RootMaker™ Products Company, LLC

Summer 2001 Newsletter

RootMaker® News

The following are the trade shows where we will have a booth this summer and fall. We invite all of our customers to visit with us at one of these events. Dr. Whitcomb will be at the SNA and The Dallas Nursery/Landscape Expo.

SNA, Atlanta, Georgia, August 3, 4, & 5, Booth Number 541.
The Nursery/Landscape Expo, Dallas, Texas, August 17, 18, & 19, Booth Numbers 536-538.
FNATS, Orlando, Florida, September 21, 22, & 23, Booth Number 2021.
Western Expo, Las Vegas, Nevada, October 10 & 11, Booth Number 431.

This is a reminder that the new prices are now in effect for the following containers.

	Each	W/5% Disc.	W/10% Disc.
RMI-1R – 1-Gallon Round container -	$0.45	$0.425	$0.405
RMI-1S – 1-Gallon Square container -	$0.65	$0.62	$0.59
RMI-3R – 3-Gallon container -	$1.37	$1.30	$1.23
RMI-5G – 5-Gallon Grounder -	$1.95	$1.85	$1.76

Almost all of our customers adhere to our Net 30 terms. However, a few have not done so. Invoices that are past due will be charged 1-1/2% interest for unpaid balances. In addition, we will submit all invoices for collections that are past 90 days. We realize that unusual circumstances can prevent anyone from adhering to normal terms and we are willing to work with our customers when these circumstances arise. Just call us to discuss the situation.

Grower News

Many of our customers have talked to us this spring and all have reported that they are very busy. Some of the stories of the success that individual growers have had have been tremendous. One such story comes from Rod Reynolds with Pahrump Landscape and Design in Pahrump, Nevada. Rod was nurseryman for the Collins development company and was responsible for producing trees for a 3,000-acre, 8500 home, 2 golf course planned community west of Las Vegas, Nevada near the California border. There were 13,000 trees total under cultivation with 6,000 in Knit Fabric containers in various sizes from 12" to 24". The varieties were ash, poplar desert willow, sycamore, and mondell and afghan pine.

Before the project was completed, the owner passed away and his company went into receivership. For approximately one year the trees were not fertilized and received a limited amount of water when it rained. During that time, the courts resolved the situation and new owners took over. They decided to liquidate the tree inventory. The 5,000 trees that were field grown were harvested in the fall and winter with standard digging methods. The 6,000 trees in Knit Fabric containers were to be harvested later.

When the decision was made to sell the 6,000 trees in Knit Fabric containers, many people came to the nursery to purchased and dig trees. This included homeowners that bought 5 to 10 trees, digging with shovels to landscape/nursery owners that bought 500 to 1000 trees. Rod harvested about 1200 using a 24" backhoe. Still other people popped out trees with a digging attachment on skid loaders.

This all took place at the beginning of the summer with temperatures hovering around 100° F. Much of the time the trees were under additional stress of high, dry winds and very low humidity. Rod anticipated a poor survival rate given these conditions. He brought the trees he harvested to an area where he could keep the root balls wet with a sprinkler. Many of the homeowners did not take this precaution and left their trees in the yard until they had time to plant.

Now we get to the exciting part. Of the 1200 trees that Rod harvested, only one died. Likewise, he has not heard of any of the other landscaper loosing any of these trees. He also noticed that nearly all of the trees that were purchased by the homeowners survived. He was able to recognize the trees that were in the area because this nursery was set up under the direction of Dr. Whitcomb and all the trees were easily identifiable. He estimates that the survival rate to be 98%. Under these conditions, that is fantastic. This speaks volumes about the results that can be achieved with the Knit Fabric containers

There is a correction from the Spring Newsletter. The correct phone number for Connor Shaw at Possibility Place Nursery is (708) 534-3988. We apologize for any inconvenience that this might have caused.

It's All About Energy

By
Carl Whitcomb

Plants, cars, lights, **everything**, runs on energy. When you need more electrical energy you pay your electric bill. When your car needs more energy, you fill it up at the pump. When your trees, shrubs, or other plants need energy, do you know what to do?

The energy for plant growth comes from the leaves and other green tissues. Through the amazing process known as photosynthesis, leaves of plants take in carbon dioxide from the air and combine it with water absorbed by the roots and with the aid of 12 essential nutrient elements, the energy from the sun is captured and turned into a variety of sugars and starches to make the energy for plant growth.

