Container Gardening - Part 1: The Container

Container gardening is an important aspect of many, if not most landscapes. Especially those in urban areas. Over the next several months, we will present a series of articles on container gardening with each one highlighting different important aspects of container gardening with information that, hopefully, helps you to be successful. With that in mind, let's begin with the beginning of any container garden – the container.

The container is the entire world for whatever plant you put in it and is a major part of the visual appearance of your container garden. Almost anything that can hold soil and a plant can become a container for the container garden. From elegant to whimsical, large to small, reserved to outrageous, the possibilities are almost limitless as you can see in Figure 1. However, to be a long-lived and functional plant container for years, there are certain attributes that are important. The ideal container needs to be stable enough to not tip over, hold adequate water for the number and size of the plants grown, withstand seasonal environmental changes, last at least as long as the plants grown in it, and still look good.

Material

The containers shown in Figure 1 are made up of all kinds of different materials – some better than others.

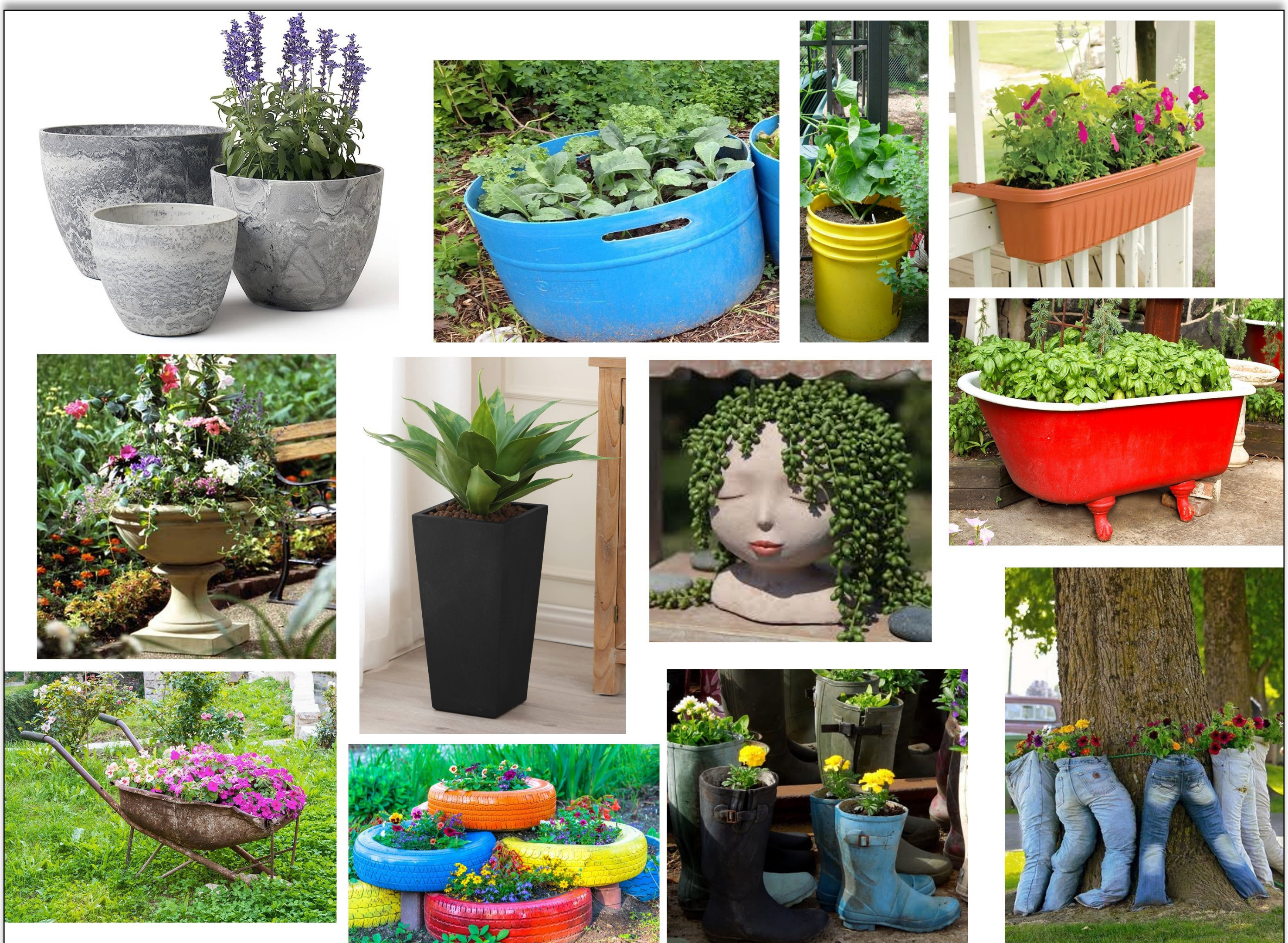
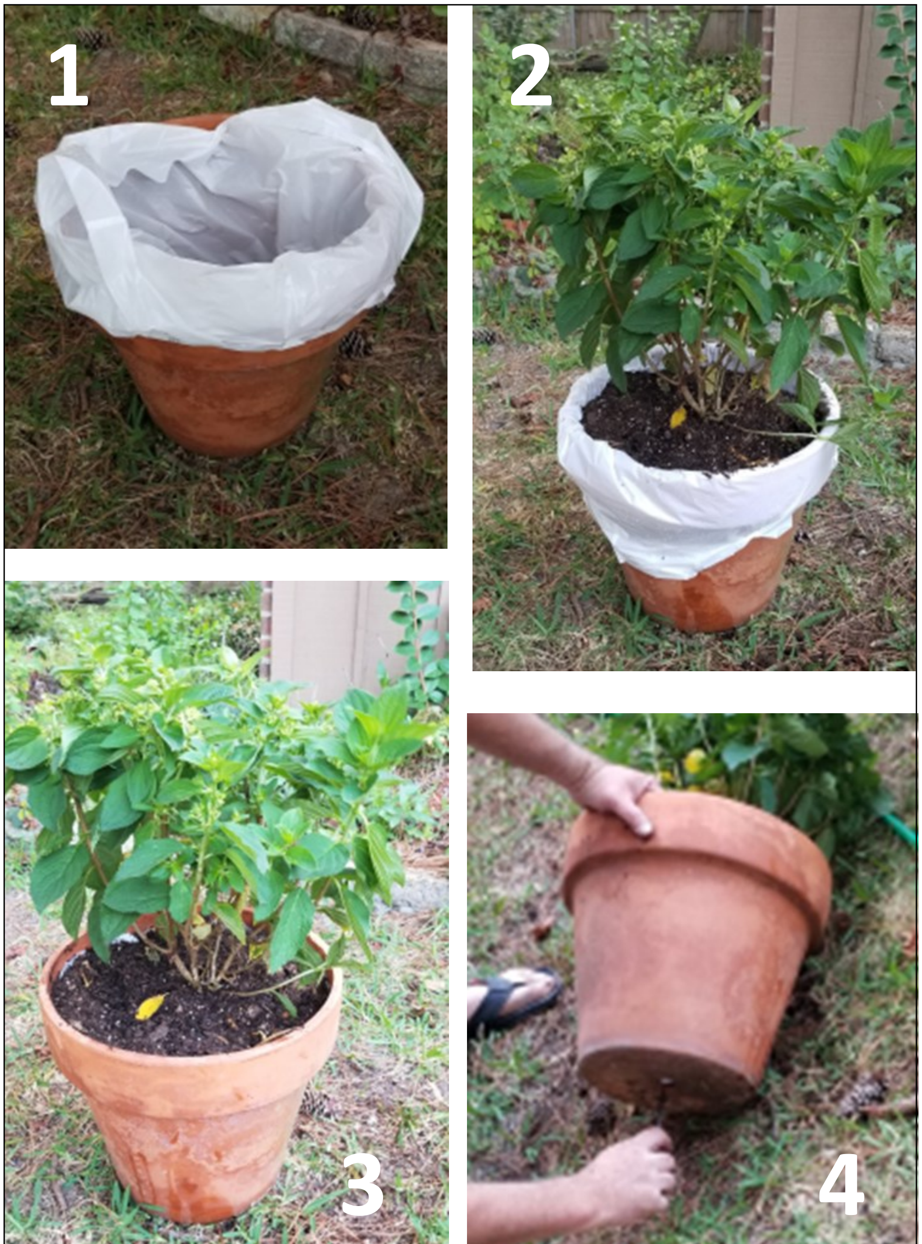


