

Practical 3

EXERCISE 3.1: IDENTIFICATION OF MAJOR VEGETABLE CROPS OF OUR COUNTRY

Objective :

- Imparting knowledge for the identification of different vegetable crops on the basis of different morphological characters at different plant growth stages

Delivery schedule : 03 periods

Student expectations/learning objective:

- To demonstrate different characteristic features of different vegetable crops for their easy identifications

Pre-learning required : Names of different vegetable crops and knowledge about classification of vegetable crops

Handouts/material required/equipment's & tools: Forceps, hand lens, paper sheet, pen to note down the instructions and pictures of different vegetables.

Introduction:

Vegetables are the products of herbaceous plants which are annuals, biennial and perennials (mostly annual) whose plant parts such as fruits, leaves roots, stems, petiole, flower etc. are used for culinary or consumed as raw. As discussed in Practical 1 that it is important to identify different vegetable crop plants at different growth stages. The vegetable plants differ with respect to each other in their morphological characters. The keen and frequent observations on vegetative and reproductive parts of plant help in easy and clear identification. It is essential to know the different parts of the plants before undertaking the identification as these forms the basis of distinguishing characters. In this practical you will learn how to identify a vegetable keeping in mind their characteristic morphological features. The important distinguishing characters of important vegetable crops have been discussed here under which may help the students in distinguishing them even at early stages of their growth. It takes time and exposure to learn to identify vegetable plants.

Procedure:

Step 1: Critically observe the morphological characteristics of the specimen. To identify plants in garden, look for morphological features such as size, shape and color of the leaves as well as unusual characteristics like scent or hair.

i) Root system:

- Adventitious
- Tap root system.

ii) Stem characteristics:

- Hollow or pithy
- Number and length of internodes
- Branched or single stem
- Smooth or ridged
- Leaf arrangement on the stem- alternate or paired
- Presence or absence of any specific characters like tendrils, spines etc.

iii) Leaf characteristics:

- Shape of leaf- long narrow or ovate or lanceolate
- Presence or absence of pubescence
- Type of leaf - simple or compound leaf, petiolated or sessile
- Presence or absence of leaf sheath
- Leaf margins: serrated or smooth
- Texture of leaf- smooth or rough.

iv) Inflorescence:

- Colour of flowers
- Type of inflorescence.

v) **Economic part**

- Colour
- Size
- Shape

Step 2: Draw the sketch of each plant.

Step 3: Record the observations with respect to root, stem, leaf, inflorescence and fruit characteristics in the data sheet.

Step 4: Use chart of morphological features

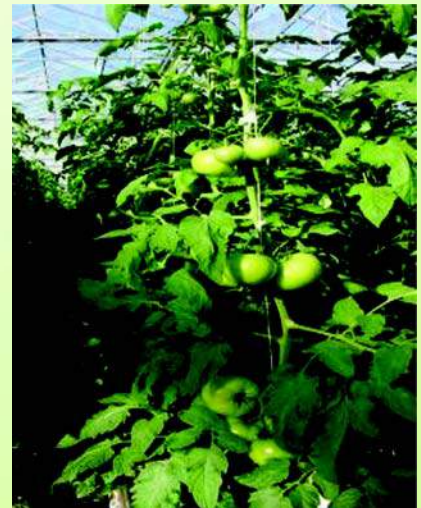
IDENTIFICATION CHARACTERISTICS OF DIFFERENT VEGETABLE CROPS

Summer vegetables

Tomato (*Solanum lycopersicum*)

Family : Solanaceae

- Examine the stems of the plant. They have short, fine, white hair on them i.e. slightly fuzzy. Observe the growth habit of plants which may be determinate or indeterminate. Indeterminate type bears inflorescence cluster at every third internode.
- Notice the leaves on the tomato plant. Tomato bears compound leaves with multiple leaflets (5-9) growing along a common stem (called rachis). Leaves are green, hairy, serrated/oval/pointed, and have visible veins.
- Sniff your fingers after touching a tomato plant leaf. Tomato leaves have a pungent scent that remain on the skin.
- Observe the flowers on the plant. Tomato flowers are bright yellow with pointed petals.
- Notice the fruits growing on the plant. After pollination, a flower of tomato grows as a single small, round, green fruit. Colour of the fruit changes with the onset of maturity.
- Cut open the fruit you will see the locules filled with jelly like substance containing seeds.



