BENEFITS OF USING **BIO-RECYCLERS**

Hydro-organics and the use of biological recyclers
by Todd Salemi

Organic soil gardening has always been known to be the best way to grow for earth friendly reasons and a more natural tasting crop, but hydroponics can deliver larger yields at faster growth rates with an almost incomparable taste. Hydroponics and the goal to achieve organic recognition have been long overdue. The goal of this article is to show that in a hydroponic application, microbial activity, biological recyclers and bio-diversity can lead to organic certification, increased yields, flavors and harvests. The use of synthetic fertilizers prevents the hydroponics industry from supplying the rapidly increasing demand for "organic" fruits and vegetables. Until the hydroponics industry can provide the nutrients from all organic forms this growing market is not attainable.

In current conventional methods, synthetic fertilizers and mineral salts provide the plant nutrients. When these synthetic fertilizers become aqueous in the reservoir, the plants are able to access the nutrients directly without the facilitation of microbial activity. The advantage to this is faster growth than standard soil applications and a more sterile gardening practice. The downside is the increased salts level that is produced by the chemical base of fertilizers. These mineral salts build up, cause pH deficiencies, root lock, pathogenic buildups, and cause negative environmental impacts.

Bio-technology and the use of microbial rich solution can change the way hydroponic gardeners produce crops. (Note: this solution is not a compost tea; the NOP, National Organic Program, does not allow "compost teas" to be used for food crops within 120 days of harvest). This biological approach will take the hydroponic industry in a huge step in the right direction towards organic recognition. Hydro-organics are a basic concept of bio-diversity, balanced biology, and an increased concentration of chitin and cellulose recycling organisms.

Full range biology and Bio-diversity

Significant academic research has shown that healthy, biological growing environments include both beneficial bacteria and fungi in a wide diversity. The beneficial bacteria provide the highest concentration of biological nitrogen. Each bacterial organism is comprised of seven carbons and one nitrogen. The beneficial fungus is comprised of 30 carbons and one nitrogen, which is the second highest nitrogen source. Bacteria and fungi are consumed by the microbial biology contained within the hydroponic solution, and are releasing needed sources of nutrients into the root web system. A full-range of biology significantly reduces the amount of fertilizer required.

Bio-diversity is also very important. In order to prevent any one specific set of organisms from predominating and causing imbalance in the hydroponics system, a wide set of beneficial organisms are needed. A healthy soil or hydroponic system must have diversity of at least 10,000. When bio-diversity reaches an excess of 30,000, the optimal health and growth rate of the plant increases and the rate of nutrient absorption and mineral control becomes augmented through symbiotic plant and microbial relationships.

Chitin and cellulose recycling biology

Both refined chemical nutrients and unrefined organic nutrient approaches can breed unbeneficial competitors. Most beneficial and pathogenic competitors are predominantly made of chitin, although the Pythium and Phytophthora fungi groups are cellulose based. Chitinase and cellulase producing organisms consume and recycle both beneficial and pathogenic competitors exuding nutrients as a result of the recycling process. If the unbeneficial competitors surround the root zone of the plants they will deprive the plants' ability to absorb the necessary nutrients for robust and vigorous growth. If the unbeneficial competitors overwhelm the root zone the plant will virtually starve. Dr. Garn Wallace of Wallace Labs states that unbeneficial competitors are not strong and only thrive when beneficial organisms are not present. By increasing chitinase and cellulase producing organisms, the rate at which nutrients is supplied to the plant is dramatically increased.

BENEFITS OF USING **BIO-RECYCLERS**

A healthy organic hydro system needs a balanced concentration of bacterial & fungal organisms with wide diversity.

Tests and Research

Tests have shown phenomenal results with microbial rich solution.
The 150,000sf Ohtani Hydroponics facility provides 90% of the restaurants in Tokyo with table lettuce, Chinese cabbage and other green vegetables. The test was performed under the guidance of Japanese Agriculture with the five ministers of agriculture observing the results. Two separate systems were assembled to determine the effect of adding biologically active solution compared to the standard protocol.

Iceberg lettuce and Chinese cabbage were grown from seed for this test. In 12 days, the plant mass of the treated plants had grown 387% greater than the standard protocol. At the end of the second year Ohtani found that harvests have increased from four to seven harvests a year with an average of 30% yield increase for each harvest.

Dr. Joe Bradford, the director of ARS-USDA, at Texas has been using this same solution on pecans. The application is not hydro, but the results are significant. Texas A&M gives the max yield of 23 pounds/tree for the Pawnee variety. The yield increased to 32 pounds the first year. Many other pecan growers felt the yield would drop the following year. 2005 was the second growing season and the yield on the Pawnee pecan trees increased to 43 pounds/tree. The taste improvement is best described by Dr. Bradford's statement that even a blind man will be able to tell the improved taste and will not choose to eat the pecans that did not have this advantage.

The rate and amount of biological build up and balance that old grove trees require are unnecessary for hydroponic applications. The non soil media results in a balanced biology that can be acquired within five minutes of adding microbial rich solution.

The same yield increase and taste improvement was seen in onion production testing. The standard protocol onions from eight different farms are the size of a cue ball. Production in side-by-side field with only organic nutrients and microbial rich solution with high levels of biological recyclers produced grapefruit size onions. In the case of many fruits & vegetables, improved taste can be directly determined by Brix level. This is a measurement of the sugar content. In tested onions, the standard protocol onions produced a Brix level of 2-3. The "solution" produced onions at a brix level of 10. This level of sweetness means the onion is so good it can be sliced & eaten like an apple.

An additional advantage of balanced biology and increased biological recyclers is extended shelf life. The average shelf life for the large sweet onions is less than six (6) weeks at room temperature. Onions tested with "solution" lasted well past six months. Similar long shelf life periods have been seen across the board in a wide range of applications. This includes lettuce that lasts longer, and flowers that hold their blooms longer.

More research and application results will be presented in future articles, but the following can be applied by the hydroponic industry:

--- Supplying the needed plant nutrients in organic form is possible when the hydroponic systems are inoculated with the right biology.
--- This biology must have a balance of the bacterial and fungal with diversity in excess of 10,000+.
--- Optimal growth is possible if sufficient recycling organisms are present to digest the biology and provide it as a food source for the plants.
--- Chitin and cellulose degrading organisms should be increased to the range 200 and 400 cfu/gwd.
--- Quality growth can be achieved by a simple inoculation of quality solution every time the reservoir is refilled.