Figure 1: Here are several examples of different objects used as garden containers.

What makes the best material for your containers depends on what you're after but there are some attributes about the various materials to take into consideration.

Porous

Porous materials are any materials that allow water to pass through the wall of the container through natural pores. Some porous materials used to make plant containers include: clay (terracotta), ceramic (unglazed), concrete, wood, fiber (coir), cloth (the recycled jeans), paper (pressed material or recycled), peat, basket (straw), and woven containers made from nonporous materials. The last one listed, though not made of nonporous material, fits this category because it allows water to pass through the container wall. There are two major aspects of porous material containers to keep in mind. First, because the whole container is porous, water will leave the container from every surface, not just the top of the potting mix or through plant transpiration. Therefore, the soil in porous containers dries out much quicker than nonporous containers so these container plants need watering more often. Second, porous plant containers, especially clay, may be damaged by freezing temperatures. If the pores of the container material and filled with water, when it freezes it will expand. This can result in cracking and breakage of porous containers. Porous containers can be sealed with a sealing material like paint or varnish to prevent water from passing through the walls. Keep in mind that if you seal from only one side, the container wall can still fill with water and be susceptible to freeze damage.



Use a plastic garbage bag to line porous containers to prevent moisture lose.
1) Insert the bag into the container. 2) Install the plant in the lined container.
3) Cut away the excess bag from the top. 4) Cut out the drain hole in the bottom.

Nonporous

Nonporous materials are materials that do not allow water to pass through an intact surface. Nonporous container materials include: plastic, metal, fiberglass, porcelain, styrofoam, glass, and resin. Glazed containers made from porous materials like terracotta and ceramic are nonporous but are not included here because they are originally made from porous materials. Here are a few points to remember about containers made from nonporous materials. Water will not pass through the container wall so it is imperative that there is an avenue for drainage provided in these types of containers. Some of the materials, especially metals, may react with chemicals in the soil or in the water (fertilizer) and release metal compounds into the soil. Some of these may be phytotoxic. Containers made from nonporous materials tend to heat up more quickly and get hotter than porous containers. The reason for this is because porous containers have water passing through the walls and evaporating therefore having a cooling effect on the container and potting soil. Metals, in general, also tend to heat up more quickly and get hotter than most of the other nonporous materials.

Durability

The durability of a container must consider several factors, but some general statements can be made about most container materials. Let's look at weathering. By weathering, I mean the breakdown and wearing away of the container due to climatic and environmental forces. I'm including rain and moisture, temperature extremes, sunlight, and biological forces. As stated above, containers made from porous materials may be fractured by freezing temperatures if water is trapped inside the container walls. Extreme heat can also have a weakening effect on some plastics. And the fluctuation of heat and cold can cause damage to containers made from materials that expand and contract over a broad range.

Sunlight (UV rays) has its most dramatic effect on plastic containers. Plastics that are going to be exposed to UV radiation are treated with additives such as UV stabilizers, black coloration, or protective surface coatings. These may be generally labelled for outdoor use. Creating containers from nonstabilized plastic materials ends with brittle plastic containers that disintegrate at the touch.

