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VEGETABLE CROPS

‘Eating colourful vegetables protects against various diseases and sharpens the eyes and mind’. As discussed in the previous lesson, vegetables are part of horticulture, and their scientific cultivation falls under olericulture. The term ‘Olericulture’ refers to a branch of horticulture that deals with the commercial cultivation, marketing, storage and value addition of vegetable crops. It is derived from the Latin words: ‘*Olus*’ means cabbage and ‘*cultura*’ means cultivation. Vegetables are short duration crops with high yield potential per unit area and time. India has diverse agro-climatic regions, ranging from sub-tropical to temperate, which are suitable for growing different kinds of vegetables throughout the year.



LEARNING OUTCOMES

After studying the lesson, the learner:

- differentiates between vegetable and fruit crops;
- summarizes the scope of vegetable cultivation in India;
- explains different types of vegetable gardens;
- describes the method to develop a vegetable nursery; and
- tabulates the cultivation techniques of common vegetables grown in India.

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Sr. No.	Vegetable crops	Fruit crops
1	Vegetables are mostly annual in nature	Fruits are mostly perennial in nature
2	Vegetables are generally herbaceous or have non-woody stem	Fruits generally have woody stem
3	Vegetables are eaten in raw, cooked or processed forms	Fruits are typically eaten in raw form
4	Vegetables are low in sugar	Fruits are high in sugar
5	Mostly vegetables are propagated by seeds	Mostly fruits are propagated by vegetative means i.e., cutting, grafting or budding
6	Vegetables are planted closely to each other i.e. within centimeters	Fruits are planted at wider distances i.e. meters apart
7	More labour is required for vegetable cultivation	Less labour is required for fruit cultivation
8	Vegetables are consumed at an immature and tender stage	Fruits are consumed at the ripe stage

**INTEXT QUESTIONS 10.1**

1. Olericulture is an important branch of
2. The branch of science that deals with the commercial cultivation, improvement and, value addition of vegetable crops is:
 - a. Pomology
 - b. Olericulture
 - c. Arboriculture
 - d. Floriculture



3. The word 'Olericulture' is derived from Greek language (True/False).
4. In nature, vegetables are mostly
 - a. Annual
 - b. Biennial
 - c. Triennial
 - d. Perennial
5. Vegetables have or type of stem.
6. The sugar content in vegetables is compared to fruits.

10.2 IMPORTANCE AND SCOPE OF VEGETABLE CULTIVATION IN INDIA

Indians mostly follow a vegetarian diet, and vegetable cultivation in India has tremendous scope for the following reasons:

- **Sources of nutrients:** Vegetables are also called 'protective foods' as they provide essential nutrients and antioxidants to our body that protect us from various diseases.

Sr. No.	Nutrients	Function	Vegetable Source	Deficiency disorder
1.	Carbohydrate	Provide energy	Potato, Sweet potato, Cassava, Yams	Growth retardation
2	Proteins	Formation of amino acid	Peas, cowpea and beans	Kwashiorkor disorder (Potbelly)
3	Calcium	Bone/teeth formation	Spinach, Coriander, Fenugreek, Amaranthus, Drumstick	Brittle bone and teeth
4	Iron	Essential component of hemoglobin	Drumstick leaves, mint, Spinach, Coriander, Fenugreek, Amaranthus	Anemia
5	Vitamin A	Overall health of body, eye health	Orange/yellow-colored vegetables viz., Carrot, Sweet Potato, Pumpkin, Tomato	Night blindness, dry skin

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Sr. No.	Nutrients	Function	Vegetable Source	Deficiency disorder
6	Vitamin B complex	Important for nervous system, helps in heart functioning	Pea, Bean, Garlic, Tomato, Colocasia	Beriberi, Ulcer, sore tongue
7	Vitamin C	Essential for growth and disease resistance	Cabbage, cauliflower, Turnip, Tomato, Drumstick	Scurvy, loss of energy
8	Vitamin D	Health of bone and teeth	Leafy vegetables	Fragile bone and teeth
9	Vitamin E	Antisterility	Cabbage, Lettuce, Spinach	Affects fertility
10	Cellulose and Fiber	Helps in digestion	Okra, Leafy vegetables, Root crops	Constipation

- **Balanced diet:** Vegetables are key ingredient of a balanced diet. They provide dietary elements, minerals, protective nutrients and to some extent energy. According to the Indian Council of Medical Research (ICMR), New Delhi, an average adult should consume 300-350g/day of different type of vegetables (*i.e.* leafy, tuber and other vegetables) to obtain the necessary nutrients and minerals. Vegetables enhance the palatability of a diet through their attractive colour, taste, texture and flavour.
- **Prebiotic source:** Vegetables are also a source of prebiotics. Prebiotics are substances found in foods that feed probiotics (beneficial micro-organisms present in the gut). Tomato, onion, garlic, leek, etc. are the important sources of prebiotics.
- **Short duration:** Most vegetables are annuals, completing their crop cycle in one season, except for a few such as onion and carrot (biennial), and drumstick, ivy gourd (perennial). Examples of short duration vegetables include radish, green onion, spinach, fenugreek, and coriander, etc.



