



Raising Plants in Containers

A Need For Urban Horticulture

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All over the world, many people don't get enough food and proper nourishment due to overgrowing population and domestication towards urban areas. Domestication of the human being towards the urban areas not only increasing their proportion in towns but also decrease the available land and cause major constraints to sustainable crop production in and around cities. Adapting cultivation of horticultural crops in urban areas not only enhance the production of the produce but also improve the environmental conditions of the area by reducing pollution, temperature and provides fresh air. The increasing pollution and the rising temperature make it more imperative to take steps and support this urban gardening. It is of great significance to see greenery in the cities and towns. Cultivation of fruits, vegetables, flowers and other medicinal plants in urban areas will also increase the interest of coming generation towards horticulture. People will rely less on market produce and will consume their own cultivated products. Urban horticulture will occupy less space with more output and will also beautify the surroundings.

Selecting a container/types of container

Select as large a container as possible. Daily watering is required by small containers due to smaller size, less water holding capacity and drying out quickly. Time period between watering can be extended in self-watering planters which are designed for urban patios and balconies. Most importantly is to think about the depth of the container. Plants with deep root systems will be stunted and unhealthy if they don't have adequate space. Remember that the deeper the pot, the larger the

According to 1901 census, urban population in India was 11.4 per cent and after Independence urbanization comes on fast track as the country has adopted mixed economy, especially focusing on the private sector. This count increased to 28.53 per cent according to 2001 census, and crossing 30 per cent as per 2011 census, standing at 31.16 per cent. In 2017, the numbers increased to 34 per cent, according to the World Bank. World population report of 2007 of United States says that more than 40 per cent of the country's population is expected to move towards urban areas by 2030. As per World Bank, India, along with China, Indonesia, Nigeria and the United States will lead the world's urban population surge by 2050.

Urban gardening often means growing on rooftops, balconies, alleyways, sidewalks or whatever little space the gardener has available. Gardeners with physical disabilities find that growing vegetables in containers makes them far easier to reach and tend. In urban areas, growers save their harvest from rabbits, beer and woodchucks through container gardening.

reservoir of moist soil and the less often you'll need to water.

There are different varieties of containers according to their prices, colours, materials, shape and sizes and every container is having its particular advantages as well as disadvantages. One can classify the containers on the basis of porosity also *viz.* Nonporous (plastic, metal, fiberglass, glazed), Semi-porous (wood, pressed fiber) and Porous (pressed paper, clay, unglazed ceramic, terracotta)

Pressed Paper

Pressed paper containers are a great choice when dealing with vegetables or small rooted fruit plants. Better aeration, eco-friendly, biodegradable, well breather, promoting healthy root growth, tolerates temperature fluctuation without any harm to plants are some benefits of pressed paper with a single drawback that we have to replace pressed paper every year. Due to low cost, such pots are still an economically sound choice. Some pressed paper pots are now being lined with a wax coating, which gives them a slightly longer life span.

Coir

Coir containers are economically and ecologically sound choices. These planters are made from coconut husk and are sturdier than the pressed paper pots, but still keep the benefits for the paper pots. Other types are made from grain husks and various binding agents rather than coconut husks. These pots are inexpensive and can be found in a wide variety of colors and shapes, up to around a foot in diameter.

Ceramic

Ceramic containers or stoneware, are made from finely textured, light-colored clay and then glazed. These containers are fired at a high kiln temperature, which reduces the pot's porousness and vulnerability to the elements. However, if a ceramic pot is left out in the cold weather it can still crack. The down side to this durability is that the pots are quite heavy, although this factor makes them a good choice for plants that will grow to be top heavy. Although these planters come in wide range of colours, glazes, designs, shapes and size, but these are costly. The most preferred ceramic planters are of large size bowls.

Terracotta

A unique type of clay is generally used in making such pots and planters of various types of shapes and size called as terracotta. Size of terracotta pots can vary from two inches to as large as possible with various shapes and quite adjustable size. It gives soil like appearance to growers because it is having warm reddish colour. These type of pots are easily available and cost-effective, which is favoured by the gardeners and is used for indoor and outdoor conditions.

