

EVALUATING THE POTENTIAL FOR PARTIAL REDUCTION IN SUGAR IN MILK CHOCOLATE USING SWEET WHEY POWDER

•Linda Boamah^{1*}, Esther Awurama Asante², Victoria Ama Adjah¹ Mary Marshall¹

•¹NICHE Confectionery Ghana Limited, Ghana

•²Hungarian University of Agriculture and Life Sciences, Hungary

INTRODUCTION & AIM

Many of us find chocolate to be a tempting treat, but due to its high sugar content, it can be challenging to indulge without feeling guilty.

Obesity, type 2 diabetes, heart disease, tooth decay, and other dental disorders have all been connected to excessive sugar consumption (Malik et al., 2006; Malik et al., 2010).

Cheese whey, with a chemical oxygen demand (COD) of 50 to 80 g/L and a biochemical oxygen demand (BOD) of 40 to 60 g/L, is a strong organic effluent and, if not handled well, can be toxic to the environment (Chatzipaschali and Stamatis, 2012). Because a significant volume of whey is disposed of as wastewater, whey is considered one of the major environmental contaminants in the dairy business in the absence of sustainable procedures (Macwan et al., 2016).

As a by-product of cheese production, whey is often discarded as waste. However, by using sweet whey (produced by drying pasteurized fresh whey generated during cheese production) in chocolate production, it can be repurposed and contribute to a circular economy.

This research therefore aimed to investigate the effect of partial replacement of sugar with different concentrations of sweet whey powder (0%, 5%, 7%, 10%, 12.5%, and 15%) w/w in 38% milk chocolate on the physicochemical and sensory characteristics.

METHOD

Chocolate processing

Table 1: Percentages of sugar replacement with sweet whey powder

	Sugar / %	Sweet whey / % (Sugar replacement levels)
R0	30	0
R1	25	5
R2	23	7
R3	20	10
R4	17.5	12.5
R5	15	15

Mixing

+ Sugar, milk, cocoa butter (3/4), cocoa liquor

Refining

speed 60%, temp 50°C for 30 mins

Conching

+emulsifier and 1/3 butter
Temp 70°C for 8hrs

Tempering

Temp 30 ± 2 °C

Moulding

Temp 10 ± 2 °C for 30mins

De-Moulding

Figure 1: Chocolate process

Physico-chemical analysis

☐ Moisture Content (IOCCC116:1990): oven drying method.

☐ Ash Content (AOAC, 2005)

☐ Maximum Particle size: A modification to Marchioretto et. al, 2024 particle size determination was used

Sensory analysis

☐ Descriptive sensory evaluation (Lawless & Heymann, 2010) by 12 trained panelists

Table 2. Sensory attribute definition list for evaluations.

Attribute	Definition
Flavor	Mild to intense chocolate/cocoa flavor
Mouthfeel	Smooth to grainy
Sweet	Very sweet to very bitter
Salty	No salt to very salty
Texture	Very soft to very hard

Source: Aidoo et al, 2012

Data analysis

One-way Analysis of Variance (ANOVA) with Tukey's HSD Test ($p \leq 0.05$) was used to investigate differences in physicochemical properties. Spider plot was generated to represent the perceived intensity among the samples.

