First Half 2011

Volume 6, Issue 1

Contributors: Todd Cavins, Shiv Reddy and the Technical Network Team

Inside this Issue:

NEXT ISSUE...

- **Update on biorational additives**
- **What is PTS?**
- **Sunshine Advanced products**

The Sun Gro'er *is a newsletter distributed two times yearly for the purpose of communicating horticultural and Sun Gro product information.*

Editors: *Rick Vetanovetz and Dan Jacques*

Using Sun Gro Products

Quality manufacturers of growing media products, peat moss, and aggregates strive to produce and deliver products in a safe environment that ensures product freshness. Herbicides or other harmful chemicals are not kept in or near the manufacturing facilities. Every effort is made to select shipping carriers that are reputable and agreements require them to operate clean trailers. In order to ensure your satisfaction consider these suggestions and implement similar safety and product freshness measures as well to help maintain the quality of the products you receive.

INSIDE STORAGE

It is preferable to store growing media products inside a building with a clean, solid floor. Exposure to excessive heat and sunlight causes decay of packaging and accelerates degradation of nutrients and wetting agents in mixes. Products should be kept on shrink wrapped and covered pallets until time of use. No product should be stored under or near chemicals such as herbicides, insecticides, disinfectants, or even fertilizers. Whether liquid or dry, such chemicals can penetrate packaging and affect the contents. Growing media products should also be stored away from seed and seed products such as bird food, livestock feed, and forage or pasture seeds which are common in warehouse and retail settings.

OUTSIDE STORAGE

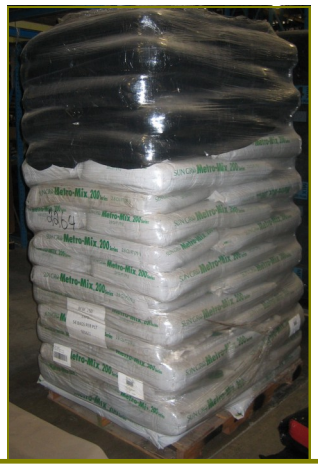
If it is necessary to keep potting mixes, peat moss, or aggregates outside, they should be stacked on pallets or a raised platform to minimize exposure to vegetation, water, and soil. The stacked bales or bags should be shrink-wrapped and under an open-air roof or covered with a tarp. The goal is to eliminate direct sunlight and precipitation yet provide ample circulation and prevention of heat build-up. Prolonged heat exposure can result in drying or hardening of growing mixes and peat moss as well as degradation of wetting agents. If not protected appropriately, water can enter loose-fill bags through the vent holes if exposed to precipitation. When growing mixes get wet in the bag, nutrients can be lost and lime is activated causing pH to rise. This leads to performance issues when the product is used.

Products stored outside should not be placed where they are subject to drift, splash or spray from chemicals used on farms, ranches, railroads, power lines, ditches, manufacturing facilities, roadways, etc. Furthermore, bales or bags kept outside are more likely to pick up drifting weed seeds that get caught in folds or stick to the packaging.

SHELF LIFE

Normal stock rotation practices i.e., first in/first out (FIFO) should be observed with growing media products. Ensure that your potting mix ships to you soon after being manufactured and work with your potting mix manufacturer to be able to read and understand their dating/ coding system. Ideally, all

Pallets usually have placards underneath the shrink-wrap indicating the product and lot code.



Using Sun Gro Products....

plug and propagation mixes be used within the first six months of being manufactured. If plug and germination mixes are one year or older from the date of manufacture they should be properly disposed.

Standard potting mixes should not be stored for more than six months either. However, the usage of these mixes may be possible up to one year. If the product is older than one year according to the production code on the bag or bale, you should test the mix for wettability prior to planting.

CONTROLLED RELEASE FERTILIZER AND SPECIAL ADDITIVES

Some growing media manufacturers offer flexibility and convenience by incorporating controlled release fertilizers (CRF), fungicides, or other special amendments and additives into growing mixes. However, precautions apply. Please note that all controlled release fertilizers are not created equal and therefore manufacturers have specific storage guidelines when they are added to potting mixes. Most CRF manufacturers suggest that potting mixes be used within one (1) week after manufacturing, with some exceptions. Refer to the CRF product label for specific instructions on longevity and usage of CRF incorporated potting mixes.

Incorporated biofungicides and similar products can also have a shelf life and are affected by storage conditions such as temperature, moisture and oxygen. It is important that the mix not only be used rather quickly (ideally within a few weeks; check with the manufacturer) but also be stored out of harsh conditions as noted above.

