

Toxicity of 56 substances to trees - DTU Orbit (09/11/2017)

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Toxicity data of substances to higher plants is needed for the purpose of risk assessment, site evaluation, phytoremediation, and plant protection. However, the results from the most common phytotoxicity tests, like the OECD algae and Lemna test, are not necessarily valid for higher terrestrial plants. The willow tree toxicity test uses inhibition of transpiration (aside of growth and water use efficiency) of willow cuttings grown in spiked solutions or soils as end point to quantify toxicity. This overview presents results from 60 studies including 24 new unpublished experiments for 56 different chemicals or substrates. Highest toxicity ($EC_{50} < 1$ mg/L) was observed from exposure to heavy metals like copper and cadmium. Also, organotins and free cyanide showed very high toxicity. The toxic effect of chlorophenols on willows was comparable to that on duck weed (Lemna) and green algae, while volatile compounds like chlorinated solvents or benzene, toluene, ethylbenzene, and xylene had less effect on trees than on these aquatic plants, due to volatilization from leaves and test media. In particular low (g/L range) toxicity was observed for tested nanomaterials. Effects of pharmaceuticals (typically weak acids or bases) depended strongly of the solution pH. Like for algae, baseline toxicity was observed for willows, which is related to the water solubility of the compounds, with absolute chemical activity ranging from 0.01 to 0.1, but with several exceptions. We conclude that the willow tree toxicity test is a robust method for relating uptake, accumulation, and metabolism of substances to the toxicity to trees.

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