INNOVATING PORTUGUESE TRADITIONAL PASTRY – ON THE USE OF PASTEURISED EGG YOLK IN "OVOS MOLES"

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ABSTRACT

"Ovos moles" is a renowned traditional Portuguese sweet that is confectioned with egg yolk, sugar and water.

In this work a safer and easier to manipulate raw material - pasteurised liquid egg yolk - is proposed to substitute the intact shell eggs used in traditional *"ovos moles"* production. Due to previous heat treatment, pasteurised liquid egg yolk presents different sensorial, nutritional and physical properties. These changes may alter the final product's characteristics. In order to develop a safer formulation, using pasteurised raw products, with minimised differences from the traditional product, a study on adding pasteurised egg white (as bulking agent) to the pasteurised liquid yolk was carried out. Samples made with normal shell eggs and with pasteurised liquid eggs were compared in terms of rheological parameters. Results allow characterising the physical properties of traditional *ovos moles* and of alternative formulations, using pasteurised egg yolk and white. A new formula, with rheological properties identical to the traditional one, was developed.

Keywords: "*ovos moles*", safety, pasteurised egg, rheological properties.

INTRODUCTION

Public opinion is concerned about the capacity of current food chain systems to provide safe products (Macfarlane 2002). Modern consumer's requirements and trends made necessary a constant attention and intervention of specialists, in areas such as microbiology and technology, aiming at guaranteeing the commercialisation of safe products, with high quality.

"Ovos moles" is a famous traditional Portuguese sweet obtained through the mixture of uncooked egg yolk with a syrup of fine white sugar (sucrose), submitted to a few minutes of soft heating. The added egg yolk must be uncooked, to provide the typical structure, colour, aroma, smoothness and consistency (Instituto de Desenvolvimento Rural e Hidráulica n.d.). The main safety issue associated with "*ovos moles*" recipe is the use of uncooked egg yolk, which is often the origin of foodborn outbreaks caused by

pathogenics (*Salmonella* spp. is the most relevant contaminant). Good hygienic practices may reduce the level of egg contamination, but this may not be sufficient (Farkas 1998).

Thermally processed eggs, the so-called *liquid eggs*, are safer products. The whole egg, after broken and shell removal, suffers a pasteurisation treatment. The final product is commercialised in tetrapack packages, and usually contains less than 1000 microorganisms per gram (even in the case of *Salmonella* spp., which shows a minimum of six log reductions; Vanderzant and Splittstoesser 1992). There is also commercially available pasteurised egg yolk and white, separately, or mixtures of both in different proportions. The thermal treatment affects the physico-chemical properties of the raw egg (Hou et al. 1996), namely the viscosity (Calderon-Miranda et al. 1999). Consequently, if *liquid eggs* are used in *"ovos moles"* production, the final quality attributes may differ from the traditional products, thus affecting consumers' acceptance. This fact may explain why producers, especially small and medium enterprises, still choose intact shell eggs instead of liquid products in confection of egg-containing products (Denys et al. 2004).

Texture is one important feature of *"ovos moles"*, which is the response of the consumer's sensory perception to the sweet. Texture is dynamically evaluated throughout consumption (Bourne 1982), and it is not possible to quantify human's perception using a single mechanical tool. However, results from rheological experiments can be used to explain a number of aspects related to food texture (Malone et al. 2003; Heath and Prinz 1999).

The aim of this work was to study the substitution of raw eggs by pasteurised *liquid eggs* in *"ovos moles"* production, by evaluation of rheological behaviour of the formulations.

MATERIAL AND METHODS

Sample preparation

The *"ovos moles"* samples used in this study were prepared by an experienced cooker, following the traditional recipe. Thus, 240 g of white sugar and 125 ml of water were heated until formation of a syrup with specific viscosity characteristics, traditionally called “*ponto de pasta*”. Afterwards, 220 ml of eggs were incorporated into the syrup. Four different formulations of this recipe were elaborated (table 1). Raw shell eggs and pasteurised *liquid eggs* (pasteurised yolk and white parts) were used. Shell eggs were acquired in a local supermarket, while pasteurised egg yolk and white were bought in a food company (*Derovo*, Pombal, Portugal). In the traditional formulation only egg yolk was used, being the yellow and white parts separated by hand. With respect to the pasteurised eggs, three levels of white part addition were studied (0%, 10% and 20% v/v) and total egg content was maintained constant. For each formulation, two different batches were prepared and analysed.

