

**C**hocolate spread is a sweet fat-based spread with major ingredients consisting of sugar, fat, cocoa powder, milk powder, stabiliser and emulsifier. The spread is a favourite amongst adults and children who like the taste of milk chocolate. The traditional product contains 38%-42% sugar, which is high in calorie (4 Kcal g<sup>-1</sup>). Consumption of a high amount of sugar is unhealthy and would lead to various illnesses such as obesity and diabetes.

Chocolate spread without sugar was successfully produced in MPOB and is ready for commercialisation. It is produced by replacing sugar with a sweetener or a combination of sweeteners derived from disaccharides. These sweeteners are low in calorie (2.4 Kcal g<sup>-1</sup>) and they are digested through a slow enzymatic hydrolytic process resulting in low glycemic index. The consumption of these types of sweeteners does not trigger an immediate rise in blood glucose levels, thus making it suitable for diabetics. The choice of sweeteners to replace sugar in the product formulation is based on their relative sweetness to sugar, performance during processing using existing machine and effect on physical and sensory quality of the product.

## OBJECTIVES

- To determine suitable sweeteners and formulation for the production of sugar-free chocolate spread.
- To determine the required processing conditions.
- To evaluate the physical and sensory characteristics of the product.

## METHODOLOGY

The process of making sugar-free chocolate spread requires efficient equipment in order to produce a very fine product. The particle sizes were below 20 μm. The same equipment for the production of chocolate spread with sugar may be used provided that the temperature can be controlled

during processing. All the ingredients are mixed and refined under controlled temperature to meet the required fineness. The product is filled into containers and stabilised in cold room (17°C-20°C) before delivery.

## DESCRIPTION OF THE PRODUCT

- Less sweet than traditional chocolate spread, is smooth and has a pleasant taste.
- Contains a lower calorie sweetener (2.4 Kcal g<sup>-1</sup>) compared to sugar (4 Kcal g<sup>-1</sup>).
- Suitable for diabetic patients. The sweetener has a low glycemic index and therefore does not quickly raise blood plasma glucose.
- The formulation does not require an additional intense synthetic sweetener.
- Physical and sensory properties are comparable to the traditional spread.
- Stable without oil separation even when stored at a warm temperature of 30°C.
- The product can be produced with the existing equipment and the right processing conditions.

## CHARACTERISTICS OF SUGAR-FREE CHOCOLATE SPREAD

### Spreadability

The spreadability of the sugar-free chocolate spread is comparable to the traditional spread (Table 1). The product is stable, with no occurrence of oil separation even when stored at 30°C.

TABLE 1. SPREADABILITY OF CHOCOLATE SPREAD STORED FOR EIGHT WEEKS AT VARIOUS STORAGE TEMPERATURES

Storage temperatures (°C)	Sugar-free chocolate spread (g cm <sup>-2</sup> )	Traditional chocolate spread (g cm <sup>-2</sup> )
10	1 324.26	1 567.28
20	307.21	481.98
30	351.21	249.39
20/30	207.59	170.64
Room (24°C -26°C)	286.25	316.41

## Sensory Evaluation

The scores for sensory evaluation by trained panels on chocolate spread with sweetener and sugar (control) are shown in *Figure 1*. The scores for mouth feel, taste and overall acceptability of the chocolate spread with the sweetener were comparable to those of the control. The product with the sweetener was slightly less sweet compared to the product using sugar. This was because the sweetener was 90% less sweet than the sugar. This was acceptable by the panel. If the customers prefer a sweeter product, low calorie intense sweetener can be added.

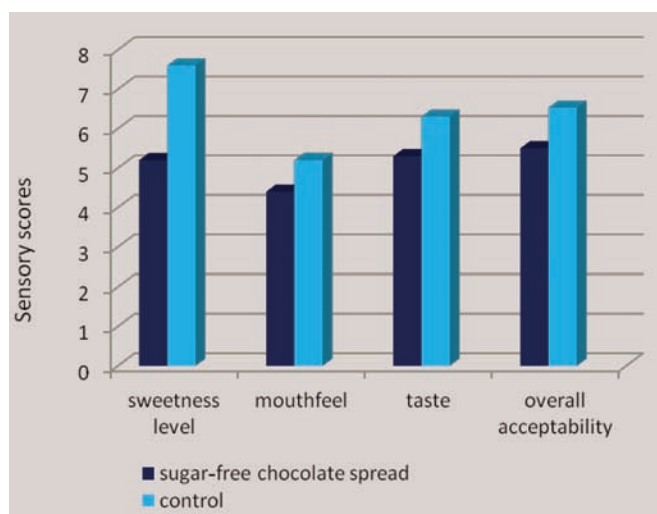


Figure 1. Sensory scores for sugar-free chocolate spread and traditional chocolate spread (control).

## APPLICATION OF CHOCOLATE SPREAD

The chocolate spread can be consumed with bread and biscuit as shown in *Figures 2* and *3*. *Figure 4* shows another variety of spread that can be produced using the same equipment and processing procedure.



Figure 2. Application of sugar-free chocolate spread on bread.



Figure 3. Application of sugar-free chocolate spread on biscuits.



Figure 4. Sugar-free milk chocolate spread and white milk spread.

## ECONOMIC ANALYSIS

The economic analysis for the production of chocolate spread using a new plant is shown in *Table 2*.

TABLE 2. ECONOMIC ANALYSIS FOR THE PRODUCTION OF CHOCOLATE SPREAD

Capital investment, RM	500 000
Estimated plant capacity	150 kg day <sup>-1</sup>
B:C	1.09
Payback period	3.6 yr
Internal Rate of Return	24.4 %
Net Present Value, RM	339 221

## MARKET POTENTIAL

- Worldwide sales of reduced sugar and sugar-free products are growing, forecasted at approximately 6% annually from €45 005 million in 2010 (Euromonitor International, 2012) as quoted in *Roquette Application Note (September 2012)* on sugar-free hard boiled candies.
- In Malaysia, there are no similar products in the market, either imported or locally produced. With an increase in incidence of diabetes in the country, the public is cautious of what they consume. Hence, sugar-free chocolate spread will have its place amongst consumers who love chocolate.



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