RESULTS & DISCUSSION

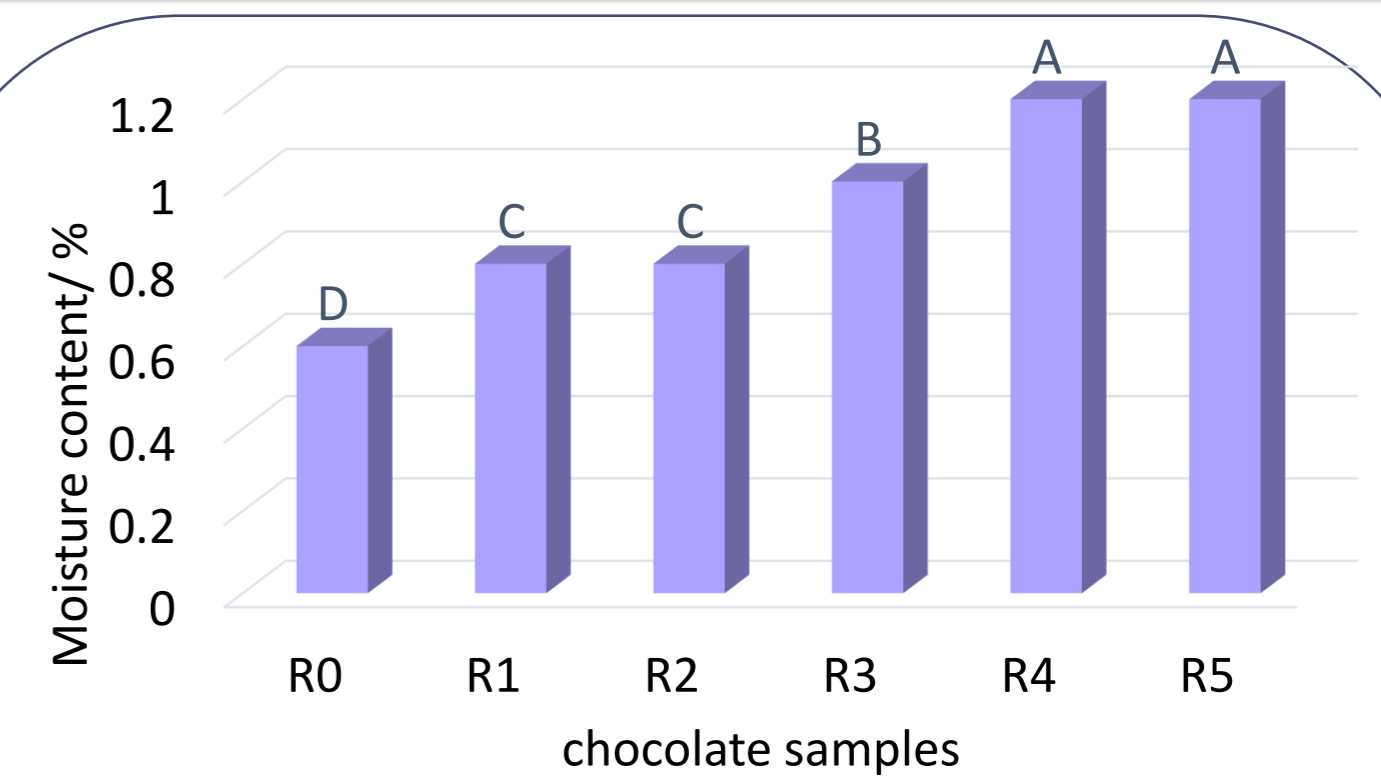


Figure 2: Effect of the sugar reduction on moisture content.