Terracotta pots are more delicate than other planting pots and are more permeable because it is mostly sold unglazed. During very cold winters, it is important to store any terracotta pots upside-down and indoors to prevent early destruction from the elements.

Fibre glass and Resin

A mixture of resin and glass fibers is used in making the fiberglass pots/planters and which are moulded in such a way that these looks like stone pots or terracotta. For better texture limestone of clay to the resin blend is also used by some manufacturers, but such pots are not ecologically friendly. Fiberglass planters are light weight, durable and look very much like the materials they are molded to imitate. These containers do not need any specific storage; they can handle any expected weather without having to be taken indoors.

Plastic

Plastic containers can also be made to look like other materials, but these are less realistic and durable. Because of the cheapest price, most of the plants that are bought from stores or from the nurseries are sold in plastic containers to commercial growers for use. Thicker versions of plastic planters can be made to look like stoneware or terracotta pots, but they do not have the

heft of the real thing. Plastic containers are of different shapes and sizes.

Wood

Wooden containers can look great in just about any outdoor or patio setting. A wooden container is of squared, rectangle or curved shapes and also depends upon requirement. Wood resists cracks and conserves moisture. The only disadvantage is that these containers can rot so to overcome this problem these are lined with plastics. Put some holes in the plastic for drainage.

Metal

Metal containers are extremely durable and in the case of case iron, extremely heavy.

Because of more longevity, light weight, rust resistance and cheaper generally aluminium metal is used than any other metals. Other metals which used are zinc, lead, copper and copper coated stainless steel.

Concrete

Concrete containers are very eye catching, especially when they have aged a little. Some plants needs strong support against wind making it difficult to move because of its higher sheer weight. Concrete also act as insulator because it protects roots from adverse temperature fluctuation.

Table 1 Container size required for fruit plants

Fruit crops	Container size
Apples	20-25 gallon
Blueberries	2 feet x 2 feet x 2 feet
Figs	10 gallon
Grapes	15 gallon
Peaches	20-25 gallon
Strawberries	8 inch deep container

Table 2 Container size required for vegetable crops along with varieties

Vegetable crops	Size of container	Varieties
Beans, snap	5 gallon window box	Bush 'Blue Lake', Bush 'Romano', 'Tender Crop'
Broccoli	1 plant/5 gallon pot, 3 plant/15 gallon pot	'DeCicco', 'Green Comet'
Carrot	5 gallon window box at least 12 inches deep	'Danvers Half Long', 'Short 'n Sweet', 'Tiny Sweet'
Cucumber	1 plant/1 gallon pot	'Patio Pik', 'Pot Luck', 'Spacemaster'
Egg plant	5 gallon pot	'Black Beauty', 'Ichiban', 'Slim Jim'
Lettuce	5 gallon window box	'Ruby', 'Salad Bowl'
Onion	5 gallon window box	'White Sweet Spanish', 'Yellow Sweet Spanish'
Pepper	1 plant/2 gallon pot, 5 plant/15 gallon pot,	'Cayenne', 'Long Red', 'Sweet Banana', 'Wonder', 'Yolo'
Radish	5 gallon window box	'Cherry Belle', 'Icicle'
Tomato	Bushel basket	'Early Girl', 'Patio', 'Small Fry', 'Sweet 100', 'Tiny Tim'

Potting Mixes, Substrates, or Growing Media

The soil or media which is used to grow container plants is actually not the soil. True soils are field soils that often retain too much water, have too little pore space (for oxygen), are too heavy, and potentially harbour harmful diseases, insects, and weeds. Because of these drawbacks, field soils are no longer used for growing plants in containers.

Mainly soilless substrates are used to grow container plants. Most soilless potting mixes are free of insects, diseases, and weeds and are ready to use immediately. Perlite, vermiculite, sphagnum moss and bark of pine either individually or in combination is most widely used ingredients.

