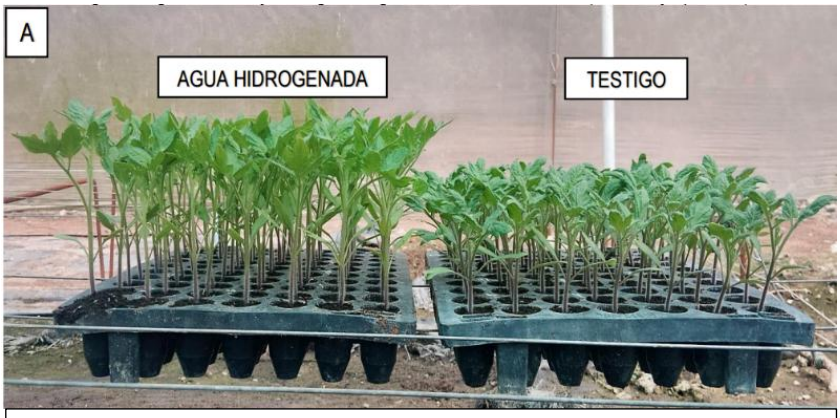
Application Profile
Tomato and Cucumber Production

Hydrogen-rich irrigation (H2i) offers several benefits in the cellular health of plants, enabling facilities to reduce inputs and improve operational efficiency.

Customer trials and independent researchers demonstrate that using HyO to boost molecular hydrogen and oxygen in irrigation water increases nutrient uptake, disease resistance, growth, quality consistency, and shelf life.

Ten Ways Tomato and Cucumber Production Benefits from using Agricultural Hydrogen:

1. Faster seedling production
2. Increased nitrogen uptake
3. Better disease resilience
4. Higher nutrient density
5. Improved root development
6. Greater leaf development
7. Longer shelf life
8. Faster time to harvest
9. Elimination of quality defects
10. Higher overall fruit yield



A) The relative growth achieved in the hydrogenated water treatment (T1) was 9.3 cm, compared to 5.9 cm in the control treatment (T2), representing a difference of 57.6% compared to the control. This difference reflects a favorable effect on stem elongation during the nursery stage.

B) Tomato plant roots treated with HyO water.

Left: Seedlings at 2 weeks

Right: Mature roots in greenhouse at 3 months. The whiter color indicates the plant is still thriving and less prone to attack.

C) Tomato plant control roots.

Left: Seedlings at 2 weeks

Right: Mature roots in greenhouse at 3 months. The darker color indicates the plant is less healthy and is more prone to attack.

Tomato plant shoot and roots washed from the treatment applied with HyO water (D) vs control (E). An improvement was observed in the daily growth rate (0.31 cm/day in T1 vs. 0.19 cm/day in T2) and in the average leaf diameter (60.5 mm in T1 vs. 53.2 mm in T2), indicating greater leaf development.

Hydrogen improves nutrient uptake into the leaves. Cucumber fruit from hydrogen-treated plants (Figure F) showed consistently higher BRIX values (average 6.3 °Bx) compared to control plants (Figure G, average 4.27 °Bx), suggesting a potential improvement in fruit sugar content and flavor. Leaf tissue testing demonstrates that HyO causes the top leaves to have higher levels of nitrogen, Zn, and Cu, with improved modulation of Fe without antagonism. According to independent researchers, the leaf tissue test results indicate that more than 1/3 of nitrogen can be saved by using HyO.

Hydrogen improves root quality. Researchers also report that the root systems of the HyO-treated cucumber plants were more developed and the soil coloration was much darker.

