PRACTICE MAKES PROFIT

Greenhouse Grower magazine this past summer and fall did a series of articles on the best management practices for greenhouse soilless media. I thought they were very well done with lots of useful information. The magazine has agreed to our reprinting the articles in SUREVISION. The first one is with this issue. We will continue with all four in later issues.

The articles focus on:

Part 1 – Five major media components and their properties

Part 2 - Buying manufactured media versus mixing your own

Part 3 – Media selection and storage

Part 4 – EC, water quality and pH management

SOILLESS MEDIA: PRACTICES MAKE PROFIT

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The primary purpose of a soilless media is to provide a lightweight substrate that holds water and nutrients, permits gas exchange to and from the roots, as well as mechanical support. Many different components can be used to formulate soilless mixes, and historically, we tend to define a mix by the type of components used rather than the physical and chemical environments created by the mix when used by the grower.

It is a common misconception that desired characteristics of the mix can be obtained solely by the appropriate blending of mix components. Blending mix components is only one of many factors that ultimately affect the container environment. Growers should focus on media properties that provide for the plants, needs (water retention, air space, pH, fertility) rather than the components themselves.

Methods of pot or flat filling, pot size, initial watering practices, and quantity and type of media amendments play significant roles in determining the plants, ultimate physical and chemical environment.

Soilless mix manufacturers have the responsibility to provide growers with a predictable starting point, but 75% of the responsibility for establishing the physical environment and 90% of the responsibility for establishing the chemical environment of a container on a greenhouse bench is determined by the grower's management practices.

MEDIA COMPONENTS AND THEIR PROPERTIES

Media Components And Their Properties

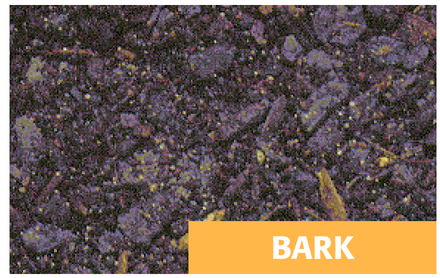
There are five major components used by professional mix companies for greenhouses in the U.S. and Canada today. These are peat (mostly Canadian sphagnum peat moss), bark (aged or composted), coir, perlite, and vermiculite. Other components also are used, but mainly in more regional mixes.

Additionally, lime, a wetting agent, and a nutrient charge (in most, but not all mixes) are commonly added to professional greenhouse mixes.

Canadian sphagnum peat moss (CSP) is the most commonly used peat in greenhouse media, and it will be the one discussed here. CSP is harvested from bogs across Canada. It generally has a pH range of 3.0-6.0, with most of it on the lower end of the range. Generally, soluble salts are below 0.1mmhos/cm3.

The organic content of CSP is from 90%-99%, with high nutrient and water holding capacities, along with a relatively low bulk density. Moist CSP will readily absorb water, but as it dries, it will tend to repel water. That is why mix companies use wetting agents, which help the mixes take up and evenly distribute water.

Because CSP is harvested in various bogs across Canada, there will be some variability in the CSP from one location to the next. Mix companies will test and adjust for some of these differences. That is also why mixes made by the same company, but from different locations (East versus West, for example) will sometimes have slightly different physical and chemical properties.



The most common bark source for greenhouse mixes is softwood barks (i.e., Southern pine bark and Northern softwoods). Bark tends to increase bulk density, along with slightly increasing air space and decreasing water holding of a mix. Many studies have shown that properly composted bark has a potential for imparting some disease resistance.

Bark used in greenhouse mixes is generally either aged or composted. This can be confusing at times as, in reality, both types of bark do compost. However, in the mix industry, the "composted" bark is composted in a more controlled process than "aged" bark. Generally this is done by adding some type of nitrogen source and then turning the pile frequently to enable aerobic conditions to continue, which allows for more even and quick composting. This type of bark has been shown to impart some disease resistance for plants grown in mixes made with it.

Aged bark is turned less often and is usually piled in higher and larger piles. This tends to cause more anaerobic conditions. However, all companies will test their bark, whether aged or composted, to be certain the bark has composted adequately to prevent overheating or excessive nitrogen draw.

Bark generally will have a pH in the range of 5.0 – 6.5, with a relatively low soluble salts level, similar to that of CSP. Mixes made with either type of bark will be suitable for plant growth because the mix companies have tested the barks prior to incorporation into the mix.

All bark mixes will tend to require a higher level of fertilizer in comparison to a similar

CSP mix due to nitrogen draw by the bark. Many companies will add a nitrogen source (usually urea formaldehyde) to help decrease the level of nitrogen draw by the bark mix.

Coir is a by-product of the coconut fiber industry and is produced primarily in Sri Lanka, the Philippines, Indonesia, Mexico, and parts of the Caribbean and South America. The coir used in greenhouse mixes is produced from the "dust" that is left after the fiber is processed for products such as mats, furnace filters, and rope. It has a pH range of 5.5 – 6.5 and a soluble slats level that is somewhat higher than CSP and bark.

Coir has a slightly lower nutrient-holding capacity than CSP, but it contains higher levels of sodium, chloride, phosphorus, and potassium than CSP. Some sources of coir can have high levels of chloride (up to 700 ppm), but the coir used by mix companies generally has much lower levels. The higher chloride level in coir as compared to CSP has not posed a problem.

Coir has very high air and water-holding capacities and readily absorbs water. Trials done with coir-based media show growth similar to CSP and bark-based products. Because of coir,s lower nutrient-holding and higher water-holding properties, some adjustments in watering and fertilization regimes may be needed.

