



Understanding
**UNDERSTANDING
CHOCOLATE**

“I love food – it’s about creativity and passion. And when you understand the science of food you can experiment in so many ways. It’s like having wings.”

Photos within this article thanks to Tammi Kwok



Galit Segev is a scientist who, at the height of her pharmaceutical career, decided to follow her passion for food. She is a qualified chef, pastry chef and chocolatier. Galit has her own business focussed on product development and innovation, and she also undertakes education and volunteering.

Her education programs have been delivered through the CSIRO, Ultimo

Science Festival, University of New South Wales, The Royal

Institution of Australia, Sydney Botanical Gardens and the Australian Museum. Her unique approach has gained increasing attention in the national media circles.

She has used her science background to consult with diverse clients from seafood producers to chocolatiers and bakeries.

Galit graduated with High Distinction in her Biochemistry and Food Science Masters degree, as well as winning an excellence Award for her Masters Research thesis. She has won many training Awards, graduated with Distinction in Patisserie – Best Pre-Apprentice commercial cookery and a Medallist Winner in the Callebaut Chocolate Competition.



Galit's Chocolate Ideas

There is something about chocolate that gives me goose bumps of pleasure. The smooth, silky, melt-in-your-mouth texture and the rich complex chocolate-flavour explosion in my mouth. For me it is true love.

Chocolate is the ugly duckling of food.

The journey of chocolate starts on the cocoa trees, inside the fibrous cocoa pods. The pods are cracked open by machete, to reveal the cocoa beans, coated in a delicious white sweet pulp with a tropical fruits flavour. The chocolate flavour we all know and love, does not exist at this stage.

If you bite into the beans, you find out that they are shockingly bitter. Despite the fact that I knew this, I could not resist this regrettable experiment - for the sake of science! That this bitter bean should transform into irresistible chocolate, seems unbelievable!

From the bitter bean come the most wonderful things – it is about unlocking the potential. A labour intensive process follows to unlock the chocolate flavour.

Fermentation

The beans and the pulp get scooped out from the cocoa pods and left for a few days to ferment. The fermentation of the sugary pulp around the cocoa beans is essential to produce a good flavour in the final chocolate. During this complex process, the bean is killed (this stopped the germination) and the flavour precursors are formed.

Drying

After the fermentation is completed, the farmer dries the beans, usually by spreading them in the sun.

Roasting

The roasting of the dried fermented cocoa beans, will convert the flavour precursors, to reveal the chocolate taste.

Understanding
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 continued...



Grinding

After roasting the cocoa beans, the shells are removed exposing the cocoa nib, the centre of the bean. The cocoa nibs are ground to small particles and form a thick dark paste, called cocoa mass, with a concentrated chocolate taste.

Conching

Conching is extended agitation and rubbing of the cocoa mass and other ingredients such as sugar and milk solids against a solid surface. It makes the chocolate smoother and milder in taste. The milder taste is achieved by removing undesirable astringent/acidic flavours. The smoothness of the chocolate is the result of coating the surface of solids' particles with cocoa butter.

The different types of chocolate

Dark chocolate is made of cocoa mass, usually with added cocoa butter and sugar.

The cocoa solids percentage on chocolate bars, represents the proportion of the cacao bean materials in the chocolate.

Dark chocolate with 70% cocoa solids contains 70% cocoa beans and the rest is sugar (around 30%).

Chocolate with higher percentage of cocoa solids, provides intense/stronger source of chocolate flavour.

Milk chocolate has lighter colour than dark chocolate as it contains the same ingredients - cocoa mass, cocoa butter and sugar with the addition of milk solids. Milk chocolate has higher sugar content (sometimes more than 50%) than dark chocolate.

White chocolate has a distinctive white colour because it contains only cocoa butter and none of the cocoa particles, with the addition of sugar and milk solids. Therefore it tastes like milk without any of the chocolate flavour.

The different types of chocolate, usually contain vanilla and lecithin. Lecithin is produced from soy and helps to emulsify the chocolate.

Single origin chocolate is made of cocoa beans harvested from the same region.

Tempering

Tempering is the process of melting and cooling chocolate, to produce its appetising gloss and snap.

The tempering process ensures that the cocoa butter in chocolate hardens in a uniform crystal structure.

Tempering is controlled crystallisation of the cocoa butter. The cocoa butter can solidify into 6 different fat crystals. Only 2 crystals, are stable forms that can produce a tight crystal network. Therefore, tempered chocolate has hard texture and gloss.