Biological forces means biological agents that tend to break down containers. This includes microbes, insects, rodents, and other living organisms. As you might guess, containers made from organic materials are most susceptible to these. So containers made from wood, woven straw, and paper are much more likely to be damaged by biological forces. Microbial organisms decompose these containers much as they do a compost pile. Insects, particularly those like termites, use these materials for food or for building materials for their nests. Larger animals may also use these materials for homebuilding or just to gnaw on. Metal, glass, clay, fiberglass, ceramic, resin, and plastic containers are more resistant to these biological forces.

Fragility is another consideration regarding container durability. Containers made of materials like terracotta, porcelain, glass, stone, and even concrete are sturdy but fragile. If these containers are dropped, turned over, or drastically disturbed, they make fracture. This can result in small fractures that weaken the containers or even shattering into pieces. Plastic, woven (basket), and resin containers are more flexible and can withstand drops, tip-overs, and sharp jolts better than the previously mentioned materials. Metal, fiberglass, and wooden containers are even less fragile than the aforementioned. Most metal containers can withstand impacts without breaking though cast iron will crack from extreme impact. Metal containers made from thin metal or softer metals like aluminum, tin, or copper can be dented or misshaped due to impact.

Finally, chemical reactivity has an impact on a container's durability. How is a container exposed to chemical reactions? There are a couple of easily identified ways. One is from fertilizers, especially chemical fertilizers. Soil amendments are another source of reactants that can react with container materials (lime, sulfur, etc.). And then there is water. Anyone who has left a metal tool out in the rain for a few days will tell you how quickly rusting (a chemical reaction) can take place. In general, plastic, resin, glass, clay, fiberglass, fiber, and porcelain are extremely resistant to chemical reactions. Concrete, stone, wood, baskets, and some metals are also very resistant to chemical reactions. Metals like aluminum and galvanized metal are extremely resistant. Containers made of bare metals of tin, copper, and iron can react and break down over time. Bare iron being the most susceptible to rusting. However, coated metal containers and enameled metal containers are as durable as any of the container materials. Commercially available containers are generally designed to be inert (non-chemically reactive).

Shape

Shape is not something that we usually pay much attention to when selecting containers (Figure 2). Have you noticed how the vast majority of containers have either straight walls or slanted walls with the top having a larger diameter than the bottom? That's because containers are meant to be used and reused; have root balls taken out for repotting or transplanting; have old plants removed and new plants put in. The straight walls and especially the slanted walls make removing plants with their root balls intact a fairly easy process. But try to easily remove a plant, root ball intact, from a container where the top is narrower than the bottom, or one with constrictions or ridges in the walls, or with a strawberry pot design, and you have a virtually impossible task on your hands. These work okay for growing annuals or small perennials that will never need repotting, but they are a poor choice for shrubs, trees or larger perennials that will need repotting or root pruning during their life.

