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Instrument Bulletin

Solution Extraction from Root Zone



**Extracting solution from
Grow bag to measure EC
and pH using a syringe.**



Citizens Development Corps



**MARYLAND HAWK
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TOOLS FOR SUCCESS

The following bulletin outlines the different types of instruments needed to effectively and efficiently manage your greenhouse(s). It is important to keep your instruments clean and calibrated. The instruments will allow you to adjust the pH and electro conductivity (EC). They will also allow you to keep proper logs of temperatures and other readings, so you can make modifications.

Greenhouse growers should strive to maximize their production from a limited space area. To achieve their goal, growers have to purchase and know how to operate several tools to avoid making serious mistakes during the course of production

Thermometers

- A minimum/maximum thermometer is a must for greenhouse producers
- Temperature in the greenhouse has a lot of influence on nutrient uptake, plant growth, pollination, fruit set, fruit cracking, etc.
- Locate the thermometer at the center of the house and at the plant level not facing the sun.
- Every effort should be made to keep temperature within the acceptable range for maximum yield and quality
- Read the thermometer at the same times each day
- Keep proper records of the temperatures, and make adjustments when necessary



Humidity Meter

- Also called Hygrometers
- Best pollination can be achieved when humidity ranges between 60-80%
- High relative humidity in the greenhouse can predispose the plant to fungal disease
- Growers should use this meter to adjust for the desired level of relative humidity
- These meters can be digital or analog and are often paired with thermometers



The meter on the right is an analog humidity meter



The meter on the right is a digital meter with both temperature and humidity

pH meter and EC meter below

pH Meter

- Growers should invest in buying a good quality pH meter
- The degree of acidity is measured by the pH
- It is measured on a scale of 0-14. 7 is neutral. 0-6 is considered acidic and 8-14 is alkaline
- Regularly check the pH of the nutrient solution as well as the pH for the growing medium
- Some pH meters also come with an EC meter



Electrical Conductivity (EC) Meter

- An EC meter is used to estimate soluble salts in water which are usually measured by their electrical conductivity.
- EC meters express EC as millimhos per centimeter (mmhos/cm)
- Analysis should be made for the nutrient feed solution and for root medium
- The EC measurement alone does not indicate the types of fertilizer in the nutrient solution, but this measurement can provide a good indication of the total amount of fertilizer being applied
- A root-zone EC of above 2.5 mS/cm should alert growers to salt buildup and growing medium should be flushed



Production Systems

NUTRIENT FILM TECHNIQUE (NFT):

- Is one the most popular culture for growing lettuce, hydroponically.
- Special growing channels or gullies may be purchased or 2" diameter PVC pipes cut with holes at 6-7 inches apart will serves as the growing channels.
- NFT is set up to continuously re-circulate a thin layer of nutrient solution past the plant roots providing nutrients and oxygen.



- The floor of the greenhouse is covered with a concrete slab or other barrier to prevent weed growth and to keep it clean.
 - The channels are supported on a table about waist height.
 - Tables with the channels are sloped 2% to allow for drainage of solution.
- The piping for irrigation and return lines are above the floor level and attached to the benching system

SOIL PRODUCTION:

- Lettuce requires loose soil with good aeration
- Beds can be 4 feet wide with spacing between beds at 1 1/2 feet.
- Lay ground cover, or plastic mulch to suppress weeds.
- Planting distance between plants is 6-7 inches apart, staggering is not necessary.
- Use 3 drip lines per bed
- Make sure when planting, that the drip holes are near to the seedling
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Crop Nutrients and Fertilizer

It is important to follow a proper nutrient and fertilizer programme to have proper growth of crop

The following is a general plan for distribution through a fertigation system. Remember to use high quality, water soluble fertilizers for your greenhouse system

NOTE: These are recommendations assuming you are using soilless culture. If you plan on using soil, it is necessary to test your pH and water system before you plan your nutrient application

PPM	N	K	P	Mg	Ca	Fe	Mn	Zn	B	C u	Mo
Seedling		105	25	20-25	60-100	3-5	0.5	0.1	0.5	0.1	0.05
Young Plant to Harvesting		210	50	40-50	120-200	3-5	0.5	0.1	0.5	0.1	0.05

NOTE: The pH for lettuce is between 5.5 and 5.8

Nutritional, Environmental Disorders and Pest and Disease: General Information

Most of the pests that attack other crops will also infest lettuce. Thrips, whiteflies, and larvae from moths and butterflies are the most common (See Crop Bulletin #5 Pest and Diseases for more information). One of the worst diseases of lettuce is Pythium, and the most common nutritional disorder is Tip burn. Tip burn is caused by excessive water from the leaves accompanied by inadequate water uptake by the roots. Some growers claim high relative humidity above 70% causes the lettuce to have tip burn. It may also be caused by low calcium levels. Sufficient oxygen in the nutrient solution is important to maintain healthy roots.

- Check that the EC is not too high
- Avoid excess temperature fluctuations
- Try to keep day temperatures under 80° F (find C)

“Bolting” is another problem with lettuce. This is when an elongated stalk with flowers shoots up from the main stem of the plant (lettuce seed stalk). Bolting occurs when temperatures are too high. There is nothing to do after bolting occurs. However, choosing good seeds that are resistant to high temperatures will help eliminate this problem

Harvesting Lettuce

- Lettuce can begin to be harvested 45-60 days after transplanting or when the head is compact.
- The entire plant is cut first and the first leaves removed
- Lettuce deteriorates rapidly with increasing temperatures, therefore lessen the handling of it