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ABSTRACT

Two pathways can be used by gluconeogenesis in plants: one employs phosphoenolpyruvate carboxykinase (PEPCK) and the other pyruvate orthophosphate dikinase (PPDK). The occurrence-location of these enzymes was determined in developing kernels of maize. PPDK was much more abundant than PEPCK in extracts of whole kernels. However, their location within the kernel was different. PPDK was particularly abundant in the peripheral endosperm (in which alanine is abundant), whereas PEPCK was localised in the pedicel and basal endosperm transfer cells (where asparagine is metabolised). The abundance of these enzymes was also determined in maize roots where there was a massive increase in abundance of PEPCK and a small increase in abundance of PPDK when they were fed ammonium; PEPCK was located in the pericycle and various cell types associated with the vasculature. On the other hand, there was a large increase in abundance of PPDK in roots subjected to anoxia (which induces an accumulation of alanine), whereas the abundance of PEPCK was decreased. These results show: firstly, that gluconeogenesis can potentially occur in many different tissues of maize. Secondly, within one organ PPDK can be abundant in some tissues and PEPCK in others. Thirdly, the abundance of PPDK and PEPCK is often associated with the metabolism of certain nitrogenous compounds and can be dramatically altered by factors related to nitrogen metabolism. In maize roots and developing kernels PPDK was implicated in alanine metabolism. By contrast, the presence of PEPCK in maize roots and kernels was