

Remediating Paclobutrazol from Irrigation Water using Activated Carbon.

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Paclobutrazol is an active ingredient used in plant growth regulators to control plant height. Because this chemical has a half-life of approximately 6 months in water, growers who recirculate irrigation water require a method to reduce the level of this residual chemical to below biologically-active levels. The objective was to evaluate the removal of paclobutrazol from water using granular activated carbon filtration (GAC). A 0.05 mg·L⁻¹ paclobutrazol solution was passed through a small-scale, 0.50 to 4.75 mm particle size (8x30 mesh) coconut coir GAC system at 6L·minute⁻¹. A randomized complete block design was used with six contact times (0, 12, 24, 36, 47, or 59seconds), which corresponded to 0, 1.9, 3.7, 5.6, 7.5, or 9.4L of empty filter housing volume (excluding the carbon). The experimental design was a randomized complete block with three blocks (time periods) and three replicates of each GAC treatment per block (54 replicate solutions total). For bioassays, 15mL of each GAC-treated solution were then applied to broccoli [*Brassica oleracea* 'Waltham 29'] seed and begonia [*Begonia x semperflorens-cultorum* 'Super Olympia White'] seedlings. Broccoli hypocotyls at 14 days were 103% longer and begonia dry mass was 36% greater when treated with solutions that had a contact time of 59seconds GAC compared with the 0seconds GAC treatment. With the highest GAC level, begonia dry mass was the same as for plants treated with a zero paclobutrazol solution. However, the broccoli hypocotyl length was 10% shorter for plants treated with 59seconds GAC compared with a zero paclobutrazol solution. Analysis of paclobutrazol concentration using liquid chromatography-mass spectrometry (LC-MS/MS) found that paclobutrazol concentration decreased by 90% or 99% with a contact time of 12seconds or 59seconds GAC, respectively. Overall, this experiment showed that granular activated carbon has the potential to remediate paclobutrazol from irrigation water to below biologically-active concentration.