- **Higher yield:** Vegetable crops have higher yield (4-5 times) per unit area and time compared to most cereals, millets and oilseeds. For example, wheat yields 20-25q/ha, and paddy yields 25-30q/ha, while potato yields 150-200q/ha, and cauliflower yields 125-175q/ha. The yield of vegetables grown in polyhouses can exceed 500q/ha.
- **Suitable for diversification:** Due to their short duration, vegetables fit well into any cropping system and help to diversify the cropping systems. Diversification provides extra income, improves soil health and reduces the incidence of insect-pests and diseases.
- **Higher employment:** Compared to cereals and other crops, vegetable cultivation generates higher employment due to their short duration and increased frequency of intercultural and farm operations, which are mostly done manually.
- **High export potential:** Due to diverse agro-climatic conditions, high quality vegetables can be produced year-round in different parts of India. Vegetables are also ideal crops for protected cultivation, boosting their export potential. The pesticide residue free and quality vegetables are being exported to European, African and Middle Eastern countries.

**INTEXT QUESTIONS 10.2**

1. Carbohydrates provide to the human body.
2. Which of the following vegetables is a source of proteins for our body?

a. Pea	b. Potato
c. Cabbage	d. Carrot
3. Deficiency of which element makes bone and teeth brittle?
4. Anemia can be prevented by adequate supplementation of theelement.
5. Which vitamin is also known as antisterility vitamin?
6. According to ICMR, New Delhi, the dietary consumption of vegetables for an adult should be:

a. 50 g/day	b. 100 g/day
c. 250 g/day	d. 350 g/day

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7. Probiotics are harmful microorganisms present in the gut that help to decrease digestion (True/False).

10.3 CLASSIFICATION OF VEGETABLES

Over 10,000 plant species are consumed as vegetables worldwide, with around 50 being commercially cultivated. Therefore, it is important to classify vegetables for better understanding. Among the various methods of classification, botanical classification, classification based on life cycle, and culture are the most commonly followed.

Botanical classification: This is a universally accepted classification. All vegetables belong to Angiospermae division and are divided into two classes: Monocotyledoneae and Dicotyledoneae. Vegetables in the Monocotyledoneae class have fibrous root systems and parallel leaf venation, while those in the Dicotyledoneae class have tap root systems and net like leaf venation. The botanical classification of important vegetables is given in Table 10.1.

Table 10.1: Botanical classification of vegetables

Family	English name	Botanical name
Monocotyledoneae		
Alliaceae	Onion Garlic	<i>Allium cepa</i> <i>Allium sativum</i>
Araceae	Arvi or taro	<i>Colocasia esculenta</i>
Dicotyledoneae		
Chenopodiaceae	Spinach Beetroot	<i>Spinacia oleracea</i> <i>Beta vulgaris</i>
Convolvulaceae	Sweetpotato	<i>Ipomoea batatas</i>
Cruciferae	Cabbage Cauliflower Radish	<i>Brassica oleracea</i> var. <i>capitata</i> <i>Brassica oleracea</i> var. <i>botrytis</i> <i>Raphanus sativus</i>
Cucurbitaceae (Gourd Family)	Cucumber Muskmelon Watermelon	<i>Cucumis sativus</i> <i>Cucumis melo</i> <i>Citrullus lanatus</i>



Family	English name	Botanical name
Fabaceae/Leguminosae	Pea	<i>Pisum sativum</i>
	Cowpea	<i>Vigna unguiculata</i>
	Cluster bean	<i>Cyamopsis tetragonoloba</i>
Malvaceae	Okra or lady's finger	<i>Abelmoschus esculentus</i>
Solanaceae	Potato	<i>Solanum tuberosum</i>
	Eggplant or brinjal	<i>Solanum melongena</i>
	Tomato	<i>Solanum lycopersicum</i>
	Chilli	<i>Capsicum annuum</i>
Apiaceae	Carrot	<i>Daucus carota</i>
Moringaceae	Drumstick	<i>Moringa oleifera</i>

Classification based on culture: In this system of classification, vegetables are grouped according to their requirements for cultural operations. Crops requiring similar cultural practices are placed in the same group. This method of classification is particularly important for farmers and students from cultivation and study point of view, respectively. Based on cultural practices, vegetable crops are grouped as follows:

- **Root vegetables:** These crops are cultivated primarily for their fleshy roots, which are found underground. These vegetables are mostly grown during the winter season and are planted on ridges, e.g., carrot, radish, turnip and beetroot, etc.
- **Cole crops:** These crops are mostly transplanted and cultivated during the winter season, e.g., cabbage, cauliflower, broccoli, and knolkhol, etc.
- **Leafy vegetables:** Crops in this group are typically directly sown at closer spacing for succulent leaves, e.g., spinach, fenugreek, coriander, etc.
- **Cucurbitaceous vegetables:** These crops are also known as gourd family crops. These are warm season vegetables and mostly grown in the summer season. They have vine type plant growth. This group includes crops that can be consumed as salads (cucumber, long melon), desserts (muskmelon, watermelon), cooked dishes (pumpkin, gourds), and for making petha (ash gourd).