1. Perlite

Perlite is a white, heat-treated, expanded volcanic rock used to improve drainage. Because of light weight and easy mobility pea gravel has been replaced by perlite. While growing fluoride sensitive plants perlite should not be used as growing media because perlite is known to have fluoride in it.

2. Pine bark

Pine bark has large particles, making it good for aeration in a potting mix. If it is allowed to dry out than re-wetting of bark is very difficult.

3. Sand

Sand was once used extensively but is now often replaced with lighter-weight products, such as perlite. It provides low aeration due to its less water holding capacity. It is useful in stopping heavy metals from tipping over because practically it imparts counter weight to top heavy metals. In place of fine playground sand, coarse builders sand should be used. Due to lower nutrient material and large particle size of playground sand. The potting mix must be almost 50 per cent sand by total volume to drain quickly.

4. Sphagnum peat moss

It is the decaying matter in a peat bog. It is not sustainable source though it increases both water holding capacity and nutrients.

5. Vermiculite

Vermiculite is a heat-treated, expanded clay mineral that absorbs water and attracts nutrients when wet.

Potting mixes sometimes include other ingredients:

a. **Compost** benefits include good water-holding capacity, disease suppression, and the addition of nutrients and organic matter. Depending upon the matter of plants or waste of animals that was used in making it, nutritional value of compost differs. Because many types of compost have a pH over 7.0, it is best to limit the amount of compost to between 15 per cent and 40 per cent of the total container mix. Composted grass clipping of lawns should not be used

which are treated with herbicides because some herbicides may persist in composting cycle and can affect the plants.

b. **Pasteurized soil** has been heated to 82.2°C for 30 minutes to kill most diseases, weed seeds and insects. It should be taken in mind that when we heat soil at home then it doesn't emit any odour.

c. **Sedge peat** is a granular material made of partially decomposed sedges. As it

compacts easily and is poor in drainage so it should not be used in containers. A different combination of soilless potting mix is available which make great growing mixes.

Common mixtures consist of these proportions:

- 50 per cent peat and 50 per cent perlite
- 60 per cent peat, 20 per cent perlite, and 20 per cent vermiculite
- 60 per cent pine bark, 20 per cent peat, and 20 per cent sand

Qualities of Good Growing Media

High quality potting mixture is required to supply the roots with all the required nutrients, air and water because the plants are grown in containers with confined and limited amount of media available within each pot. The potting mixture used must have features like:

1. High permeability to water and air

Larger particles and pore spaces allow rapid percolation of water and air.

2. Water-holding capacity

Small particles and pore spaces and high quantities of organic matter increase water retention.

3. Drainage

Large particles and pore spaces allow water to drain quickly, but a compacted growing medium does not.

4. Aeration

Large particles and organic matter create air space, providing roots with access to the oxygen that is necessary for a plant to grow, take up nutrients, and absorb water.

5. Light weight

The lighter a mix is, the easier it is to move the container. Likewise, a lighter mix has lower bulk density and more air space than a heavier mix.

6. Fertility

A fertile mix is necessary for healthy growth. Plants need nutrients to thrive.

7. Pasteurized

A mix that is mostly free of weed seeds, insects, and diseases.

Table 3 Planting and harvesting time of fruits in containers

Crops	Apple	Blueberries	Citrus	Figs	Grapes	Peaches	Strawberries
Months							
January	P	P	-	P	-	P	P
February	P	P	-	P	P	P	P
March	P	P	-	P	P	P	P
April	-	-	P	-	P	-	H
May	-	-	P	-	-	-	H
June	-	H	-	-	-	H	H
July	H	H	H	H	H	H	-
August	H	H	H	H	H	H	-
September	H	-	H	H	H	-	-
October	H	-	H	H	P	-	-
November	-	P	H	-	P	-	P
December	P	P	-	P	-	-	P

Nutrient Management

A regular fertilization schedule must be followed to maintain healthy plants. Controlled-release, slow-release or liquid fertilizers are the preferred ways to supply nitrogen, potassium, and phosphorous to container plants. These fertilizers can be

used single or in the mixture of two or three. Micronutrients such as copper, zinc, boron, manganese and iron are also required by plants and can be supplied with a micronutrient solution.

