Salt-tolerant crops show higher capacity for carbon fixation

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Salt can have drastic effects on the growth and yield of horticultural crops; studies have estimated that salinity renders an about one-third of the world's irrigated land unsuitable for crop production. Imbalances in soil salinity can cause ion toxicity, osmotic stress, mineral deficiencies, and drastic physiological and biochemical changes in plants. Salt stress can even cause plants to adjust their water usage—to conserve water, some plants close their stomata, thus restricting the entry of carbon dioxide (CO_2) into the leaf and reducing photosynthesis.

One solution to salinity issues has been to boost the salt tolerance of conventional crops and plants, but resulting gain in crop yield has traditionally been low. To better understand the behavior of salt-tolerant and -sensitive plants in challenging situations, scientists performed a comparative study of carbon fixation by different plant species under conditions of salinity. Tomato, lettuce, pepper, melon, and watermelon were tested in a greenhouse in southeast Spain. The net photosynthetic rate, gS, and transpiration rate of the plants were measured at atmospheric CO_2 during the daytime and were related to the total chlorophyll, carbon, and mineral contents of each species.

According to the research study (*HortScience*), melon or pepper crops showed significantly lower photosynthetic rates when they were grown in saline conditions. The total chlorophyll content and carbon percentage were also lower in the salinity-treated plants of melon and pepper. Treated lettuce plants showed a significant decrease in photosynthetic rates and chlorophyll content, but there were no differences in carbon

content. "On the other hand, there were no significant differences in the values of total chlorophyll content, photosynthetic rate, or carbon content for tomato and watermelon plants when control and salt-treated plants were compared", the report said. The mineral composition data showed greater increases of sodium in both roots and leaves of melon and pepper when plants were treated with NaCl compared with the rest of the species.

"Almost all of the results obtained showed that lettuce, pepper, and melon are less adapted to saline conditions and that these crops seem to be less efficient in CO_2 fixation and, therefore, have less capacity for carbon accumulation", noted corresponding author Micaela Carvajal. "We concluded that the species more tolerant of saline conditions (tomato and watermelon) showed a higher capacity for fixation of atmospheric CO_2 than the sensitive species (lettuce, melon, and pepper). These results seem to be related to the capacity of each species to maintain the photosynthetic processes and gS in stressing situations."

More information: The complete study and abstract are available on the ASHS HortScience electronic journal web site: hortsci.ashspublications.org/c … /abstract/45/12/1798

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