Physiological and metabolic consequences of autophagy deficiency for the management of nitrogen and protein resources in Arabidopsis leaves depending on nitrate availability

Submitted by Jose Gentilhomme on Wed, 05/20/2015 - 11:51

Titre: Physiological and metabolic consequences of autophagy deficiency for the management of nitrogen and protein resources in Arabidopsis leaves depending on nitrate availability

Type de publication: Article de revue

Auteur: Guiboileau, Anne [1], Avila-Ospina, Liliana [2], Yoshimoto, Kohki [3], Soulay, Fabienne [4], Azzopardi, Marianne [5], Marmagne, Anne [6], Lothier, Jérémy [7], Masclaux-Daubresse, Céline [8]

Pays: France

Editeur: Wiley-Blackwell

Ville: Cambridge

Type: Article scientifique dans une revue à comité de lecture

Année: 2013

Langue: Anglais

Date: Août 2013

Numéro: 3

Pagination: 683-694

Volume: 199

Titre de la revue: New Phytologist

ISSN: 1469-8137

Mots-clés: aminopeptidase [9], carboxypeptidase [10], leaf senescence [11], nitrate availability [12], nitrogen remobilization [13], selective autophagy [14]
Autophagy is present at a basal level in all plant tissues and is induced during leaf ageing and in response to nitrogen (N) starvation. Nitrogen remobilization from the rosette to the seeds is impaired in autophagy mutants. This report focuses on the role of autophagy in leaf N management and proteolysis during plant ageing. Metabolites, enzyme activities and protein contents were monitored in several autophagy-defective (atg) Arabidopsis mutants grown under low and high nitrate conditions.

Results showed that carbon (C) and N statuses were affected in atg mutants before any senescence symptoms appeared. atg mutants accumulated larger amounts of ammonium, amino acids and proteins than wild type, and were depleted in sugars. Over-accumulation of proteins in atg mutants was selective and occurred despite higher endopeptidase and carboxypeptidase activities. Specific over-accumulation of the ribosomal proteins S6 and L13 subunits, and of catalase and glutamate dehydrogenase proteins was observed. atg mutants also accumulated peptides putatively identified as degradation products of the Rubisco large subunit and glutamine synthetase 2 (GS2). Incomplete chloroplast protein degradation resulting from autophagy defects could explain the higher N concentrations measured in atg rosettes and defects in N remobilization.

It is concluded that autophagy controls C : N status and protein content in leaves of Arabidopsis.

DOI 10.1111/nph.12307 [16]
Lien vers le document http://dx.doi.org/10.1111/nph.12307 [16]
Titre abrégé New Phytol