

21st Century Cakes

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Cakemaking has been around for many centuries and actually started with the manufacture of bread in Egyptian times. The bread products developed into cakes by the addition of honey, sugar then eggs and finally fat to produce the sweet, open textured, soft crumb cakes we know and love.

In more modern times cakemaking methods have developed due to various factors, but most predominantly due to changes in ingredients, the availability and quality of which were at times unreliable, particularly during World Wars 1 and 2.

New equipment and the need for faster and larger production has also influenced the changes in cakemaking technology. Similar radical changes have been made in the breadmaking sector, causing much emotional debate and disagreement in the industry about the relative merits of traditional and modern baking processes. The flour confectionery sector has however accepted the changes in cake mixing and recipe formulation developments with a little less emotion.

This presentation will be concentrating on the changes experienced throughout the last century, the balance of recipe formulations and methods used. Also, what is perhaps in store for the flour confectioner in the next century - the 21st century.

Use of a balanced recipe formulation is essential for the proper control of cake or sponge production and quality. The basic characteristic of a balanced formulation is that it maintains a correct relationship between its various ingredients. Once the recipe formulation has been established and essentially proved in practice, there is a tendency by everyone from production staff to marketing to consider the recipe as infallible. Ingredients and processing parameters can change through time and this is perhaps the major quality problem in cake/sponge terms, and can lead to the recipe becoming unbalanced.

Modern ingredients made available by new science and technology, plus new and improved processing methods and techniques, allow the cake technologist to produce products and recipes which could be classed as unbalanced, in classical terms.

Cake recipe changes over the last 50 years have been influenced by the following factors :-

advances in ingredient technology

advances in processing technology

consumer acceptance of natural additives e.g. gums and flavour changes

consumers' adverse reaction to E numbers on ingredient declarations

rationalisation of distribution and supply

These have led to a change in the way recipes are re-balanced, and cake products can no longer be distinguished and separated into exact types.

In the first half of the 20th century cakes were generally made at home using a low ratio type, pound-all-round recipe. A low ratio recipe can be defined as containing an equal to, or lower levels of, sugar and total liquids to that of flour. Low ratio cake formulations led to a short shelf-life product with a low

volume and slightly dense structure, which would be eaten within a short space of time e.g. within 48 hours.

Such traditional cake formulations require a specifically developed method to ensure that air is incorporated into the batter during mixing - the sugar batter or flour batter methods. These early recipes did not rely on chemical leavening from bicarbonate or baking powder additions. Mixing was usually done manually, rather than mechanically.

The sugar batter method involves creaming the fat and sugar together to create the air bubble nuclei; the egg is gradually added to the batter and beaten in. This method can be very successful provided good aeration is achieved during the creaming stage, and the air is retained whilst adding the flour and any further liquids.

The flour batter method was also developed during this time, again to concentrate on the aeration of the batter in the early stages of mixing - essential if ingredient quality was poor. This method is more elaborate and time consuming, but many bakers felt that this extra effort produced better quality cakes. The fat and an equal quantity of flour are mixed together; the egg and sugar are whisked together separately to make a sponge. The sponge is then carefully blended with the flour/fat mixture to combine the two and finally beaten to produce the batter.

There are quite a number of variations to these traditional methods which include the addition of the sugar to the egg component without whisking; addition of melted butter to a foam based sponge batter after the aeration stage; and the blending method where all the dry ingredients are initially blended with the fat then the liquids added slowly, followed by fast mixing.

In the second half of this century chlorinated flour and emulsifiers enabled recipes to become more complex. New fat and sugar products followed to create a brand new concept - the high ratio cake. The high ratio cake formulation originated in the United States and refers to the high level of liquid and sugar used in relation to the flour weight.

These new cake formulations relied on the functional properties of chlorinated flour which included the ability to sustain high levels of sugar, and liquids. Not to forget the production of a bright, white and fine textured, light crumb, with a very sweet taste because of the higher sugar levels. This appealed to consumer taste buds and also the cost reduction to the manufacturer due to the increased inclusion of water in the formulations.