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- **Solanaceous crops:** These are mostly summer season transplanted crops and cultivated for their fruits, e.g. tomato, capsicum, chilli and brinjal.
- **Peas and beans:** These are pod vegetables that belong to the leguminosae family. Members of this group have tendrils as modified leaf structure, e.g. pea, cowpea, cluster bean and french bean, etc.
- **Bulb crops:** These crops have modified stem (bulb) that is consumed as vegetables, e.g. onion, garlic, etc.
- **Tuber crops:** These vegetables are cultivated for their fleshy underground tubers, e.g. potato, sweet potato, and cassava, etc.

Classification based on life cycle: Different vegetables require varying amounts of time to complete their life cycles. Therefore, vegetables can be grouped into three categories viz., annuals, biennials and perennials. Most vegetables are annuals in nature, i.e., they complete their life cycle in a single growing season or one year. Crops that require two consecutive growing seasons to complete their life cycle (producing seeds) are called biennial vegetables. Perennial vegetables are sown/planted just once and, after a certain period, continue to yield their economic parts (vegetables) year after year, e.g., drumstick (Moringa), asparagus, artichoke, Malabar spinach, colocasia. Perennial vegetables can be grown from three to 15 years depending on their economic yield.

**INTEXT QUESTIONS 10.3**

1. Vegetables belong to the division of the plant kingdom.
2. Vegetables in the Monocotyledoneae class have a type root structure and leaf venation.
3. Give two examples of vegetables from the Alliaceae family.
4. Cauliflower is a
 - a. Root crop
 - b. Cole crop
 - c. Tuber crop
 - d. Fibre crop
5. Potato, chilli, brinjal and tomato belong to the plant family
6. Which family of plant has a modified leaf structure called tendrils?

7. What is another name for cucurbitaceous family crops?
8. Based on life cycle, how many types of vegetables are classified ?

10.4 TYPES OF VEGETABLE GARDENS

On the basis of purpose and method of cultivation, the vegetable garden / cultivation can be grouped into the following six types:

1. **Home or kitchen garden:** This type of garden is located in and around the house to meet daily requirement of fresh vegetables for the family. The purpose of such gardens is to harvest pesticide free fresh vegetables. Soil based home gardens can vary in size and shape depending upon availability of space. They may be as small as 6m × 6m size (**Fig. 10.1**) or as large as 25m × 10m. In urban and peri-urban areas, kitchen gardening using agro-waste media such as cocopeat or compost is being practiced (**Fig. 10.2**). These models provide around 250-300 kg of vegetables year round, which is sufficient for a family's needs.



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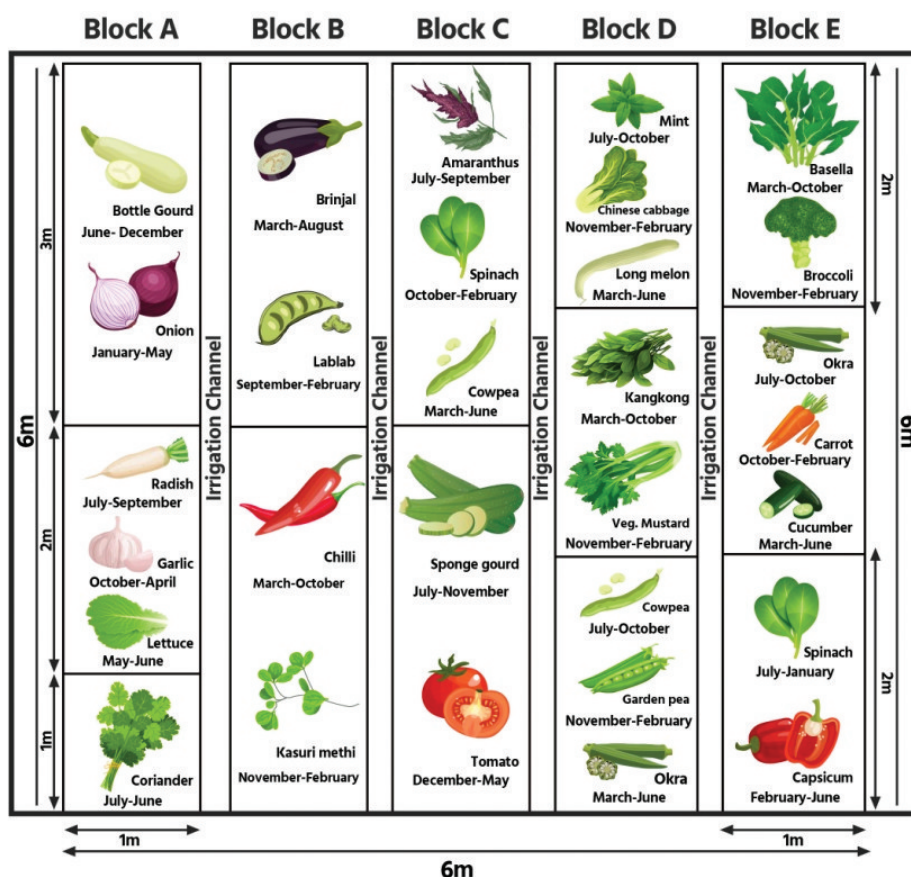