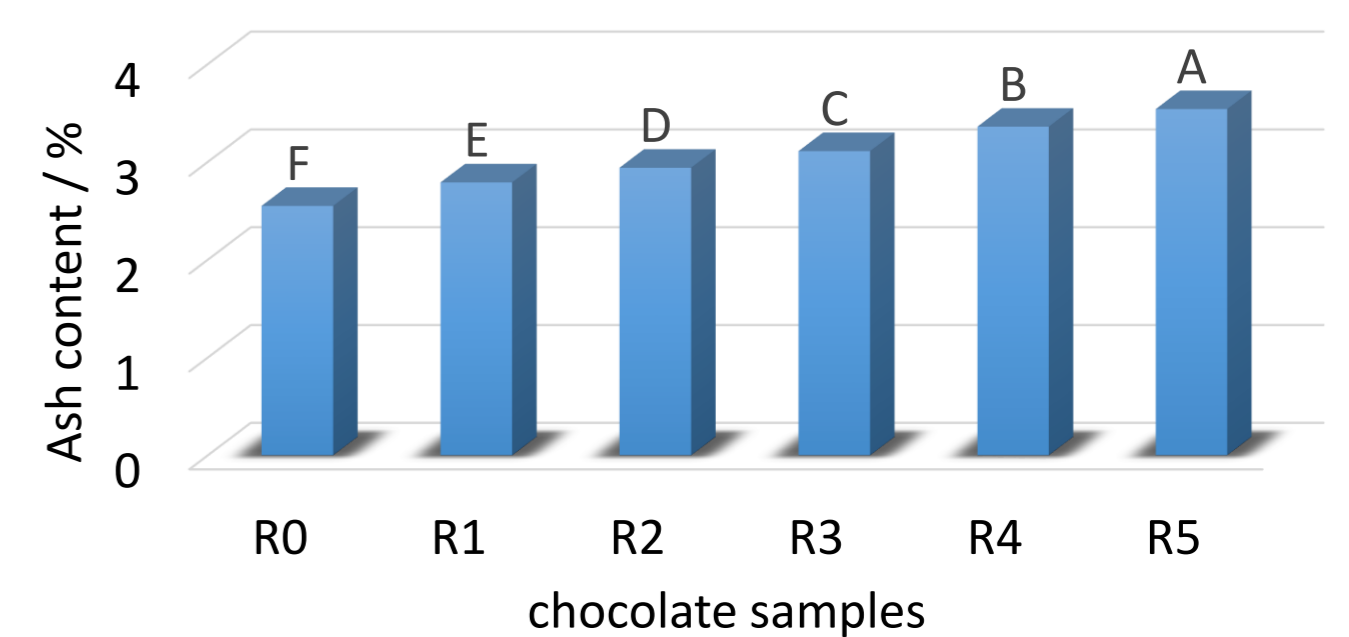


Figure 3: Effect of the sugar reduction on ash content.

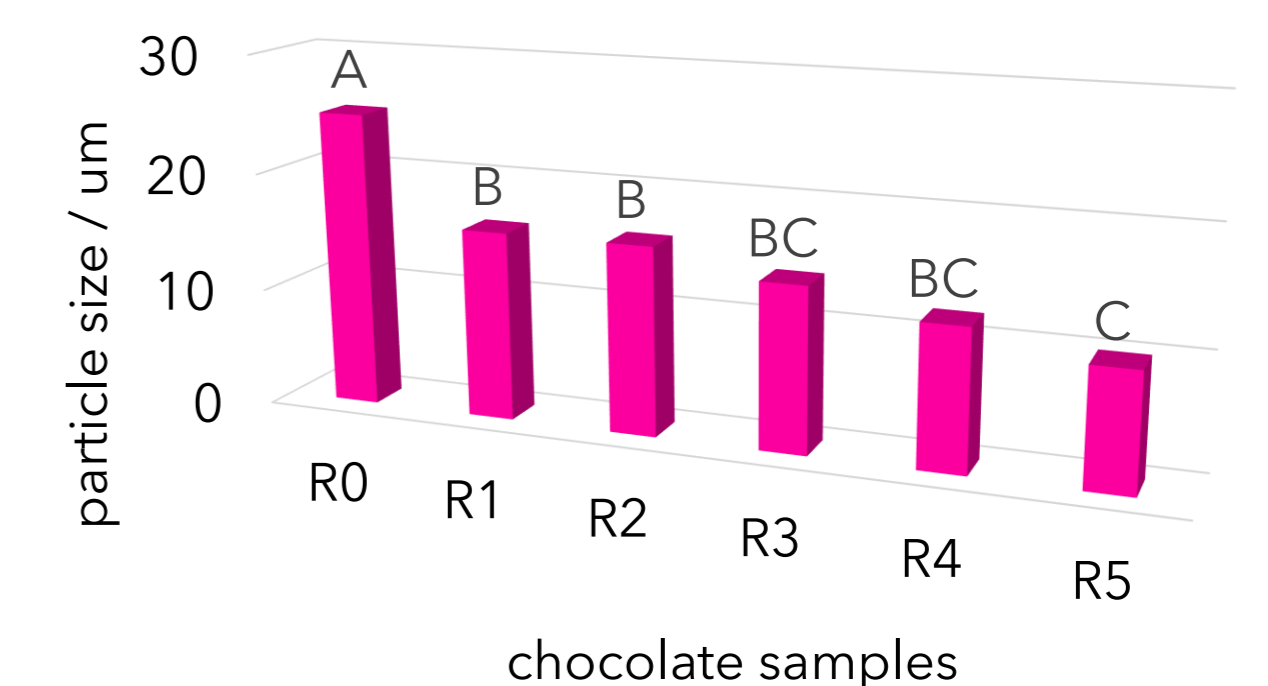


Figure 4: Effect of the sugar reduction on particle size.