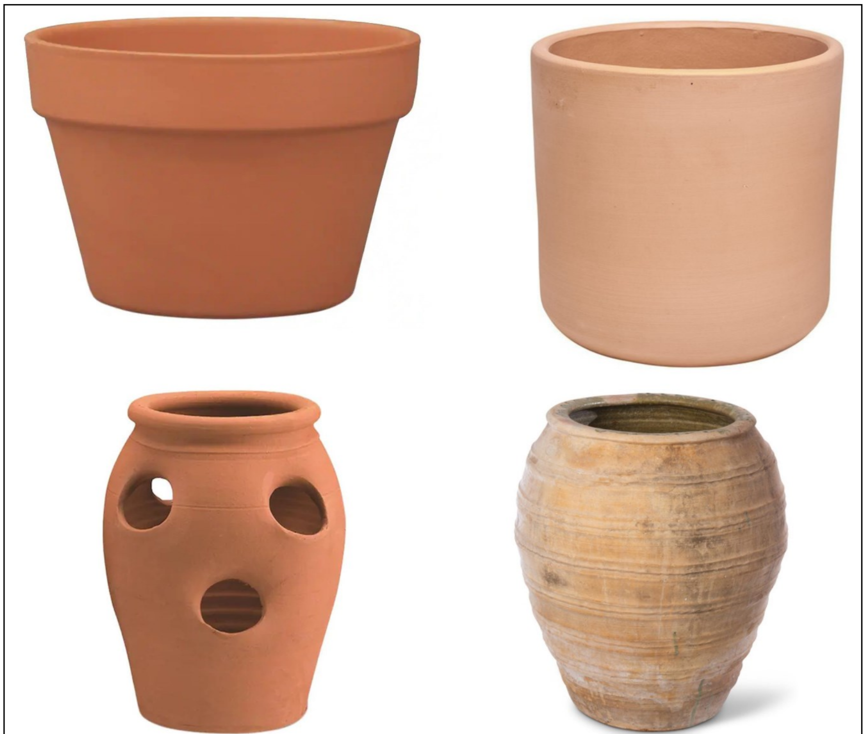


Figure 2: Clay plant containers of different shapes.

Container dimensions are also an important aspect to consider. Tall containers have a smaller saturated soil layer at the bottom in comparison to short containers. Generally speaking, taller containers allow for better root development because they have a larger soil area for the plant root systems. On average, plants need soil depths of 6" – 18" for their feeder roots with the optimal depth being dependent on what variety of plant is being grown.

Size/Volume

Total container volume (Ht. x W x D) is mostly what is being considered here regarding container size. Since the size of the container will determine the size of the plant's root system which in turn determines the size of the above ground plant, container size is a very important container attribute. Figure 3 shows two pepper plants of identical age. The only difference between the two is the size of the container they are being grown in. The larger pepper plant has a larger area for root system development and the larger root system can support a larger plant above ground. This effect can be a positive or a negative, depending on your goal. If growing plants like vegetables or many ornamentals, you want to maximize plant performance by giving the plant as much room as possible for its roots. The converse is true if growing something like a citrus tree. You want to restrict the above ground plant size, so you grow it in a container that restricts root system development. Essentially, you are dwarfing the plant by growing it in a smaller container.

Container volume also effects maintenance. The smaller the container volume the less space available for water and nutrients to be stored. Smaller containers need to be fertilized and watered more often than larger containers with all else being equal.

Weight

The net weight of a containerized plant would include the pot, the soil, and the plant. But prior to adding the soil and the plants, container weight should still be a consideration. The empty weight of a container is primarily determined by the material it is made of and then by the size of the container. Plastic, resin, fiberglass, basket, fiber, cloth, paper, and styrofoam are very light materials. Wood is fairly light but can be heavier than expected depending on what type of wood is used. Glass, porcelain, clay, ceramic, concrete, and metal make heavy containers which is also affected by container wall thickness. Container weight itself is important when it comes to storing empty containers or moving them around. Container weight is also important as it adds to the weight of the planted container. It can increase the ballast of the containerized plant making it more difficult to turn over. But this also makes it more difficult to move or relocate the containerized plant.

Use a lightweight liners inside of heavy pots to make them easier to move.

Color/Spacing

There are multiple research articles on container color and container spacing. All come to similar conclusions. In dark containers spaced apart, the soil temperature is higher than in white containers at the same spacing. Under standard growing conditions, this increased soil temperature was sufficient to cause reduced root development and reduced plant growth. If the plants are jammed together, the plants on the interior grow the same regardless of container color. The take-home point is that the soil temperature in dark/black pots when exposed to sunlight is higher than the soil in light/white colored pots. Light colored pots reflect solar energy. Spacing containers close together tends to attenuate this effect. So, container color and spacing are also factors to consider when selecting a container for your container garden.

~ Dr. Joe Willis

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