Fig. 10.1: Soil based vegetable nutrition garden model (6m × 6m)

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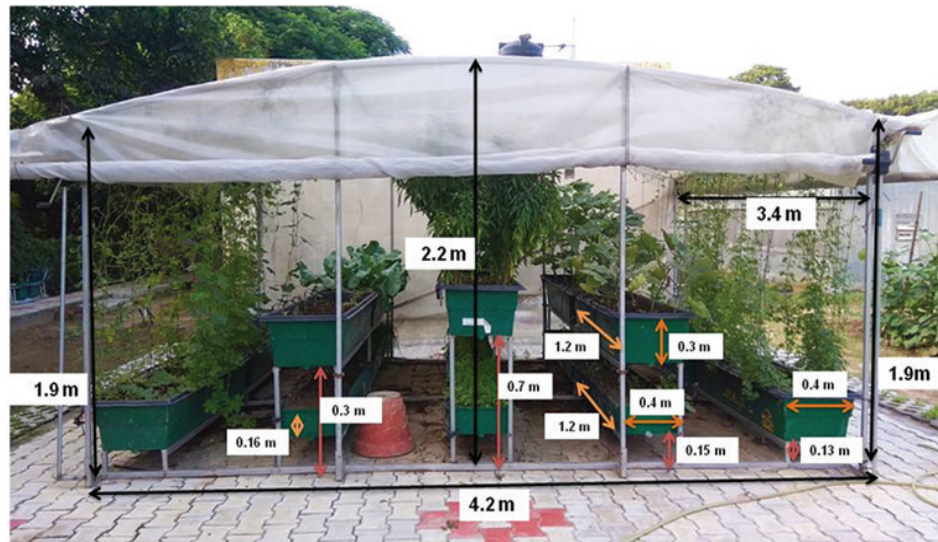


Fig. 10.2: Vegetable nutrition garden model using agro-waste (compost) plant growing media

2. **Market garden:** These gardens supply vegetables to the local market. They are mostly located within 15-30 km of cities, allowing farmers to quickly sell their produce due to proximity to the market and higher demand. Such gardens follow intensive cultivation practices and use higher inputs such as fertilizers and pesticides to maximize yield. Soil fertility is generally maintained through municipal compost.
3. **Truck garden:** This type of garden produces one or two specific crops in large quantities for distant markets. These gardens practice extensive cultivation over large areas using special techniques. The produce is sold in distant markets or cities, often hundreds of kilometres away, typically through middlemen.
4. **Vegetable garden for processing:** These gardens specifically produce vegetables for processing industries. Various vegetables are processed into products such as ketchup, sauces, puree, canned, frozen, or dehydrated products. In such gardens, specific varieties of crops are grown over large areas to ensure bulk supply, usually through contract farming.
5. **Vegetable forcing:** Forcing refers to growing vegetables outside of their normal growing seasons. In India, cucurbits are often cultivated on riverbeds before their usual cropping season. Protected structures such as polyhouses, net houses, and low tunnels are widely used to grow vegetables out of season.



6. **Organic vegetable garden:** Due to the adverse effects of chemical farming on soil, human and animal health, organic vegetable cultivation is gaining popularity among the consumers. The basic principle of organic farming is to feed soil but not the plant directly. In this type of garden, synthetic (inorganic) fertilizers and pesticides are replaced with natural sources such as farm yard manure, vermicompost, and plant based biopesticides.

**INTEXT QUESTIONS 10.4**

- Depending on the purpose and method of cultivation, vegetable gardens are grouped into
 - 2
 - 4
 - 6
 - 8
- Which type of garden is found around residential houses?
- What is the purpose of market garden located near cities?
- Extensive cultivation systems (use of low input) are followed in gardens.
- Give one example of a vegetable used for vegetable forcing.
- In which type of garden synthetic chemicals and fertilizers are replaced with natural resources?
- The basic concept of organic farming is to feed but not directly.

