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铝对小麦根尖细胞壁过氧化物酶活性和过氧化氢含量的影响

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Effects of aluminum on hydrogen peroxide content and cell wall-bound peroxidase activity in wheat root tips

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摘要 以2个小麦基因型鉴-864（耐性）和扬麦5号（敏感）为材料，采用溶液培养方法研究了铝胁迫下小麦根系伸长、根尖铝含量、根尖细胞壁过氧化物酶活性和H_2O_2含量的变化。结果表明，随着铝浓度的提高，小麦根系伸长受铝抑制程度加剧，根尖铝含量也明显升高; 但敏感基因型根尖铝含量较高，根系伸长受抑程度更为明显。在铝胁迫下，2个小麦基因型根尖可溶态愈创木酚过氧化物酶（GPX）和松柏醇过氧化物酶（CAPX）活性没有显著变化，细胞壁离子键结合态GPX和CAPX的活性则随着铝浓度的提高而显著升高，H_2O_2含量也呈现类似的趋势; 而敏感基因型过氧化物酶活性升高和H_2O_2积累更为明显。因此，铝胁迫下，小麦敏感基因型根尖细胞壁离子键结合态GPX和CAPX活性升高而引起H_2O_2积累，促进根系木质化和细胞壁氧化交联，导致根细胞壁刚性提高而伸展能力降低，是其根系伸长受到严重抑制的原因。

关键词： 铝毒 小麦 根尖 细胞壁过氧化物酶 过氧化氢

Abstract： Aluminum(Al)toxicity is one of the most important factors limiting crop production worldwide on acidic soils. Although Al inhibits the elongation of plant roots, the exact mechanism by which this growth reduction occurs remains controversial. A hydroponic experiment was conducted to investigate the effects of Al on root elongation, aluminum content, cell wall bound enzyme activity and hydrogen peroxide content in the root tips of Al-resistant(Jian-864)and Al-sensitive(Yangmai-5)genotypes of wheat(*Triticum aestivum* L.). Root elongation of both genotypes was greatly inhibited with the increasing Al concentrations, but more severe inhibition was observed in the Al-sensitive genotype(Yangmai-5). Total Al content in root tips was significantly higher in Yangmai-5 than in Jian-864. The soluble guaiacol peroxidase(GPX) and coniferyl alcohol peroxidase(CAPX)activities in root tip of both genotypes was not influenced, while cell wall-ionically bound GPX and CAPX activity were greatly enhanced and more evident was found in Yangmai-5. H_2O_2 content also had the similar trends. In conclusion, it appears that the increase in cell wall-ionically GPX, CAPX and H_2O_2 content may lead to the enhancement of lignification and suberisation and H_2O_2 dependent peroxidase-catalyzed formation of cross-link among cell wall polymers and thus increase the rigidity of cell wall, thereby reducing cell wall extensibility and inhibiting root elongation.

Keywords： aluminum toxicity wheat root tips cell wall peroxidase H_2O_2

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