

HIGH PERFORMANCE PUFF PASTRY MARGARINE

WAN NURUL FATIHAH WAN YAACOB; MISKANDAR MAT SAHRI;
MUHAMAD RODDY RAMLI; KARIMAH AHMAD; RAFIDAH ABD HAMID
and SIEW WAI LIN



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Puff pastry is distinguished by its laminated structure with large air pockets between the layers. This structure is made up of many layers of dough sandwiched between several layers of fat. During the baking process, water content in the dough forms steam that gives leavening power to the laminated dough to rise. Puff pastry is prepared by repeatedly folding a layer of fat and a layer of dough with a well-developed gluten network so that the baked product has a puffed and flaky structure (Padmore, 1994).

Special fat is used to make puff pastry. Characteristics of the fat include plasticity, consistency and melting properties (Skogerson *et al.*, 2006). These characteristics are crucial to keep the layers of dough separated throughout the sheeting and folding process. Margarine that is too soft tends to be absorbed by the dough, while hard and brittle margarine is difficult to stretch during the layering process. Therefore, the fat blend must be sufficiently tough and plastic, remain solid enough to retain its hardness (Keogh and Morrissey, 1990), and capable of separating the layers of dough during the sheeting process (Garcia-Macias *et al.*, 2011).

METHODOLOGY

Puff pastry margarine processing was carried out in a Perfector Pilot Plant at the Malaysian Palm Oil Board (MPOB). Various ratios of formulations in developing puff pastry margarine were analysed but only two formulations showed promising results and were further tested. The selected formulations of puff pastry margarines were coded as 1461 and 1462. Consistency of the samples was analysed at 20°C, 25°C and 30°C over 30 days to study their stability at various conditions. Baking tests, which reflect product performance, were conducted in the MPOB Bakery Laboratory. For these tests, pastry margarines from Belgium and Malaysia (CPM1 and CPM2) were used as refer-

ences respectively. Puff pastry baked using the formulated high performance puff pastry margarines is shown in *Figure 1*.



Figure 1. Puff pastry baked using high performance puff pastry margarines.

CHARACTERISTICS OF HIGH PERFORMANCE PUFF PASTRY MARGARINES

The content of fat used to blend pastry margarine must be well balanced to provide good plasticity over the widest possible temperature range (Berger, 1989). As shown in *Figure 2*, sample of formulation 1461 matched the solid fat profile of the commercial samples, CPM1 and CPM2. Solid fat content (SFC) ranged from 33% to 51% at working temperatures of 20°C to 25°C. This

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Malaysian Palm Oil Board, Ministry of Plantation Industries and Commodities, Malaysia

6 Persiaran Institusi, Bandar Baru Bangi, 43000 Kajang, Selangor, Malaysia.

Tel: 03-8769 4400

Fax: 03-8925 9446

Website: www.mpob.gov.my



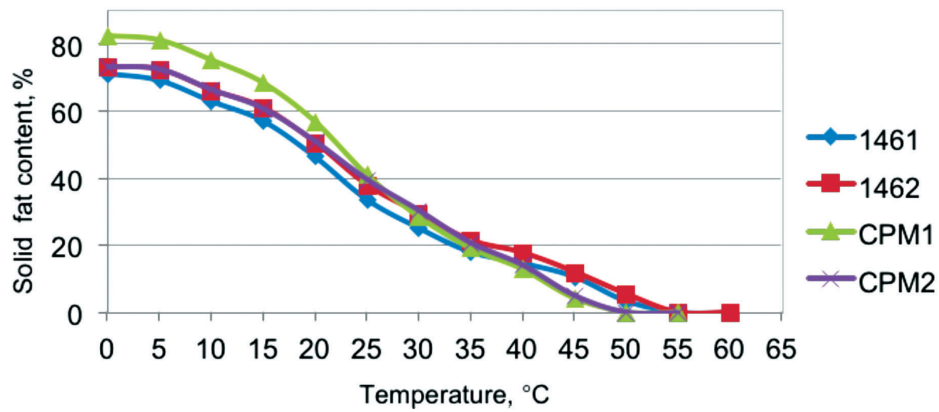


Figure 2. Solid fat content profile of samples of formulations 1461 and 1462 compared with similar commercial products, CPM1 and CPM2.

temperature range is the typical temperature at which puff pastry margarines are thinly layered between the dough and when the lamination process takes place in bakery units. A high percentage of solids at this temperature is important to endure the extensive stretching during the laminating process. At 35°C, SFC decreased to 18% - 21%, which would minimise the greasy mouth-feel of the final products.

