# Effects of salinity and nutrient deficiency determined for spinach

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Spinach plants are shown four weeks after treatments in which they were deprived of nitrogen, phosphorous, or potassium. The study recommended ways to improve the nutritional value of spinach. Credit: Chenping Xu.

Salinity and nutrient-depleted soil are two major constraints in crop production, especially for vegetable crops. In the January 2016 issue of the *Journal of the American Society for Horticultural Science*, researchers Chenping Xu and Beiquan Mou from the U.S. Department of

Agriculture, Agricultural Research Services, report on a study in which they assessed the effects of salinity and single nutrient (nitrogen, phosphorous, or potassium) deficiency on spinach growth, physiology, and nutritional value. Their results suggest that producers could employ cultural practices that impose either low fertilizer levels or slight salt stress to improve spinach nutritional values and experience only "moderately or slightly reduced" yield.

Spinach plants (cultivar 'Crocodile') in the study were watered daily with Hoagland nutrition solution, deprived of nitrogen, phosphorous, or potassium for nutrient deficiency, either with or without 20/10 mM sodium chloride/calcium chloride for salinity treatment.

Results showed that salinity "greatly inhibited" plant growth, as indicated by reduced shoot fresh weight and dry weight.

The researchers also analyzed the effects of the treatments on nutritional values of the spinach. Among other findings, they determined that salt stress increased carotenoid content under complete nutrient treatment. Nitrogen deficiency greatly reduced carotenoid content either with (by 45%) or without (by 50%) salt stress, while phosphorous and potassium deficiencies increased carotenoid content without salt stress.

Anthocyanin content was greatly enhanced under nitrogen deficiency (by 145% and 88% under no-salt controls and under salt stress, respectively), but neither salt stress nor phosphorous or potassium deficiency influenced anthocyanin content. Spinach plants' total antioxidant capacity increased under no-salt treatments with nitrogen or potassium deficiency.

"These results suggest that the nutritional value of spinach could be improved with only moderately or slightly reduced yield through cultural practices that impose either low fertilizer levels or slight salt stress," the

authors concluded.

**More information:** The complete study and abstract are available on the ASHS J. Amer. Soc. Hort. Sci. electronic journal web site: journal.ashspublications.org/c … nt/141/1/12.abstract

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