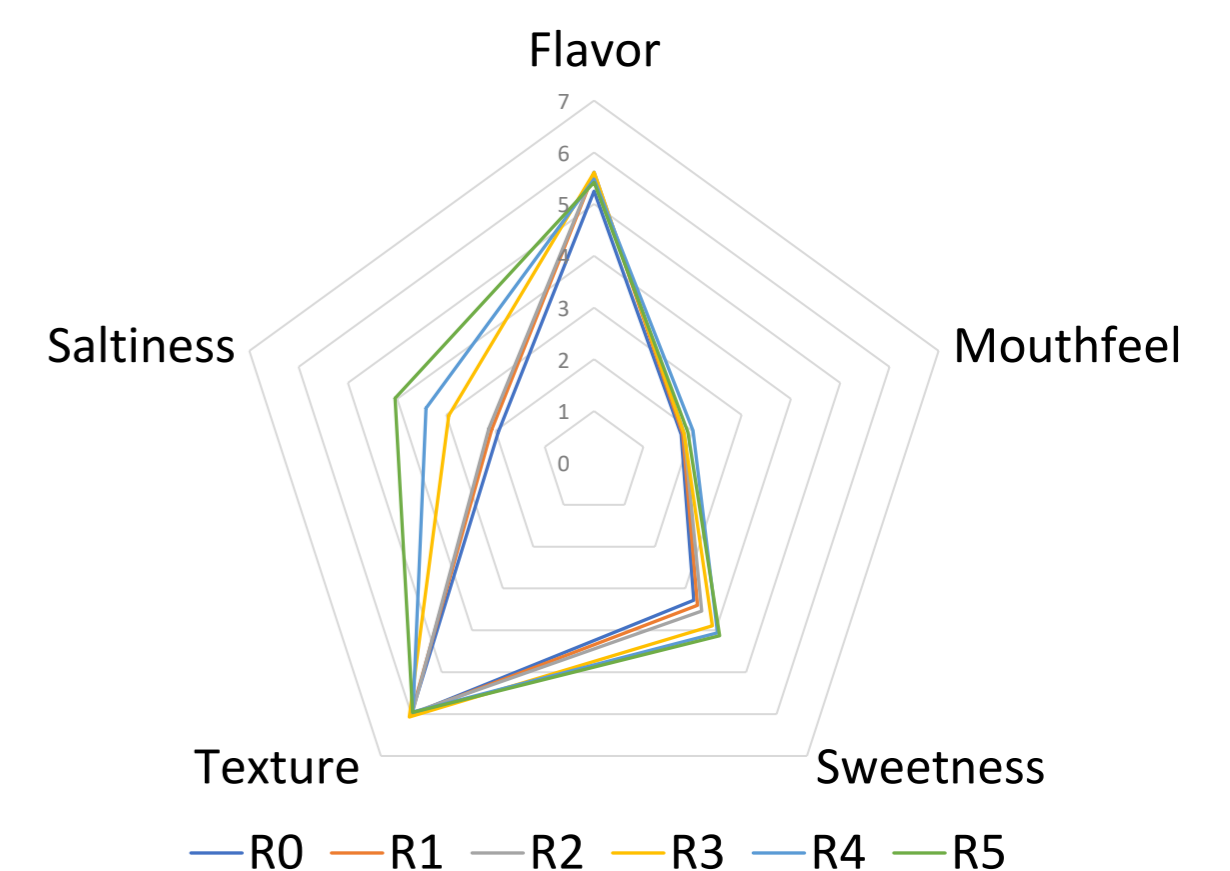


Figure 5. Effect of the sugar reduction on sensory attributes.

CONCLUSION

Sweet whey powder has the potential to be used as partial sugar replacer in milk chocolate at levels of 12.5% and below.

ACKNOWLEDGEMENT

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