

SUPPLEMENTAL FIGURE LEGENDS

SUPPLEMENTAL FIGURE 1. Validation of direct organelle mass spectrometry with GC-FID total fatty acid analysis. Analysis of total fatty acid methyl esters (FAMES) prepared from the seed LDs of Coker 312 wildtype (black) and *Bnfad2* transgenic lines (grey).

SUPPLEMENTAL MOVIE 1. Representative video of direct organelle mass spectrometry of approximately four lipid droplets purified from mature embryos of Coker312 cottonseed—representative TAG profile in Fig. 2a. The video was acquired in real time with a Plan Fluor 40X objective lens. The nanospray emitter opening is approximately 3 microns.

SUPPLEMENTAL MOVIE 2. Video of direct organelle mass spectrometry of a single lipid droplet purified from mature embryos of *Bnfad2* cottonseed. Snapshot image and TAG profile shown in Fig. 5a. The video was acquired in real time with a Plan Fluor 40X objective lens. The nanospray emitter opening is approximately 2 microns.

SUPPLEMENTAL MOVIE 3. Video of direct organelle mass spectrometry of a population of purified lipid droplets from wildtype *Arabidopsis* leaf tissue—TAG profile in Fig. 8a. The video was acquired in real time with a Plan Fluor 40X objective lens. The nanospray emitter opening is approximately 5 microns.