Tomato

Brinjal (*Solanum melongena*)

Family : Solanaceae

- See the stem of the plants. They are branched, erect, have fine hairs and in some varieties may have spines.
- Notice the leaves which are usually large, lobed, ovate, thin and relatively hairy on the under surface. Leaves also bear sharp spines. Petiole is about one fourth as long as the leaf blade.
- Observe the flowers of the plant. Flowers are violet in colour, borne solitary and forms cluster of two or more in lateral cymes. Flowers are deeply lobed with toothed calyx. Calyx is five lobed and covers the base of the fruit on enlargement. Fruit is berry with numerous seeds.



Brinjal

Bell pepper (*Capsicum annuum*)

Family : Solanaceae

- Observe the plants. They have straight main stem which bear secondary branches forming 'V'. Flowers are white in colour and star shaped. Fruits are juiceless berries which vary in shape and size.
- Observe the shape of the peppers. A standard bell pepper form blocky fruits in shape with three or four lobes at the bottom of the fruit. Skin of fruit (pericarp) is thick and glossy in appearance.
- Check color of the fruits. Bell peppers are usually green in colour and change color to red, orange or yellow on maturity.



Bell pepper

Cucumber (*Cucumis sativus*)

Family : Cucurbitaceae

- Observe the growth habit of the plant in question. Summer and winter squash plants grow very fast in the early days of summer while cucumber plants take a few days more to grow.

- Cucumber plants along with its leaves are usually smaller than squash plants and the stems are not as thick as squash plant.
- A cucumber vines grow vertically with the help of strong tendrils that make grip with staking material and provide upward growth.
- Cucumber leaves are triangular in shape with pointed lobes. The leaves are large, dark green and have a slightly rough texture.
- See the stem of cucumber, it is delicate and has tender spines.
- Cucumber bears male and female flowers separately on the same plant (monoecious flowers). Flowers are small and yellowish coloured. Cucumbers usually form long thin fruits.



Cucumber

Bitter gourd (*Momordica charantia*)

Family : Cururbitaceae

- Observe the growth habit of the plant. Plant vine may grow upto the height of 15 feet. The stems have twining tendrils and are slender, green and hairy.
- The leaves are green, hairy, alternate, deeply palmate and lobed with 5 coarsely toothed lobes.
- The flowers are monoecious and yellow in colour.
- The fruits may be egg-shaped to oblong, green, tapering at the ends and covered with blunt tubercles (swellings).
- Taste the fruit. It is bitter in taste.



Bitter gourd

Bottle gourd: (*Lagenaria siceraria*)

Family : Cucurbitaceae

- Observe the plant habit. The bottle gourd is a vigorous, annual, running or climbing vine with large leaves and lush in appearance. The vine is branched and climb by means of tendrils along the stem. The foliage is covered with soft hair and has a foul musky odour when crushed.
- Look at the leaves. The leaves are circular in overall shape with smooth margins, a few of them may have broad lobes or undulating margins. Leaves have a velvety texture because of the fine hair, especially on the undersurface.
- Look at the flower of bottle gourd. The bottle gourd flowers are borne singly on the axils of the leaves, the males on long peduncles and the females on short peduncles. The flowers are white and attractive with spreading petals.
- It bears two types of fruits namely, long and round.



Bottle gourd

Summer squash:

Family : Cucurbitaceae

- The summer squash plant has bush type growth and no vine formation.
- The plant has separate male and female flowers on the same plant. The female flowers can be easily identified as they bear miniature fruit (ovary) at the base. Flowers are showy and yellow in colour.
- Feel the outside skin of summer squash fruit which is tender (not hard).
- Look at the color of the squash. It looks bright green and has a shiny gloss.



Summer squash

Musk melon (*Cucumis melo*)

Family : Cucurbitaceae

- A muskmelon plant has trailing prostrate stems generally upto 10 m in length and often forming large mats. Stems are viny, herbaceous, slender, angled in cross-section, branched near the base and rough in texture with short stiff hair.

- Observe the leaves of the plants. Leaves are alternate more or less palmate, angled or shallowly 3-7 lobed and covered with very short stiff hairs (scabrous). Tendrils are unbranched and borne singly per node from the base of the leaf petioles.
- Flowers are axillary, monoecious, with 1 or more male flowers per node and single female flowers at few different nodes.



Musk melon

- The fruits of the muskmelon are oblong to round. Surfaces are net-veined or covered with minute stiff hairs and lack prickles. Immature fruits are green, but become mottled or striped with yellow or orange, or are solid yellow or orange at maturity.