10.5 NURSERY RAISING OF VEGETABLES

Nursery raising is a fundamental step in successful vegetable production. Its goal is to produce healthy and vigorous seedlings. A healthy nursery is the first and essential requirement to achieve the potential yield of a crop. It requires a smaller area; for example, a tomato nursery grown in 100m² area will be sufficient to transplant into one hectare area. A smaller area also facilitates the management of land, water and labour. Additionally, it allows enough time for field preparation after harvesting the preceding crop.

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The vegetable nursery should be located in an area close to a water source and free from permanent shade. The land should not have water stagnation during rains and should be free from insect-pests (e.g., termites, nematodes) and diseases (e.g., damping off). The site should also be protected from stray animals. Different methods of nursery raising can be used, including soil-based, plug tray, and polybag-based nurseries. Differences among these nursery raising methods are given in Table 10.2.

Table 10.2: Differences amongst different nursery raising methods

Sr. No.	Soil nursery	Plug tray	Polybag
1.	Soil is used as growing media	Cocopeat: Perlite: Vermiculite (3:1:1) used as growing media	Soil + Farmyard Manure (FYM) (1:1) is used as growing media
2	Raised bed (15-20cm) are formed (Fig. 10.3)	Plastic plug tray is used (Fig. 10.4)	Polyethylene bags of 10 cm × 15 cm are used (Fig. 10.5)
3	Weed problem is there	No weed problem	Weed problem is there
4	Soil borne diseases may occur	No incidence of soil borne diseases	Soil borne diseases may occur
5	Soil sterilization with formaldehyde (1.5-2%) or soil solarization (hotter month i.e. April-June)	No need for sterilization	Soil sterilization can be done
6	Normal season nursery can be raised	Early nursery can be raised	Early nursery can be raised
7	Line sowing is followed	Single seed is placed in each cell	2-3 seeds are placed in each bag

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Sr. No.	Soil nursery	Plug tray	Polybag
8	Competition between plants will be there	No competition between plants	No competition between plants
9	Thinning of weak and diseased plant is required	No need of thinning	Thinning can be done
10	Hardening treatment is required	No hardening is required	Hardening treatment is required
11	Roots may damage while uprooting plant	No roots will damage while uprooting plant	No roots will damage while uprooting plant
12	Examples include all vegetables, except cucurbits	Examples include all vegetables, especially F_1 hybrids	Examples include mostly cucurbits



Fig. 10.3: Raising of onion nursery by raised bed method with line sowing

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Fig. 10.4: Raising of cucurbit nursery in plug tray method



Fig. 10.5: Raising of cucurbit nursery in polybag method

10.5.1 Protection of Nursery with Low Tunnels

Plastic low tunnels (low tunnel technology) are a miniature form of greenhouse that work on the principle of trapping long wave radiation and minimizing the exchange of temperature, humidity, and other environmental factors with the outside environment. These tunnels protect plants from low temperature, frost, rain, wind and other unfavourable conditions. Seeds sown in low tunnels or young plants covered with low tunnels can be protected from frost during winter. These tunnels are typically removed

during the month of February. For construction, 2m iron rods or bamboo sticks are bent into a semi-circle shape and fixed around the bed width, then covered with a polyethylene sheet (Fig. 10.6). This technology is primarily recommended for the early raising of vegetable nurseries or the early cultivation of crops.



Fig. 10.6: Plastic low tunnel for vegetable cultivation



INTEXT QUESTIONS 10.5

- raising is the basic step in successful vegetable production.
- The nursery area should be located in and near a source.
- Soil solarization can be done during
 - April-June
 - January - March
 - July - September
 - October – December
- Soilless nursery growing media in the plug tray method is::
- Which type of technology is used to protect young seedlings from rain, wind, low temperatures, frost, and other unfavourable weather conditions?

10.6 CULTIVATION OF VEGETABLES

In general, bold seeded vegetables such as okra, pea, and cowpea can be sown directly in the main field at recommended spacing during their growing seasons. However, seedlings of small seeded vegetables are raised in a nursery before being transplanted into the main field. Generally, 2-3 ploughings are required for land preparation. The recommended quantity of compost or farm yard manure (FYM) should be added at the time of the first ploughing. The crop-wise recommended doses of phosphorous and potassium fertilizers along with half the dose of nitrogen should be



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applied just before final ploughing or ridge making. The remaining half dose of nitrogen should be applied either all at once or in two equal split doses to minimize leaching losses of nitrogen from the root zone. Direct sowing can be done throughout the day, but seedlings should be transplanted in the evening. A light irrigation should be applied immediately after transplanting to avoid transplanting shock and support the field establishment of the seedlings. After transplanting, timely irrigation, fertilizer application (remaining dose), training and pruning (in cucurbits, beans, and indeterminate tomato), earthing up (in potato, cauliflower, etc.), weeding, intercultural operations, insect-pest and disease management and harvesting activities should be performed efficiently for each crop. A summary of cultivation practices for important vegetables is given in Table 10.3.

