

Irrigation water alkalinity, not pH, affects substrate pH[©]

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Substrate pH of container-grown crops is predominantly affected by irrigation water alkalinity and much less so (if at all) by irrigation water pH. Despite this issue having been discussed in numerous extension and trade publications, there still seems to be widespread confusion as to how irrigation water should be managed to maintain optimum substrate pH. While irrigation water pH and alkalinity can be related, a survey of 192 Ohio groundwater samples showed no correlation between the two variables ($R = -0.1077$, $P = 0.1369$). High irrigation water pH does not necessarily result in high alkalinity, and vice versa. The objective of this study was to provide nursery growers and extension educators with a simple demonstration of how irrigation water pH and alkalinity affect substrate pH. There were three substrate treatments. One treatment included 15-cm diameter pots filled with a substrate composed of 80 pine bark: 20 peatmoss (fallow). The second treatment included the same substrate amended with a controlled release fertilizer (Osmocote 15-9-12) incorporated at 7.7 kg m^{-3} . The third treatment included the same substrate and fertilizer potted with a single liner of rose (*Rosa* 'Radrazz', Knock Out[®] rose). Containers were irrigated with either reverse osmosis (RO) water, a 0.0001 mM KOH solution in RO water, or a 0.005 M KHCO_3 solution in RO water. The RO water had pH of 6.26 and alkalinity of $3.4 \text{ mg L}^{-1} \text{ CaCO}_3$. The KOH solution had pH of 8.23 and alkalinity of $10.0 \text{ mg L}^{-1} \text{ CaCO}_3$. The KHCO_3 solution had pH 8.28 and alkalinity of $275 \text{ mg L}^{-1} \text{ CaCO}_3$. There were six replications per treatment combination. Substrate pH was recorded over 3 months using the pour-through procedure. Substrates irrigated with the KHCO_3 solution had higher pH throughout the study. Substrates irrigated with RO or KOH solution had similar, but lower, pH values throughout the study. Substrates containing roses and fertilizer had slightly lower pH compared to fallow substrates, but both substrates responded similarly with respect to the irrigation treatment received. These data demonstrate with a simple case study how irrigation alkalinity, and not irrigation pH, increases substrate pH in fertilized or non-fertilized container substrates over time.

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