SCIENCE OF BAKING –Understanding How Ingredients Work *Caroline’s Easy Baking Lessons*

Theory Lesson 3

Since I often hear or read people asking “why did my cake sink?” or “why is my cake too dense?”, I thought I would give some brief explanations of the science behind how the ingredients you regularly use in your baking act or interact together.  I have said it before & will quote myself again:

“Baking is a science –  chemistry of a precisely measured set of ingredients, prepared and altered in a specific way to produce something very different in taste, texture and volume, (as well as being delicious to eat)!  “

If you think about it, simple ingredients can produce magnificent structures and tastes.  This is not only because of the ingredients themselves, but also how they interact and affect each other.  Here is some information on how standard baking ingredients work:

**LEAVENERS**

Also known as raising agents, these cause the bake to rise and result in a lighter & less dense (or compact) texture.  Sieve the leavening with the flour & make sure it is still in date.

Yeast

This is a single-celled organism also known as Saccharomyces Cerevisiae.

It grows/activates when it receives/comes in contact with food (ie. sugar), moisture, oxygen, and warm temperatures.

The fermentation process produces carbon dioxide bubbles, expanding the dough to make the bread rise.

Most recipes now use instant, rapid-rise or fast-acting yeast with no need to bloom (putting in warm water first).

Never use hot liquid with yeast as it will kill it’s rising power. Similarly, don’t let the yeast come into direct contact with salt, as it will retard it.  Mix the salt in well with the flour first before adding the yeast.

Individual packets of yeast are better than jars as they can be opened fresh when you need them.

Yeast like flour, can be frozen to preserve it.

Baking Soda/Bicarbonate Of Soda (Sodium Bicarbonate)

This causes the batter to rise by interacting with an acid (examples being citrus, vinegar, brown sugar, cocoa powder or buttermilk), and creating carbon dioxide bubbles.

It is activated when it comes in contact with a liquid, so is best baked quickly.

The small addition of baking soda will also boost the leavening power of baking powder.

Baking Powder

This is a combination of bicarbonate of soda, an acid & starch.

With this combination, it slows down the activation process.

Because of the combination, it needs liquid and heat to be activated and so does not need to baked right away.

Cream Of Tartar

This helps activate the alkaline baking soda and is often mixed with baking soda to make baking powder.

Cream of Tartar stabilises egg whites when you are whipping them.  A pinch alone will strengthen the network of bubbles and prevent the foamy egg whites from collapsing.  It also increases the volume of whipped egg whites and gives them a pure white colour.

On the flip-side, adding to boiling sugar, it acts as an interfering agent and gets in the way of the sugar’s natural tendency to bind and prevents sugar crystals forming.

**DAIRY PRODUCTS**

Moisture in dairy ingredients activate the leavening agents, as well as binding everything together.

Eggs

Eggs provide protein, fat & moisture to the bake.

In turn this provides structure, texture, strength and acts as a binding agent.

Beating of the eggs results in the protein creating structure that traps air and liquid and from then on defines the texture of the bake.

When baking, the trapped air bubbles expand and cause the bake to rise.  So always beat your eggs first to ‘wake up the protein’.

They also provide richness, tenderness and colour to the bake.

They should be used at room temperature rather than cold, as they will beat to a higher volume and will incorporate into the mixture easier, all producing lighter baked goods.

Egg-wash applied to bread for example, gives an appealing golden colour to your bakes & for me colour means flavour!

Milk

Milk contains fat & protein, both of which build and support the structure of the bake.

They also affect the texture of the bread by producing a tender crumb.

A higher fat content in the milk, will increase the flavour of the bake.

Less than 2% fat content will have a noticeable difference in flavour & texture.

Sugar in milk (lactose), turns the bake a golden brown and adds flavour.

Sour Cream

Produces a more tender texture & moisture to the bake.

Also provides the acid required to activate the bicarbonate of soda/baking soda.

An alternative is Greek Style yoghurt.

Butter

This adds fat and flavour, making the bake tender.

It also provides the moisture, essential during baking.

Unsalted is best as the percentage of salt in salted butter can vary and also has a higher water content than unsalted.  (Salt in butter increases its shelf-life).

You can also control the salt intake using unsalted.

Unsalted butter has a higher fat content and so gives a better texture and less dry crumbly bake.

Buttermilk

This is thick, creamy cultured milk, curdled by the acid and provides flavour as well as texture.

It also supplies the acid needed to activate baking soda/bicarbonate of soda.

In baking, you can achieve this acidity by adding lemon juice or vinegar to regular milk ([see video](https://youtu.be/H_Nf-vnjivw))

COOKING OILS

Oils provide fat as well as moisture and therefore produce a more tender bake.

It does not however, help with leavening, as it can’t be creamed to incorporate air.

SUGAR

This provides not only sweetness and flavour, but also aids structure and makes the bake tender.

Sugar also enhances the texture and crumb of the bake.

It attracts & retains moisture, prolonging freshness of the baked goods.

Sugar is also important for yeast to feed off and assist growth.

Brown sugar also interacts with baking soda causing the batter to rise.

When creamed together with the butter, the small sugar grains provide friction and increase air, leading to a lighter and tender texture of our bake.

‘CREAMING’ INGREDIENTS TOGETHER

This is simply beating the softened butter & sugar together, till soft, creamy & paler in colour.

 This method thoroughly combines the sugar and butter before adding any other ingredients.

It incorporates air into the batter, resulting in a lighter bake.

This process also begins the dissolving of the sugar into the butter.

The butter should be soft (65f/18.3c)  when it will cream better & hold more air.

Too soft and the butter won’t hold much air and produce a dense bake.

Eggs should be added gradually, then the flour and liquid in small batches to reduce the chances of deflating the batter.

Folding ingredients in also helps reduce the deflation of the batter.

Fold in in a figure ‘8’, as if you were writing a number 8 in the batter.

By understanding how ingredients work and interact, it can help us understand why maybe something didn’t bake as we had hoped.  These are important reactions (or relationships) and where the chemistry of baking comes into play.  It’s not always about things we do as a baker or don’t do, it’s whether we have supported these reactions to enable them to occur.  In other words, combining the correct ingredients & in the correct manner, so as not to undo these special reactions that have occurred.

**Thanks for reading.**

***Happy Baking & Making***

***Happy Memories & Tummies!***

*Caro x*