Impact of waterloging-induced hypoxia on nitrogen metabolism in the legume Medicago truncatula

Titre	Impact of waterloging-induced hypoxia on nitrogen metabolism in the legume Medicago truncatula
Type de publication	Article de revue
Auteur	Diab, Houssein [1], Cukier, Caroline [2]
Pays	Inde
Ville	Hyderabad
Type	Article scientifique dans une revue à comité de lecture
Année	2013
Langue	Anglais
Date	2013/07
Numéro	3
Pagination	401-409
Volume	2
Titre de la revue	International Journal of Life Sciences Biotechnology and Pharma Research
ISSN	2250-3137
Mots-clés	alanine [3], GABA [4], Hypoxia [5], Medicago truncatula [6], nitrogen metabolism [7], waterloging [8]
Résumé en anglais	Flooding and waterlogging due to the induced oxygen limitation in the root zone is harmful for plant development. This study examines short term modulation of nitrogen metabolism in Medicafo truncatula submitted to waterlogging. The objective was to evaluate whether and how nitrogen metabolism contributes to the mitigation of damaging effects of hypoxia. The processes that were affected early after the onset of stress were nitrate reduction and amino acids synthesis. NADH-dependent nitrate reductase activity increased dramatically in the root. It is suggested that nitrate reductase contributes to cellular acclimation to hypoxia by regenerating NAD + from NADH. The regeneration of NAD+ is a crucial issue in hypoxic cells because it is necessary for supporting increasing rates of glycolysis. Amino acids metabolism shifted from the ATP consuming pathway leading to asparagines, the most accumulated amino acid in Medicago truncatula, to pathways leading to alanine and GABA accumulation. Synthesis of alanine is not dependent on ATP and allows for storage of carbon used in glycolysis (pyruvate) in a form readily utilizable at the return to normoxic condition. GABA synthesis through the GABA shunt starts by decarboxylation of glutamate by glutamate decarboxylase (GDC) a proton consuming enzyme that helps maintaining cytosolic pH homeostasis
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