Table 10.3: Summary of cultivation practices of important vegetable crops

Crop	Variety/hybrid	Seed Rate (g/acre) and Sowing time	Spacing level	Approximate Yield (q/acre)
Muskmelon	Variety: Arka Jeet, Pusa Madhuras, Punjab Sunehri, Hara Madhu Hybrid: Pusa Rasraj, MH-51, MH-27	400 gLast week of Jan-1 st week of Feb	3m×60 cm	90.0
Watermelon	Variety: Sugar Baby, Durgapura Kesar Hybrid: Pusa Bedana (seedless), Arka Manik, Arka Jyoti	1.5-2 kgLate Jan-1 st week of Feb	2.5-3m×60 cm	70.0
Cucumber	Variety: Poinsett, Punjab Kheera-1, Punjab Naveen Hybrid: Pusa Sanyog	1.0 kgLate Jan-1 st week of Feb	1.5-2m×45-60cm	350

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Crop	Variety/hybrid	Seed Rate (g/acre) and Sowing time	Spacing level	Approximate Yield (q/acre)
Tomato	Variety: Pant Bahar, Arka Saurabh, Roma, PVB-1, PVB-2, PVB-4, Punjab Ratta, Punjab Sona Cherry Hybrid: Pusa Ruby, Pusa Divya, Arka Vardan, TH-1 & PTH-2	100 g July, Sept and Oct	75cm×30 cm	Open field: 250 Protected Condition: 1000 Cherry type: 400
Brinjal	Variety: Pusa Purple Long, Arka Shirish, Arka Kusumkar, Punjab Raunak, Punjab Bharpoor Hybrid: Pusa Kranti, Arka Navneet, PBH-3, PBH-4	300-400g June, Oct, Nov & Feb-March	67.5cm×30-45cm	Variety: 150 Hybrid: 250
Chilli	Variety: Arka Lohit, Punjab Sindhuri, Punjab Tej, Bhagyalaxmi Hybrid: Pusa Jwala, Pant C-1, CH-52, CH-27	200g Oct-Mid Nov Feb-March	75cm×45cm	Variety: 70 Hybrid: 100
Okra	Variety: Pusa Makhmali, Punjab Suhawani, Punjab 8, Punjab 7, Pusa Bhindi 5 Hybrid:	4-6 kg June-July	45cm×15cm	50

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Crop	Variety/hybrid	Seed Rate (g/acre) and Sowing time	Spacing level	Approximate Yield (q/acre)
	Pusa Sawani, Arka Abhay, Arka Anamika			
Onion	Kharif: Arka Kalyan, Agri Found Dark Red, N-53 Rabi : Nasik Red, Arka Pragati, Pusa Ratnar, Punjab White, Punjab Naroya	4-5 kg Kharif: Sowing mid of June Rabi: Nursery Oct-Mid Nov	15cm×7.5cm	Kharif: 120 Rabi: 160
Pea	Early: AP-3, Arkel Main: Mithi Phali	Early: 45 kg Main: 30 kg	30cm×7.5cm	Early: 30 Main: 60
Cole group	Cauliflower: Pusa Meghna, Pusa Sharad, Pusa Himjyoti, Pusa Snowball-1, Pusa Snowball Kt-25 Cabbage: Golden Acre, Pusa Ageti, Pusa Drumhead, Pusa Mukta Broccoli: Palam Samridhi, Pusa KTS-1	Cauliflower: 200-250g Cabbage: 200g Broccoli: 250g	45cm×45cm	Cauliflower: 90-120 Cabbage: 80-100 Broccoli: 60-70
Potato	Early Season: Kufri Ashoka, Kufri Surya Mid Season: Kufri Jyoti, Kufri Lalima Late Season: Kufri Badshah, Kufri	13-18 q/acre	60cm×20cm	Early: 100 Mid: 150 Late: 125 Processing: 165

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Crop	Variety/hybrid	Seed Rate (g/acre) and Sowing time	Spacing level	Approximate Yield (q/acre)
	Megha Processing: Kufri Frysona, Kufri Chipsona-1			
Root Crop	Radish: Arka Nishant, Pusa Chetki, Pusa Himani Carrot: Pusa Rudhira, Pusa Kesar, Pusa Yamdagini Beet root: Crimson Globe, Early Wonder	Radish: 4 kg Carrot: 4 kg Beet Root: 3 kg	45cm× 7.5cm	Radish: 140-150 Carrot: 180-200 Beet root: 250-300

**INTEXT QUESTIONS 10.6**

- seeded vegetables are sown directly in the main field.
- When FYM or compost is incorporated into the soil?
- Why nitrogenous fertilizer is applied in split doses to field?
- Intercultural operation specifically followed in potato and cauliflower crops is:
 - Training
 - Pruning
 - Retting
 - Earthing up
- Which is the seedless variety of watermelon?
 - Sugar Baby
 - Pusa Bedana
 - Arka Manik
 - Durgapura Kesara
- Cucurbits are mostly sown during months.

