FLAVOR ENHANCEMENT OF SOME BAKERY PRODUCTS.

By

MOHAMED YEHIA SAYED AHMED

B.Sc. (Food Sci. Tech.), Fac. Agric., Menofya Univ., Egypt, 2000.

THESIS

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APPROVAL SHEET

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ABSTRACT

The aim of the present study was to improve the overall quality of some baked products (cookies & cakes) by addition of the appropriate precursors of the desired flavour (cookies) or flavouring the product with exogenous flavour (cakes). The cookies were prepared by replacing wheatflour with soy protein isolate (SPI) (5, 10, 15 and 20% w/w) or addition of β-alanine (0.2, 0.4, 0.6 and 1.00% w/w). The chemical composition and sensory evaluation of cookies supplemented with SPI were studied during storage for three months. The volatiles of all cookie samples under investigation were isolated and subjected to gas chromatography – mass spectrometry (GC – MS) analysis. The results of sensory evaluation revealed that cookies fortified with 10% SPI or 1.00% β-alanine possessed the highest quality. The GC – MS analysis showed that these cookie samples comprised the highest yield of the most potent odourants of cookies aroma.

The cake was flavoured with freeze dried cinnamon oil encapsulated in Arabic gum (AG). In present study (AG) has a dual functions as encapsulant material and as replacer of fat at 10, 20, 30, 40 and 50% of fat in control sample. The samples were subjected to chemical and sensory evaluation. The effect of replacing fat in cake samples by AG on the retention of some thermally generated volatiles (2,3-butandione, 2-furfural and trimethylpyrazine) and the most potent odorants in HD cinnamon oil (cinamaldhyde, euogenol and β-caryophelene) were studied. Results showed that no linear behavior was present concerning the effect of increasing the fat replacer level on retention of the added or generated flavours which are consistent with the published studies.

Key words: Cookies, volatiles, sensory evaluation, soy protein isolate, β-alanine, cakes, fat replacers and encapsulation.

DEDICATION

I dedicate this work To My Parents,

To My wife Arwa and my son yehia for their patience, To My Brothers, To All My Family, And To All My Friends for all the support they lovely offered along the period of my post graduation.

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INTRODUCTION

For centuries, baked cereal products have been present in our diets. Nowadays there are a wide variety of products that can be included in this category of foodstuff such as breads, cakes, doughnuts, cookies, crackers, and others. They can be classified depending on product type (unsweetened or sweetened), method of leavening (biological, chemical, or unleavened), or from a technological point of view, on the basis of their pH, moisture content, and water activity (Smith *et al.*, 2004).

The flavour of bakery products is the result of the aroma compounds produced by enzymatic, fermentation, and thermal reactions during baking (endogenous aroma compounds) and the aroma compounds deliberately added to the products to obtain baked goods with specific aromatic characteristics (exogenous aroma compounds) (Pozo-Bayon *et al.*, 2006). The aroma composition of baked cereal products has been widely studied, and as the methods for isolation and identification have been developed, more volatile compounds have been described (Rega *et al.*, 2009). Nevertheless, there has been a recent interest to find the compounds more representative of the aroma in these products. Surprisingly, only a relatively small number of them seem to have an impact in the final aroma.

Modifications in the production process can change the aroma composition (Guichard, 2002). Although most of these products can be considered as traditional products, nowadays the control of production is a necessity when homogeneous product and a standard aromatic

quality are required. Therefore, the understanding of the involvement of raw materials and ingredients and all the elaboration steps will be necessary to improve or maintain the endogenous aromatic characteristics. Flavouring of baked cereal products is more and more employed to reinforce or to create new products with desirable aromatic notes. Nevertheless, the exogenous aroma compounds added to the products are susceptible to transformation or loss during processing. Therefore, strategies to try to minimize this loss must be developed. In order to improve the final flavour in aromatic baked cereal products, the knowledge of the physical-chemical behavior of the aroma compounds will be necessary when changes in the ingredient formulation are made (Guichard, 2002).

Although flavouring is widely used in baked products to reinforce or to generate a desired aromatic note, some added volatile compounds could be lost or modified during the elaboration process. During the initials steps (incorporation of the aroma in the dough, kneading, etc.), the loss of the most volatile compounds would occur by evaporation or because of the unsuitable distribution of the aroma compounds in the dough (Reineccius and Whorton, 1990; Brauss *et al.*, 1999; De Roos and Mansecal, 2003). Interactions between aroma compounds and food ingredients, lipids, proteins and polysaccharides may also take place (Guichard, 2002) which could increase the retention of the compounds by the matrix, but could also reduce the availability of the aroma compounds for the perception during consumption.

It has been shown that some important odor compounds, such as pyrazines, are quickly lost from bread after baking (Grosch and Shieberle, 1997), however, the release of aroma compounds deliberately added to aromatize a dough has not been widely studied in the products after baking in spite that could be especially important to explain the modification in the aroma of flavoured baked goods during the storage.

Loss of added aroma compounds will produce a global decrease in the aromatic intensity of the product and a distortion of its final aromatic note (Jackel, 1992 and Varadachari, 2002), as well as economic loss for the food industry. It is, therefore, important to favour retention of the aroma in the baked cereal matrices in order to preserve the initial added aroma or to facilitate the retention of the molecules generated during baking. Encapsulation techniques or suitable aroma formulations depending on the composition of the product would be efficient for solving these problems.

Cookies and cake are the most baked products influenced by change in life style. Therefore, the baking industry has introduced important modifications in the original recipes of traditional products as well as the development of new technologies of production. This fact represents a challenge for the food technologists that will have to adapt to the consumer's demand without losses in the sensorial quality of the new products.

Previous studies of aromatic compounds in baked products have mainly focused on bread and bread-making steps (Komaitis and Aggelousis, 1993; Hansen and Hansen, 1994; Schieberle and Grosch,

1994; Galey *et al.*,1994, Gobetti *et al.*, 1995; Zehentbauer and Grosch; 1998 and Quilez *et al.*,2006) and second cookies model system (Prost *et al.*, 1993). However, only little studies have been carried out, recently dealing with cookies and cakes aroma.

Cookies and cakes are among the most popular baked products that affected by the consumers' life style.

Therefore the main objective of the present work was:

1- Improve the flavour and overall qualities of the studied baked products either by supplementation with the appropriate precursors of the desired flavours or addition of exogenous flavouring compounds and other ingredients that improve and retain the flavours.
2- Evaluate the addition of soy protein isolate at different levels to wheat flour on flavour and overall qualities of cookies during storage.
3- Study the effect of addition of β-alanine to wheat flour on the generated volatile compounds in cookies.
4- Evaluate the effect of fat content and fat replacers on the quality characteristics and aroma composition of cakes.