



Unis Horticultural Co2 Controller

INSTRUCTION MANUAL

INTRODUCTION

Carbon dioxide (CO₂) is a colourless, odourless gas that occurs naturally in our environment. It is normally present in the atmosphere at a concentration of approximately 0.036% or 360 PPM. Carbon dioxide in our atmosphere is known as a "greenhouse" gas. This naturally occurring gas, along with hydrogen vapour, methane, nitrous oxide, and ozone act something like the glass walls and ceiling of a greenhouse. It lets sunlight in to keep things warm, but it doesn't let the heat escape. That's why scientists began to call gases "greenhouse" gases because of their warming effect on the earth. If it were not for these greenhouse gases, scientists predict that our planet would be un-inhabitable with an average temperature of about -23°C.

Although it comprises a very small percentage of our atmosphere, it is vital for nearly all forms of life. Without CO₂ we would probably not exist because carbon dioxide is the principle inorganic compound that plants use to construct their tissues. Consequently, we derive our energy resources by either consuming plants directly, or indirectly when we eat the animals that consume the plants. Therefore, it is clear that carbon dioxide enhances and makes possible the very existence of life on earth. As a vital atmospheric ingredient, CO₂ makes our planet a place where all forms of life may flourish. Many growers fail to recognize the importance of Carbon Dioxide in their growroom. Most plants grow faster and larger with enhanced CO₂ levels because of more efficient photosynthesis and a reduction in water loss. There are also many other benefits for plants, among them greater resistance to temperature extremes and other forms of stress, better growth at low light intensities, improved root/top ratios & less injury from air pollutants.

Photosynthesis is the term used to describe the process by which plants combine CO₂ molecules with water molecules to form complex sugars, there is a resultant spare oxygen atom which is released back into the air, the sugars being further processed by the plant to form natural polymers for growth. The ambient level of CO₂ in air is 300-400 PPM, fast growing plants in your grow room or glasshouse can use all the available CO₂ in less than an hour slowing photosynthesis and therefore growth to a virtual halt. It can be seen that the rate at which plants are able to grow is relative to the availability of photosynthesized complex sugars. Raising the ambient CO₂ level in your grow room causes more sugars to be produced allowing the plant to grow bigger and faster. The optimum level of CO₂ for plant growth is generally accepted at 1200-1600 PPM, plants grown in this environment can grow up to 40% faster thus shortening crop times and increasing yields. This is of course assuming no other limiting factors such as lack of available light etc.

It should be noted that there is no advantage to increasing CO₂ levels beyond 2000 PPM for most greenhouse plant species. It should also be noted that there is generally no advantage to raising CO₂ levels during dark hours.

SETUP AND USE

The Ecotechnics Unis CO₂ controller has been specifically designed to allow easy CO₂ enrichment for home grow room and glass house horticulture. In use the Unis CO₂ controller is very simple and should provide years of trouble free use.

The first thing you must do is to calculate the internal volume of your growing area in cubic meters or M³ ... This can be done easily by multiplying length x breadth x height. For example a room 3M wide, 5M long and 2.5M high has an internal volume of ... 37.5 M³. You must then look up the Recommended Setting on the Set-up Chart and Dial in the required setting on the Unis controller using a small screw driver. Now the brass regulator must be bolted onto a CO₂ bottle and the Unis controller plugged into it by the flying lead, not forgetting the rubber seal. The plug should now be secured to the regulator via internal fixing screw. The Unis controller can now be plugged into the power source. In use there is virtually no maintenance except regular bottle changes. Bottle changing is recommended when the pressure in the bottle falls below 10 Bar, at pressures below this regulation may become unstable, this is not hazardous but your plants will not be receiving the maximum possible benefit. The removable fiber washer on the regulator stem should be inspected at each bottle change for damage to ensure that gas cannot leak due to a poor seal. It is also good general practice to chain heavy CO₂ cylinders to a wall to prevent accidents.

Glass House Usage

For glass house use the Unis CO₂ controller should be connected to a 24 Hour timer in order to turn it off during dark hours as there is no benefit to raising CO₂ levels during darkness.

