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CANADA'S INDOOR EDGE

MEDIUM

in motion



Root-zone chemistry and irrigation strategy determine whether a crop thrives or stalls

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While the physical structure of a growing medium sets the stage for healthy roots, the story doesn't end there. Once plants begin to grow, the root zone becomes a dynamic environment where water, nutrients, salts, and acidity constantly shift. Managing pH, EC, and irrigation ensures that the medium you've chosen continues to support strong, balanced growth.

In Part 2 of our series, we explore how chemistry and irrigation interact with the substrate and how growers

can keep the root zone stable throughout the crop cycle.

ROOT ZONE pH AND ELECTRICAL CONDUCTIVITY (EC)

Selecting the right growing medium is only part of successful crop production. Equally important is maintaining the correct pH and electrical conductivity (EC) within the root zone. Even a growing medium with excellent water-holding capacity and air-filled porosity cannot support

ABOVE

A crop of well-managed cocktail tomatoes. For most crops grown in soilless media, a root-zone pH between 5.8 and 6.3 provides good nutrient availability but can vary depending on the crop and production system.

healthy plant growth if the pH or EC is outside the optimal range.

ROLE OF PH IN NUTRIENT AVAILABILITY

The pH of a growing medium indicates whether it is acidic, neutral, or alkaline. Although pH does not directly supply nutrients to plants, it determines how easily roots can absorb them. When the pH is outside the recommended range, some nutrients become less available, even if they are present in sufficient quantities.

For example, if the pH is too high, micronutrients such as iron (Fe), manganese (Mn), and zinc (Zn) become less available, often causing young leaves to turn yellow (chlorosis). On the other hand, if the pH is too low, nutrients such as calcium (Ca) and magnesium (Mg) may become deficient, while certain elements can reach toxic levels and damage plant roots.

For most greenhouse crops grown in soilless media, a root-zone pH between 5.8 and 6.3 provides good nutrient availability. However, the ideal range may vary slightly depending on the crop and production system.

UNDERSTANDING EC

Electrical Conductivity (EC) is a measure of the total concentration of dissolved salts in the growing medium or nutrient solution. Since dissolved fertilizers contain charged ions, the EC gives an indication of how much fertilizer is available to the plant. A higher EC generally means a higher concentration of dissolved nutrients, while a lower EC indicates fewer available nutrients.

It is important to remember that EC measures the quantity of dissolved salts, not the balance of individual nutrients. Therefore, two nutrient solutions may have the same EC but contain very different nutrient compositions.

IMPORTANCE OF EC IN ROOT-ZONE MANAGEMENT

Maintaining the correct EC is essential for healthy plant growth. If the EC is too low, plants may not receive enough nutrients, leading to slow growth, pale leaves, and reduced yields. If the EC is too high, excessive salts accumulate around the roots, making it more difficult for plants to absorb water. This can slow growth,

cause wilting, and reduce plant health. This condition is commonly referred to as salt stress. Routine monitoring allows growers to identify developing problems before crop quality or yield is affected.

MONITORING ROOT-ZONE PH AND EC

Because pH and EC change over time as plants absorb nutrients and irrigation water passes through the growing medium, they should be monitored

regularly. Measuring both the nutrient solution and the runoff provides valuable information about root-zone conditions. If runoff EC continues to rise, salts may be accumulating within the growing medium, indicating that irrigation or fertilizer management should be adjusted. Likewise, changes in runoff pH can signal nutrient imbalances before visible symptoms appear.

