Ready for debut: Fruit-juice-infused chocolate with 50 percent less fat

April 7 2013

Already renowned as a healthy treat when enjoyed in moderation, chocolate could become even more salubrious if manufacturers embraced new technology for making "fruit-juice-infused chocolate," a scientist said here today. The presentation was part of the 245th National Meeting & Exposition of the American Chemical Society, the world's largest scientific society, which continues through Thursday.

Stefan A. F. Bon, Ph.D., who led the research, explained that the technology would allow manufacture of chocolate with fruit juice, vitamin C water or diet cola replacing up to 50 percent of the fat. The juice is in the form of micro-bubbles that help chocolate retain the lush, velvety "mouth-feel"—the texture that is firm and snappy to the bite and yet melts in the mouth. The process also prevents "sugar bloom," the unappetizing white film that coats the surface of chocolate that has been on the shelf for a while.

"We have established the chemistry that's a starting point for healthier chocolate confectionary," Bon said. "This approach maintains the things that make chocolate 'chocolatey', but with fruit juice instead of fat. Now we're hoping the food industry will take the next steps and use the technology to make tasty, lower-fat chocolate bars and other candy."

Chocolate's high fat and sugar content is a downside, compared to its high levels of healthful plant-based substances termed antioxidants or flavonoids, Bon explained. A 2-ounce serving of premium dark chocolate may contain 13 grams of fat — 20 percent of the total daily

fat recommended for a person who eats 2,000 calories per day. Much of that fat is the unhealthy saturated variety. Substituting fruit juice or cola also reduces the overall sugar content of the candy.

The technology works with dark, milk and white chocolate. Bon's team at the University of Warwick in the United Kingdom has made chocolate infused with apple, orange and cranberry juice.

"Fruit-juice-infused candy tastes like an exciting hybrid between traditional chocolate and a chocolate-juice confectionary," he said. "Since the juice is spread out in the chocolate, it doesn't overpower the taste of the chocolate. We believe that the technology adds an interesting twist to the range of chocolate confectionary products available," according to Bon. "The opportunity to replace part of the fat matrix with water-based juice droplets allows for greater flexibility and tailoring of both the overall fat and sugar content."

Bon's team used fruit juices and other food-approved ingredients to form a Pickering emulsion, named for British chemist Percival Spencer Umfreville Pickering. In 1907, Pickering discovered a new way to stabilize emulsions — combinations of liquids like the egg yolk and oil in mayonnaise that normally would not mix together. Chocolate is an emulsion of cocoa butter and water or milk combined with cocoa powder. Lecithin appears on the ingredient label in many chocolates because it is an emulsifier that fosters the process. Pickering's method used solid particles rather than an emulsifier, and Bon's team embraced that century-old approach in their work.

More information: Abstract

We demonstrate a route toward the preparation of healthier fruit juice infused chocolate candy. Up to 50 wt% of the fat content in chocolate, that is cocoa butter and milk fats, is replaced with fruit juice in the form

of emulsion droplets using a quiescent Pickering emulsion fabrication strategy. Fumed silica particles are used in combination with chitosan under acidic conditions (pH 3.2-3.8) to prepare water-in-oil emulsions, the oil phase being sunflower oil, molten cocoa butter, and ultimately white, milk, and dark chocolate. Adsorption of the polycationic chitosan molecules onto the surface of the silica particles influenced the particle wettability making it an effective Pickering stabilizer, as shown by cryogenic scanning electron microscopy analysis. The formation of a colloidal gel in the continuous (molten) oil phase provided the system with a yield stress, hereby giving it a gel-like and thus quiescent behaviour under low shear conditions, as determined by rheological measurements. This warrants a homogeneous distribution of emulsion droplets as settling through gravity upon storage under molten/liquid conditions is arrested. In our low-fat chocolate formulations the cocoa butter has the desired polymorph V structure, and neither sugar nor fat bloom was observed upon storage of the fruit juice containing chocolate confectionaries.

Provided by American Chemical Society