

Phenolic Compounds in Emulsions : A Methodological Approach of their Partition and Antioxidant Activity

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In complex multiphase matrices, the capacity of phenolic compounds to inhibit lipid oxidation is not only dependent on their chemical structure. It also depends on their partitioning within the matrix and on their interactions with other compounds. In fact, phenolics interact with emulsifiers that, in food emulsions, may be present either in the aqueous phase or adsorbed at oil-water interfaces.

We have developed an approach to compare the effect of protein as bovine serum albumin by comparison with Tween, on the behavior of phenolic antioxidants in oil-in-water emulsions. It consists in:

- measuring the partitioning of phenolic compounds between the aqueous and creamed phases of oil-in-water emulsions stabilized by BSA or Tween. The results are then compared to values obtained with biphasic oil-water system with no emulsifier;
- measuring the ability of the phenolic compounds to delay or slower oxidation of the both oil-in-water emulsions during storage at 50°C (formation of conjugated dienes and production of volatile compounds in the headspace).

The results obtained with quercetin, caffeic acid and Trolox at 100 ppm reveal various behaviour according to the emulsifier.

In the biphasic system, the partition of the antioxidants in oil phase is in relation with their apolarity (quercetin > Trolox > caffeic acid). In the emulsified system, this order remains but the oil partition of the polar antioxidants as Trolox and caffeic acid is increased by the surfactant Tween, and decreased in the case of quercetin. BSA changes the partition of only quercetin, in the same manner as Tween.

Concerning the ability to delay the oxidation in oil-in-water emulsion, the first results show that quercetin is more efficient than caffeic acid in both systems, that seems in relation with their oil phase content.

A third step will consist in evaluating *in situ* the phenolic-protein interactions by front-face fluorescence. This will be done in collaboration with INRA-BIA, Nantes-France.