

THE ELEMENTS FOR SUCCESS

Effectively Implementing CO₂

First a little Plant Science 101 – For a successful, productive garden, hydroponic, indoor and greenhouse growers must control six “essential elements” – air, light, nutrients, water, humidity and temperature. Remove or alter the ratio of only one of these elements, growth will slow, and plants could eventually die. In this article, we will review the air element, specifically carbon dioxide (CO₂), it's role in the most vital plant process – photosynthesis – and how to effectively implement CO₂ enrichment.

Photosynthesis begins when stomata, pore-like openings on the undersides of leaves, are activated by light and begin breathing in carbon dioxide (CO₂) from the air. This CO₂ is broken down into carbon (C) and oxygen (O). Some of the O is used for other plants processes, but most is expelled back into the air. The C is combined with water to form sugar molecules, which are then converted into carbohydrates (starches) combine with nutrients, such as nitrogen, to produce new plant tissues. CO₂ is vital to plant growth and development, and yet is often the most overlooked element in indoor gardening.

Successful indoor growers implement methods to increase CO₂ concentrations in their enclosure. The typical outdoor air we breathe contains 0.03-0.045% (300-450 PPM) CO₂. Research demonstrates that optimum growth and production for most plants occur between 1200-1500 PPM CO₂. These optimum CO₂ levels can boost plant metabolism, growth and yield by 25-60%. Plants under effective CO₂ enrichment and management display thicker, lush green leaves, an abundance of fragrant fruit and flowers, and stronger, more vigorous roots. CO₂ enriched plants grow rapidly and must also be supplied with the other five “essential elements” to ensure proper development and a plentiful harvest.

Commercially available CO₂ generators offer the most economical, practical and consistent method of enriching indoor gardens. Using atmospheric control systems in conjunction with CO₂ generators, ensure the most effective production and use of CO₂. Atmospheric control systems with automatic override or defeat, and CO₂ monitoring logic, enrich and maintain optimum levels in the environment during the photo (light) periods, when most plants can absorb CO₂; and they defeat CO₂ production during dark periods. Automating your CO₂ enrichment system pays for itself quickly with shorter crop cycles, improved quality and higher yields.

When enriching an indoor garden with CO₂, proper light is essential for effective assimilation. For plants to use CO₂ efficiently, light spectrum and intensity should be appropriate for the plant species in your garden. Remember – CO₂ enriched plants under intensified lighting demand higher levels of nutrients, water, space and room temperatures of 80-85°F (27-29°C).

As CO₂ is a critical component of growth, plants in environments with inadequate CO₂ levels – below 200 PPM – will cease to grow or produce. And, growers should be cautious when experimenting with CO₂ levels above 2000 PPM. CO₂ is heavier than oxygen and will displace the O₂ required by both plants and human to function and live. (FYI: OSHA max allowable for human exposure is 5000 PPM). So, air circulation and ventilation is critical to profitable CO₂ enrichment.

Plants use all of the CO₂ around their leaves within a few minutes leaving the air around them CO₂ deficient. Without air circulation and ventilation, the plants' stomata are stifled and plant growth is stunted. Proper air circulation with oscillating fans and in-line blowers, will eliminate potential stagnation problems and ensure efficient CO₂ enrichment.

If you have never enriched your garden with CO₂, start with 700-900 PPM (double the normal atmospheric levels). If yields improve, increase CO₂ enrichment to 1200-1500 PPM. If there is no response to the CO₂ enrichment, double-check your other five “essential elements” to ensure they are not limiting factors.

Want more information on efficiently implementing CO₂ in your hydroponic, indoor garden or greenhouse?

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