

ORIGIN, AREA, PRODUCTION, VARIETIES, PACKAGE OF PRACTICES FOR CUCURBITACEOUS VEGETABLES

Crops belonging to family Cucurbitaceae are generally known as 'Cucurbits'. It consists of a wide range of vegetables either used for salad purpose (cucumber) or for cooking (all gourds), pickling (West Indian gherkin) or as dessert fruit (muskmelon, water melon) or candied or preserved (ash gourd). As a group, cucurbits occupy the largest area in India and in other tropical countries. Its use is not primarily because of calories, minerals or vitamins since they are generally low to moderate in nutrients with a few exceptions like bitter gourd (rich in vitamin C 96 mg/100g), parwal and chow chow (calcium – 531 mg and 140 mg / 100 g respectively). From the nutritional point of view, cucurbit seeds are valued for their high oil and protein contents. Seed proteins of cucurbits are comparable to that of legumes and are richer in methionine.

Taxonomic classification of the family is differently by botanists. The family Cucurbitaceae comprises about 117 genera and 825 species in warmer parts. Chakravarthi (1982) estimated 36 genera and 100 species in India.

General features

Cucurbit vegetables have the following common features:

1. Long tap root system – Tap root may grow up to 175-180 cm and laterals are confined to top 60 cm. Hence crops like bottle gourd, ash gourd and parwal are largely utilized in river bed cultivation.
2. Branched stem-Stem is 3-8 branched and prostrate / climbing and spread up to 9-10 m in *Cucurbita* and *Lagenaria*. Crops like *Cucurbita pepo* have short internodes and are bushy. Nodes usually produce roots by touching on soil
3. Leaves are simple, mostly 3-5 lobed, palmate and rarely pinnately lobed (*Citrullus* sp.).
4. Tendrils on axils of leaves are simple in *Cucumis*, simple or bifid in others and absent in bush types.
5. Cucurbits are highly cross pollinated and pollination is done by honey bees and bumble bees. Flowers are born in axils of leaves and are solitary or in racemose clusters. Individual flowers are unisexual, large and showy.
6. Fruit is essentially an inferior berry and is called as "pep" due to hard rind when mature. Fruits can be stored for long period in ash gourd, pumpkin, oriental pickling melon, etc. while keeping quality is less in cucumber, snake gourd, bitter gourd, etc. The fruits of all cucurbits except chow chow are many seeded.

7. Seeds are borne in parietal placentation-Placenta is the edible portion in water melon while in ash gourd, ridge gourd and smooth gourd it is endocarp. In muskmelon, edible portion is mostly pericarp with a little mesocarp.
8. Cucurbits are mostly seed propagated. A few are vegetative propagated like parwal and coccinia.
9. Most cucurbits are annuals except chow chow and coccinia, both having perennial habit.
10. Cucurbitacins – Majority of cucurbits are characterized by presence of bitter principles, cucurbitacins at some portions of plant and at some stages of development. Cucurbitacins are tetracyclic triterpines having extensive oxidation levels. Its highest concentration is in fruits and roots and is less in leaves. Pollen grain also carries fairly good amount of bitter principles. This is a common problem in oriental pickling melon, cucumber and bottle gourd and is rarely noticed in ridge gourd and snake gourd. The consumers usually remove fruit tips during conception to avoid possible chance of bitterness in fruits.
11. Sex forms – A wide range of sex forms like monoecious, andro monoecious, gynandro monoecious and dioecious forms are noticed in the family.
 - *Hermaphrodite form* - This is the most primitive form and bisexual flowers only are produced in a plant. This is noticed in Satputia variety of ridge gourd and in a few lines of cucumber and mush melon.
 - *Monoecious form* - This is the advanced form and plants produce both male and female flowers in a plant. Majority of the cucurbits exhibit monoecious condition.
 - *Andromonoecious form* – Muskmelon and some cultivars of water melon produce both male and bisexual flowers in a plant. However, non dessert forms like oriental pickling melon, photo under *Cucumis melo* are monoecious.
 - *Gynomonoecious* - This is noticed in cucumber and the plants produce female and bisexual flowers.
 - *Gynoecious form* - Lines producing female flowers alone are rarely noticed in cucumber and have got great potential for commercial F₁ production.
 - *Trimonoecious form*- This is a condition wherein, the male, female and bisexual flowers are produced in a single plant
 - *Dioecious form* – Male and female flowers are produced on separate plants in parwal, coccinia and kakrol.

Flowering

Majority of cucurbits start flowering 30-45 days after sowing and it follows a definite sequence. An alternate sequence of male and female flowers follows upto fruit set. The first 4-6 flowering nodes bear male flowers and alter female flowers. Developing fruits in a vine determine production of further female flowers further down in the vine. In crops where immature fruits are harvested at tender stage, this kind of inhibiting mechanism will not be perceptible. But in melon, pumpkin, ash gourd etc. even if perfect or female flowers are produced in the vine, fruits may not set or develop fully or shed in immature condition. That is why number of fruits / vine in a seed crop will be less (4-5) than in a vegetable crop (12-15) in bottle gourd, ash gourd and cucumber.

Pollination

Pollination takes place early in morning between 6-8 am in cucumber, pumpkin, muskmelon and watermelon. Pollination is altered in the day when temperature is high in bottle gourd and ridge gourd. In snake gourd and pointed gourd, anthesis takes place during night and pollination early in the morning.

In pumpkin, pollen production is more while in muskmelon, pollen production is scanty and pollen grains are sticky due to oily film surrounding them.

Extent of cross pollination in cucurbits is 60-80%. They are entomophilous and bees, beetles and moths cause pollination.

Sex modification

Majority of cucurbits are monoecious and sex ratio (male: female) ranges from 25-30:1 to 15:1. Sex ratio is influenced by environmental factors. High N content in the soil, long days and high temperature favour maleness. Besides environmental factors, endogenous levels of auxins, gibberellins, ethylene and abscisic acid also determine sex ratio and sequence of flowering. A primordium can form either a female or a male flower and it can be manipulated by addition or deletion of auxins. Endogenous application of plant growth regulators can alter sex form, if applied at 2-4 leaf stage. High ethylene level induces female sex and is suggested to increase female flowers in cucumber, musk melon, summer squash and pumpkin. In cucumber, maleic hydrazide (50-100 ppm) GA 3 (5-10 ppm), Ethrel (150-200 ppm), TIBA (25-50 ppm), boron (3 ppm) also induce female flowers.

Gibberellins promote maleness and are antagonistic to the action of ethylene and abscisic acid. In fact, gynoecious line of cucumber is maintained by inducing male flowers through spray of GA 3 (1500-2000 ppm). Silver nitrate (300-400 ppm) also induces maleness.