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桑树(*Morus alba*)幼苗对铅污染的生理耐性和积累能力的性别差异

Sexual differences in physiological tolerance and accumulation capacity against lead pollution in *Morus alba* seedlings

关键词: [桑树](#)|[雌雄异株](#)|[铅处理](#)|[生理生态特征](#)|[生物量积累](#)

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摘要: 以桑树(*Morus alba*)雌雄幼苗为实验材料,研究了施铅处理对其生长发育、生理过程和铅元素积累的影响,以揭示桑树幼苗对铅污染的生理耐性和积累能力的性别差异.结果表明:施铅后桑树雌雄幼苗的可溶性蛋白(Pr)含量和超氧化物歧化酶(SOD)活性显著增加,雄株增幅略高于雌株,而丙二醛(MDA)含量和相对电导率无显著变化;雌雄幼苗的净光合速率(P_n)、气孔导度(G_s)和蒸腾速率(T_r)显著增加,雄株比雌株具有更高的 P_n 和 T_r ;雌雄幼苗的叶绿素a、叶绿素b、总叶绿素及叶绿素相对含量显著增加,雄株增幅高于雌株;雌雄幼苗的形态生长与地上部生物量显著增加,根冠比显著降低,而雌株比雄株具有更高的株高、基径和总叶片数;铅在植物体内的分布为根>叶>茎,雌株根、叶中的铅含量和转移系数略高于雌株.综上,灌施剂量为 $800 \text{ mg} \cdot \text{kg}^{-1}$ 的铅离子对桑树雌雄幼苗生长的促进作用高于雌株,雌株比雄株具有更强的生理耐性和积累能力.

Abstract: The growth, physiological process and accumulation capacity of male and female *Morus alba* seedlings were investigated to explore their sexual differentiation against lead pollution. The results showed that lead pollution induced a significant increase of the soluble protein (Pr) contents and super-oxide dismutase (SOD) activity for the male and female seedlings. However, the increment on Pr content and SOD activity was greater in the males than females. In addition, significant effects of lead pollution on the malondialdehyde (MDA) content and relative conductivity were not observed for male and female *Morus alba* seedlings. The net photosynthetic rate (P_n), stomatal conductance (G_s), and transpiration rate (T_r) of male and female seedlings increased significantly by lead pollution, and the males exhibited higher P_n and T_r than females. Similar patterns were observed in terms of chlorophyll a, chlorophyll b, total chlorophyll and relative conductivity. The morphological growth and aboveground biomass of male and female *Morus alba* seedlings significantly increased, but their root/shoot ratio decreased when suffering from lead pollution. Additionally, height growth, basal diameter and total leaf number were greater in the males than females when suffering from lead pollution. The lead content of plant organs decreased in the order of root > leaf > stem, and the males had slightly increment than the females in the lead contents of root, leaf and translocation factor. Our results indicated that lead pollution ($800 \text{ mg} \cdot \text{kg}^{-1}$) is to some extents more effective in promoting growth of the males. Compared with the females, the males may possess greater physiological tolerance and accumulation capacity.

Key words: [Morus alba](#)|[dioecious](#)|[lead treatment](#)|[ecophysiological characteristics](#)|[biomass accumulation](#)

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