PRODUCTION CODES

Most reputable mix manufactures stamp or label their products in some manner with production codes. For example with Sunshine LC1 will have an adhesive sticker on the side of the bag or bale with a code such as *E10 215* which means the product was produced at the Elma, MB facility in 2010 on the 215th day of the year. A placard is often attached to the pallet shrink-wrap with the same information (see picture on first page). We encourage the education of all employees on how to read and understand the production codes. This will aid in maintaining FIFO practices and maximum mix performance.

In addition to producing quality products, reputable growing media, peat moss, and aggregates manufactures will perform extensive tests to assure quality. Records and samples are kept from each lot produced. Every bag or bale should have a code number and record which should be traceable to bills of lading and/or invoices as needed. This information can be very useful if a question arises as to the quality or freshness of a product. As growers, you should also keep records of these numbers on your own invoices or production records.

This information is for your protection. Use these guidelines to preventing damage to your profits!

-Todd Cavins

Workings of a Peat-Based Seed Topper!

FOR STARTERS...

'No vermiculite' was a cry we heard last year. Growers and sales people in the Western US were scrambling to obtain vermiculite— proper grade at any price in the beginning, then whatever grade that was available, as if few flakes of vermiculite are a must for growing seedlings.

This vermiculite scarcity brought memories of vermiculite scare (from asbestos fibers) in early 1990s. One of my projects then was to find a substitute for vermiculite as a component in potting mixes. Some of you may remember that a lot more vermiculite was used in the mixes then. A "Plan B" was desired in case vermiculite was banned from use in our mixes, at the time.

At the same time, we did a side project looking into alternatives to vermiculite as a "seed topper" or covering. As you know, ornamental plug and vegetable transplant growers sow seeds and then "top the seeds" with vermiculite. We looked into alternatives for use as seed topper.

Here I present our findings from the seed topper trials. My hope is that this information improves your understanding of the functions of a "seed topper" and generates interest to try the this technique — So then, you can have your own Plan B!

SURPRISING SCIENCE

Back in the 90s, we searched scientific databases and did not find data for any seed topper materials. While there were mentions of topper materials in the trade press, we were surprised as to why seed topper materials did not receive attention in the scientific circles even though seed topping is a common practice in our industry. Since 90s, I have not yet seen any research on seed toppers.

Without any previous research and guidance, we approached the subject of seed topping from the requirements of the seed and the grower. We analyzed these requirements to establish the attributes for a good topper.

WHAT A SEED NEEDS AND WHAT A GROWER WANTS...

What does a seed need to germinate and establish? A seed's needs are few and simple, when compared to the needs of a whole plant. A seed needs:

- Water / Moisture
- Proper temperature
- Oxygen

Light is not required for germination as seeds don't photosynthesize. Indeed, most crop seeds germinate in dark. There may be a minority of exceptions including some petunias and impatiens varieties.

What does a grower want? A grower is concerned about not just one seed but the whole lot of seeds. A grower wants:

- All seeds in the lot to germinate so not even one valuable seed is lost
- All seeds to germinate fast so plug production time is minimal
- All seeds to germinate consistently and developing to the same seedling size so sorting and grading seedlings are minimized

A seed topper obviously should have attributes to help fulfill these requirements.

Usefulness of a seed topper is indeed for just few days— at the most a couple of weeks— after sowing seeds. Once seedlings establish, the plug mix influences seedling growth.

For even dispensing of the peat-topper, dispensers meant for vermiculite need to be adjusted and/or modified. But the rewards in savings with the peat topper are enormous.

TRIALS AND TRIBULATIONS

We did our trials on benches in a greenhouse. We noticed that in germ chambers, where optimum conditions can be maintained, differences in results between topper materials were not significant. For instance, when seeds were kept moist by frequent misting, low water holding sand and 100% perlite seemed to be acceptable as toppers. But when sand and perlite were used in "outdoor" greenhouse settings, differences became more pronounced as moisture stress / other environmental conditions become severe.

Though we occasionally looked into other topper materials, we concentrated on the peat topper as it started showing promise from the outset.

To exclude the influence of plug mix on seed germination, in some of the trials, seeds were placed on a paper or glass and then covered them with the topper materials for observations.

