

Lipid droplets, dynamic organelle in germinating seeds that gives a versatile emulsion

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In addition to their central role in the life cycle of higher plants, seeds from oil crops are major sources of oil for food, feed, and to a lesser extent for green chemistry. Seed oil is stored in specialized intracellular structures, with a size close to μm , called Lipid Droplets (LDs), Oleosomes or Oil Bodies. LDs consist of a core of neutral lipids (mainly triacylglycerols and sterol esters) surrounded by a half membrane in which various proteins, mostly structural, are embedded. These proteins have a role in controlling lipid mobilization. In water, LDs form a very stable emulsion. LDs contain minor compounds (vitamins, sterols) of interest for food and health. LDs are destroyed during the oil extraction process and the refined oil lacks minor compounds.

Results from a detailed study of LDs from seeds of several *B. napus* accessions with contrasted oil extractability suggest that the protein and lipid compositions of the half membrane of LDs affect their rigidity (1,2). We have deciphered the topology of structural proteins at the surface of LDs (3). We followed the digestibility of LDs using an in vitro model digester mimicking different compartments. While seed LDs are quiescent in dry seeds, their structure and composition rapidly evolve during seed germination. We have identified a novel mechanism controlling LD dynamics and required to remove the oleosin coat that stabilizes LDs in dry seeds (4, 5). It seems to us necessary to consider new methods of seed fractionation and extraction of oil taking into account the living nature of seeds. Water based extraction is an alternative to existing processes using a lot of energy and organic solvents.

References

(1) P. Jolivet *et al.*, *Industrial Crops and Products* **44**, 549 (Jan, 2013) (2) C. Boulard *et al.*, *Planta* **242**, 53 (Jul, 2015). (3) P. Jolivet *et al.*, *J Proteomics* **169**, 87 (Oct 3, 2017). (4) C. Deruyffelaere *et al.*, *Plant Cell Physiol.* **56**, 1374 (Jul, 2015). (5) Deruyffelaere *et al.* *Plant Cell*, under press