

KEY INGREDIENTS

INGREDIENT	FUNCTION & SPECIFICATIONS
Flour	Cake flour is a soft, low protein wheat flour, which is finer than other flours. May be chlorinated, which increases its water holding ability and reduces gluten strength.
Shortening and oil	Gives a tender structure. Fats are foam destabilisers so the way in which fat is mixed with other ingredients needs to be considered, and use of emulsifiers is essential.
Sugar	Provide sweetness, tender structure. Fine castor sugar readily dissolves in butter.
Eggs, egg white	Foam stabilisers, which slow down the coalescence of air bubbles.
Emulsifiers	Reduce the foam destabilising effect of fats. Cake emulsifiers reduce surface tensions so it is easier to incorporate air into a batter during mixing.
Baking powder	Double acting baking powder; with Mono Calcium Phosphate as the fast-acting leavening acid to produce a lighter batter directly after mixing, and slow-acting Sodium Acid Pyrophosphate to produce carbon dioxide gas for extra leavening during baking. The rate of the slower leavening agent is most critical – it must be fast enough to give sufficient leavening before the cake structure sets but not so fast as to cause tunnels when the gas escapes early in the baking when the batter viscosity is low. Baking powder affects pH of the product, which affects final colour.

AIMS & METHODS OF CAKE MIXING

- To blend the ingredients into a smooth, even batter.
- To beat the maximum amount of air into the batter.
- To form a batter that will hold the air until it is baked, i.e. be stable.
- To develop a desirable visual texture, volume and mouth-feel texture in the baked product.

1. THE 'WHISKING' OR 'WHIPPING' METHOD

Cake applications: sponges, egg whites for meringue, pavlova cakes, and for chiffon products.

When making sponge cakes, most of the sugar is added to the eggs before whipping. During egg whipping, air cells are formed and incorporated into the mix. In pure sponges these cells affect the entire leavening or raising process because no baking powder is used. Warm eggs and sugar to 38°C before whipping to soften the egg yolk and allow quicker whipping and greater volume. Egg yolk contains lecithin which surrounds the bubbles in the foam and allows a greater number of cells to form, each containing a larger amount of air. An addition of 20% egg yolks to the whole eggs improves the foam formation during whipping. For some types of sponge cakes it is best to whip the yolks and part of the sugar first, then the egg whites and remaining sugar are whipped and the two whipped products combined. This produces maximum aeration of the foam. For whipped sponge cakes, sift and fold flour in gently in stages to ensure that aeration is maintained. Loss of aeration results in a smaller product with a coarse texture.

For pavlova, best results from whipping occur when the egg whites are at 15°C. Whip egg whites slightly to a foam and then add the sugar in a steady stream. Whip at high speed until the eggs are almost completely whipped and then slow it down for maximum aeration, and finer, more even air bubbles. Aeration is only successful if the air remains in the batter until it is baked. For large mixes this is aided by modern stabilisers and emulsifiers (or fats) which are added during the whipping stage. These help produce a stiff foam with small bubbles.

2. THE 'SUGAR-SHORTENING' OR CREAMING METHOD

Cake applications: Creamed cakes are rich and soft with a fairly close, even grain and soft crumb.

In this method, the sugar and shortening fat are blended together first and then creamed by more mixing. During creaming, small air cells are formed and then incorporated into the mix, making it larger in volume and softer in consistency. The time needed for proper creaming is controlled by the temperature of the shortening or fat.

The ideal temperature is 21°C. If it is too cold shortening is not plastic enough to incorporate quickly and hold air cells, while fats that are too warm will not be able to hold as much air, nor give as much volume because they are soft and cannot tolerate the friction of the machine and constant mixing. Cream sugar and shortening at a medium speed until soft and light as high speed mixing tends to destroy or reduce the number of air cells that are formed. During the second stage, add eggs in several portions.

> INFORMATION SHEET

The yolk of the egg contains a fat that coats the surface of the cells formed in creaming and allows the cells to expand and hold the liquid added (egg whites, milk, etc.) without curdling. A creamed mix that has been carefully mixed and does not curdle has a water-in-fat solution. Cake mixes that curdle are those in which the water or liquid has been released by the cells to create a fat-in-water emulsion.

