



Cooperative Extension Service
Institute of Food and Agricultural Sciences

Terrariums¹

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Growing small plants in a transparent enclosed container is a relatively new idea. Only a century has passed since Nathaniel Ward accidentally discovered a few plants growing in a little soil inside a discarded bottle. Ward developed his discovery into what was then known as a Wardian case, and is now known as a terrarium.

Additional leisure time and a growing awareness and concern for what living plants mean to our environment has contributed significantly to the popularity of terrariums. Artistically arranged and designed plant materials create a new dimension in our crowded living spaces. With increasing numbers of people living in apartments and condominiums, access to natural beauty is becoming limited, and more and more people are becoming interested in miniature indoor gardening. A small garden under glass allows one to see and enjoy nature without being bothered with the difficulties of large scale gardening. The terrarium, then, becomes a beautiful and relaxing device for the creation, preservation and maintenance of living plants.

Terrarium Environment - A Self-Sustaining System

In many cases, a closed terrarium might be considered a miniature, self-operating greenhouse, and can be equated to a small ecosystem. The water from the soil is taken up by the plants and transpired into the surrounding air. In the closed container, the water vapor is trapped within the system, creating a desirable high humidity environment for certain shade-requiring mosses, ferns, and tropical plants.

When the room temperature is lowered, the excess moisture within the glass enclosure condenses on the side of the terrarium and is recycled back into the soil. The moisture is again taken up by the plant roots and the process is repeated.

The terrarium is therefore a self-sustaining system. At night, plants use oxygen and release carbon dioxide. During daylight hours, plants use that carbon dioxide for photosynthesis, releasing, in turn, oxygen and water vapor. The photosynthetic process supplies energy for growth, and the oxygen is used again by the plants at night.

Containers

Traditionally, clear glass is used for terrariums. This can be in the form of goldfish bowls, glass covered candy jars, aquariums, canning jars, or bottles of any size. In addition to clear glass, many types of acrylic or clear plastic containers are available. These are usually less expensive and more durable than glass containers. Depending on the type of terrarium that is to be constructed, these containers may have a lid or stopper to make the system air tight.

The color of the plastic or glass is also important: you have to be able to see inside the terrarium to appreciate it, and light has to enter the terrarium if plants are to survive. Colored glass is available and can be very interesting, but the choice should be restricted to those types of glass that have only a very slight tint.

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Containers can be purchased from florist shops, garden supply stores, or variety stores. Unusual containers can be purchased at garage sales, junk shops, and antique stores. (See Figure 1) The choice of container is not restricted to any certain size, although small containers are more in keeping with today's average home. The container opening should be large for ease of planting. It is very difficult to arrange and plant in a container with a small opening.

Soils

Premixed potting soils can be purchased for terrariums. These soils are sterilized, and therefore do not contain pathogenic organisms which may cause rot or deterioration of the plants. If you prefer, you can mix and prepare your own soil, though it will then need to be sterilized.

Common garden soil needs to be mixed with equal amounts of peat. Sterilization of the soil mixture will be necessary to destroy weed seeds and disease organisms. The simplest way to do this is to moisten the soil and place it in a shallow roasting pan, a couple of inches deep. Cover the pan with aluminum foil, and bake in a 400°F (204°C) oven along with a potato. The potato will show you when the soil is sterilized. When the potato is thoroughly baked the soil should be ready. Soil produces a vile odor as it bakes, so an alternative procedure is to put the moist (not wet) soil mixture into a roasting bag. This should seal in the odor and prevent the soil from drying. Soil temperature should be kept at 180°F (82°C), for 1/2 hour. This can be checked by inserting a meat thermometer into the soil. As soon as sterilization is complete, the container should be moved outdoors, and the plastic bag removed to allow the water vapor and odor to escape.

A complete fertilizer such as 6-6-6 or 8-8-8 can be added, although it is not necessary. If fertilizer is added, it should be mixed in with the soil at a rate of 1 teaspoon per gallon (5 cm³ per 3.8 liters) of soil mix.

Accessories

If the desired effect of the terrarium is to be more than just plants growing in bottles, some accessories are needed. For instance, if a natural woodland scene is desired, materials such as a small piece of driftwood, pinecones, empty snails shells, acorns, lichen-covered rocks, pea gravel, a piece of mirror to represent a pool or rocks of various sizes might be used. Small stones or even sand may be used to represent a small stream or foot path.

Small pottery items and brightly colored figurines should be avoided since they usually detract and do not improve the natural effect of the scene.

Assembling the Terrarium

Line the bottom and about 1/5 of the side walls of a clean container with sphagnum moss, small stones, pea-size gravel, or ground charcoal. Charcoal can be used alone, or a thin layer can be placed over any of the other drainage materials. It will absorb unpleasant odors which occur when terrariums are overwatered. If the moisture level inside the terrarium is properly controlled, charcoal need not be used.