Mixing methods also changed with the advent of chlorinated flour and newly developed high ratio shortenings which contained emulsifiers. Improved cake quality with the all-in method was achievable: all the liquids and dry ingredients plus fat are added together and mixed on high speed to aerate. High speed mixers, pressure whisks and continuous mixers such as Oakes and Mondo equipment all provide efficient aeration, compared with hand mixing. The all-in method is also used for the preparation of cakes from premixes, which are often used in in-store bakeries. New premix technology allows the baker to produce excellent quality cakes, without holding a large diversity of scratch ingredients. The egg in a premix can be in a dried format, liquids added are often only water and oil.

Going hand-in-hand with this new high ratio recipe formulation was the extension of the products' shelf life in both quality and mould-free terms. The level of sugar in the recipe allows the liquid components to be 'bound' within the cake structure, thus reducing the availability of that moisture to promote mould growth. Retaining the moisture within the crumb also gives a perception of freshness to the consumer.

With these points in mind we can begin to wonder whether the high ratio cake was developed for the consumer or for the manufacturer's benefit ?

The whole attitude to high ratio cakes has perhaps changed in the last few years, apparently due to consumer appeal for a more traditional cake with natural ingredients. Has this change occurred as the

manufacturers respond to the consumers demands, or perhaps implemented by the retailers to produce a more premium range of cake products, at an extra cost to the consumer ?

The use of certain additives in cake formulation have recently been deemed unacceptable by the consumer, such as chemical preservatives, which may have influenced the recent move towards a low ratio based cake formulation. Changes, driven in part by E.U. regulatory bodies, are also being made to adapt the high ratio formulation to replace chlorinated flour with the use of an untreated or heat treated flour.

But with these recipe changes, manufacturers have encountered problems. Cakes made with a low ratio formulation automatically have a higher ERH (equilibrium relative humidity) and shorter mould-free shelf life due to lack of sugar holding on to the liquid in the system. They also have a drier eating character, and loss of perceived freshness is accelerated compared with a high ratio formulated cake.

Healthy eating campaigns and dietary guidelines have also affected the cake manufacturer. Cakes contain quite high levels of fat and the high ratio cake formulation rates poorly, particularly due to its high sugar content. Recipes have started to change to encompass these guidelines, i.e. reducing the fat and sugar content. The high sugar, or sucrose, content is essential to maintain a low ERH and therefore extended mould-free shelf life. Reducing the sucrose content in the formulation will therefore have a negative effect on the shelf life of the cake.

Reducing the fat content of a cake formulation may also affect the mould-free shelf life of the final product. Many fat mimetics ('fake fats') make use of the water holding functionality of emulsifiers, gums and starches to replace the fat in the recipe. Again this will effectively reduce the mould-free shelf life of the final product due to the increased water in the system.

Now that consumers have grown attached to a moist, soft cake recipes may require higher levels of water in the formulation. This water needs to be bound, making it unavailable for microbial spoilage. If reducing the level of water in the formulation compromises the product quality, chemical preservatives or modified atmosphere packaging are the most obvious answer to extend the mould-free shelf life of a moist product.

To add preservatives to a cake product has merely created a vicious circle, consumers do not always accept artificial ingredients visible on their product declaration, but want their cake products to remain affordable and have a long shelf-life.

The problem being experienced by the manufacturers is : how to hold moisture within a cake product to maintain a quality cake with a moist eat, whilst retaining an adequate mould-free shelf life, without resorting to preservatives.

With the development of ingredient science and technology - starches, gums, fat replacement products and emulsifiers to name a few, have emerged. Such ingredients can help to maintain consumer and manufacturer demands on product quality, specifically the loss of perceived freshness during product shelf life.

We expect that technology in the next century, the 21st century, will concern both the ingredient suppliers and cake technologists - who are concentrating on providing the consumers with new and interesting cake products and extending the barriers of recipe balance