Our observations are placed here in the context of the attributes of a seed topper, as described earlier. However, it is very difficult to measure an attribute, say temperature or moisture, at the seed level and directly connect that attribute to the observations. Though our explanations here are empirical, they have physical and physiological basis.

WATER IMBIBITION

Seeds in storage are very dry and that's why they don't germinate. As soon as a seed imbibes water, it starts germinating.

A seed needs continuous availability of water. If water available in germinating environment becomes low, even after seed starts germinating, that seed goes into a suspension mode. This suspension ability of seeds is in fact exploited by seed companies to improve seeds of high value crops in a technique called priming. In priming, seeds are imbibed and germinated to a certain point and then redried. Upon sowing by growers, primed seeds resume germination. Since the resumption takes less time than full germination, primed seeds germinate faster. Still, after sowing, water availability to even primed seeds is vital for their continued germination.

Upon sowing, a seed draws water from the materials it is in contact with. Thus, seed germination is dependent on the ability of a topper material to provide water.

Peat topper provides more water to the seeds. We found that peat graded to a particular particle size gives more, good contact points for most sizes and shapes of seeds. Peat particles even adhere to some seeds. Such contacts ensure better availability of water to the seed. We saw the result as faster and more consistent increase in the weight of the imbibing seeds.

We found that most peat particles used as topper should be of similar size to enable good contact with seeds. If some peat particles are large and some small, all seeds do not get the same degree of contact, so seeds "experience" different conditions, which could

Peat-Topper on the right seemed to cover the top of the flat better than some other grades of vermiculite in our trials.

cause variation in their germination.

We modified the wetting ability of the peat used as topper, so when watered, all particles absorbed water quickly, thoroughly and consistently. Such modified peat tended to maintain humidity in the vicinity of seeds even after water uptake by seeds and evaporation.

The peat-based topper held more water than sand and perlite. Therefore, we didn't have to water the peat topper as often as sand or perlite. Some crop seeds germinated in higher percentages under the peat topper than under sand or perlite toppers. The seedlings also emerged in less time under the peat topper.

Seeds seem to absorb water from water vapor too. We saw this in seeds covered with plastic. However, imbibition was faster and more uniform when seeds were in contact with liquid water in the peat topper.

IMBIBITION AND SALINITY

Water moves from solutions having a low salinity to one with high salinity (osmosis). Practically, the purer the water, the faster the rate of this movement and thus the imbibition into the seed.

We observed that high salinity (soluble salts) in a topper slowed seed germination. So, any component that adds to the salinity of a seed topper is not beneficial.

Peat by nature has hardly any salts. However, we found certain elemental ions when present stretched hypocotyls of germinating seeds of some crops. Therefore, we eliminated such ions in the peat used as topper.

TEMPERATURES

Various crop seeds have their own optimum temperature for germination. Seeds don't germinate well at very high or very low temperatures. Fluctuating temperatures also slow the germination.

Since seeds are just below the topper, they are subject to almost the same temperature as that of the topper, with hardly any lag in time. Temperature during germination can be scorching during midday in summer or freezing during late night in fall or early spring.

Since topper temperature is dependent on topper moisture, irrigation can be used to moderate the temperature. Alternatively, a topper that can hold more moisture can moderate the temperature fluctuations.

Since peat holds more moisture, it would not reach very high temperature during the day, thus keeping the seeds cooler. Nor would it reach very low temperature during the night, thus insulating the seeds. Less temperature fluctuations means less risks of scorching or frost damage to seeds. And, one doesn't have to irrigate to moderate the temperatures.

This temperature moderation might have been another reason we saw uniform and earlier germination under the peat topper. However, as mentioned before, it was difficult to measure temperature around seed.

BREATHING SEEDS

Germinating seeds respire, therefore require oxygen.

There is often a compromise between maintaining sufficient oxygen and sufficient water during seed germination as both require the same space in the germinating environment. For instance, increasing water holding in the topper could decrease oxygen.

However, a narrow range of the particle size distribution in the peat-topper seems to help in the formation of enough pore spaces and diffusion of gases to provide enough oxygen to the germinating seeds.

We observed that peat particles seem to wick away the water film that occurs on some germinating seeds. And this is a good thing because the existence of such water film on the seed would lower the oxygen diffusion to the seed.

Additionally, growers often mentioned that judging when to irrigate was easier with the peat-based topper (compared to the vermiculite topper), because the peat topper color changes were more evident of the growing mix water needs.

MR. CLEAN

Growers understandably worry about toxins, diseases, weeds, etc. that can come in a topper.

