Grower 101: MIX IT UP

There are many different components that can be mixed to create a successful growing medium. But to get a successful mix, it's also important to understand how the different components' properties work together.

By Bob Steinkamp

***Top:** Low-growing medium pH can cause iron toxicity, as shown with this pothos. **Bottom:** High-growing medium pH can result in iron deficiency, as shown with this bougainvillea. (Photos: Bob Steinkamp)*

Based on the number of custom mix formulas available, many combinations of components can be successfully used. When discussing mix formulas, growers often ask questions like, "What does the bark do?" or "What does peat do?" We can generalize about the roles played by each component in the mix, but the properties of the various components can differ from source to source. Because of these varying properties, a given component does not always "do" the same thing.

For example, consider this formula: 60-percent peat and 40-percent vermiculite. What does the peat do in this mix? Everyone knows peat holds a lot of water. But because of peat's spongy texture, it has a lot of channels and air spaces that allow for drainage. How much water retention or drainage the peat provides depends on the peat's properties. The texture of peat can vary ranging from fine to fibrous (coarse). A mix made with fine peat will hold more water and less air than one made with coarser, fibrous peat. So aeration and water retention can be influenced by the texture of the peat used to make the mix.

Our above formula also contains 40-percent vermiculite. However, two grades of horticultural vermiculite are available: a coarse grade and so-called medium grade (which is actually a fine grade). A mix made with 40-percent fine vermiculite will hold more water than if it were made with coarse vermiculite. So what does the vermiculite do? It depends on the grade and the percentage used in the mix.

Think About Air

One can see that two mixes made with the same formula can have different properties unless the properties of the components are specified. To understand how the components affect the mix's properties, consider them from a different perspective. Instead of thinking about peat, perlite and vermiculite, think about air.

Consider a sponge. A sponge is absorbent because of all of the air spaces it contains. When squeezed, the air spaces collapse and the air is forced out. When squeezed, the sponge is much smaller, showing us that a sponge is mostly air.

Now consider squeezing a handful of mix. Like a sponge, the mix contains air spaces that collapse when squeezed. Just like a sponge, a mix is mostly air. A gallon of mix can easily hold 3 qt. of air. In fact, greenhouse mixes often range from 75- to 90-percent air space. The mixture of components simply acts as a skeleton to support air spaces.

The size of these air spaces depends on the coarseness or fineness of the particles comprising the mix. A mix made of all small particles will form a skeleton of small air spaces. A mix made with coarse, large particles will form a skeleton of large air spaces. These air spaces serve as water and air reservoirs. We refer to this as an air-water relationship. The size of each air space determines if it holds air or water.

Using Air Spaces

When a mix is watered, the larger-sized air spaces drain and fill with air. The smaller-sized air spaces have a tighter hold and remain filled with water. The balance of large-versus-small air spaces determines the water-holding properties of the mix.

Many large but few small air spaces will result in a well-drained mix that is low in water retention — a mix that would require frequent watering. A mix with many small but few large air spaces would be soggy and poorly drained. Most growers want a mix that is between the extremes — a mix that drains appropriately but retains a desirable amount of water.

If you want a well-drained mix that requires frequent watering, use a combination of components that result in many big but few small air spaces such as fibrous peat; chunky, dust-free perlite; coarse vermiculite; and/or coarse screened bark. The key is to reduce the amount of fine particles in the final mix.

To increase water retention and decrease drainage, use components that result in small air spaces such as finer peat, medium-grade vermiculite and/or fine screened bark. As the amount of finer particles increases, the mix will start to hold more water.

Clearly, making a consistent, uniform mix relies on more than just following a cookbook recipe. The properties of each component — peat, coir, bark, vermiculite or perlite — must be the same each time the mix is made. If not, the mix will not be consistent from batch to batch. Remember, the properties of the mix depend on the properties of its components.

Understanding pH

The most important chemical property of a mix is pH. A measure of degree of acidity or alkalinity, pH is measured on a scale of 1-14: pH 1 is very acidic, pH 14 is very alkaline and pH 7 is neutral (neither acidic or alkaline). With a few notable exceptions, most plants grow best when the mix pH is slightly acidic: pH 5.5-6.5.

Mix pH is adjusted by mixing in limestone, a

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mineral that neutralizes acidity. If too little limestone is added to the mix, the pH might be below 5.5, which is too low. Too much limestone could result in a pH of above 6.5, which is too high. When fresh, unused mix is watered in, the pH can be seemingly low because limestone takes a few days to react and raise the pH. The mix has a limited ability to resist a pH change caused by external factors. Over time, the properties of the irrigation water and fertilizer can cause a pH change.

In plant nutrition, the concept of pH is very important because pH affects the availability of fertilizer elements to the plant. To be absorbed by the roots, each element must be dissolved in water. Many of the fertilizer elements dissolve more readily if the soil is slightly acidic. If the pH is too high (basic), some fertilizer elements, while present in the soil, might not be dissolved and are unavailable to the plant. Plants growing in high pH conditions might become deficient in some of the fertilizer elements.

If the pH is too low, the opposite situation can occur. As the soil becomes more acidic, increasing amounts of fertilizer elements become dissolved. Toxicity can occur if plants absorb more of certain elements than they need. When managing plant nutrition, maintaining the soil pH within the desired range is important.

Understanding Salt Levels

A second important chemical property is the mix's soluble salt level. A soluble salt test measures the amount of fertilizer in the mix. A growing mix containing little fertilizer will measure low in soluble salts. Excessive fertilizer in the mix will result in high soluble salts. Maintaining a moderate soluble salt level in the mix is important. If the soluble salt level is too low, the plant will lack fertilizer and not grow well. If soluble salts are too high, plant root damage can result.

In a basic unused mix, the soluble salt level mostly results from two sources: a starter fertilizer to provide a balanced initial fertility level and gypsum to provide long-term calcium and magnesium fertility. The starter fertilizer only lasts a short time, and the grower must start the fertility program very soon after watering in. Many growers incorporate a controlled-release fertilizer (CRF) into the mix before planting. During storage before use, the CRF will start to release fertilizer into the mix, resulting in an increased soluble salt level. If a mix contains a CRF and is stored for more than a short time, the soluble salt level should be checked before planting.

In conclusion, a properly formulated growing mix should allow for aeration and drainage yet retain enough water for good plant growth. The mix should also be pH adjusted and have a low to medium soluble salt level. GPN

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