greyish spots with powdery mass appear on the upper surface of leaves which may cover the whole plant. Spray with dinocap or bitertanol or hexaconzole @ 0.05% at the first appearance of symptoms on the leaves have been reported effective.

Downey mildew (*Pseudoperonospora cubensis*): It does not attack the fruit but causes defoliation and yield loss. Symptoms first evident are as blocky, chlorotic spots that become later necrotic. Grayish fungal sporulation may be observed on the underside of the lesions. Poor air circulation and overhead watering aggravate the problem. Spray the crop with zineb (0.25%) to control this disease.

Anthraxnose (*Colletotrichum orbiculare*): Leaves initially show small, pale yellow or water-soaked areas that enlarge rapidly and turn tan to dark brown. These lesions may develop holes or cracks in the center. Depending on weather, spotting may occur on young plants and fruit especially in late plantings. Grow resistant varieties such as Poinsette (cucumber), Arka Manik (water melon). Sow the seed after treatment with Blitox or Bavistin (2.5 g/kg of seed).

Fruit rot: Symptoms occur on the underside and blossom end of the fruit that are in contact with soil. As the disease progresses, lesions become sunken and irregular in shape which result in rotting of the entire fruit. Treat the seed with carbendazim or thiram or captan (2.5 g/kg of seed). Avoid flood irrigation.

Cucumber mosaic: Plants have mottled yellow-green and green leaves, and may be stunted. They may show epinasty, downward bending of the petioles. It is transmitted by aphids, so control this pest at right stage is essential.

Insect-pests management

Fruit Fly: The adult female lays egg on the flowers, buds and fruits. The maggots after hatching feed on pulp of the fruits and render them unfit for human consumption.

Field sanitation should be ensured by removal and destruction of fallen fruits and infested fruits daily to minimize the pest intensity. Growing 2-3 rows of maize as a trap crop in between the cucurbits. Trap crop act as resting site for the adult fruit fly. Any contact insecticides can be sprayed on maize during evening hours to kill adult fruit flies.

Use of pheromone traps (Palam trap @ 25 nos./ha) for monitoring pest population. Apply malathion (0.05%) as cover spray to kill the insects on contact

or a bait spray that attracts and kill the adults. Bait spray prepared by adding 50 g *gur* + 10 ml malathion in 10 litre water can be used.

Epilachna beetle: Adults and larvae (grubs) feed on leaves leaving a fine net of veins. Damaged leaves shrivel and dry up. Young plants can be entirely destroyed while older plants can tolerate considerable leaf damage. Hand picking and destruction of eggs, grubs and adult beetles is effective, if the cropped area is small. Foliar application of malathion (0.05%), carbaryl (0.1%) and lambda-cyhalothrin (0.004%) checks the pest.

Red pumpkin beetle: It is the most serious insect pest of cucurbits. The larvae and adult of this pest cause damage by eating away the young leaves and flowers at the seedling and flowering stage respectively. Creamy yellow coloured larvae feed on the roots, stem and fruits touching the soil whereas red coloured adults feed on leaf and flowers. Collection and destruction of beetles in the early stage of infestation. Spray the crop with malathion (0.05%) or dichlorvos (0.05%) or carbaryl (0.1%).

Aphids: The first sign of aphid damage is a downward curling and crinkling of the leaves. Aphids are often found on lower leaves and on flower buds and flowers. They are also involved in the spread of several viruses that affect all cucurbits. Spray cypermethrin (0.01%) or acetamiprid (0.01%) bifenthrin (0.01%) or malathion (0.05%).

Whiteflies: They can affect the crop directly by its feeding and by acting as a vector of viruses. When whiteflies are very numerous, the sticky honeydew they produce supports the growth of sooty mold on leaves. Spray acetamiprid (0.01%) or triazophos (0.04%).