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THE USE OF SOYA FLOUR FOR SUBSTITUTION IN NOODLES

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RINGKASAN

Satu kajian awal dalam memproses mee 'segera' dari tepong gandum dan tepong kacang soya telah dijalankan.

Dalam perumusan awal, hanya tepong gandum digunakan. Dengan menggunakan perumusan asas ini, tepong gandum telah digantikan dengan tepong kacang soya dari takat penggantian 5% hingga 35%. Dari kajian objektif dan cerakinan proksimat, perumusan dari 65% tepong gandum dan 35% tepong kacang soya masih memuaskan. Walau bagaimanapun, keputusan dari kajian organoleptik menunjukkan bahawa takat penggantian dari 15% tepong kacang soya adalah yang paling memuaskan.

INTRODUCTION

Wheat flour normally forms the basic ingredient in noodle making besides other main ingredients such as salt and water. An optimum quality of wheat flour should have a protein range of 10–12%, moisture content of 12.5% and ash 0.6% (MATSUO, *et al.*, 1972; SOOI, 1976, per comm.).

Experimental work has been done on the use of soya flour in the manufacture of noodles in other countries, although the results obtained were variable. JACOBS (1951) stated that wheat and soyabean noodle products conform to the standard for noodle products except that soyabean flour was added in quantity not less than 12.5% of the combined weight of wheat and soya bean ingredient used. PAULSEN (1961) found that the firmness of the macaroni products containing soya flour could be increased by autoclaving. MATSUO *et. al.*, (1972) found that by adding soya flour, the product might be nutritionally advantageous but it did not improve the cooking quality. The substituted samples were found to be soft with little elasticity. A product of 25% level of substitution had good cooked firmness, although it lacked in taste and had a high cooking loss (BANASIK, 1975).

This present work studied the use of soya flour for substitution of wheat flour in 'instant' noodles.

MATERIALS AND METHOD

The materials used were wheat flour, full fat soya flour, salt (sodium chloride) and water. No colouring was added since the presence of the soya flour could impart a yellowish colour to the product.

Wheat flour and whole soyabean were bought from the local market at a price of (MR) $0.40 and (MR) $0.80 per kati, respectively. Full fat soya flour was prepared from whole soyabean, as shown in *Figure 1.*

Drying of whole soyabean

↓

Removal of unwanted particles

↓

Dehulling & Winnowing

↓

Washing and soaking (15 hours)

↓

Cooking in the pressure cooker
for 3–5 minutes

↓

Drying in the dehydrator at 70–75°C
for 4–5 hours

↓

Milling

↓

Sieving (mesh sieve number 25)

↓

Packing

Figure 1. Flow chart for the production of full fat soya flour

'Instant' noodles was first prepared from wheat flour, the conventional base ingredients. All the formulations of soya substituted noodle was based on this standard recipe.

The general steps that were involved in the preparation was similar to that adopted by Kasetsart University (1971), and INAGAKI (1968), as represented in *Figure 2.*

Wheat flour ↘ ↙ Soya flour

Sieving

+

Salt Solution

↓

Mixing

↓

Rolling

↓

Cutting

↓

Steaming

↓

Drying

↓

Packing

Figure 2. Flow chart for the production of soya supplemented noodles.

Soya flour was substituted at different levels (5% to 35%) and sieved together with the wheat flour. A salt solution of 3–4% was added to the mixture and mixed into a stiff dough of relatively low moisture content.

Rolling (Hand operated noodle was used) of the dough was repeated 4–5 times (the distance between the rollers being reduced gradually at each roll) to obtain a uniform and elastic sheet. The final rolling was set to a thickness of 1.5–2.0 mm. The sheeted dough was then passed through the cutting rolls to form noodles.

These noodles were then distributed on a perforated based containers lined with muslin cloth. After steaming for 8 minutes, the noodles were dried in a dehydrator at 60°C for 2 hours.

The dried noodles were then cooked for 3, 4, 5 minutes and evaluated objectively. Proximate analysis as well as organoleptic evaluation were also carried out.

The noodles were cooked according to the methods by HARRIS and SIBBIT (1958), PAULSEN (1961), HOLLIGER (1963) and LORENZ *et. al*, (1972).

RESULTS AND DISCUSSION

The dried substituted product was yellowish in colour. The yellowness increased as the level of soya flour substituted was increased.

