Cyanobacterial blooms are widespread and increasingly affecting freshwater resources. Phosphorus (P) enrichment is often described as promoting blooms and may influence growth rates and response to management. The impact of P in growth media and cellular P content were assessed in terms of susceptibility of *Microcystis aeruginosa* (Kützing) Lemmerman to copper sulfate. Five strains of *M. aeruginosa* were tested under three different P concentrations (1,500 ug L\(^{-1}\) = high; 150 ug L\(^{-1}\) = medium; 75 ug L\(^{-1}\) = low). All *M. aeruginosa* strains grown at low P concentration, compared with medium or high concentrations, had significantly decreased (P <0.05) P and chlorophyll a content per cell, though strain 2664 still had significantly higher P content than the other strains. *Microcystis aeruginosa* strains grown in high and medium P concentrations had similar 96-h 50% lethal concentration (LC\(_{50}\)) on the basis of chlorophyll a content and cell densities. In the low-P growth concentration, *M. aeruginosa* strain 2386 had significantly decreased 96-h LC\(_{50}\) than all other *M. aeruginosa* strains, and *M. aeruginosa* 2665 had a significantly higher 96-h LC\(_{50}\) compared with *M. aeruginosa* strains 2386, 2388, and 2664. The relative sensitivities of strains grown in low-P medium to copper were *M. aeruginosa* 2386 > 2388 ≥ 2664 ≥ 2061 ≥ 2665. All strains had significantly decreased growth rates under low P compared with high P, but only *M. aeruginosa* 2386 had increased sensitivity to copper. This research provides insights about altered sensitivity of cyanobacteria to reduced P supplies. Decreasing P availability can decrease the amount and need for reactive copper algicides by altering growth rates and carrying capacity of *M. aeruginosa* strains and, in specific cases, increase the sensitivity of cyanobacteria to copper.