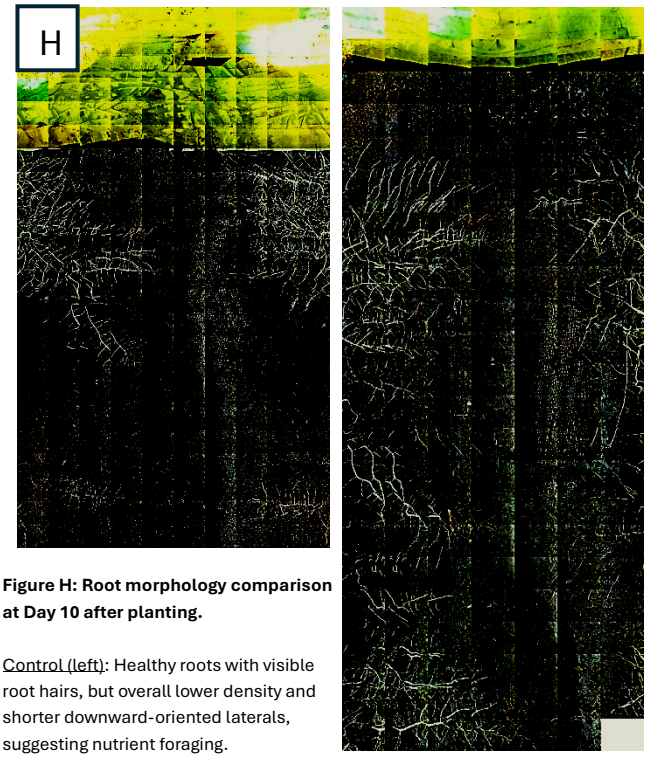


Figure H: Root morphology comparison at Day 10 after planting.

Control (left): Healthy roots with visible root hairs, but overall lower density and shorter downward-oriented laterals, suggesting nutrient foraging.

HyO trial (right): More extensive root system with greater density, longer and thicker laterals, and deeper penetration toward the bottom of the grow bag.

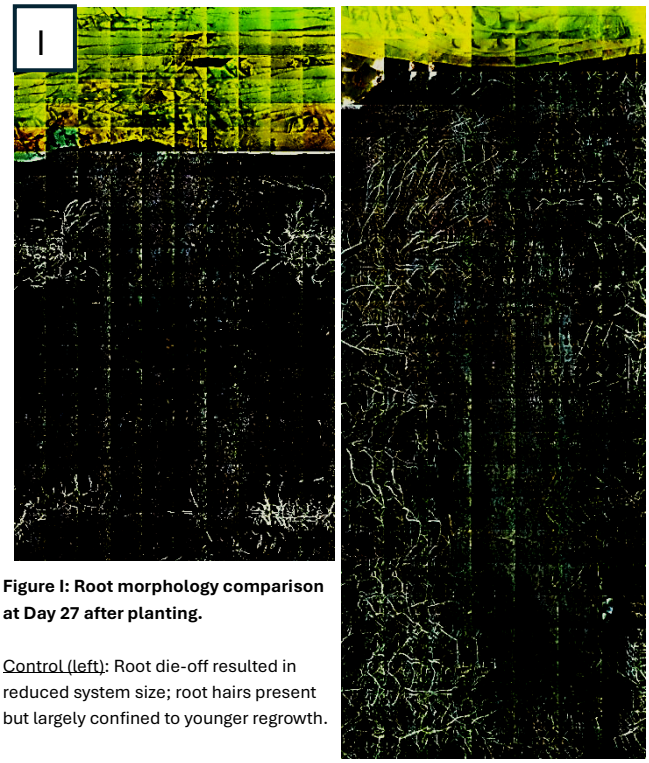


Figure I: Root morphology comparison at Day 27 after planting.

Control (left): Root die-off resulted in reduced system size; root hairs present but largely confined to younger regrowth.

HyO trial (right): Root system continued expanding, with older roots retaining root hairs (indicative of sustained vitality). Root presence also altered the coir color, suggesting increased exudation or microbial interaction.

Hydrogen improves fruit production. Tomato plants grown in soil in a greenhouse in South Dakota receiving agricultural hydrogen were notably flourishing.

Figure J shows the HyO-grown plants, after 10 days, were larger, more bushy, and darker green. These plants were determined to be at least 35% larger than the control plants. Fruit size was unaffected by the addition of hydrogen in the water in these trials. Figure K demonstrates the difference in color earlier in the grow cycle, demonstrating faster cycle time as well as fruit color improvement. The target red color was reached in less time than in the control grow area. Note the increase in main branch diameter. Blossom-end rot normally found from time to time, was drastically reduced to near zero occurrences on the rows receiving agricultural hydrogen.