

new food

Application Notes

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Water activity in chocolate

Not just for sweet teeth...

Introduction

While enjoying the lovely taste and texture of a chocolate bar or a praline, just a few of us would expect that a lot of science stands behind. Texture, taste, appearance and organoleptic, all of that have to be brought under one roof to obtain a perfect praline which fulfils consumer's expectations. While most of us think about pH, rheology or fat analysis in connection with analytical technology used to develop new and control existing chocolate products, it could be shown that one key parameter must fit to avoid big problems: Water Activity. Read below to find out why.

What is water activity?

As simple as water activity is defined by the relation of vapour pressure of water over the sample to the saturation vapour pressure over pure water, the more complex it is to fully understand it. It describes the potential of the free water in a product and not the amount (mass) of the same. While pure water has the highest potential, each interaction with a substance or a product will lower the potential and thus change the water activity. State of the art instruments measure the air humidity over the sample in equilibrium state which corresponds to water activity in the product.

Water migration – THE enemy for chocolate!

Aside of pure milk chocolate, fancy mixtures are present on the market. Nowadays it is not enough just adding hazelnut into chocolate – no, from jelly beans to fruits, all is packed into a chocolate bar and with them a lot of problems: unexpected growth of moulds, texture changes, fat oxidation, just to name a few. But why? The answer is: water migration. As two different compounds are mixed, water starts to migrate from the area of high to the one with low water activity and *not* from high moisture to low moisture. In principle, you can have the following situation, where the dry area is getting drier and wet area more wet: Typical fat-based fillings have a water activity of 0.20-0.35aw, water-based ones have 0.65-0.90aw and pure chocolate 0.40-0.50aw

Not respecting this fact can bring or remove a lot of water to or from a place in the product where it is definitely not wished, thus biscuits can get bent or moulds will grow where they normally do not. Water migration can be avoided by adjusting water activity of all components

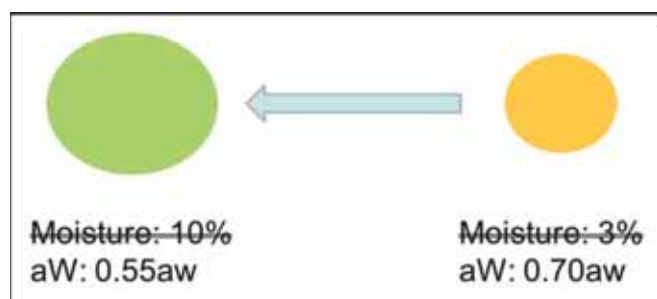


Figure 1: Water migration in a product with different water activity values

to the same level. That sounds easy; but the challenge lies in keeping texture and taste as it's change is not really appreciated by consumers. What would you think if the well-known Lindt balls did not melt irresistibly smooth in your mouth?

Finding best formulation

To find the best formulation which fulfils customer's expectations on texture, taste, organoleptic etc. it is wise to keep an eye on water activity. Having it in the right range will bring consumer's love. Factors which influence water activity of chocolate products are:

- Temperature
- Manufacturing process
- Homogeneity of filling
- Addition of sugars
- Composition of formulations

In the case of truffle manufacturing, variation in compounds can influence water activity and all other physical properties dramatically. It is of crucial importance to get the right mix of all ingredients which have initially the following aw-values: Cream: 1.00aw // Butter: 0.98aw // Glucose: 0.71aw // Sorbitol powder: 0.32aw // Couverture: 0.30 aw.

Figure 2 illustrates the influence in compound variation:





Compounds:				
Milk-Couverture	55%	55%	57%	59%
Cream	45%	35%	30%	25%
Glucose		5%	7%	10%
Butter		5%	6%	6%
Aw-Value	0.922	0.891	0.843	0.805
Moisture	27.0%	22.8%	20.6%	17.9%

Figure 2: Influence on water activity value of variation of compounds of truffles¹

As seen, water activity offers much more than just microbial information for chocolate production. It can help you making the products better, more constant in quality and finally, meet customer's expectations perfectly.

Reference

1. G. Sargenti, "Bedeutung der Wasseraktivität in der Coniserie", May 2013

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