Results from the objective evaluation showed that for every level of substitution, the water absorbed increased as the cooking time was increased *(Figure 3)*. For the same cooking time those with higher level of substitution seemed to absorb more water when cooked. This is probably due to the fact that soya proteins present in the flour contain numerous polar side chains along their peptide backbones, thereby making the proteins hydrophillic (WOLF and COWAN, 1971).

The percentage of cooking loss for each level of substitution, too increased slightly with longer cooking time *(Figure 4)*. For the same cooking time, the cooking loss did not vary very much with the levels of substitution. However, those with more soya flour seemed to get higher cooking loss. This is probably due to the fact that soya contains about 35% soluble carbohydrates and 6–9% ash. However, this is not considered significant from the stand point of nutrition because carbohydrate in soya are mostly pentoses, which are not utilized nutritionally (PAULSEN, 1961).

The colour of the cooking water due to the pigments going from the product into the cooking water was determined by the percentage of transmission of the cooking water *(Figure 5)*. The results indicated that for every level of substitution, the percentage of transmission decreased with longer cooking time. For the same cooking time, the transmission decreased as the substitution was increased. This indicated that at any cooking time, as the level of substitution was increased, the colour of the cooking water became darker and darker.

The proximate analysis of the product is represented in *Figure 6*. The moisture content varied, from 6.25% at 0% substitution to 10.5% at 25% substitution. The ash content was around 2% in all levels of substitution. The fat content was 1.2–2.3% up to 10% substitution, after which the content has increased to 4% and more. The protein content increased steadily as the level of substitution was increased.