Coverture is chocolate of the highest quality. Chocolate couverture - contains only cocoa butter fat, which gives you that "melt in the mouth" feeling.

The cocoa butter fat crystals in the couverture melt in a narrow temperature range, just below body temperature.

When chocolate is melt in the mouth, it creates a cooling effect. This is because the cocoa butter absorbs heat energy from the mouth, to change phase from solid to liquid.

Chocolate compound - contains vegetable fats such as palm oil and coconut oil.

Chocolate compound will give the sensation of an oily film on the roof of your mouth.

Storage

Chocolate should be stored in a cool, dry and dark place and away from strong odours as it can absorb different aromas.

Chocolate is sensitive to temperature and humidity; store in a cool (15°C - 17°C) and dry (less than 50% humidity) place.

Chocolate is sensitive to light and oxygen; store in a dark place or protected from light by wrapping paper.

Inappropriate storage may result in fat or sugar bloom - the result of fat or sugar crystals rising to the surface of the chocolate.

Cocoa powder is the dried cocoa particles left after pressing out most of the cocoa butter from the cocoa mass. Cocoa powder contains 5%-25% cocoa butter fat, therefore the fat-coated cocoa particles do not blend easily with water.

Natural or raw cocoa powder is untreated cocoa powder and is usually a lighter brown colour, bitter and slightly acidic. Natural cocoa powder will react with leavening agents like baking soda, which depend on the presence of an acidic ingredient to activate them.

Alkalisied or Dutch cocoa powder Dutch cocoa powder is natural cocoa powder that has been alkalisied to remove its acidity and make it neutral. The colour is usually darker and the flavour is milder. Alkalisied cocoa powder will not react with baking soda in the same way as the natural cocoa powder, therefore you can adjust the recipe with the addition of acid.





Understanding the science of food gives you the freedom to create:

Why?

Chop chocolate finely? These fine pieces melt faster and more evenly than large lumps.

Melt chocolate over low heat?

Overheating separates the cocoa solids and other dry ingredients from the cocoa butter. High temperature will burn the chocolate. White and milk chocolate contains more milk solids therefore are more sensitive to heat than dark chocolate.

Stir chocolate continuously as it melts?

Chocolate transfers heat poorly therefore continuous stirring helps to distribute the heat evenly in the chocolate.

Ensure chocolate is dry and away from water?

Chocolate is extremely dry (0.5-1.5% by weight) so if a small amount of water is stirred into melted chocolate, the chocolate will seize up into a hard paste.

The sugar and cocoa particles will be glued together and will change glossy melted chocolate into a grainy, dry paste.

To rescue seized up chocolate, add more liquid (water/milk/cream), so that all the sugar particles get wet and dissolved, and cocoa particles will no longer stick together. You will end up again with a smooth glossy chocolate mixture.

This slightly watered down chocolate mixture is fine for icing, filling cakes and can be used in a cake mixture while adjusting the liquid quantity in the recipe.

Melt chocolate and butter together?

The addition of butter helps to protect the melting chocolate from seizing up and burning.

Cool down the melted chocolate before folding it into cold, whipped cream?

If the melted chocolate is too warm it will deflate the aeration of the whipped cream resulting in a dense texture. As well as this, the cocoa butter in the chocolate will harden instantly due to the cold temperature of the cream

and form grainy particles of chocolate rather than a mixture with a smooth silky consistency.

Use the recommended type of chocolate in the recipe? Different types of chocolate have a different composition of cocoa butter, sugar, cocoa particles and milk solids. Dark chocolate has more cocoa particles than white chocolate and therefore will absorb more liquid. This will need to be taken into account when developing a recipe.

Different types of chocolate also have different amounts of cocoa butter. White chocolate contains less cocoa butter than dark chocolate. Therefore if you use the same ganache recipe with white chocolate you will have a different outcome as if you use dark chocolate. The white chocolate ganache will be softer than the dark chocolate ganache because it contains less cocoa butter.

Working with chocolate

Always use the recommended type of chocolate in the recipe. Most of the flourless cakes and sometimes chocolate mousse recipes require chocolate with 70% cocoa solids. The higher cocoa solids content intensify the chocolate flavour of the product as well as rely on the higher cocoa butter content to help with solidifying the final product. Replacing with milk chocolate or dark chocolate with lower cocoa solids (e.g. 50% cocoa solids) will change the final product resulting with a sweeter and less intense chocolate flavour. Your chocolate mousse will end up softer and your cake may collapse in the centre and be heavier and too moist.