Adding eggs too quickly or adding all the other liquid (milk) at once will cause curdling. Addition of a small portion of the flour at the start of the mix will help to eliminate curdling in mixes with high liquid content. Adding flour alternately with the liquid after the mix is creamed will also eliminate the curdling tendency. The batter is then mixed slowly until smooth and the flour completely mixed in and wet. For pavlova, best results from whipping occur when the egg whites are at 15°C. Whip egg whites slightly to a foam and then add the sugar in a steady stream. Whip at high speed until the eggs are almost completely whipped and then slow it down for maximum aeration, and finer, more even air bubbles. Aeration is only successful if the air remains in the batter until it is baked. For large mixes this is aided by modern stabilisers and emulsifiers (or fats) which are added during the whipping stage. These help produce a stiff foam with small bubbles.

3. 'FLOUR BATTER' OR 'COMBINATION METHOD'

Cake applications: Old-fashioned pound cake, cheese cakes and marble cakes.

Flour is creamed with shortening to form a soft and light, fluffy mass. At the same time in a second bowl, the eggs and sugar are whipped at medium speed to form a semi-firm foam. The two mixtures are gently combined by folding the whipped eggs and sugar into the creamed flour and shortening. The maximum aeration is the basic means of leavening and little, if any, other leavening is used. Over mixing results in the formation of large holes in the cake and uneven grain, as well as a loss in volume.

4. THE 'ALL-IN' METHOD

Cake applications: Commercial production.

Cakes made by this method are distinctly different from sponges and cakes made by the sugar batter method. They depend on the use of hiratio chlorinated flour and an emulsifier or stabiliser. In this method, dry ingredients are sieved, placed in the bowl with the other ingredients and blended slowly for 2 minutes. The mixture is then beaten at medium speed for about 4 minutes and finally on slow speed for a further 2 minutes.

The finished batter should be thick and smooth but still pourable. The major advantage of this method is that it does not depend on long beating to aerate the batter. A high quality cake is produced with consistent volume; fine, moist, even crumb texture; tender eating quality and excellent keeping qualities.

FACTORS AFFECTING BAKING

FACTOR	DETAILS
Steam	A humid atmosphere is essential in order to achieve a flat top on a cake and to ensure that thorough baking is carried out with a pleasing crust colour. A pan of water inserted in the oven is usually sufficient for this purpose.
Richness	The more sugar a cake contains, the cooler the oven temperature and the longer the cooking time that is required. The richer the cake, the more crust colour is formed
Shape & size	Penetration of heat into the cake mass. The smaller the cake, the shorter the baking time, and the higher the baking temperature. A thin slab of cake cooks much quicker than same weight of cake but double the thickness.
Additions	Adding sugar or almonds to the surface of a cake improves its richness. Reduce the baking temperature by 5 - 10°C to compensate. Glucose, invert sugar and honey take on colour at lower temperatures than sugar, so baking temperature should also be lowered.
Preparation of fruit	Moist eating and keeping qualities of cakes containing dried fruit depend to a large extent on the amount of moisture retained by the fruit in the cake. To achieve the maximum retention of moisture by fruit, proper preparation is essential. Fruit should be sorted, washed and well drained before use. Fruit is always added last after flour is mixed in.

> INFORMATION SHEET

TROUBLE SHOOTING

<p>Cake sinks in the centre</p>	<p>Too much aeration Undercooked Knocking in oven prior to setting Too much liquid</p>	<p>Too much sugar or baking powder added. Overbeating fat/sugar/egg. Detected by presence of wet seam just below surface of top crust. Side/top will tend to cave in – not noticeable till cake removed from oven.</p>
<p>Peaked tops</p>	<p>Flour too strong Mixing was toughened</p>	<p>Cake will be too tough giving rise to peak. Flour of cake should only just be mixed in to avoid gluten development.</p>
<p>Small volume with bound appearance</p>	<p>Too hot an oven with insufficient steam Insufficient aeration</p>	<p>Ideal baking conditions are to have quantity of steam present which will delay crust formation till cake aerated and set. Insufficient beating of batter. Insufficient sugar used in recipe. Insufficient baking powder used – close crumb & tough to eat.</p>
<p>Fruit sinking in fruit cakes</p>	<p>Cake mixing too soft to carry weight of fruit Fruit was washed and insufficiently dried before incorporating into batter Baking temperature too low</p>	<p>Overbeating of fat/sugar/egg. Excessive sugar or baking powder used. Insufficient toughening of batter. Too weak a flour.</p>

REFERENCES

- Brooker BE 1993. The stabilisation of air in foods containing fat – a review. *Food Structure* 12(1): 115–122.
- Nicolello LG, Dinsdale J 1991. Cakes. In: *Basic Pastrywork Techniques*. London, Hodder & Stoughton. Pp. 198-202.
- Lallemand Inc 2000. Cake process and ingredients. *Milling & Baking News*, February 29.
- School information – cake making. www.bakeinfo.co.nz.