

Free amino acids content and nitrogen mobilization in *Panicum maximum*

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Introduction ¹⁵N-tracer techniques cannot be used accurately in the field to quantify N mobilisation due to problems of equally and uniformly labelling all the different soil N pools with ¹⁵N. In remaining tissues of grasses following defoliation, protein is degraded to amino acids through the action of protease enzymes; the amino acids being subsequently transported to leaf meristems to support growth. Potentially therefore, amino acids concentrations could be used as a surrogate for N mobilisation determination in the field. A greenhouse experiment involving ¹⁵N techniques was used to test the hypothesis that, following defoliation of *P. maximum*, a correlation exists between the N mobilised from leaves and the amino acids concentration of these tissues.

Material and methods *P. maximum* Tanzania plants were cultivated in pots filled with fine sand. The position of the pots in the greenhouse was randomised in replicate blocks. Plants were cut to 30 cm 33 days after seeding. Three replicate pots were harvested immediately after cutting (day zero) and 1, 2, 3, 5, 7, 14 and 21 days thereafter. Concurrent with the first harvest, all nutrient solution was washed from the remaining pots that were then watered with a nutrient solution enriched with ¹⁵N. At harvest, young leaves (two youngest expanded leaves at the time of the first harvest) were separated and weighed. Total free amino acids content was determined following reaction with ninidrine and OPA derivatives amino acid were detected as described by Jarret et al. (1986). The total N and ¹⁵N concentrations were determined using a continuous flow mass spectrometer. The difference between the total and labelled nitrogen content (unlabelled nitrogen) was assumed to be the nitrogen present within the plants at the time of the first harvest.

Results and discussion Unlabelled N content of young leaves decreased from 1.53 ± 0.06 to 0.61 ± 0.01 on the first seven days after defoliation and unlabelled N mobilisation rate was highest just after defoliation (decrease of 0.51 mg/plant of unlabelled N between day zero and day 1). There was also an increase of amino acids concentration in young leaves of Tanzania just after defoliation, which was higher two days after defoliation (200.8 nmol/mL; Figure 1). The increase of the amino acids content at the same time as unlabelled N mobilisation increases may be related to protein degradation through the action of protease enzymes and subsequent transport of amino acids to meristems to support growth. Aspartic acid, glutamic acid, asparagine, glutamine, glycine, threonine, tyrosine and leucine+isoleucine represented more than 90% of free amino acids in young leaves of Tanzania. Although the most important transportable amino acids (aspartic acid, glutamic acid, asparagine and glutamine) represented around 50% of free amino acids, its concentration did not follow any pattern throughout harvests.

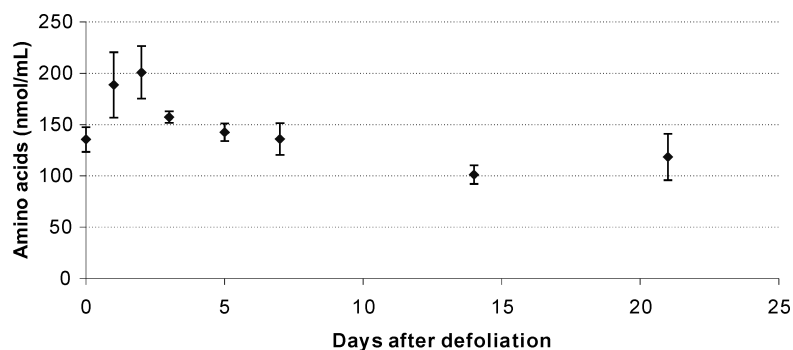


Figure 1 Free amino acids concentration (nmol/mL) on young leaves of *P. maximum*. Means of three replicates \pm s.e.

Conclusion There is a correlation between free amino acids content and N mobilisation on young leaves of *P. maximum* after defoliation.

Reference

Jarret, H.W.; Coosky, K.D.; Willis, T. et al., 1986. The separation of o-phthalaldehyde derivatives of amino acids by reverse-phase chromatography on octylsilica column. *Analytical Biochemistry*, 153, 189-198.