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Notes**WHAT YOU HAVE LEARNT**

- Olericulture, derived from Latin words, is a branch of horticulture that deals with the commercial cultivation, improvement and value addition of vegetable crops.
- Vegetables are closely planted annual, biennial or perennial crops with non-woody stem (sometimes woody, as in certain perennial vegetable plants, e.g. Moringa). They can be eaten raw or cooked and are low in sugar.
- Vegetables are the good source of nutrients and pre-biotic and thus help in providing a balanced diet. These short duration crops have higher yields and their cultivation generates employment opportunities. Vegetables also help diversify cropping systems and have high export potential.
- Vegetables are classified on the basis of botanical families (mostly acceptable), cultural practices and life cycle.
- Based on purpose and cultivation, vegetable gardens can be of several types: home (for family), market (nearby city), truck (distant market), processing (industry), forcing (off season cultivation), and organic (no chemical use) gardens.
- Nursery raising is a basic step of vegetable cultivation where small seeded crops are sown, and special care must be taken. After attaining proper age, seedlings are transplanted into the main field.
- Of the three methods of nursery raising i.e. soil, plug tray, and polybag based nurseries, the plug tray method is most commonly used as it provides seedlings with enough space and nutrients for growth.
- Low tunnel technology is a mini greenhouse that protects plant from adverse climatic conditions.
- Land preparation, nursery raising, fertilizer application and various intercultural operations are crucial for producing high quality vegetables and achieving higher prices.

**TERMINAL QUESTIONS**

1. Define Olericulture. Write down the difference between vegetables and fruits.
2. What are the importance and scope of vegetable cultivation in India?
3. Why are vegetables called protective food? Describe with suitable examples.
4. Describe different ways of classification of vegetables with suitable examples.
5. What are the different types of vegetable gardens? Explain briefly.
6. What is nursery raising? Describe steps involved in nursery raising.
7. Briefly describe the advanced method of nursery raising.
8. What are low tunnel technology and its principle? How to construct it?
9. Describe the cultivation practice of Muskmelon, Tomato, Chilli and Potato under the following heads:
 - i. Variety/hybrid
 - ii. Spacing
 - iii. Seed rate and Sowing time
 - iv. Fertilizer
 - v. Yield
10. Describe the cultivation practice of Onion, Pea, Watermelon and Cauliflower under the following heads:
 - i. Variety/hybrid
 - ii. Spacing
 - iii. Seed rate and Sowing time
 - iv. Fertilizer
 - v. Yield

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Notes**ACTIVITY**

1. Visit nearest vegetable garden and fruit orchard and record visual differences on the basis of leaf, stem, fruits, spacing between plants, etc.
2. Collect pictures of different vegetables as classified on the basis of culture, i.e. root crops, cole crops, leafy vegetables, cucurbitaceous crops, solanaceous crops, bulb crops and tuber crops.
3. Plan a soil based vegetable nutrition garden model around your house (as given in Fig. 10.1) according to suitable growing season.

**ANSWERS TO INTEXT QUESTIONS****10.1**

1. Horticulture
2. Olericulture (Option b)
3. False
4. Annual (Option a)
5. Herbaceous, non woody
6. Low

10.2

1. Energy
2. Pea (Option a)
3. Calcium
4. Iron
5. Vitamin E
6. 350 g/day (Option d)
7. False

10.3

1. Angiospermae



2. Fibrous root, parallel leaf venation
3. Onion and Garlic
4. Cole crop (Option b)
5. Solanaceae
6. Leguminosae
7. Gourd crop
8. Three types

10.4

1. Six
2. Home/kitchen garden
3. To supply vegetables in local market
4. Truck garden
5. Cucurbits
6. Organic garden
7. Soil, plant

10.5

1. Nursery
2. Shade free, water source
3. April-June (Option a)
4. Cocopeat: Perlite: Vermiculite
5. Low tunnel technology

10.6

1. Bold seeded
2. At last ploughing during land preparation
3. To avoid leaching loss of nutrients
4. Earthing up (option d)
5. Pusa Bedana (option b)
6. January-February

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Notes

GLOSSARY

Earthing-up: It is an intercultural operation in which soil is picked up and placed near the stem of a plant to cover its roots.

Hardening: This refers to the process of stopping irrigation to avoid transplanting shock and reduce mortality of young seedlings.

Hi-tech nursery: This involves the production of nursery plants in enclosed structures such as polyhouses or net houses, providing suitable environmental conditions for the growth of young seedlings.