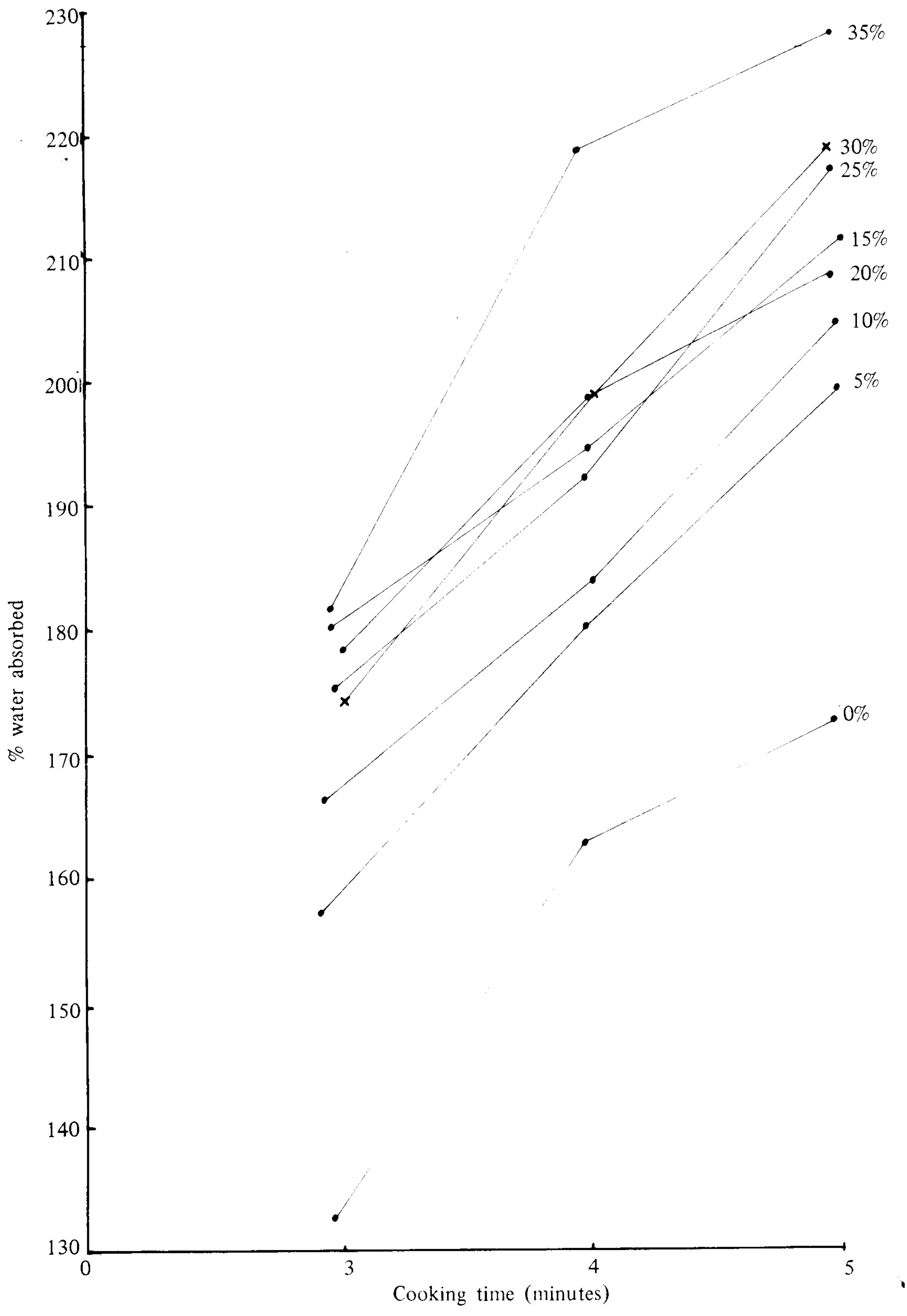

Figure 3. Relationship between % water absorbed and cooking time for different levels of soya substituted noodles.

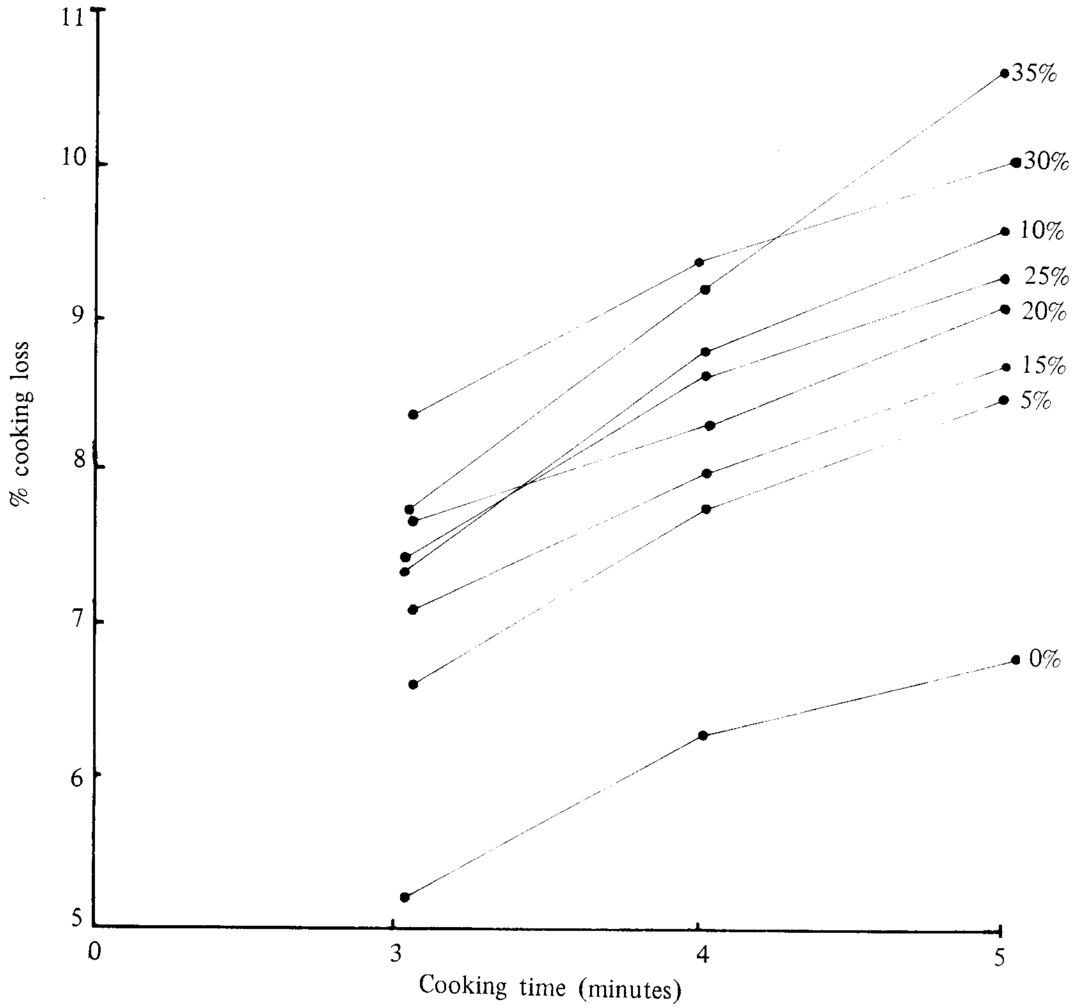

Figure 4. Relationship between % cooking loss and cooking time for different levels of soya substituted noodles.

