

SOIL-BASED AND SOILLESS SUBSTRATE

The substrate, or growing media, of a plant provides support, holds water for plant use, provides aeration, and holds plant nutrients. Different substrates will perform differently under any set of conditions, and the grower must decide which substrate meets their particular needs. For example, infrequent watering practices necessitate a high moisture substrate, while frequent watering practices require a peat moss or bark-based mix. Also, large soil particles provide better aeration but poor water retention. In general, two types of substrate are used: soil-based, which contains a portion of field soil, and soilless, with no field soil added. Characteristics and examples of each type are given below.

SOIL-BASED SUBSTRATE

- Used to grow only a small portion of potted plants
- Growers using soil-based substrates have a local supply of good topsoil
- Most cut-flower crops are grown using a soil-based substrate
- Contains equal parts:
 - Loamy field soil
 - Concrete-grade sand

- Sphagnum peat moss with added phosphorous
- With sandy field soil, less sand is incorporated
- With soils high in clay, more sand is incorporated
- Sand is used to promote good aeration
- Sand substitutes include perlite and polystyrene
- Desired pH range is between 6.2 and 6.8
- Micronutrients need to be added
- Limestone is added to adjust pH

SOILLESS SUBSTRATE

- Reduced shipping cost due to lighter weight than soil-based substrates
- Ready to use
- Mixture requires saturation before use
- Common soilless formulas include Peat-Lite Mixes, containing 50% peat moss and either 50% vermiculite or 50% perlite
- For more even distribution of components, mix coarse components (sand or perlite) before adding water
- Incorporate organic matter or clay to provide nutrient retention (peat moss, calcined clay)

- Add sand, perlite, or polystyrene to increase aeration
- Some mixes incorporate artificial moisture enhancers to promote water retention
- Limestone is added to adjust pH
- Micronutrients need to be added

SUBSTRATE MIXES AVAILABLE

- Germination substrates:
 - Fine vermiculite and peat moss
 - High fine texture uniformity to insure even water retention in plug trays and appropriate placement of seeds
 - High cost of ingredients
- High moisture substrates:
 - Vermiculite and peat moss
 - Larger particle size to increase aeration in the larger pot size
 - Proper watering is necessary to avoid overly wet or dry conditions
- Peat moss-based substrates
 - Vermiculite, peat moss, and perlite
 - Peat moss and perlite only
 - Easier to regulate watering requirements
- Bark-based substrates
 - Contain vermiculite, bark, and perlite

- Lower price than peat moss substrates
- Fir, pine, and other hardwood bark is most commonly used
- Good aeration, nutrient, and water holding capacity
- To increase the water holding capacity, add sand, vermiculite, or peat moss
- More composted, finer bark holds more water, is similar to peat moss and combined with vermiculite
- Coarse, less composted bark is used with perlite or polystyrene, which have less water retention and greater aeration
- High aeration substrates
 - Vermiculite, larger bark, and perlite
 - High aeration and good drainage
 - Inexpensive substrate
 - Good for plants in large containers
- Compost-based substrates
 - Generally incorporate up to 50% organic matter by volume into a peat-based or bark-based substrate
 - Emulates growing conditions found in compost-enriched soil
 - Adequate soil temperature must be maintained
 - The higher the volume of compost, the higher the water retention

References

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