Maintaining appropriate pH and EC is creating a stable root-zone environment

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CHALLENGE	POSSIBLE CAUSE	PRACTICAL SOLUTION
Plants wilt even though the growing medium is moist	High EC due to salt accumulation	Apply a leaching irrigation, reduce fertilizer concentration
Growing medium dries too quickly	Low water-holding capacity or insufficient irrigation	Increase irrigation frequency or use a growing medium with greater water-holding capacity.
High runoff EC	Salt accumulation	Periodically apply sufficient leaching to remove excess salts and adjust fertilizer application if required.
Low runoff EC	Insufficient fertilizer	Adjust fertilizer concentration to meet crop requirements.
High root-zone pH	High alkalinity irrigation water or inadequate acidification	Use acid-forming fertilizers and regularly monitor irrigation water alkalinity.
Low root-zone pH	Excessive acid application or prolonged use of acid-forming fertilizers	Reduce acid application and, if needed, use more basic fertilizers to gradually increase pH.

where nutrients remain available, roots stay healthy, and plants can grow to their full potential. When combined with proper irrigation and a well-balanced growing medium, careful pH and EC management plays a major role in achieving consistent crop growth and high yields.

IRRIGATION MANAGEMENT FOR ROOT-ZONE HEALTH

The primary goal of irrigation is not simply to supply water

to the plant but to maintain a healthy root-zone environment where water, oxygen, and nutrients remain in balance.

Irrigation and growing media should always be considered together because each directly influences the other. After each irrigation event, the growing medium should contain enough moisture to support plant growth while still leaving adequate air-filled pore space for root respiration.

The number of irrigations, the timing of irrigation, and the duration of each irrigation are very important in greenhouse cultivation. These factors vary depending on the plant's growth stage, crop type, growing medium, and environmental conditions.

Young plants require less water and shorter irrigation cycles because their root systems are small. As plants grow larger, they need more frequent and longer irrigations to meet their increasing water demand. Different crops also have different water requirements. For example, leafy vegetables generally



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ABOVE

Example of finished products in a well-managed soilless growing medium. Growers are advised to regularly monitor both the nutrient solution and runoff pH and EC of their crops.

require more frequent irrigation than drought-tolerant plants.

The type of growing medium also affects irrigation scheduling. Growing media with high water-holding capacity, such as coco coir or peat moss, retain water for longer and require less frequent irrigation. In contrast, growing media with high air-filled porosity, such as perlite, drain quickly and may need more frequent irrigation.

Environmental conditions also play a major role. On hot, sunny, and windy days, plants lose more water through transpiration and require more frequent irrigation. On cool or cloudy days, water use is lower, so fewer irrigation events are needed.

INTEGRATING GROWING MEDIA, IRRIGATION, PH AND EC MANAGEMENT

Growing media, irrigation, pH, and electrical conductivity (EC) work together to create a healthy root-zone environment. Even the best growing medium cannot support healthy plant growth if irrigation is poorly managed. Likewise, irrigation practices must be adjusted according to the physical properties of the growing medium.

A common mistake in greenhouse production is reducing irrigation frequency simply because a growing medium has a high water-holding capacity. For example, coco coir can retain large amounts of both water and dissolved nutrients. Since the growing medium remains moist for longer, it may seem logical to irrigate less frequently. However, reducing irrigation **without maintaining adequate leaching** can lead to an unexpected problem. With less runoff, fertilizer salts are not flushed from the root zone and gradually accumulate as plants absorb water. This increases the root-zone EC, making it more difficult for roots to absorb water and nutrients, even though the growing medium still appears moist. Over time, salt accumulation can reduce plant growth and increase the risk of nutrient imbalances. Therefore, irrigation decisions should not be based only on how long the growing medium stays wet. They should also **consider leaching, runoff, salt management, and regular monitoring of pH and EC** to maintain a healthy root-zone environment.

To maintain healthy roots, growers

should regularly monitor both the nutrient solution and runoff pH and EC. Rising runoff EC often indicates salt accumulation, while changes in runoff pH can signal nutrient imbalances before visible symptoms appear.

CONCLUSION

Every crop has different needs, so there is no one growing medium that works best for all plants. The key is to understand your crop and create the right root environment. With the right

growing medium and proper irrigation management, growers can produce healthier plants and achieve more consistent yields.

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