Table1: Tested “*ovos moles*” formulations.

	Formulation category			
Characteristics	Traditional formulation **(TF)**	Pasteurised egg yolk **(PY)**	Pasteurised egg yolk + 10% white **(PY10%W)**	Pasteurised egg yolk + 20% white **(PY20%W)**
Type of product	raw	pasteurised	pasteurised	pasteurised
Egg yolk (ml)	220	220	198	176
White part (ml)	0	0	22	44

Rheological measurements

Rheological behaviour was determined by a controlled stress rheometer Bohlin VOR (Bohlin Instruments Ltd, Cirencester UK) at 25ºC, using a 20 mm parallel plate configuration. Due to the large particle sizes of the samples, the gap was set to 2 mm. In accordance with a previous creep test, 2 minutes delay was given before testing to allow shear history relaxation and to reconfigure the initial state. All measurements were done in the viscoelastic region (strain sweep tests were carried out previously). Dynamic rheological properties were investigated by applying oscillatory dynamic testing and measuring tanδ for different frequencies. This frequency sweep test was performed in the 0.1 to 10 Hz range. Dynamic measurements were replicated at least six times.

RESULTS AND DISCUSSION

Rheological behaviour

A typical result from a strain sweep test of "*ovos moles*" formulations is presented in figure 1. It is possible to observe that the linear viscoelastic region was within the deformation range $1x10^{-5}$ to $1x10^{-2}$. Accordingly, the strain value set for further tests was $1x10^{-3}$.

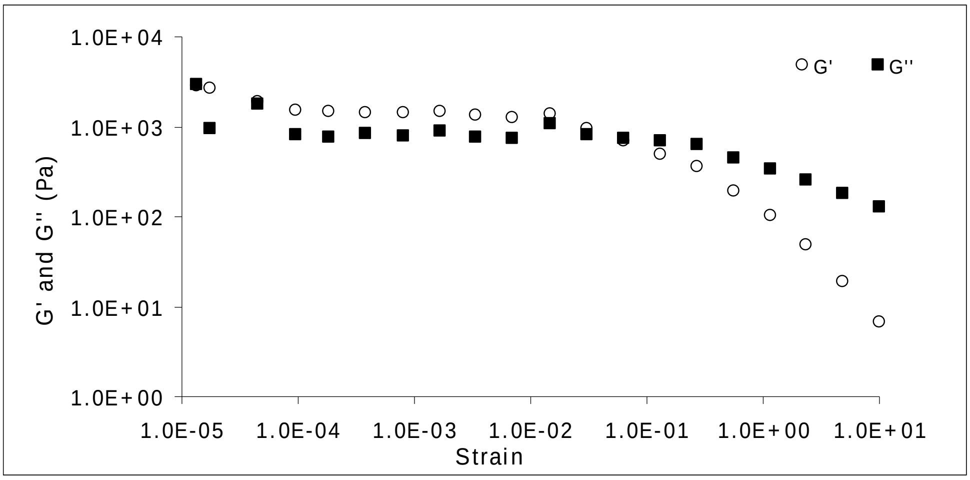

Figure 1: Results of a typical dynamic strain sweep test in traditional "*ovos moles*" formulation.

Characterisation of "*ovos moles*"

Traditional formulation

Results of a frequency sweep test, applied to traditional "*ovos moles*" formulation, are presented in figure 2. These samples presented solid viscoelastic behaviour. However, for higher frequencies, tanδ values approached 1. This means that, at typical processing frequencies (high frequencies), traditional "*ovos moles*" are more viscous, i.e. their behaviour shifts towards a more "softer viscoelastic solid". From the standard deviation of experimental values presented in figure 2, it was also possible to observe the high variability of traditional *"ovos moles"*. This variability was observed in different batches and in different replicates from the same batch.

Formulation with pasteurised egg yolk

"Ovos moles" produced with pasteurised yolk showed a rheological behaviour more "liquid like" than traditional formulations (figure 2). This is probably due to the observation that even mild thermal processes lower eggs yolk viscosity. In all frequencies analysed, tanδ values are higher than the ones obtained in samples produced with intact shell eggs. However, the tendency is the same for both formulations (TF and PY). Figure 2 also allows observing that PY samples variability (evaluated by standard deviations) is much lower than the one observed in traditional ones.