Watermelon (*Citrullus lunatus*)

Family : Cucurbitaceae

- Watermelon grows on vines which usually sprawl across the ground in a sunny location. At maturity, each vine is 10 to 15 feet in length and has tiny tendrils or thread-like curling stems at leaf bases.
- Look at the vine's foliage and feel its texture. Watermelon leaves are light green with silvery white tinge. The leaves are deeply lobed having three to five finger-like lobes that have coarse rounded teeth.
- The flowers are yellow and occur singly. Flowers appear on the young vines, usually at the tips. Fruits are large in size, green, smooth and round.



Water melon

- Cut open a fruit. The flesh of a watermelon fruit is easily recognizable both at mature and immature stages. Mature or near ripening fruits have red flesh and black seeds while the flesh of young developing fruits is pale green to white with small white seeds.

French bean (*Phaseolus vulgaris*)

Family : Fabaceae

- Observe the plant of the French bean. It is erect or twine annual herb.
- Look at the leaves of the plant. The leaves are trifoliate, compound. The edge of the leaf blade is entire (has no teeth or lobes).
- Study the flower of French bean. Flowers white to violet-purple. Flowers are bilaterally symmetrical.
- Look at the pods of the French beans. Pods are slender, straight or slightly curved, the surface glabrous or faintly pubescent with prominent beak.



French bean

Cowpea (*Vigna unguiculata*)

Family : Fabiceae

- Observe the growth habit of the plant. Plants are herbaceous annual with twining stems varying in erectness and bushiness.
- Study the leaves of the plant. Leaves are alternate and trifoliolate. The lateral leaflets are opposite and asymmetrical, while the central leaflet is symmetrical and ovate.
- Look at the flower of the plant. Flowers are white, cream, yellow, mauve or purple in colour.
- Look at the pods of the cowpea. Pod pendulous, smooth, with a thick decurved beak and contains 10- 15 seeds.



Cow pea

Guar or cluster bean (*Cyamopsis tetragonoloba*)

Family : Fabaceae

- Study the growth habit of the plant. Plant grows upright, reaching a maximum height of up to 2-3 m. It has a main single stem with either basal branching or fine branching along the stem.

- Look at the leaves of the plant. Leaves are elongated oval in shape and borne on alternate position. The leaves and stems are mostly hairy.
- Check the flowers of the plant. Clusters of flowers grow in the plant axil and are white to bluish in color.
- Look at the pods of the cluster bean. The developing pods are rather flat and slim containing 5 to 12 small oval seeds.



Cluster bean

Okra (*Abelmoschus esculentus*)

Family : Malvaceae

- Observe the growth habit of the plant. The plant is erect herb up to 2 m tall. Stems are succulent with scattered stiff hair.
- Study the leaves. Leaves are 50 cm wide and 35 cm long, deeply lobed, with toothed margins, hairy on both surfaces, especially on the nerves. Each leaf is borne on a petiole.
- Look at the flower of the okra. Flowers are showy, usually yellow with a dark red, purple or mauve centre, borne on a stout peduncle.
- The fruits of okra are 6-20 cm long (at harvesting stage), roughly circular in cross-section with a pointed end, usually 5-ribbed, borne at the leaf axils. Immature fruit dark green or pale green.



Okra

Amaranthus (*Amaranthus tricolor* or *Amaranthus bicolor*)

Family : Amaranthaceae

- Observe the plant of amaranthus. They are erect-growing plants.
- Its stems are vigorous, cylindrical and fibrous. On maturity stems becomes hollow inside. The plant has the stripes on the stem and shades of green, red, pink, brown or purple depending upon the variety.

- Look at the leaves of the amaranthus plant. The leaves are stalked, compound, alternate, long or oval and green or dark red at the base and bright yellow, orange or florescent pink at the top.
- You will find tiny green, red or purple flowers clustered densely together, sometimes slightly drooping at the head of the plant. The flowers last for a long time.



Amaranth

Winter Season vegetables

Potato (*Solanum tuberosum*)

Family : Solanaceae

- The potato plant is leafy, herbaceous and spreading type. The leaves are compound with 7-15 leaflets.
- Study the flower of the potato. Potato flowers are star-shaped, white, lavender, pink or light blue with yellow centers and borne in clusters.
- Look at the fruits of the potato plant. The fruits are like small green tomatoes, about an inch in diameter and contain several hundred seeds.



