

The best possible taste

With increasing pressure on the bakery and confectionery industry to provide healthy alternatives to their products while cutting costs, Dorte Petersen, product manager at Danisco, discusses current developments in calorie reduction and extended product shelf life.

There's nothing like fat when it comes to giving food products a good taste. However, with lifestyle-related obesity becoming a serious problem, the food industry is keen to find alternatives. BENEFAT®, Danisco's brand name for salatrim, is among the fat substitutes with real potential. Unlike traditional fat replacements, which cannot match the taste profile of fat, BENEFAT has only two-thirds of the calories that fat normally provides and all of the taste. It is also entirely free of trans fatty acids, which many health authorities consider a potential health hazard.

Low-calorie alternatives

BENEFAT consists of short- and long-chain acyl-triglyceride molecules – also known as salatrim – and can be used to replace the fat content of new or existing products. It is a real fat, and so contributes to the texture, taste and overall pleasure of food products without having a high caloric density. Previous attempts at calorie reduction have involved taking out the fat at the expense of taste. However, consumers still prioritise taste over health, and this has led to the failure of many low-calorie products. BENEFAT has opened up new opportunities to develop low-calorie concepts with a more indulgent taste profile.

Following several years on the US market, BENEFAT has now been approved for use in European food manufacture. While BENEFAT is approved for many applications in the USA, the EU approval covers bakery and confectionery products for adult consumers. The EU gave BENEFAT a caloric value of 6kcal/g, compared with the 9kcal/g value of traditional fat. Manufacturers are allowed to make a 'low-calorie' claim on product labels if the overall calorie reduction is at least 30 per cent.

Customised fatty acids

The structure of BENEFAT consists of a glycerol, with three fatty acids attached. While most fats contain three long-chain fatty acids, BENEFAT contains a mixture of long (c16-c22) and short (c2-c4) chains. The long chains are predominantly stearic acid, and the short chains can be a mixture of acetic, propionic or butyric acid.



Two-thirds of the calories, and all the taste

A reduced calorie value arises because the short chains are digested in the stomach at a lower calorie count, and the long chains are only partially absorbed at a level of 60 per cent or less.¹ By picking and choosing the short-chain fatty acids, it is possible to design tailor-made versions of BENEFAT. According to requirements, a client can adjust the ratio of di-shorts (either short-long-short or long-short-short) to di-longs (long-long-short or long-short-long).

Although salatrim contains stearic acid, which is saturated fat, a UK clinical study has shown that salatrim consumption causes a lower rate of post-prandial plasma triglyceride production than a meal enriched with cocoa butter or oleate.² This is probably due to reduced absorption of salatrim in the digestive system.

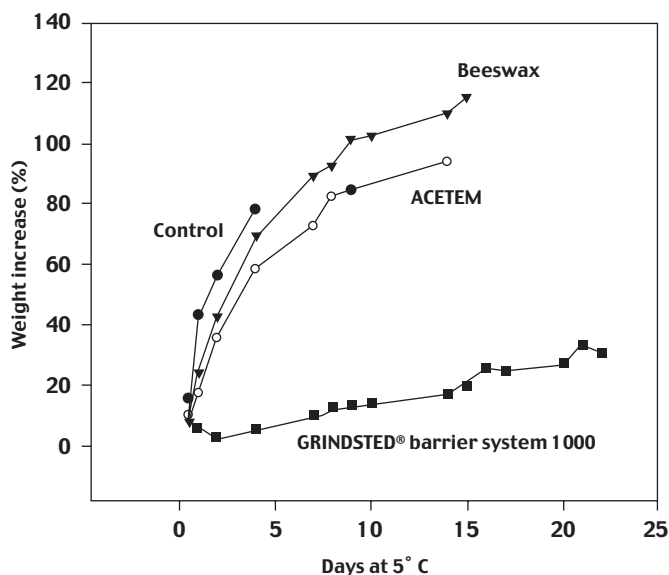


Figure 1. Water uptake at 5°C in crackers coated with the GRINDSTED barrier system.

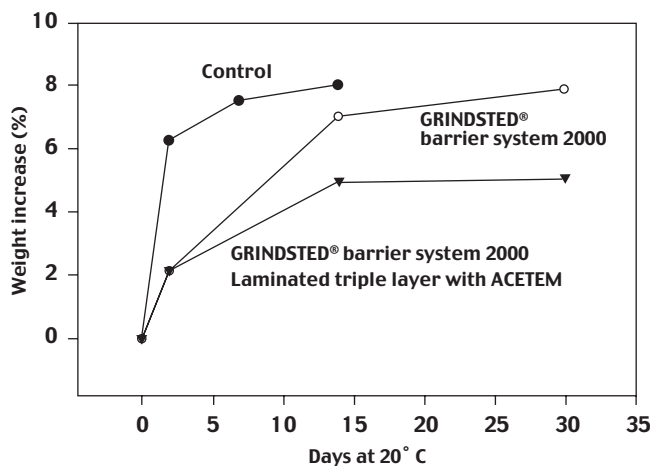


Figure 2. Water uptake at 20°C in crackers coated with the GRINDSTED barrier system

Indulgent replacements

BENEFAT is primarily used as a low-calorie cocoa butter replacement in confectionery and a low-calorie shortening replacement in bakery products.

