

The crystallisation behaviour and post-hardening problems of palm oil are complicated and of major concern to the industry. For example, in the production of palm oil-based margarine, a few weeks after manufacturing, the crystals will grow in size and tend to give an unacceptable grainy or sandy mouth-feel with poor spreadability upon application. The storage data of solid fat content (SFC), textural properties (firmness) and storage temperatures (T°C) of the binary blends of refined bleached and deodorised palm stearin (RBDPS) and palm oil (RBDPO) were used to develop the post-hardening index (PHI) as the mathematical model for palm oil-based products using the Multiple Linear Regression Model (MLRM) equation:

$$PHI = -b_1(X_1) + b_2(X_2) + b_3(X_3) + e$$

where :

- PHI = Post-hardening index
- b1-3 = Regression estimates/coefficients
- X1 = Temperature (°C)
- X2 = Solid fat content (%)
- X3 = Firmness (g force)
- e = Error

## MATERIALS AND METHODS

The formulated fat blend for low saturated fat margarine (LSFM) was tested for pilot plant trials under two different process conditions. The conditions of scrape surface heat exchanger speed (SSHE) were 550 rpm and 100 rpm, respectively. The samples were labelled as 1391 (550 rpm) and 1393 (100 rpm). The samples were then stored at 5°C for one day prior to the physicochemical analyses. The data was used as a baseline (Day 0) for the prediction of the post-hardening at 5°C, 10°C and 15°C during storage for five weeks.

## RESULTS AND DISCUSSION

Results indicated that different PHI were obtained for the LSFM produced under different processing conditions (rpm) and storage temperatures (5°C, 10°C and 15°C). Figures 1 and 2 (5°C and 10°C) showed the PHI of the samples gradually increased from Day 0 and thereafter to week 1 then slowly increased from week 2 to week 5. This implied that the crystal network of the LSFM had achieved maximum solid levels and firmness within one week of storage and slowly increased from week 2 to week 5. On the other hand,

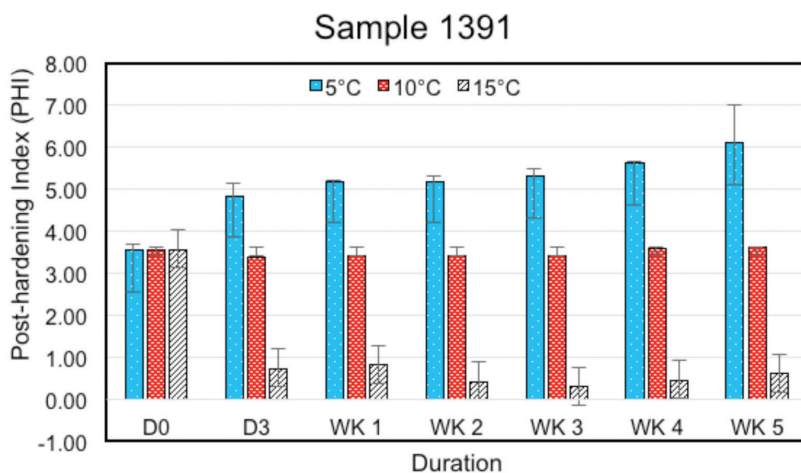
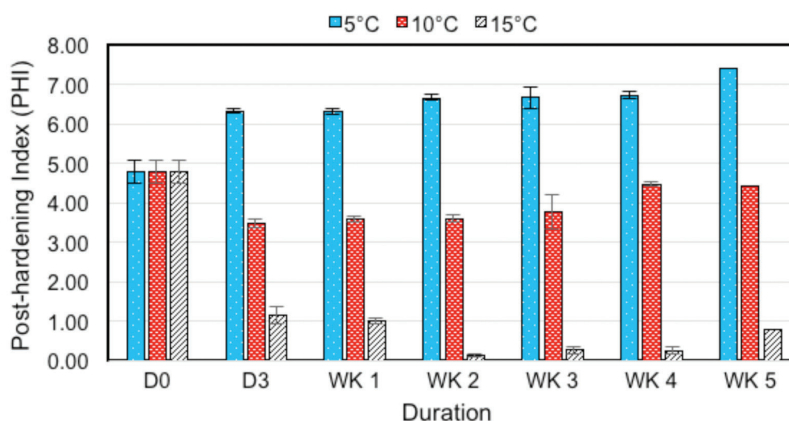


Figure 1. The PHI (mean values) of LSFM (1391) produced under the operating on scrape SSHE of 550 rpm during storage at various temperatures.

## Sample 1393



Note: PHI = post-hardening index.  
LSFM = palm-based low saturated fat margarine.

Figure 2. The PHI (mean values) of LSFM (1393) produced under the operating on SSHE of 100 rpm during storage at various temperatures.

samples with smaller PHI *i.e* the LSFM stored at 15°C drastically decreased after two weeks of storage and the crystal network started to separate into two layers of liquid and solid fractions. Thus, both phenomena contributed to the poor product quality such as appearance, taste, texture, *etc*.

### CONCLUSION

PHI could be used as a good indicator to predict the degree of post-hardening during handling and storage of palm-based LSFM.

### SERVICE OFFERED

Prediction of post-hardening of palm-based products such as margarines, shortening, *etc*.

### TARGET MARKET

- Food and palm oil industries.
- Universities.

### INDICATIVE FEE

The indicative fee in 2015 is RM 500/sample and subjected to change.

### REFERENCES

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