The size and shape of the container will determine the amount of drainage material that should be used. A 1/2 inch (1.3 cm) layer is about the minimum and 1-1/2 inches (3.8 cm) should be enough for large containers.

Place a piece of synthetic material over the drainage layer to prevent soil from settling into it and destroying its ability to drain. Materials such as fiberglass draperies, nylon stockings, or discarded curtains are good choices because they are porous enough to allow water to pass through, fine enough to hold soil particles, and will not decompose rapidly. To reduce visibility of the material, avoid bright colors and cut the material so that it barely touches the sides of the container. Next, add enough sterilized soil to fill approximately 1/5 of the container, being careful to keep the soil off the walls of the container. Do not remoisten the soil after sterilization; a drier soil mix is easier to work with. The soil can be leveled or molded into contours and valleys with a tablespoon, teaspoon, or any other blunt instrument.

After the soil has been arranged in the container, rooted plants can be planted. If a bottle type container is used, it might be necessary to use long tweezers to place the plants and accessories. Shallow depressions should be made with the tweezers for the plant roots. After the plants have been placed, the roots should be covered with soil, and the soil should be slightly compacted with a blunt instrument. Place accessories such as stones, sand, rocks, and driftwood at the desired location in the terrarium. After this, small unrooted cuttings of foliage or tropical plants can be planted. The closed container will provide the ideal high humidity environment necessary for the rooting of cuttings. After a period of time, usually 3 to 4 weeks, roots will be formed at the base of the cuttings and the plants will resume active growth. If a container with an

open end is used, the top should be sealed with plastic film or glass until rooting has occurred.

If the terrarium is to be viewed from all sides, the largest plant should be placed near the center. If the terrarium is to be seen only from 2 or 3 sides, the tallest plant should be placed in the background. Of course, this depends on the taste of the individual and on the arrangement of the landscape.

A common mistake for beginners is to crowd too many plants into the container. Use plants sparingly. The terrarium might look bare in the beginning, but once the plants start growing, the terrarium will soon be filled with plants.

When all the plants are planted, the sides of the container can be washed off by sparingly rinsing or spraying them with water. The best way to do this is to use a rubber bulb that has a sprayer attached to one end. Rinse loose soil from plant foliage. Avoid the application of too much water when rinsing plants and container since excess water will saturate the soil and may cause disease problems. Never allow standing water to remain in the container. If too much water is applied, remove the excess water with an eye dropper. The lid can also be removed to allow excess moisture to escape.

Place the terrarium where it is exposed to bright indirect light, usually in a northeast or north window. Avoid direct sunlight, since this will increase the air temperature inside the terrarium and may burn the plants. It is a good practice to turn the terrarium, if it is designed to be viewed from all directions, once or twice a month to avoid one-directional plant growth. If the sides of the container become foggy due to the condensation of water, remove the lid until all condensate evaporates and then replace the lid.

Plant Materials

In addition to enthusiasm and imagination, a little knowledge of plant materials and their growth habits is necessary to build a good terrarium. A well-constructed terrarium can flourish for years with no more attention than watering once or twice a year. Such a terrarium begins with the knowledge of what plant materials should be used. Since longevity is one of the desired attributes, it is essential to select plants that do not need to be replaced too often. It means choosing small plants which have a dwarf growth habit, or possess a characteristic which makes it possible to dwarf their growth in a terrarium. A

tiny sansevieria may be a small plant in a 2-inch (5-centimeter) pot, but it has no place in a terrarium because it grows too large. Heart-leaf philodendron (*Philodendron scandens oxycardium*) may look pretty when first planted with other small plants, but within a few months it will crowd out other plants.

On the other hand, some plants which at first seem unsuitable for terrariums may work quite well because of their limited growth in a confined space or because they can be dwarfed by judicious pruning. This is why miniature trees (for example, a Bonsai) can be grown in small containers, even if the same tree will grow to 50 feet (15.2 m) in a nonconfined space. Boxwood, pittosporum, and podocarpus are examples of plants which can be kept from getting too large in a terrarium if they are cut back periodically. Peperomia and small vines tend to stay small in a terrarium, even though they may grow large elsewhere.

Plant compatibility is equally as important as plant selection. All plants in a grouping should have the same environmental needs, and these needs should be compatible with the atmospheric conditions in which they are to live. A closed container maintains a high relative humidity, and the grouping should consist entirely of plants which grow best under moist conditions (Table 1). Plants such as cacti, which grow best under dry conditions, would not survive long in a high humidity environment, and therefore should never be included in a grouping for a tightly closed container. Desert plants are usually planted in dish gardens in which the soil consists mainly of sand, and the plant level is about even with the rim of the container. Plants which grow best in an environment which is neither too dry nor too moist should be planted in a container with the sides enclosed but the top open—for example, a brandy-snifter (Table 2).