Potato plant

- Dig out the potato plant; you will see tubers growing underground which are round to oval in shape and in general light brown in colour.

Cauliflower (*Brassica oleracea var. botrytis*)

Family : Brassicaceae

- Look at the cauliflower plant. The stem/stalk varies from short to medium in length. Leaves are produced close to the ground, which are longer, narrower and brighter green in color than cabbage and broccoli leaves. The leaf petiole is long and broad that looks flat on the upper surface and is little raised on the lower side.



Cauliflower

- The edible portion of cauliflower is called curd which is formed in the centre of the leaves. The inner leaves curve inwards to cover the curd in mid and late group varieties and keep curd blanched (white).
- Curd is white to creamish in colour and compact.

Cabbage (*Brassica oleracea var. capitata*):

Family : Brassicaceae

- Cabbages have very short stem joints and in some varieties the heads are practically coreless. It grows rosette on a short stalk with the broad outside leaves close to the ground and the "wrapper" leaves form the heads. The leaves have wavy edges. Upper leaves are sessile while those on the base are much more fleshy, petiolated with lobules.



Cabbage

- As the plant grows, the leaves increase in number and form a ball-shaped "head" in the center of the plant.
- The leaves of cabbages can range from smooth to crinkled, green to red. They are usually very broad and cupped, with a network of veins that connect to a large central mid-vein.
- Observe the head of the plant. The head of the cabbage plant is made up of several layers of overlapping leaves. Head cabbage and head lettuce are similar in appearance, but cabbage leaves are usually more tightly wrapped on the head. The head is very solid. The cabbage heads are glossy light green in colour. The red cabbage is purple in colour.
- Flowers are yellow in colour, grouped in loose racemes.

Broccoli (*Brassica oleracea var. italica*)

Family : Brassicaceae

- Broccoli leaves have elongated petiole, somewhat round in shape. Leaves are green grey in colour with very curly deep lobes. Broccoli leaves are also broader than cauliflower leaves and have a lobe-like structure(s) at the base of the leaf.

- It has succulent, loose, leafy edible stem, which support large and compact heads of thickly clustered flower buds which are green in colour.
- The main group of florets or "head" grows in the center of the leaves. After the harvest of the main head, shoots may arise from the stem which is called as spears.



Broccoli

Garden pea (*Pisum sativum*)

Family : Fabaceae

- Observe the plant. Garden pea plant may be dwarf or vining/ tall types.
- Stem of pea plant is round and hollow covered with a waxy bloom.
- Observe the leaves of garden pea. The leaves are compound (made up of two or more discrete leaflets). The edge of leaf blade has teeth. Leaves consist of one or more pairs of opposite leaflets borne on petioles together with several pairs of tendrils (which are essentially modified leaves) and a single or compound terminal tendrils.
- Leaflets are broad and ovate with distinct ribs which may be slightly toothed or entire.
- The two (pseudo) stipules at the base of the leaf are also ovate but much larger than the leaflets.
- Study the flower of the plant. Flower is white coloured which develops into a pod.
- Study the pods of the pea. Pods containing several seeds, flattened when young but becoming roundish at later stages and are dehiscent along two sides.



Garden pea

Onion (*Allium cepa*):

Family : Amarylidaceae

- Observe the leaves of the onion. Leaves arise from underground part of the stem. The leaves are bluish-green and grow alternately in a flattened fan-shaped swathe.
- Leaves are fleshy, hollow and cylindrical, with one flattened side. The base of each leaf is a flattened usually white sheath that grows out of a basal disc.
- From the underside of the disc, a bundle of fibrous roots extends to a shallow depth.
- Look at the inflorescence of the onion. Inflorescence of onion is called cyme.
- Onion bulbs are pungent when chopped and contain certain chemical substances which irritate the eyes.
- At maturity the foliage dries up and the outer layers of the bulb become dry and brittle.



Bulb plant *Seed umbel*
Onion

Garlic (*Allium sativum*)

Family : Amarylidaceae

- Observe the garlic plant. The leaves are long, narrow and flat like grass. This plant has narrow foliage with long, narrow and flat grass like leaves.
- Taste the plant parts. All parts of this vegetable have a very strong taste and it is widely used for culinary purposes.
- Look at the bulb of the plant. The bulb is of a compound nature, consisting of numerous 'cloves,' which are grouped together between the membraneous scales and enclosed within a whitish skin, which holds them as in a sac.