Galit's Bitter Bean Label

Bitter Bean is a range of beautifully crafted, wholesome foods from Artisan Bread Mix to gourmet chocolate.

The core focus of Bitter Bean food lines is:

- creativity with food using natural ingredients.
- expertise and quality in the making of the food.
- clean label, organic and local sourcing ethos where possible.

To find out more, go to <http://bitterbean.com.au/>

Galit's Artisan Bread Mix

The idea behind this bread mix is that anyone can make bread. You just add water, leave it overnight for fermentation, and you get beautiful crusty bread. The mission is to encourage families to bake their own bread without compromising on ingredients and clean label. This product is organic, with no additives.

Galit Food Innovation

Galit food Innovation is Galit's consulting business. GFI provides a variety of services relating to product development and improvement, utilising Galit's unique combination of a deep knowledge of the chemistry of food, the thorough understanding of food practicalities that comes from her training and experience as a chef, a pastry chef and a chocolatier, and a creative and passionate attitude to food in all its forms.

Consultancy. Food Innovation. Events. Presentations. Education.

For more information, please go to <http://www.galit.com.au>.

Or contact Galit direct at galit@galit.com.au



RECIPE

Chocolate Soufflé

BY GALIT SEGEV



One of my favourite chocolate desserts is chocolate soufflé. There is something irresistible about this warm, light cloud of chocolatey heaven.

Using 70% cocoa solids chocolate gives intense chocolate flavour, you can experiment with the range of single origin chocolates.

The rise and fall of the Soufflé

Soufflés rise in the oven when heat turns their liquid into steam, and the steam inflates their air bubbles.

When you put the soufflé in the hot oven, its air bubbles heat up and expand, so the mix rises in the only direction it can; up to the top of the dish.

The other contribution to the soufflé rise is from continuous evaporation of water from the bubbles walls into the bubbles.

Soufflés fall when they cool down and their steam condenses back into liquid.

Ingredients:	Method:
<ul style="list-style-type: none"> ■ 40g unsalted butter melted 	<p>Prepare soufflé dishes: Brush the soufflé dishes with melted butter—brush the sides of the dishes using upward brush strokes. Sprinkle and coat the base and sides of the buttered soufflé dishes with sugar. Keep soufflé dishes in the fridge.</p>
<ul style="list-style-type: none"> ■ 1/3 cup (80g) sugar 	
<ul style="list-style-type: none"> ■ 150g dark chocolate (70% cocoa) chopped 	<p>Place the chocolate and butter in a heatproof bowl, over a pan of gently simmering water (don't let the bowl touch the water). Stir until melted. Remove bowl from heat and set aside to cool slightly</p>
<ul style="list-style-type: none"> ■ 40g unsalted butter 	
<ul style="list-style-type: none"> ■ 3 egg yolks (55g) 	<p>Place egg yolks, vanilla and water in a bowl and whisk until thick, pale and doubled in size. Fold the whisked egg yolks into the chocolate mixture.</p>
<ul style="list-style-type: none"> ■ 1 tablespoon (14g) vanilla extract 	
<ul style="list-style-type: none"> ■ 20g water 	
<ul style="list-style-type: none"> ■ 7 egg whites (260g) 	
<ul style="list-style-type: none"> ■ pinch of salt 	<p>Place egg whites and salt in a bowl, whisk until they are foamy, add the sugar gradually and whisk until egg whites are shiny and form soft peaks. Do not over whisk.</p>
<ul style="list-style-type: none"> ■ 1/3 cup (80g) caster sugar 	<p>Fold the whisked egg whites gently into the chocolate mixture. Spoon the mixture into the prepared soufflé dishes and smooth the top with a knife. Run your thumb along the outer edge of the dish, about 1cm deep to allow the soufflé to rise evenly. Bake in a pre-heated, fan-forced oven, at 180°C for around 10min, until they have puffed up (2cm above the edge of the dish) and a crust has formed – the soufflé should still be moist in the centre.</p>
<ul style="list-style-type: none"> ■ 1/3 cup (80g) caster sugar 	<p>Serve baked soufflés immediately, dusted with icing sugar.</p>

For video how to make the chocolate soufflé: <http://www.galit.com.au/food/special-recipes>