Luckily, there is a long track record for peat with regard to these attributes. Peat has been successfully used for many, many years to grow plants. Nonetheless, peat processed for use as topper is to be especially clean.

Peat is not abrasive and does not cause any mechanical damage to machines, unlike sand. Peat is safe to handle.

NO CRUST

There are some mechanical aspects that should also be considered while considering a topper material.

One aspect is the topper becoming hard or forming a crust. If a crust forms, it impedes emergence of the seedling and delays the seedlings growth. Crust also restricts infiltration of water and oxygen to the seed or seedling.

We didn't observe crust formation by any topper material including peat in the trials in our greenhouse and later in the field. One reason seems to be that the time required for seed germination is not long enough for formation of any crust. Certainly, consideration is needed for the minority of seeds that require very long germination times — But issues are unlikely but caution should be exercised.

Another reason could be that we and most seedling growers used nozzles that basically mist water. I mention nozzle size because we noticed an impact of nozzles (and thus droplet size) while attending to complaints of crust during regular growing of bedding plants. When irrigation nozzles supplied large droplets, there seemed to be more crust formation. Large and heavy water droplets seem to break growing media particles into smaller and finer particles. Later on, such smaller / finer particles seem to get compressed and bind together on the growing medium surface. Then, when the growing medium surface is allowed to dry for long, a mat or crust seems to form.

Crust formation seems to be more when the water is alkaline with sodium or has a high alkalinity level (bicarbonate / carbonates). When acid is used to reduce alkalinity of the water, crust formation seems to be less.

Another type of crust formation is due to algae or microbial slime. In this case, you have to identify the source of the algae or microbial fouling first before you can focus on a cure. There are a host of avenues one can take to solve this particular issue.

BURYING & DISPENSING

The depth of topping is important so seeds, especially small seeds, are not buried by the topper.

Because of high bulk value of peat, low amounts of it as topper gave good depth and good results. With the peat-topper, burial did not prevent seedlings emerging because peat is soft and not dense. However, seedlings under deep layers of peat were slow and uneven to emerge. This

... Growers often mentioned that judging when to irrigate was easier with a peat-based topper compared to vermiculite...

was also common when sand was used as topper.

In greenhouse trials, we dispensed the topper materials by hand. However, in a commercial setting, a topper is dispensed through a machine. Therefore, the topper has to flow and disperse evenly on seeds, not drop in lumps. For such flowability, we found that peat should have a particular moisture. That level of moisture prevents formation of lumps. Addition of a particular grade of perlite at a certain proportion also helps in the flowability. So the "bottom line", is that formulation of the peat-topper blend is important.

In field trials, we found most dispensers are adjusted for dispensing vermiculite.

Trials using peat topper on many crop seeds in real-world growing situations showed fast, uniform germination and uniform seedling growth.

Therefore, when using a peat-topper, dispensers need to be re-adjusted to accommodate this material — Perhaps including an auger to break any lumps, to flow evenly, to dispense to the desired depth, etc. But this should not be too concerning because these adjustment costs are a bargain compared to the savings you make using a peat-topper.

When sawdust was tried as topper, it tended to migrate away from the seed into cell or tray corners during moving of trays and also float away during watering.

TOPFLIGHT TOPPER

You might be thinking: these observations are fine but does this peat topper perform in the real world?

Back in the '90's, we mentioned our findings about the peat topper to few professors and growers we mingled with at the The Ohio Florists' Short Course. Later we heard some growers tried the peat topper and had gotten results similar to ours. However, promotion of the idea of the peat topper fell through the cracks during the changes in our company ownership.

Last year we revived the peat-based topper idea to growers in California but most growers (like most of us) find existing practices more assuring than attempting a new practice. Although some innovative growers tried the peat topper, recent increases in cost of vermiculite and variability in supply proved to be a big motivator for growers to try the peat-topper. Interestingly enough, there was good agreement between their results and our observations years ago. Some growers have even already switched to the peat-topper as their PLAN A, replacing vermiculite. This is not to say that vermiculite is obsolete but **there are options for our customers.**

This switch is similar to the transition in the plug mixes from 1:1 (v/v) peat-vermiculite to peat-perlite blends. Growers have come a long way in the use of components in plug mixes. Nowadays you hardly see a plug or transplant grower still using vermiculite as a major component in the plug mix. One can expect the same happening with the seed topper.