Baking tests were conducted on Day 14 and Day 30 of storage of the pastry margarine samples. Samples 1461, 1462, CPM1 and CPM2 were used to bake puff pastry (Figure 3). The heights of pas-

tries were recorded and represented in Figure 4. According to Figure 4, the heights of baked puff pastry using samples 1461 and CPM1 on Day 14 were significantly different, while those of samples 1462 and CPM2 were between samples 1461 and CPM1. For pastries baked on Day 30, samples 1461, CPM1 and CPM2 were significantly different, while, sample 1462 was similar to CPM2 and 1461. The mean height of puff pastries baked using sample 1461 were the highest and consistent after 14 and 30 days of storage.

Sensory evaluation of the final products by 30 adults showed almost equal preference for the

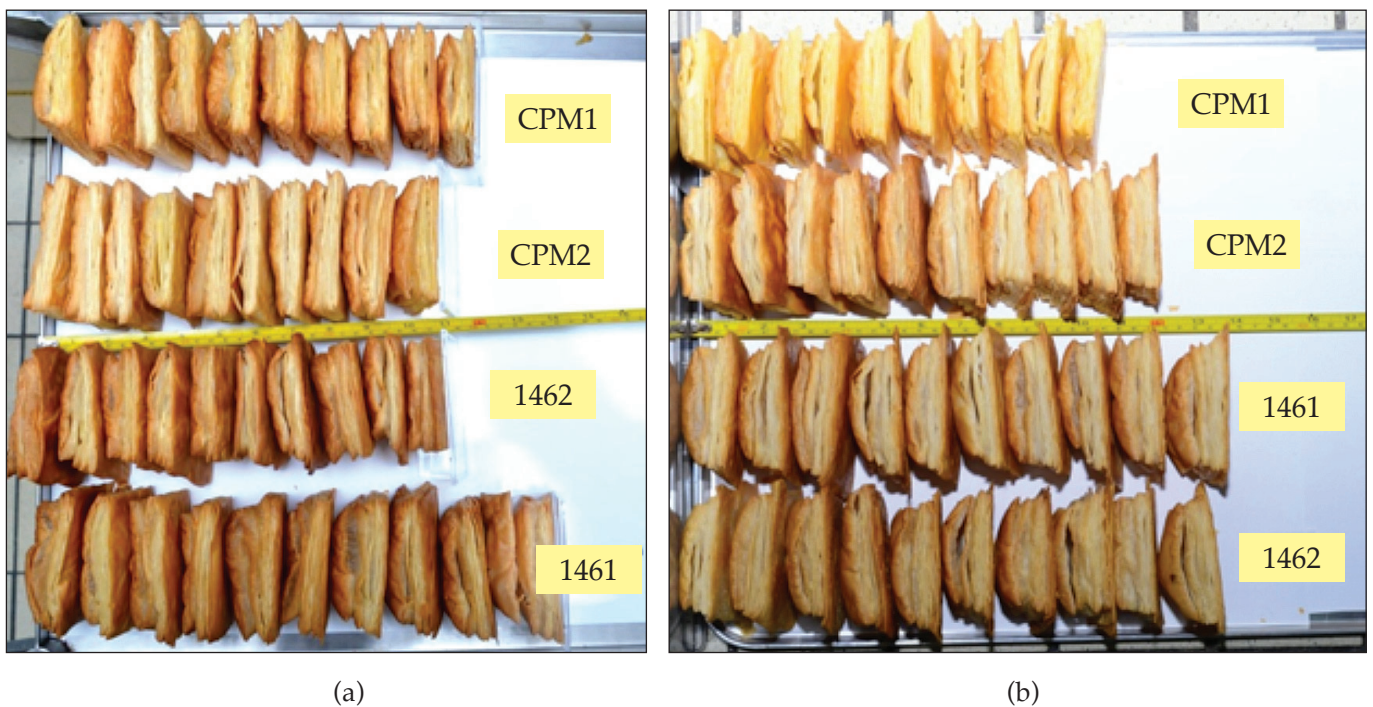


Figure 3. Baking tests conducted on Day 14 (a) and Day 30 (b) of storage of pastry margarines (samples 1461 and 1462).

four puff pastries baked using experimental pastry margarines and commercial products of formulation 1461 and 1462, CPM1 and CPM2 as illustrated in *Figure 5*. The crispiness of puff pastry baked using pastry margarine formulation 1461 gave the highest score (6.7) compared to samples CPM1 (6.3), CPM2 (5.4) and formulation 1462 (6.2).

