Formulation of vegetal creams : influence of oil kind on physicochemical properties.

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INTRODUCTION:

Recombined cream is an alternative to natural cream and is used in the production of some products such as pasteurized cream, whipped cream, cheese and ice-cream. For the manufacture of recombined creams, ingredients from both dairy and non-dairy origin are used. In comparison to milk fat, vegetal oils present broader possibilities to produce final products with specific properties. The use of vegetal oils in cream formulation allows to reduce raw material costs in comparison to milk fat. It also presents nutritional advantages (reduction of cholesterol consumption, high level of essential fatty acid).

OBJECTIVE AND STRATEGIES:

The main objective of this study is to contribute to a better understanding of the formulation and properties of vegetal creams in comparison to a reference dairy cream (standard).

The formulated creams are oil-in-water emulsions (30% w/w fat) reconstituted according to a simplified model generally used on a laboratory scale (buttermilk, water, fat). Vegetal creams formulation is done according to the model of the dairy cream but substituting the milk fat by the vegetal oil.

RESULTS:

1. Fat characterization by DSC and pulse NRM

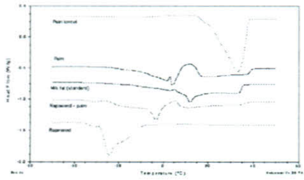

Fig.1: Second melting curves of fat obtained by DSC

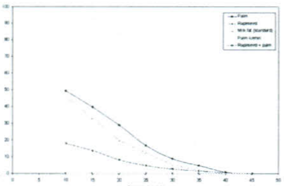

Fig.2: Solid fat content of fat obtained by pulse NRM

2. Particle size analysis of creams (after 24h storage at 4°C)

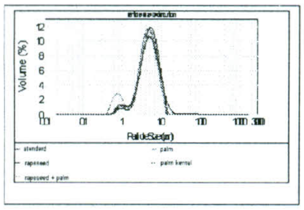

Fig.3: Particle size distribution of fat droplets of creams

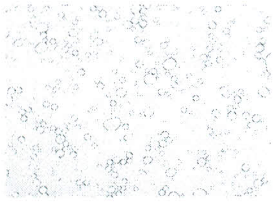

Fig.4: Microscopy images of "standard" cream (x40)

Creams are constituted by two populations of globules: the small and large globules. As "standard" cream, the large globules are mainly individual.

Tab.1: Droplet mean diameter of creams

	Standard	Palm	Rapeseed	Palm kernel	Rapeseed + palm
D (3,2) (µm)	3,64±0,10	3,61±0,11	**3,93±0,10**	**2,59±0,05**	3,74±0,08
D (4,3) (µm)	5,19±0,15	5,36±0,17	**5,56±0,08**	**4,74±0,07**	5,85±0,22

3. Flow behaviour of creams (after 24h storage at 4°C)

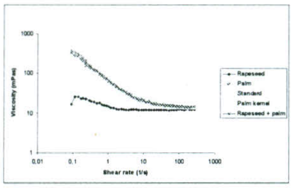

Fig.5: Creams viscosity profiles at 20°C

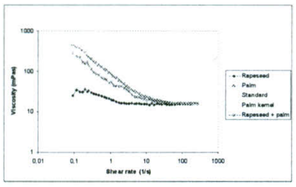

Fig.6: Creams viscosity profiles at 6°C

All formulated creams except the one from rapeseed oil show a pseudoplastic flow quite similar to that of the reference dairy cream

4. Cream stability

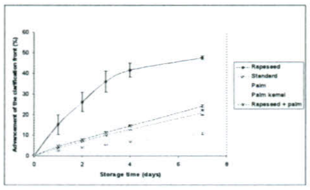

Fig.7: Evolution of cream stability as a function of storage time

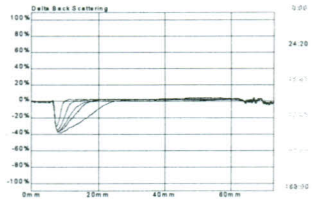

Fig.8: Graph advancement of the clarification front

The "palm kernel" cream which has the smallest of globules is the most stable whereas the "rapeseed" cream which has the largest is the most unstable. The other creams have a stability profile rather close to the reference dairy cream.

Creaming is the main phenomenon of creams destabilization (Fig.8)

5. Whippability properties

Tab.2: Overrun and liquid drainaing of creams

	Standard	Palm	Rapeseed	Palm kernel	Rapeseed + palm
Overrun (%)	41,3 ± 2,3	17,9 ± 1	36,7 ± 1,7	**150,9 ± 4,1**	10,9 ± 1,6
Liquid draining (%)	33,9 ± 3,2	-	-	**19,4 ± 2,2**	-

The "palm kernel" cream is the only vegetal cream which shows a good overrun. This cream is more stable than the reference dairy cream after whipping.

CONCLUSION:

The fat characterization clearly shows the influence of the physicochemical characteristics of fat on the technofunctional properties of creams. The fat melting profile appears to be one of the most important parameter to consider while formulating vegetal creams