Growers often mentioned that judging when to water was easier with the peat-topper (compared to the vermiculite topper), because peat topper color changes were more reflective of the growing mix water needs.

As I told a grower, if he had started using the peat topper instead of vermiculite since the time of our first findings, he would have easily saved more than $200K. That's enough to buy the Cessna airplane he wants so he can visit his customers faster and more consistently— just like what the peat topper would do to his seeds!

Still, not too late to switch to the peat-based seed topper and start saving for that Cessna!

- Shiv Reddy

Trying Sun Gro's Seed Topper…

WHAT IS SUN GRO'S PEAT -BASED TOPPER MIX?

Sun Gro's Seed Topper Mix (SKU 701) is a standard product in the Western Region but can also be ordered nationwide. It's a mix incorporating specially screened sphagnum peat moss and perlite. The blend is pH adjusted using dolomitic limestone and has a wetting agent added. Moisture is controlled for proper flowability and even topping.

This product can be used for most seed topping applications.

As Shiv Reddy's research and real-world observations have shown, it works out excellently when dosed correctly.

If you wish to trial this mix, please call your area Sun Gro district manager to arrange for a sample bag. Or call our customer service representatives at the phone numbers shown on the back of this publication.

If you're so inclined, visit our web-site at: **www.sungro.com** if you want to e-mail us your request or wish to ask our world-class technical services about the use of Sun Gro's Seed Topper.

You can contact SunGro by:

- **District Sales Manager**
- **Customer Service**
- **www.sungro.com**
- **Technical Services**

Correction and Update about RootShield

Several years ago in 2003 we reported in ***The SunGro'er*** a summary of all the granular biorational disease control inoculants that could be used in growing media as a pre-incorporated application. In the case of RootSheild® Granules, we stated that the use of peroxide based products like ZeroTol® would affect the performance of Rootshield Granules. John Francis, Director of Marketing and Technical Services of Bioworks, Inc. corrected us with the following information:

" RootShield® is compatible with ZeroTol as long as it is: a) not tank-mixed as a concentrate and b) used at concentrations lower than 1:200. Therefore, ZeroTol® foliar sprays, drenches more dilute than 1:200, or maintenance levels in irrigation water have no effect on RootShield colonization and growth. This has been verified from root colonization assays over the years showing continued satisfactory root colonization levels of RootShield when the growing medium or plants have been treated with ZeroTol."

Thanks to John Francis for the correction and update and it is good to know that growers can use these product in concert in their production for healthier crops.

-Rick Vetanovetz

SunGro can incorporate RootShield® or other dry granular Biocontrol products as a part of Sun Gro's customblend program.

Tips on growing compact plugs!

Don't stretch your transplants. Understand plant nutrition and stretch your fertilizer dollar instead!

WOULD YOU LIKE YOUR TRANSPLANTS MORE COMPACT?

Now that you know the workings of a seed topper, you may want to know how to grow compact transplants that are the most desired, without the use of chemicals.

Dr. Shiv Reddy, Sun Gro Technical Specialist in the Western Region published an article in *Greenhouse Grower*'s *Young Plant Issue* in September 2010. This article puts the relevance of phosphorus nutrition in the context of growing compact transplants in soilless media. As you may have heard phosphorous has a significant effect on the elongation of a plants internodes or "stretching" of many plants. This idea was recently brought to light by research conducted at North Carolina State University professor Dr. Paul Nelson. Interestingly, this research verified observations by Shiv and other's, like another well known vegetable expert and professor emeritus from Cornell, Dr. Ray Sheldrake. In those day, the technique of "controlled phosphorus starvation" never caught on.

But the technique does work. And now, more than ever, has relevance to the growing high quality pugs become clear.

Follow this link for the full article: http://www.greenhousegrower.com/production/?storyid=3753

Contact your Sun Gro District Manager, Sun Gro Distributor or Sun Gro Technical Specialist to obtain a growing mix to produce compact transplants.

-Rick Vetanovetz

SUN GRO HORTICULTURE

15831 N.E. 8th Street, Suite 100

Bellevue, WA 98008

Internet: www.sungro.com

Call a Sun Gro representative for more information:

Toll-free Customer Resource Centers:

Western Region:	1-888-797-7328	Fax: 1-888-797-6494
Central Region:	1-888-982-4500	Fax: 1-888-982-4501
Eastern Region:	1-888-896-1222	Fax: 1-888-896-1444
Southeastern Region	1-800-683-7700	Fax: 1-800-231-5307