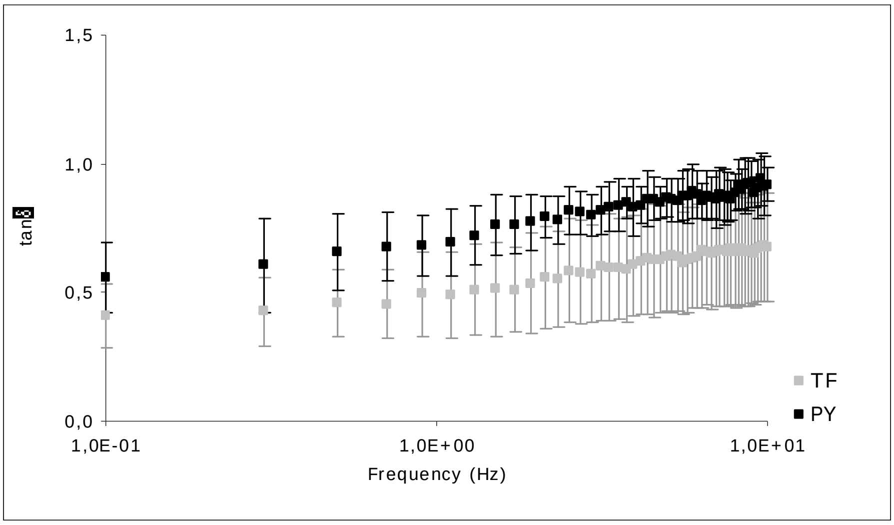

Figure 2: Dynamic behaviour of the traditional (TF) and pasteurised egg yolk (PY) formulations. The bars indicate the standard deviation of experimental values.

Formulation with pasteurised egg yolk and white

Seeking comparison, figure 3 includes all results of a frequency sweep test for the different *"ovos moles"* formulations. It is possible to observe the same tendency of the dynamic behaviour of all studied formulations. However, differences in tanδ were observed as the ratio of volumes egg white/egg yolk was increased.

Adding 10% of egg white to the pasteurised liquid egg yolk led to a product with a rheological behaviour of an “harder viscoelastic solid” than the PY formulation. Nevertheless, PY10%W presented a “softer viscoelastic solid” behaviour than the traditional formulation. Increasing egg white content (PY20%W), the rheological characteristics were identical to the ones of the traditional formulation.

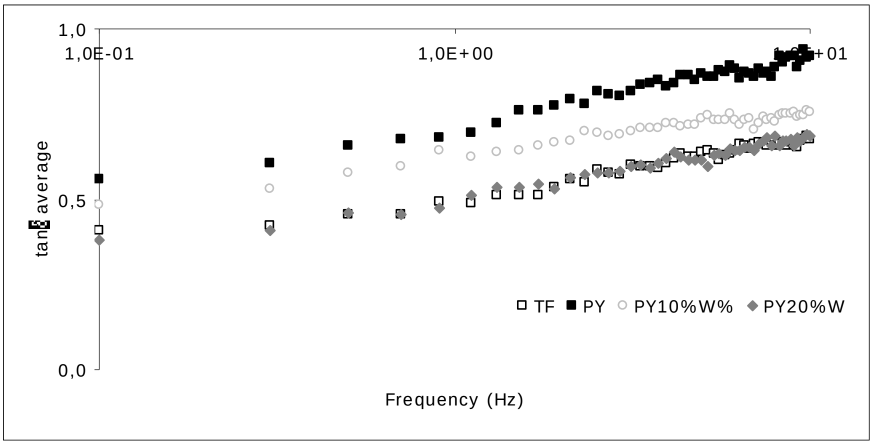

Figure 3: Dynamic behaviour of all “*ovos moles*” formulations.

In this way, it was possible to conclude that pasteurised egg white can be used as a bulking agent, and using 20% (v/v) of white part will lead to a product with a dynamic rheological behaviour similar to traditional “*ovos moles*”.

CONCLUSIONS

The rheological properties of traditional “*ovos moles*” and of alternative formulations, using pasteurised egg yolk and white, were characterised.

A new formulation for “*ovos moles*” was developed. This formulation is expected to be safer, but rheologically identical to the traditional and commercial formulations. Furthermore, the small variability of this formulation can be an extra advantage for the food industries aiming at standardizing products’ characteristics. These results shall be validated using sensorial analysis and shelf-life studies.

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