

Winter Blues to Winter Greens

By Charles Kirby

The gardening season comes and goes quickly in Alaska, as we all know. Why? Winter should not be a reason to pay higher prices for the vegetable you want at your table. Gardening simply does not have to end. With very little space, growing indoors without "creating a mess" can be accomplished by hydroponics.

Hydroponic gardening strives to optimize the nutritional and environmental conditions for plant growth in a controlled system, thus providing optimal yields. In order to optimize plant growth, we must first understand the plant requirements and the process in which they are obtained.

FUNDAMENTAL PLANT PROCESSES

Plant metabolism is fueled by photosynthesis, whereby water and carbon dioxide are converted by light energy into sugars for use by the plant. During photosynthesis, 12 molecules of water and 6 molecules of carbon dioxide are changed by light into one sugar molecule, with 6 molecules of oxygen and water left to be respired.

Root hair cells, found at the root tips, absorb water and minerals in the form of ions. Cortical cells throughout the root system then transfers the water and mineral ions deeper into the roots. The water and minerals are absorbed into the root xylem, where they are transported to the leaf cells. They are combined with carbon dioxide from the air. Chlorophyll uses light energy to convert the water and carbon dioxide into sugars called photosynthates. The photosynthates are transported throughout the plant by the phloem.

Some of these photosynthates are used for plant growth, reproduction and repair, and the rest are stored in the roots, stems and fruit as sugar. It is these stored sugars, which in food crops, are edible.

The plant processes are unchangeable, but in a controlled environment the conditions and available resources can be modified and/or altered to enhance the process. Supplying air, light, nutrients and water are conditions required for indoor gardening. The conditions can be adjusted accordingly to the plant's stages. Given the ideal conditions, the photosynthesis process is increased, heightening photosynthates or sugars. When more sugars are available, the overall health of the plant is increased and more sugars are stored in the fruit, hence, increasing the flavor of the fruit.

Simple right! Well, it gets easier.

NUTRIENTS AND AVAILABLE CO₂

Nutrients that have been developed over time have catered to the basic needs of plants in their stages. There are many stages of development in a plant's life cycle, but there are

two major stages. One stage is vegetative or "grow" and the next is maturity or "flowering." Applying specific fertilizers during the correct times allows the plants to maintain full health during the transition from vegetative stage to the flowering stage. At this time, changing the lighting schedule from 16-18 hours of light (used during the vegetative cycle) to 12 hours of light will also assist in producing the maximum amount of flowers.

There are now products that will deliver sugars directly to the roots with comparable, if not better results. Increasing the uptake of sugars strengthens the plant and increases the growth rate. During the flowering and fruiting stage, increased sugars are affecting the flavor of your fruit in the best way possible.

Hydroponics is growing without soil, but it is also capitalizing on the instant delivery of water, nutrients and natural additives that will complete the goal faster with greater results. The goal: a full-flavored, juice dripping tomato, one that you remember picking off the vine. In the world of hydroponics there are no seasons, only the ones you create. Plants can live several years and continue producing during that time period. Because the season is continuous, there are no set backs in growth. Plants develop faster!

Hydroponic systems

Any one hydroponic systems is difficult to single out, they all have the same purpose. There are several different types of systems: Flood and Drain, Nutrient Film Technique, Aeroponic, Modular Hydroponic systems, etc.

Flood and Drain: A system that floods the growing tray on a timed basis by means of a submersible plump and then drains back into the nutrient reservoir.

Nutrient Film Technique: A thin film of water and nutrients is pumped to the higher end of a trough then travels down the trough by gravity where it comes in contact with the roots of the plant and ending back into the reservoir. This is a continuous feed system.

Aeroponic: Growing plants in an enclosed trough where the roots are suspended and bathed in a nutrient mist rather than a nutrient solution.

Modular Hydroponic Systems: Single plant containers are watered by the use of an air pump. These units can be connected consecutively to a controller that automatically replenishes nutrients in response to the plant consumption.

These are four types of systems used for hydroponics. With the theory in mind, new systems are being constructed everyday. Systems are built according to the size of individual areas ranging from a couple of square feet too as large as whole greenhouses.