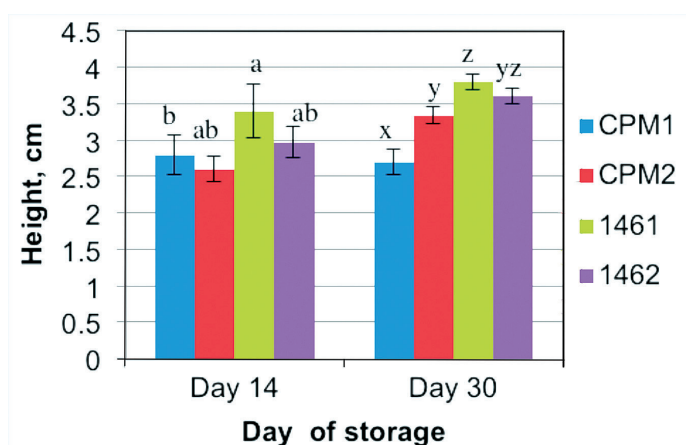
NOVELTY

The puff pastry baked using the formulated margarine 1461 has good textural properties. It is crispy and rises higher than the puff pastries

prepared using the commercial pastry margarines. High performance pastry margarine is a *trans*-free product.

ECONOMIC EVALUATION

The estimated expenditure and other economic parameters for manufacture of the formulated margarine 1461 are shown in *Table 1*. This economic evaluation is based on the assumptions that the puff pastry margarine is sold at RM13 kg⁻¹ and that there is a consistent production capacity of 1800 t yr⁻¹. Current retail prices (2015) of puff pastry margarine range from RM 12 to RM 15 kg⁻¹.



Note: Data evaluated using Tukey's test. Different letters indicate a significant difference between samples in the same group at 95% confidence level.

Figure 4. Mean heights for 10 pieces of puff pastries baked using experimental puff pastry margarines (formulations 1461 and 1462) sampled on Day 14 and Day 30 of storage and commercial margarines (CPM1 and CPM2).

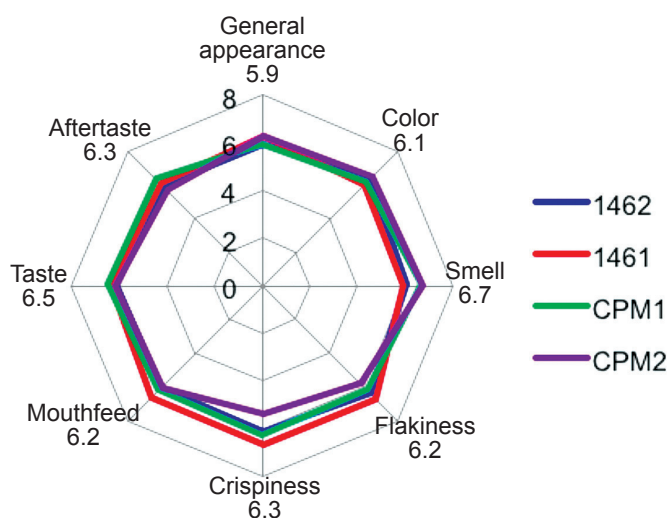


Figure 5. Sensory evaluation of puff pastries baked using experimental puff pastry margarines (1461 and 1462) and commercial margarines (CPM1 and CPM2).

TABLE 1. ESTIMATED EXPENDITURE AND ECONOMIC VALUES

Items	Value
Cost (materials), RM kg ⁻¹	7.26
Capital expenditure, RM	5 920 000
Benefit to cost ratio	1:1.17
Payback period, yr	2
Internal rate of return (IRR), %	48
Net present value (NPV), RM	8 145 785.81
Return on investment (ROI), %	54

TARGET MARKETS

The product is useful to bakeries, cake houses and pastry manufacturers.

CONCLUSION

The high performance puff pastry margarine 1461 has a great commercial value with better performance and can be produced at a lower cost compared with other commercial puff pastry margarines.

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For more information, kindly contact:

Director-General
MPOB

6 Persiaran Institusi, Bandar Baru Bangi,
43000 Kajang, Selangor, Malaysia.

Tel: 03-8769 4400

Fax: 03-8925 9446

www.mpob.gov.my