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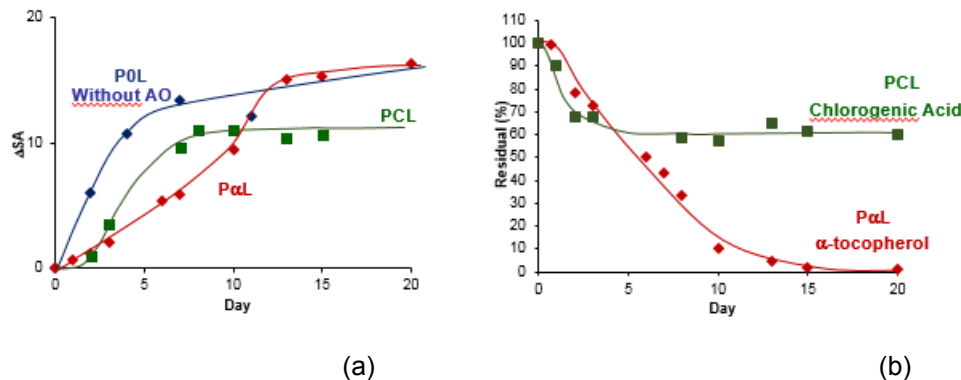
### Influence of antioxidant location on the protection of oil encapsulated in powder

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Encapsulation of Poly Unsaturated Fatty Acids (PUFAs) in solid matrix, by providing a physical barrier, is used to prevent or delay their degradation; and the use of antioxidant is expected to enhance PUFAs oxidative stability. In liquid emulsions, the effectiveness of antioxidants is known to depend on their distribution between the oil and aqueous phase. In this study, the impact of the lipophilic or hydrophilic character of phenolic antioxidants on the oxidative stability of encapsulated PUFAs was investigated following the evolution of conjugated dienes and antioxidant residual content during accelerated ageing test (50°C, 60% RH).

Dry emulsions containing 10%wt stripped sunflower oil (60% PUFAs), 89.7%wt maltodextrin DE12 (wall material) and 0.3%wt Tween@20 (surfactant) were produced by spray drying. Some were enriched with alpha-tocopherol (lipophilic - 500 ppm in oil) or chlorogenic acid (hydrophilic, 1000 ppm in maltodextrin), two scavengers of lipid radicals implied in oxidation.

Antioxidants improved the oxidative stability of encapsulated oil. With chlorogenic acid, oil oxidation occurred after a two days lag phase whilst for alpha-tocopherol, no lag phase was observed but the oxidation rate was smaller than in control and chlorogenic acid powders during the ten first days of ageing (Fig. 1a). The residual concentration of chlorogenic acid decreased rapidly during the first two days and then remained constant whilst the concentration of alpha-tocopherol decreased regularly ensuring oil protection until it has been totally consumed after ten days (Fig.1b).



**Figure 1** : Evolution of specific absorbance due to conjugated dienes (a) and of residual content of antioxidant (b) during ageing test (60°C, 50% RH)

The better oil protection provided by alpha-tocopherol during the first ten days of storage was attributed to the different location of both antioxidants within the macro-domains of the dry emulsion. Alpha-tocopherol, in oil droplets, was directly in contact with the oil to protect whilst for chlorogenic acid, entrapped in the solid matrix, only the fraction in contact with the oil droplets brought protection and 60% of initial chlorogenic acid remained preserved in the matrix.

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