19 The Regulation of Ornithine Decarboxylase Expression and Its Role in Plant Development

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Polyamines (spermidine, spermine) and their diamine precursor putrescine are known as ubiquitous growth regulator implicated in cell division, growth, differentiation and stress response. Ornithine decarboxylase (ODC) is the first enzyme in one of the two pathways to putrescine in plants. ODC activity has been regarded to be involved in cell division rather than cell elongation or stress response. We have isolated a cDNA encoding ODC (AF029349) from tomato (*Lycopersicon esculentum* Mill) and investigated the regulation of its expression in tomato and synchronized BY2 cells. We showed that ODC expression is utilization sink specific and its mRNA level is up-regulated by metabolizable sugars and kinetin. U0126, a specific inhibitor of MEK partially decreased ODC mRNA level induced by glucose but not by sucrose. With in situ hybridization, we found that ODC mRNA is expressed in shoot apical meristem, leaf primordia, cortex region of root apical meristem, microspores and megaspores in flower bud. And sucrose increased ODC mRNA level only in root tips. Thus we investigated its expression during cell cycle progression with synchronized BY2 suspension cells. ODC mRNA level showed a peak in G1 phase and ODC activity increased gradually through G1 to S phase. Transgenic tomato overexpressing ODC showed more rapid root growth than control plants. These suggest the role of ODC implicated in cell division and growth.

Keywords: ornithine decarboxylase, polyamine, sugar, cell cycle