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1 **Gluconeogenesis and nitrogen metabolism in maize**

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15 **ABSTRACT**

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

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