Controlled release

These are synthetic fertilizers and coated with materials and this material reduce their immediate solubility and availability to plants. However, such fertilizers are costly but these are rich in many ways viz. avoidance of high initial salt levels in the growing media, availability of nutrients for several months and reduction of nutrient losses from the container by leaching and runoff. Due to high summer temperatures and increased moisture in the growing

media, nutrient releases at fast rate. Top-dressing, rather than incorporating fertilizer, typically results in reduced nutrient losses, as the nutrients have to travel throughout the growing medium, which increases their chance of being absorbed by the plant. Irregular drying of top-dressed fertilizer in between the irrigation time may also slow down the leakage of nutrients through the fertilizer coating.

Slow-release

Slow release fertilizers are either in inorganic or organic form. Organic fertilizers have low water solubility, prolonged nutrient release rates (over years) and are less concentrated per unit weight than synthetic fertilizers. The main disadvantage to slow-release fertilizers is the release rate may be too slow for fast growing crops and supplementation with

liquid fertilizer may be needed. Particle size moisture content of media and microorganisms which are present in media are some factors which affect release of nutrients in slow releasing fertilizers. Particle size and moisture content are inversely proportional to each other's. Nutrients release increased at higher temperature.

Liquid

Liquid fertilizers are quick-release, water-soluble fertilizers. Water-soluble fertilizers are most desirable after plants are growing, and these fertilizers can quickly replace nutrients lost from the potting mix during a

prolonged rainfall or period of rapid plant growth. They have minimal temperature dependence and are cheaper in cost per unit of nitrogen than slow-release fertilizers.

Granular

Granular fertilizer that is not time-released is generally not recommended as a supplemental fertilizer for container gardening. Because it can burn roots of

plants if come directly in contact with roots so it can be worked into the top few inches of potting mix around plants in containers.

Foliar

Nutrients are sprayed on leaves of plants and stem through foliar method as it absorb fast. The solutions are very dilute to avoid burning plant foliage. Nutrient absorption increases when the sprays reach the leaf

underside where stomata are located. Foliar fertilization should not be a substitute for a potting mix fertility program and can be used as a way to supplement nutrients.

Container drainage

Whatever container you choose, drainage holes are essential. Waterlogged soil can be formed without drainage and plant can also die for draining out excess water holes needs not to be large but should be enough so that excess water can drained out. Drill

the container if there is no holes in it. A container having no holes can be used as a cachepot, or to hide the plain box. Cachepots (with holes and without them) are useful for managing large plants and heavy pots.

Table 1 Light, water and nutrients requirement of fruit crops

Fruits	Light			Water			Nutrient		
	Full sun	Tolerates partial shade	Partial shade	Moist	Slightly	Dry	Light	Medium	Heavy
Apples		X		X				X	
Blueberries	X			X					X
Citrus	X			X					X
Figs		X			X			X	
Grapes		X			X			X	
Peaches		X		X				X	
Strawberries	X			X				X	

Irrigation

Several sources can act as watering media for plants in container, the leaching of nutrients can be affected significantly by method of irrigation. Water requirements depends upon different variables like wind, light (wind or cloudy, sunny conditions) relative humidity, temperature, size of

container, media composition, comparison between amount of media and roots in pot, plant type, the stage of plant growth. Moisture loss can be reduced by a top dressing of mulch over the surface of potting mix.

Directions to be followed

1. Wash your pot or container with warm, soapy water. Rinse well.
2. Dampen the potting mix - either in the bag (if you bought it) or in the container you mixed it in.
3. Container should be filled partially with prepared potting mix. For large and

heavy container fine the location where it can live.

4. Plant should be removed from its original container gently. Loosen the roots before planting if it is root-bound.

5. Set the plant in the new pot at the same depth as the old container and 1 to 2 inches below the rim of the pot.
6. Add soil to the container and pack it gently around the plant.
7. To adjust to its new home, watering should be done with kelp extract or a compost tea.
8. Spanish moss or mulch can be added on the top which help in retaining water.