Garlic

Carrot (*Daucus carota*)

Family : Umbelliferae

- Note the stem of the plant. The stem at its vegetative state is just above ground and is greatly compressed as result internodes are not visible. The stem apex is slightly convex.
- Observe the leaves. Leaves are dark green and shiny, the lowest being broadly linear-lanceolate toothed leaflets. Leaf blades are two to three pinnate, the leaflets being repeatedly divided - pinnatifid. Leaves and the basal rosette are alternate and compound.
- Generally carrot flowers are perfect, small or white or occasionally greenish white or light yellow. Flowers usually open first at the periphery of the primary umbel. The primary umbel is produced at the terminal end of the main floral stem.
- Uproot the plant and observe the roots. The root length of most of the cultivars ranges between 10 and 25 cm. Roots are orange, yellow, red, purple and white - fleshed. Root shape of many carrot cultivars is conical, but the extent of tapering varies as per cultivars.



Carrots

Radish (*Raphanus sativus*)

Family : Brassicaceae

- The plant of the radish is erect, herbaceous that grow up to 40 inches.
- Leaves are arranged in a rosette, with sizes ranging from 10-15 cm in small cultivars to up to 45 cm in large cultivars. Leaves have a lyrate shape i.e. divide pinnately with an enlarged terminal lobe and smaller lateral lobes.



Radish

- Radishes make the swollen part of the roots which is edible. Roots are round to cylindrical with a color ranging from white to red.

- The white flowers are borne on a racemose inflorescence. The flower of the radish has four white petals with rose, purple, or yellowish veins. The flower are usually bisexual.
- The fruit of the radish is a round pod-like structure called as siliqua.

Turnip (*Brassica rapa*)

Family : Brassicaceae

- The leaves grow directly from the above-ground shoulder of the root, with little or no visible crown or neck. The edge of leaf blade has lobes. Leaves are light to medium green, hairy or bristly and lyrate-pinnatifid.
- Turnip root is mostly white-skinned apart from the upper portion which protrudes above the ground and are purple, red, or greenish wherever sunlight has fallen. This above-ground part develops from stem tissue, but is fused with the root. The root is roughly conical to globular with interior white flesh
- Flowers are yellow in colour. Sex form is similar as that of radish.
- Fruit bearing seed is called as siliqua with long tapering beak.



Turnip

Fenugreek- *Trigonella foenum-graecum* (Common methi) and *Trigonella corniculata* (Kasuri methi)

Family : Fabaceae

- Fenugreek is of two types viz., common methi and kasuri methi. The common methi has quick growing upright plants whereas kasuri methi is slow growing and remains in rosette condition.
- Carefully observe the leaves they are alternate, trifoliate, and lanceolate and leaflets are shortly stalked blunt and oblong.



Common methi

Kasuri methi

- Leaves of common methi are light green in colour and that of kasuri methi are dark green in colour.
- Observe the flowers of the fenugreek. Flowers are sessile, solitary in the axils of the leaves. Flowers of kasuri methi are yellow in colour and that of common methi are white or light violet.
- Taste of the leaves is bitter with peculiar odour.
- The pods of common methi are straight, long and slender with a prominent beak and that of kasuri methi are sickle shaped.

Spinach (*Spinacia oleracea*)

Family : *Chenopodiaceae*

- Observe the plant of the spinach. It forms clumps of long-stemmed leaves that can grow up to 12 inches long and 18 inches wide at maturity.
- Look at the leaves of the spinach. The edible leaves are arranged in a rosette from which a seed-stalk emerges. The leaves are alternate, simple, ovate to triangular-based with very variable in size
- Observe the flowers of the spinach. The flowers are inconspicuous, yellow-green, maturing into a small, hard, dry, lumpy fruit cluster containing several seeds.



Spinach beet

Exercises

1. Identify the vegetable plants growing in the vegetable farm on the basis of morphological characters and record your observations in the data sheet.
2. Identify the following vegetable plants



1. _____



2. _____



3. _____



4. _____



5. _____

Data sheet (Exercise 1)

Crop	Leaf characteristics (size, shape, colour, pubescence etc)	Stem characteristics	Flower/ inflorescence characteristics (Colour, size, type)	Fruit characteristics (size, shape, colour)
Summer Season vegetables				
Tomato				
Brinjal				
Okra				
Chilli				
Bell pepper				
Cow pea				
French bean				
Winter season vegetables				
Garden pea				
Cauliflower				
Cabbage				
Broccoli				
Spinach				
Radish				
Carrot				
Turnip				