Maintenance

Terrariums are not maintenance free. In a high humidity, bright light environment, plants will often grow luxuriously, and sooner or later, many of the specimens will outgrow the container. However, even before the plants get out of control, careful trimming and pruning may be necessary to retain the desired form. Furthermore, as the plants grow, one should remove all dead leaves and flowers to avoid rotting and unsightliness.

The failure of many terrariums is due to overfertilization. If fertilizer is added at planting, there is no need to add more unless the plants begin to develop a

slight yellowish coloration. If this happens, apply a water soluble house plant fertilizer at 1/4 of the recommended rate.

Excessive watering is the number one terrarium maintenance problem. Since a terrarium is a closed system, it may need to be watered only once or twice a year. Too much water may cause excessive growth plus possible disease problems. Terrariums should only be watered when the soil is dry to the touch. Since the container has no drainage, add only enough water to moisten the soil. Plants left in standing water will usually

succumb to root rot diseases or mold which cause leaves of plants to turn yellow and gradually brown.

Avoid having leaves touch the sides of the container. The leaves will become wet from condensate that forms on the inside walls and will become ideal places for mold spores to germinate and grow.

Periodically, the glass will need to be cleaned with a damp cloth to remove dust particles.



Figure 1. Terrariums can be built in a wide variety of shapes and sizes.

Table 1. Plants for closed Terrariums.

COMMON NAME	BOTANICAL NAME
Indigenous Plants	
Artillery Plant	<i>Pilea microphylla</i>
Button Fern	<i>Pellaea rotundifolia</i>
Irish Moss	<i>Soleiurolia soleirolii</i>
Liverworts	
Maidenhair Fern	<i>Adiantum</i> spp.
Mosses	
Partridgeberry	<i>Mitchella repens</i>
Pussy-toes	<i>Antennaria</i> sp.
Selaginella	<i>Selaginella</i> sp.
Tradescantia (small varieties)	<i>Tradescantia</i> sp.
Violet	<i>Viola odorata</i>
Wild Strawberry	<i>Fragaria</i> sp.
Foliage Plants	
Aglaonema	<i>Aglaonema</i> sp.
Asparagus Fern	<i>Asparagus setaceus</i>
Baby's Tears	<i>Pilea depressa</i>
Cast Iron Plant	<i>Aspidistra lurida</i>
Episcia	<i>Episcia</i> sp.
Fernleaf-inch Plant	<i>Tripogandra multiflora</i>
Fittonia	<i>Fittonia verschaffeltii</i>
Hoya	<i>Hoya</i> sp.
Jade Plant	<i>Crassula argentea</i>
Miniature Peperomia	<i>Peperomia</i> sp.
Norfolk Island Pine	<i>Araucaria heterophylla</i>
Pellionia	<i>Pellionia</i> sp.
Piggyback Plant	<i>Tolmiea menziesii</i>
Prayer Plant	<i>Maranta leuconeura</i>
Strawberry Geranium	<i>Saxifraga stolonifera</i>
Swedish Ivy	<i>Plectranthus</i> sp.

Table 2. Plants for Open Top Terrariums.

COMMON NAME	BOTANICAL NAME
Woody Plants	
Boxwood	<i>Buxus</i> Sp.
Japanese Privet	<i>Ligustrum japonicum</i>
Juniper	<i>Juniperus</i> sp.
Pine	<i>Pinus</i> sp.
Pittosporum	<i>Pittosporum tobira</i>
Podocarpus	<i>Podocarpus</i> sp.
Foliage Plants	
African Violet	<i>Saintpaulia ionantha</i>
Aluminum Plant	<i>Pilea cadierei</i>
Chinese Evergreen	<i>Aglaonema modestum</i>
Coffee Tree	<i>Coffea arabica</i>
Corn Plant	<i>Dracaena fragrans</i> 'Massangeana'
Dieffenbachia	<i>Dieffenbachia</i> sp.
Dwarf English Ivy	<i>Hedera</i> sp.
Dwarf Peperomia	<i>Peperomia obtusifolia</i> 'Minima'
Emerald Ripple Peperomia	<i>Peperomia caperata</i>
Gold Dust Plant	<i>Dracaena surculosa</i>
Kalanchoe	<i>Kalanchoe</i> sp.
Parlor Palm	<i>Chamaedorea elegans</i>
Piggyback Plant	<i>Tomiea menziesii</i>
Prayer Plant	<i>Maranta</i> sp.
Rex Begonia	<i>Begonia rex-cultorum</i>
Spider Plant	<i>Chlorophytum comosum</i>
Strawberry Geranium	<i>Saxifraga solonifera</i>
Watermelon peperomia	<i>Peperomia argyreia</i>
Wax Begonia	<i>Begonia semperflorens</i>
Zebra Plant	<i>Aphelandra squarrosa</i>