Grow room usage

Generally for indoor grow room usage the Unis CO₂ controller would be plugged in with the lighting system supply so that it only works when the

DIFFERENT PLANT SPECIES

There are marked variations in response to CO₂ among plant species. The biggest differences are among three broad categories of plants-- C₃, C₄, and Crassulacean Acid Metabolism or CAM--each with a different pathway for photosynthetic fixation of carbon dioxide. Most green plants, including trees, algae and most major food crops, use the C₃ pathway, so named because the first products of photosynthesis (called photosynthate) have three carbon atoms per molecule. C₃ plants respond most dramatically to higher levels of CO₂. At current atmospheric levels of CO₂, up to half of the photosynthate in C₃ plants is typically lost and returned to the air by a process called photorespiration, which occurs simultaneously with photosynthesis in sunlight. Elevated levels of atmospheric CO₂ virtually eliminate photorespiration in C₃ plants, making photosynthesis much more efficient. High CO₂ levels also sharply reduce dark respiration (the partial destruction of the products of photosynthesis during night-time) among C₃ plants. Corn, sugarcane, sorghum, millet, and some tropical grasses use the C₄ pathway, so named because the first products of photosynthesis have four carbon atoms per molecule. C₄ plants also experience a boost in photosynthetic efficiency in response to higher carbon dioxide levels, but because there is little photorespiration in C₄ plants, the improvement is smaller than in C₃ plants. Instead, the largest benefit C₄ plants receive from higher CO₂ levels comes from reduced water loss. Loss of water through leaf pores declines by about 33 percent in C₄ plants with a doubling of the CO₂ concentration from its current atmospheric level. Since corn and other C₄ plants are frequently grown under drought conditions of high temperatures and limited soil moisture, this superior efficiency in water use may improve yields when rainfall is even lower than normal.

The lowest response to higher CO₂ levels is usually from the CAM plants, which include pineapples, agaves, and many cacti and other succulents. Like the C₄ plants, CAM plants do not undergo photorespiration. CAM plants are also already well adapted for efficient water use. Under arid conditions they fix carbon dioxide at night, when the stomata are open and water loss is minimal. During the day their stomata are closed, and stored CO₂ is released so photosynthesis can proceed. However, some CAM plants follow the C₃ pathway when they are not under water stress; thus, succulents that receive plenty of water experience higher productivity at elevated levels of carbon dioxide.

CARBON DIOXIDE AND SAFETY

Ordinary outside air normally contains CO₂ at a concentration of about 300 ppm (300 parts of CO₂ gas per million parts of air.) Indoors, however, whether we're at home, office, or traveling in a confined space like a plane, the CO₂ content can vary considerably. Usually in a home, the CO₂ levels can vary as much as 300 - 2000 ppm. Several studies have indicated that CO₂ does not seriously impact human health until levels reach approximately 15,000 ppm. This level is more than 40 times greater than the normal concentration of atmospheric CO₂. At extremely high levels, i.e., 30,000 ppm, (these concentrations are usually never reached in a standard home) the symptoms can include nausea, dizziness, mental depression, shaking, visual disturbances and vomiting. At extremely high levels, loss of consciousness may occur. The seriousness of the symptoms is dependent on the concentration of carbon dioxide and the length of time the individual is exposed.

CO₂ - Denser Than Air

Gaseous carbon dioxide is 1.5 times denser than air. Therefore, it will be found in greater concentrations at low levels. High concentrations of CO₂ can displace oxygen, and can subsequently cause death especially if allowed to accumulate in open pits and other areas below ground. Carbon Dioxide acts upon our vital bodily functions in a number of ways, including stimulating respiration, regulation of blood circulation, and the acidity of body fluids. Common complaints from increases in CO₂ levels include difficulty in breathing, increase in the breathing rate and/or pulse rate, headaches, sweating, shortness of breath, abnormal fatigue and a feeling of "stiffness". Introduction of fresh air can assist in eliminating these problems. Finally, CO₂ is an asphyxiate, a condition in which an extreme decrease in the amount of oxygen in the body, accompanied by an increase of carbon dioxide, leads to loss of consciousness or death. Concentrations of 100,000 ppm or more of CO₂ can produce unconsciousness or death.

STANDARDS AND RECOMMENDATIONS FOR CO₂ EXPOSURE

The Occupational Safety and Health Administration (OSHA) has set a standard for the maximum allowable concentration of carbon dioxide in the air of 0.5% (5000 ppm) for eight continuous hours of exposure. The maximum time weighted average exposure to carbon dioxide in the air is set at 1.0% (10,000 PPM) for a ten hour shift in a 40 hour week.

For more information visit www.3ch.co.uk or for any other hydroponic advice call one of our stores.