Intercultural operation: These are cultural operations performed from sowing or transplanting to harvesting, especially when the crop is in the main field.

Olericulture: Olericulture is a branch of horticulture that deals with the commercial cultivation, improvement, and value addition of vegetable products.

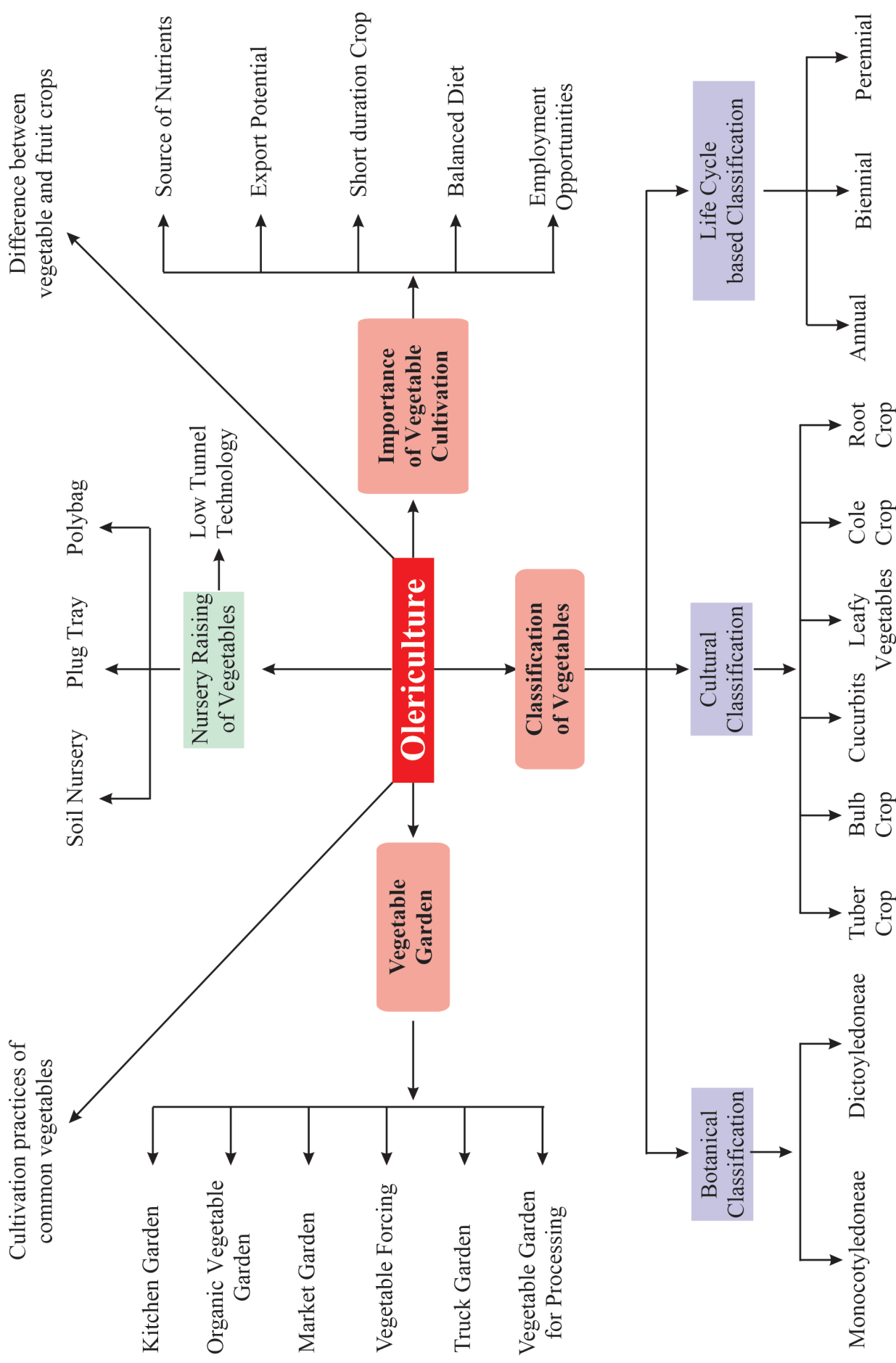
Prebiotics: Prebiotics are substances that increase beneficial micro-organisms in the human gut.

Vegetable forcing: This involves growing vegetables outside their normal growing season using various structures, such as greenhouses or low tunnels.

SUGGESTED READINGS

1. Choudhary, B. (2003). *Vegetables*, National Book Trust, New Delhi.
2. Chadha, K. L. (2019). *Handbook of Horticulture* (Vol. I & II), ICAR Publication, New Delhi.
3. Thamburaj, S. and Singh, N. (2014). *Textbook of Vegetable Tuber Crops and Spices*, ICAR Publication, New Delhi.

WHAT YOU HAVE LEARNT





NOTE

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