Table 4.13 Maximum conching temperatures of chocolate masses with different bulk sweeteners.

Sweetener	Water of crystallisation	Anhydrous	Maximum temperature with conventional conching	
			°C	°F
Fructose		+	40	104
Sorbitol		+	40	104
Xylitol		+	50	122
Standard Isomalt		+	40	104
Isomaltulose		+	60	140
Tagatose		+	60	140
Erythritol		+	70	158
Isomalt LM		+	80	176
Maltitol		(+)	80	176
Lactitol monohydrate		+	60	140
Lactitol anhydrous		+	80	176
Polydextrose (in combination with anhydrous lactitol)		(+)	80	176

4.13 Separate conching process for "no sugar added" chocolates

A special conching process has been developed, which enables the taste and texture of "no added sugar" chocolates to be improved and gritty agglomerates avoided. In this process the mixture of cocoa liquor and milk powder, with a proportion of the cocoa butter, is conched at any temperature without the sweetener and before roller refining to remove the moisture from the milk powder. The sweetener is roller refined separately with portions of the cocoa butter and lecithin and then mixed together with the conched masse with the rest of the cocoa butter and the lecithin (Krüger *et al.*, 1996).

4.14 Pre- and probiotic chocolates

Prebiotic ingredients increase the growth and/or activity of probiotic bacteria in the gut. With the growing market demand to combine indulgence with healthy ingredients, chocolate products provide a good opportunity in which to add a combination of prebiotic ingredients and probiotic cultures. Inulin, polydextrose, tagatose, isomalt and lactitol are already used as bulk sweeteners with prebiotic properties.

The stability of the probiotic bacteria is mainly dependent upon the ingredients and water activity of the product as well as the temperature and relative humidity during production and storage. The water activity of the chocolate must be as low as possible. The separate conching process (see Section 4.13) should therefore be used, with the probiotic cultures being added at the beginning of tempering and the chocolate masses maintained at temperatures no higher than 30–32 °C (86–90 °F). A storage test for one year at 22 °C (72 °F) of a milk chocolate with polydextrose and lactitol as prebiotics and *Bifidobacterium lactis* and *L-Lactobacillus acidophilus* showed an excellent stability and survival rate of the probiotic bacteria (Danisco, 2007; Krüger and Philipp, 2007).

Conclusions

The past few years have seen many developments in the field of bulk sweeteners and speciality carbohydrates, with regard to their processing and the quality of the product. The advances have been such that it can now be very difficult to distinguish a "no added sugar" product from a standard one in taste and texture. There is still the remaining problem of limited tolerance due to the laxative side effects of sugar alcohols. In recent years some progress has been made by combining sugar alcohols with better tolerated sugar substitutes like polydextrose and fructose or the use of isomatulose.

References

Anon. (1981) Moringana begins selling sugarless chocolate using dates as sweetening, *Confectionery Production* **47**, 62, 70.

Arla (2004) Tagatose, *Technical Information Paper.* Arla Food Ingredients, New York.

Arntzen, G. (1992) Untersuchungen zum Fließverhalten von Schokoladen ohne Zucker, *Zucker und Süsswaren Wirtschaft* **45**, 406–408.

Barth, U., Siwek, R., Kubainski, C., Suter, G. (1996) Staubexplosionsschutz für kleine Mahlanlagen, *VDI-Berichte* **1272**, 493–510.

Bechert, C.l., Wastijn, M. (2002) Erythritol, *Technical Information Paper*. Cerestar Marketing, London.

Beneo-Group (2012) Beneo Orafti inulin – at a glance, *Fact Sheet*. Beneo-Group, New York.

Beneo-Group (2010) Chocolate bucks the downturn, *Technical Information Paper*. Beneo-Group, New York.

Bezerra, A. (1993) Amorfo refined sugar: an old product, a new option, *Proceedings Sugar Industry Technology* **52**, 299–304.

Bollinger, H., Keme, T. (1988) Saccharosefreie Schokolade herstellen, *Zucker und Süsswaren Wirtschaft* **41**, 23–27.

Bornet, F., Blayo, F., Dauchy, F., Slama, G. (1996) Gastrointestinal response and urine determination in human subjects given erythritol, *Regulatory Toxicology and Pharmacology* **24** (2, Part 2) S286–S295.

Bruhns, G. (1997) 250 Jahre Rübenzucker 1747–1997, Verlag Dr. Albert Bartens KG, Berlin, pp. 16–17.