Vermiculite is a micaceous mineral that is expanded in a furnace, forming a lightweight aggregate. It has a good nutrient-holding capacity and provides both air space and water-holding capacity to the mix, along with additional potassium, calcium, and magnesium. Vermiculite tends to be slightly basic. It is a fragile material and can tend to break down with improper or excessive handling. It also can break down over time because of the effect of watering on the media.

Perlite is a mineral that is also heat expanded. The resulting product is a white, lightweight aggregate. Perlite is used to increase air space and will not hold water

like vermiculite. It has little effect on pH or fertility, other than the dilution effect for fertility of a mix.

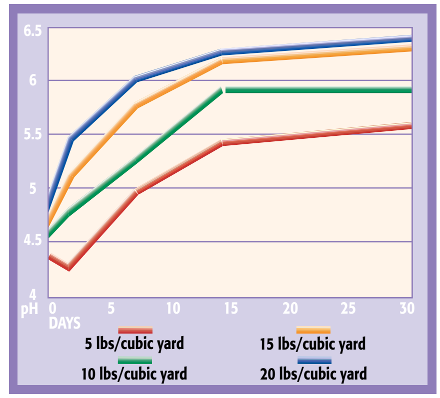
A GUARANTEED pH?

Manufacturers often receive calls from frustrated growers who wonder why the pH of their medium is too high or too low. The grower often believes the manufacturer used the wrong amount of lime. During the conversation it is often discovered that the water source and fertilizer program contributed to the problem. Too many people still believe the manufacturer controls the pH of the medium. The fact is that the amount of lime added has only a small effect on the pH of media in use.

An experiment was conducted to determine the effect of various lime rates on a peat-lite mix for a month. Lime rates were 5, 10, 15, and 20 pounds per cubic yard of mix. The mix was thoroughly wetted. Results are shown in Figure 1. There was only a 1/2 - pH unit difference immediately after mixing and about the same variance a month later.

Lime is added to soilless mixes to neutralize some of the acid from peat or bark and to buffer the pH. Other ingredients, such as vermiculite and coir also affect the starting pH and add some buffering. People often talk about the buffering capacities of particular media. However, the truth is that soilless mixes are not well buffered against pH change. So who or what does control the pH ?

pH is a dynamic system, which means that it is a moving target. There is no way to set it and forget it. Soilless mixes should be thought of as hydroponic systems. Everything



pH VERSUS LIME RATE DURING 1 MONTH

that is added to the system before and after planting can affect the pH – including the plant itself. One of the biggest factors is the alkalinity of the water used for growing. The effects of alkalinity will be discussed in detail in another part of the series.

Soilless mixes are not inert. From the day of manufacture, there are changes occurring in the mix. Moisture in the mix causes the lime to start dissolving slowly; pH starts to rise. Microbial activity in the media consumes the nutrients, which can also affect the pH. Heat and age have their effects as well.

Within 6 months to a year after production, the pH of the mix might rise from 5.3 to 6.5 or higher. The electrical conductivity (EC) level can decrease from 1.6 to 0.4. Wetting agents also deteriorate with time. There is little the producer can do to prevent these changes.

TAKING CONTROL OF THE CROP

What can the grower do to ensure consistency in the crop?

1) Water in newly planted crops with an appropriate fertilizer.

2) Do not buy mix too far in advance of expected use.

3) Test the pH and EC of each batch before use and respond accordingly. This test is best followed up by testing with a professional lab after 2 weeks in use to determine the effect of current practice.

4) Monitor pH and EC regularly throughout the crop. Conduct appropriate testing through a professional lab.

It is said that knowledge is power.

By knowing the limitations of growing mixes, growers truly can take control of the crop.

MANUFACTURED MEDIA VERSUS MIXING YOUR OWN

Most growers have struggled with the

decision to buy a ready-to-use mix rather than mixing their own. They follow the old adage "If you want something done right, do it yourself." Yet, how many growers make their own fertilizer or build their own greenhouses?

Blending numerous ingredients of various volumes and textures into a homogeneous mix is a highly technical process. Some growers have spent a lot of money on sophisticated equipment and do a pretty good job of it. Others have looked only at the cost of ingredients before deciding that it's cheaper to make their own mix. Let's look at some of the considerations.

Equipment, if adequate for the job, is expensive and requires regular maintenance. Some growers blend their mix with a tractor and bucket. Others use old cement mixers. Studies have shown that these techniques do not blend media uniformly enough for use in small pots and packs. Small volume ingredients, in particular, will not be evenly distributed. These methods are more likely to damage the components. Batch mixers made for soil mixing do an adequate job, if properly used. But overmixing or adding too much water can adversely affect the properties of the medium.

Personnel who can be trusted to follow the recipe and understand the importance of the task are also expensive and hard to find. Many growers prefer to do it themselves. Couldn't the time of a valuable employee or owner be put to better use in the growing and management process? Who is watering or supervising the crew while the boss is making soil?

Ingredients are only part of the total cost of a mix. Many growers look at only the bulk ingredients when figuring the cost of homemade media. Nutrient and wetting agent costs can be significant, not to mention labor, overhead, and equipment. Inside storage of the dry ingredients also can be an issue.

Hidden costs are rarely considered. If the mix is inconsistent, uneven quality will reduce the value of the crop. When a mistake is made in a batch, crop loss might cost more than the grower saved on the mix. Very few growers, if any, perform the quality control that media manufacturers do.

Plugging all these factors into the equation might make a grower wonder how much money is saved by mixing at the nursery instead of buying a quality manufactured medium. Then there's the peace of mind that comes from knowing that a professional team stands behind the mix in the bale or bag.