Improving Energy Output

Think of photosynthesis as a very complex machine somewhat analogous to an automobile. In the case of the auto, a complex of gears, valves, pistons, spark plugs, wheels, and other parts work together to use the energy from the fuel to cause movement. Movement was slow, erratic and very inefficient in early autos and sometimes stopped altogether. With years of experience and new technology, the automobile has greatly improved. The basic components of wheels, pistons, etc. remain the same, but the **efficiency** of those components has increased dramatically with nearly every item. Radial tires require less energy to turn and last much longer than the bias ply type they replaced. Computers precisely control fuel injectors to meter out fuel in precise amounts to meet the environmental conditions and request of the driver. Many young drivers today have no familiarity with a 'choke,' a crude device operated manually by the driver to control the fuel mixture going into the engine. Carburetors with manual chokes were grossly inefficient and wasted lot of fuel.

My first auto was a 1939 Chevy coupe with inline 6-cylinder engine, manual choke, manual 3-speed transmission, and was equipped with bias ply tires that would typically last 12000 to 15000 miles if I did not hit a rock. Today I drive a 1997 Chevy half-ton pickup extended cab with V-8 engine, air conditioning, automatic transmission, power steering, cruise control, radial tires good for 60,000 miles or more and seats that are really comfortable. Further, it goes over twice as far on a gallon of gas as the '39 6-cylinder in spite of being heavier and doing all the other tasks of comfort.

Unfortunately, many nurserymen are not far beyond the '39 Chevy technology in terms of growing plants. Can energy output in plants be enhanced similarly to that of the automobile? Absolutely. Can energy efficiency in terms of more efficient use of the energy manufactured by the leaves be accomplished? Certainly.

Improved Plant Efficiency

Energy Production: The supply of carbon dioxide and light to the leaves is more or less fixed. However a more uniform supply of moisture applied so that oxygen available for root functions is not compromised, can improve energy output **if** moisture is the limiting factor.

Supplying the eleven essential nutrient elements is the most complex set of factors over which we have control. There appears to be an optimum amount of each of the 12 elements for maximum plant growth. In practical reality, energy output of the leaves relative to the 12 essential nutrients is controlled by the one most limiting.

Using the auto example, to have a highly efficient, high energy engine can not move the machine any faster if the tires cannot stand the speed or the radiator does not have the proper cooling capacity or if the transmission cannot

effectively transfer the energy to the wheels. The modern auto combines all of the components to interact efficiently to create the desirable end result.

One of the key reasons growth of plants in soilless mixes in containers has increased dramatically over 25 years ago, is the fact that research could be done with greater precision compared to soils. For example, in the late '70s I conducted a series of complex studies and found that for the six micronutrients, it is not just the level of iron alone, bur the level of iron proportionate to copper, zinc, manganese, boron, and molybdenum. To say it another way, if five of the six elements were optimum, growth was less compared to when all six elements were optimum. If any one of the six micronutrient elements was not synchronized with the other five, plant growth was less compared to when all six were optimum. The micronutrient fertilizer Micromax is the culmination of these studies. A number of years after I introduced the formula Micromax micronutrient fertilizer, an even larger, more complicated study was done. In total, three levels of each of the six micronutrient elements were combined into one huge study with 729 treatments. Further, the study was conducted with four different species: azalea, juniper, holly, and day lily. In order to build upon the original studies that led to Micromax, the middle of the three levels of each element was the amount in Micromax. The high level doubled that level and the low level was one-half. In other words, the lowest level of any plant experienced was one-half the level in Micromax. The study was also done with the optimum levels of calcium and magnesium and the best slow release N, P, K fertilizer known at the time.
The results at the end of one growing season were quite striking. Not a single plant among all four species showed any chlorosis or other sign of deficiency or toxicity of any nutrient. Since every plant was a rich dark green, was the study a waste of time? Quite the contrary.

