The contrasting N management of two oilseed rape genotypes reveals the mechanisms of proteolysis associated with leaf N remobilization and the respective contributions of leaves and stems to N storage and remobilization during seed filling.

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Résumé en anglais	**BACKGROUND:** Oilseed rape is the third largest oleaginous crop in the world but requires high levels of N fertilizer of which only 50% is recovered in seeds. This weak N use efficiency is associated with a low foliar N remobilization, leading to a significant return of N to the soil and a risk of pollution. Contrary to what is observed during senescence in the vegetative stages, N remobilization from stems and leaves is considered efficient during monocarpic senescence. However, the contribution of stems towards N management and the cellular mechanisms involved in foliar remobilization remain largely unknown. To reach this goal, the N fluxes at the whole plant level from bolting to mature seeds and the processes involved in leaf N remobilization and proteolysis were investigated in two contrasting genotypes (Aviso and Oase) cultivated under ample or restricted nitrate supply. **RESULTS:** During seed filling in both N conditions, Oase efficiently allocated the N from uptake to seeds while Aviso favoured a better N remobilization from stems and leaves towards seeds. Nitrate restriction decreased seed yield and oil quality for both genotypes but Aviso had the best seed N filling. Under N limitation, Aviso had a better N remobilization from leaves to stems before the onset of seed filling. Afterwards, the higher N remobilization from stems and leaves of Aviso led to a higher final N amount in seeds. This high leaf N remobilization is associated with a better degradation/export of insoluble proteins, oligopeptides, nitrate and/or ammonia. By using an original method based on the determination of Rubisco degradation in the presence of inhibitors of proteases, efficient proteolysis associated with cysteine proteases and proteasome activities was identified as the mechanism of N remobilization. **CONCLUSION:** The results confirm the importance of foliar N remobilization after bolting to satisfy seed filling and highlight that an efficient proteolysis is mainly associated with (i) cysteine proteases and proteasome activities and (ii) a fine coordination between proteolysis and export mechanisms. In addition, the stem may act as transient storage organs in the case of an asynchronism between leaf N remobilization and N demand for seed filling.
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