

合成革主要化学污染物对黄山松生理生态特性的浓度效应研究

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摘要 合成革工业生产用溶剂二甲基甲酰胺(DMF)和甲苯(TOL)对中国经济发达地区的森林植被造成严重污染, 亟待探明其对树木生理生态特性的影响。该文研究了不同浓度DMF和TOL对黄山松(*Pinus taiwanensis*)生理生态特性的影响: 低浓度DMF可使黄山松可溶性总糖和谷胱甘肽含量上升, 随着DMF浓度的升高, 黄山松可溶性总糖含量和总抗氧化能力下降, 可溶性蛋白质和丙二醛(MDA)含量上升, 开始产生毒害效应; TOL浓度较低时可以促进黄山松叶绿素的合成, 随着TOL浓度的上升, 黄山松叶绿素含量开始下降, 不过可溶性总糖、可溶性蛋白的含量开始增高, 总抗氧化能力增强, MDA含量下降, 提示此时黄山松已经受到胁迫; 当TOL升高到一定浓度时, 黄山松叶绿素含量明显减少, 总抗氧化能力减弱, MDA含量上升, 毒害效应开始显现; DMF和TOL合用可能产生一定的拮抗效应, 低浓度时TOL的促进作用受到抑制, 随着污染物浓度的上升, 黄山松所受影响和受DMF影响相似, 不过污染物达到一定浓度时, MDA含量显著升高, 毒害效应比DMF单独使用时明显。结果显示: 尽管黄山松对低浓度化学污染有一定的耐受能力, 但过高浓度的化学污染将对黄山松的健康生长构成威胁。

关键词: 有机物污染 黄山松 胁迫 毒害效应

Abstract: *Aims* Vegetation in developed areas of China has been polluted by dimethylformamide (DMF) and toluene (TOL), solvents used in the synthetic leather industry; however, little research has been done on the impact of these pollutants on the physiology and ecology of trees. *Methods* In this paper, we studied the pollution effects of DMF and TOL on the physiological and ecological characteristics of *Pinus taiwanensis*. *Important findings* DMF began to induce an increase in total soluble sugars and glutathione (GSH) in the plant at low concentration. As the concentration of DMF increased, total soluble sugars and total antioxidant compounds (T-AOC) decreased and soluble proteins and malonaldehyde (MDA) increased, indicating that DMF started to have toxic effects on the plant. TOL promoted chlorophyll production at low concentration. As its concentration increased, the content of chlorophyll and MDA decreased, whereas that of total soluble sugars, proteins and T-AOC increased. When TOL reached a higher concentration, the content of chlorophyll and T-AOC decreased and that of MDA increased significantly, suggesting the occurrence of toxic effects. DMF may inhibit the facilitative effects of TOL at low concentration when they were combined. Their combined effects were similar to those of DMF at some concentrations. However, when the combined pollutants reached a rather high concentration, the content of MDA increased and the toxic effects were more pronounced than those of DMF alone. This study suggested that chemical pollutants at low concentration can be tolerated by *P. taiwanensis* whereas high concentrations are harmful to growth.

Keywords: organic pollution, *Pinus taiwanensis*, stress, toxic effect

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