For cocoa butter replacement, non-temper BENEFAT is used. It is non-lauric, with melting characteristics similar to those of tempered cocoa butter. The molecule is monomorphic and crystallises in a stable alpha-form, making it easy to handle. BENEFAT is unsuitable for moulded chocolate, as it cannot promote shrinkage in chocolate products. The product is compatible with cocoa butter up to a usage level of 10 per cent. Above this level, a eutectic mixture is formed.

In bakery applications, BENEFAT is mainly targeted at products such as biscuits, cookies, cakes and muffins. It is also ideal for the growing nutrition bar market.

Although it would be an exaggeration to claim that BENEFAT can solve the burgeoning problem of obesity, it does offer consumers the opportunity to balance the amount of energy they consume with the amount that they actually need. Calorie-reduced versions of indulgent products, combined with exercise, represent a move in the right direction.

Barrier methods

The GRINDSTED® barrier system is another patent-pending innovation from Danisco, creating additional possibilities for healthy and delicious snacks. This highly efficient water barrier is ideal for multi-layered products, as it delays water migration from water-containing fillings to surrounding crispy layers. The product is mainly targeted at the European market, where it is approved for confectionery, snacks and fine bakery applications.

During the development of the GRINDSTED barrier system, Danisco focused on creating a water barrier with low water permeability. High flexibility in the barrier was considered equally important, to ensure that it would not crack after being applied to a dry surface. Both these requirements were fulfilled using a combination of the food-grade emulsifier GRINDSTED ACETEM (an acetic acid ester of mono- and diglycerides) and beeswax.

Beeswax is already used as a protective barrier in a variety of applications, such as fruit coatings, but tends to be too brittle when applied to a dry food surface. Emulsifiers, such as ACETEM, create very flexible films but lack sufficient water permeability properties. In the GRINDSTED barrier system, a blend of these two elements provides the best of both worlds. Various versions can be chosen, according to the designated storage temperature of the final snack product.

The number of new chocolate bar and snack launches is steadily increasing. Revolutionary opportunities to combine ingredients, in response to current snacking trends, are important drivers of new product development. The GRINDSTED barrier system can be used for a wide range of snack applications, including savoury snacks, confectionery bars and fine bakery snacks. Crunchy inclusions, as well as frozen confectionery, are obvious future applications for the barrier system.

Testing times

The GRINDSTED barrier system has been tested in several model application test systems. In one case, a carrageenan gel with water activity (A_w) of 1, representing the moist food component, was placed on top of a dry cracker (A_w of 0.2) and stored at 5°C. The weight of the cracker was monitored over time to follow water uptake (see Figure 1). Without a water barrier, the cracker became soft and soggy after four to five hours. However, with a 400mm

layer of the barrier system, the crackers stayed fresh for two weeks. This has significant implications for prolonging shelf life.

An experiment involving an A_w of 1 is an extreme example. If a moist topping with lower water activity is used in a food concept, an even longer shelf-life can be expected. In another example, a carrageenan gel with an A_w of 0.54 was placed on a dry biscuit (A_w of 0.2) and stored at 20°C. Again, the weight of the biscuit was monitored over time to measure water uptake (see Figure 2). Without a water barrier, the crackers had a shelf-life of approximately ten days. With a 400nm application of the GRINDSTED barrier system the shelf-life was doubled. The most effective protection was obtained when the barrier system was sandwiched between layers of ACETEM. This triple layer kept the biscuits fresh for at least four weeks.

Universal application

In principle, the GRINDSTED barrier system can be used in any application. The best results are obtained when it is applied to a flat and mechanically stable surface, either by spraying it onto the surface of the food product or by dipping it into the

melted barrier. During spraying, the GRINDSTED barrier system has to be heated to approximately 80°C. The recommended barrier thickness is 300–500µm, depending on the application method and storage conditions.

The GRINDSTED barrier system crystallises quickly when applied to the food surface, in most cases drying in less than a minute. The food product can then move rapidly to its next process – the addition of a filling. The barrier's relatively high melting point means it will not melt or be destroyed when a warm filling is applied on top of it.

Current market trends place ever-growing demands on ingredient manufacturers supplying the food industry. BENEFAT and the GRINDSTED barrier system are prime examples of ingredient innovations that can satisfy the economic requirements of the food industry while providing sensory and aesthetic benefits for consumers. ●

References

1. J Agric Food Chem. 1994, Vol. 42, no. 2.
 2. Am J Clin Nutri. 2001; 73, 715–21.
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