Among surfactants used in this study, only anionic detergents (lauryl sarcosine, SDS) and amphipols1 (blocky A12-80B2, random A8-35R), maintained oleosins soluble after ultra centrifugation at 200,000 x g.

Aim of the project

Seeds store reserve lipids in subcellular organelles called oil bodies (OBs) until germination. OBs constitute an oil-in-water natural emulsion, covered by a phospholipid monolayer and stabilized by tri block hydrophobic proteins, oleosins and caleosin, for which no reliable structure is known. The difficulty in extracting oil from numerous seeds is reflected by the complexity of the processes used to this effect (high energy and harmful solvents i.e. hexane). Moreover, these processes strongly affect the quality of protein cakes, used in animal feed. Knowledge of OBs structure and stability are prerequisites for designing extraction schemes using conditions as mild as possible. Using various biological and physical approaches we wish to structurally characterize “structural proteins” from seed OBs and give a molecular basis to OBs stability.

Oleosins are maintained soluble and folded using various amphiphilic polymers

We have used various molecules and biophysical approaches to maintain oleosins soluble and to study their fold.

Oleosins are folded in natural oil bodies.

Oleosins are not correctly folded in reconstituted oil bodies2-4, but SRCD experiments showed that purified seed OBs contain folded proteins. S3 oleosin has been maintained soluble and folded in foscholine, a detergent with headgroup analogue to a phospholipid, thus mimicking oleosin natural environment. Upon expression in yeast, S3 oleosin is targeted to oil bodies, and is the most abundant protein. SRCD results confirm the tendency of oleosins to adopt an original structure with a majority of β-sheet folds4.

Conclusion

It is the first time that, using rigorous criteria, OB proteins are maintained soluble in aqueous media. We proved that protein surfactant complexes exhibit low polydispersity and are folded. We propose that the central region of oleosin adopts a original β-sheet fold.

References

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