The study showed that even when plants are dark green in color their overall health and vigor can be improved by further refining the rate, ration and proportion of the micronutrient elements --- as long as no other nutrient or growing condition such as water, light or temperature is limiting. Differences in size of the fashion azaleas after a nine-month growing season were small, however flower buds appeared to vary with treatments but were impossible to count. I kept the azaleas until they flowered the following spring and did flower counts. The poorest treatment averaged 24 flowers per plant while the best treatments averaged 171, 167 and 166 flowers per plant. With the best treatments the flowers were so profuse you could not see the foliage. The day lilies, hollies and juniper all had more stems and were thicker and fuller with the best treatments --- and all without pruning or growth regulator chemicals. And, most notable was the fact that all four species grew best with the same treatment.
The message from the study was quite clear, that we can further accelerate growth and vigor and plant health beyond just having the plant green and showing no chlorosis. Since pruning cuts off growth you just paid for, stimulating branching without losing plant tissue or paying for expensive labor is a huge benefit. And all by focusing on energy output of the leaves. It's ALL about energy.

Seedling Development

The Critical First Days

By
Carl Whitcomb

Consider what happens in nature.
When a seed germinates in the wild, a strong primary or taproot plunges downward. The tip of the taproot has a strong apical dominance and suppresses secondary root branching in the same manner as the tip of the new shoot suppresses branching. The objective of the taproot is to extend deeply to anchor the new plant and access moisture to avoid dehydration. The objective of the new shoot is to reach sufficient vertical height to access light to support leaf functions and to avoid being overshadowed by competing vegetation. A typical tree seedling top response is to develop few, if any, side branches until a position of leaves in sunlight is achieved. Likewise, a typical response with the taproot is to produce few, if any, branch roots until the taproot has extended considerable distance, often three feet or more and provisions for the plant have been secured. Since there are limited energy resources stored in the seed, tree seedlings proceed most efficiently. Only after the taproot is secured and is providing water and nutrients and the new leaves are producing energy does secondary branching occur both above and below ground.

Conditions in a Nursery.
In a nursery moisture and nutrients are provided and weeds are controlled. There is no need for a deep taproot; in fact a deep taproot is a liability not an asset. Further, when the tip of the taproot is destroyed by dehydration (air-root-pruning) approximately four inches below the seed secondary branch roots quickly form along the entire short taproot. These secondary roots originate oriented

mostly horizontal or slightly downward. However, in bottomless milk cartons, plastic tubes or sleeves and open bottom plug trays, there is no opportunity to maintain horizontal growth. The problem is that these containers direct all secondary branch roots down, leaving few, if any, roots to grow horizontally following transplanting. Trees grown in plug or milk carton type containers and then planted into larger containers promptly develop a complex mat of roots at the bottom and modest roots above. When trees grown in plugs or milk carton type containers are planted in the field, most roots extend downward further reducing the amount of roots in the root ball when harvested balled-in-burlap or with tree spades.

Improved Container Technology.

In 1987 it occurred to me that the way to solve this root problem was to create a seedling container that air-root-pruned at several levels on the sides as well as at the bottom. The original patented RootMaker® design is an injection molded container 2.5 X 2.5 X 4 inches deep with a series of saw tooth like ledges and openings in the sides and for bottom openings. These heavy plastic containers have a life of 10 years or more with reasonable care but are slow and expensive to manufacture. Seeds planted in the original RootMaker® propagation containers develop roots in all directions following transplanting, not just down (Figure 1).

Figure 1. These Southern red oaks germinated on the same day. The seedling at the left was allowed to extend the taproot without interference. The seedling at the right was in the RootMaker® II 32 cell Propagation tray. After 3 days the air-pruned seedling has formed many secondary branch roots and has begun to produce a top. The seedling left alone has no top development and only a few small secondary roots. These are typical of 32 seedlings allowed to germinate both ways.

After several years of study with the original RootMaker® propagation container I began to look for additional container designs that would be simpler and less costly to manufacture yet would provide the same desirable root system. Models of numerous designs were built and tested. One design that worked especially well is called RootMaker® II (Figure 2). RootMaker® II (USA Patent #5557886) comes in a thermoformed 32 cavity tray that fits into a mesh 10 X 20 flat for ease of handling. Each cavity holds 11 cubic inches (versus 14 for the original RootMaker®). Space efficiency and ease of handling have been improved without sacrificing root system branching quality and at a much lower price. Other sizes of containers based on this design are under development.

Figure 2. The RootMaker® II design has four bottom openings plus 12 openings at three levels in the sidewall to accomplish air-root-pruning and orient roots to grow in all directions following transplanting.