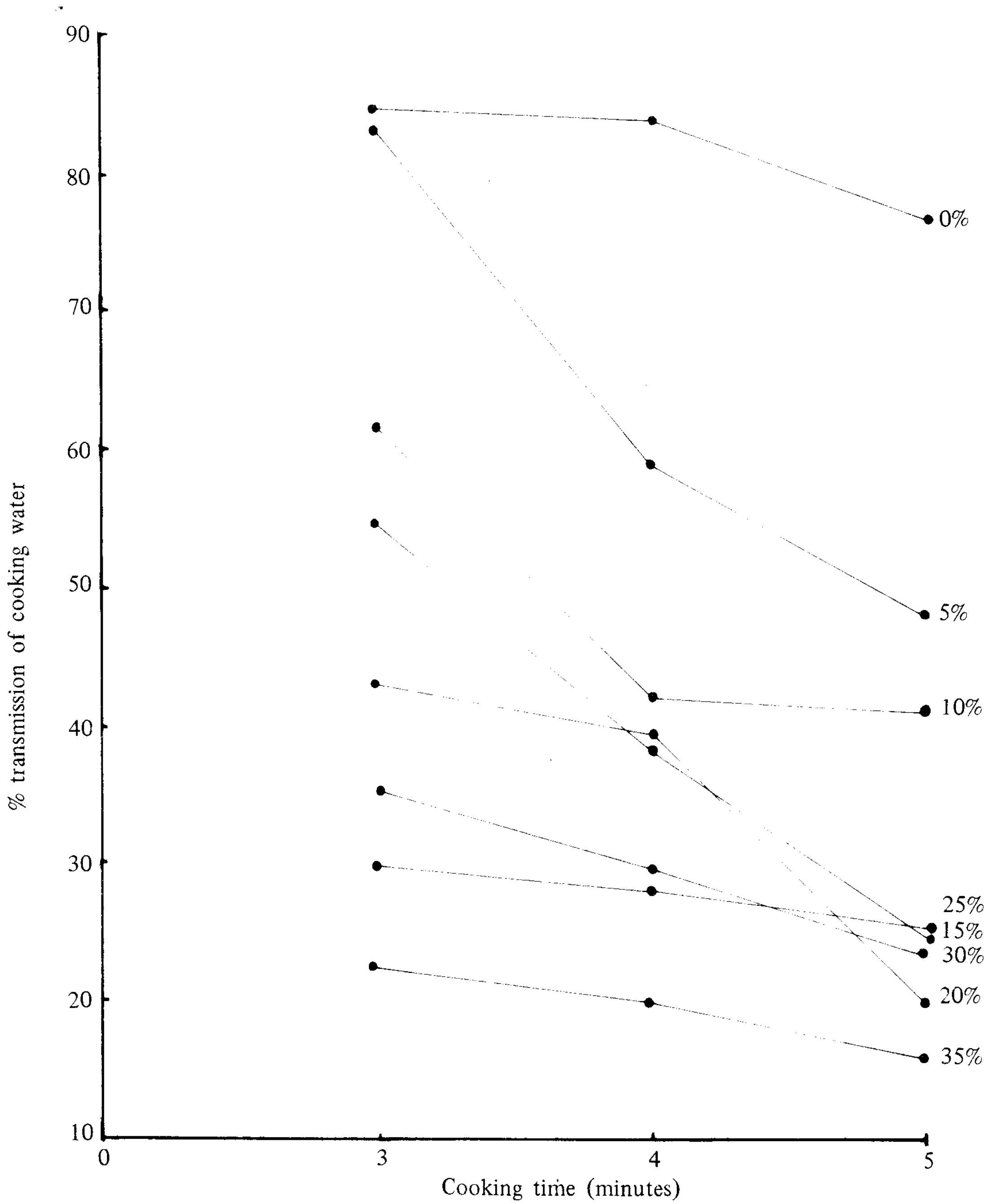

Figure 5. Relationship between % transmission of cooking water and cooking time for different levels of soya substituted noodles.

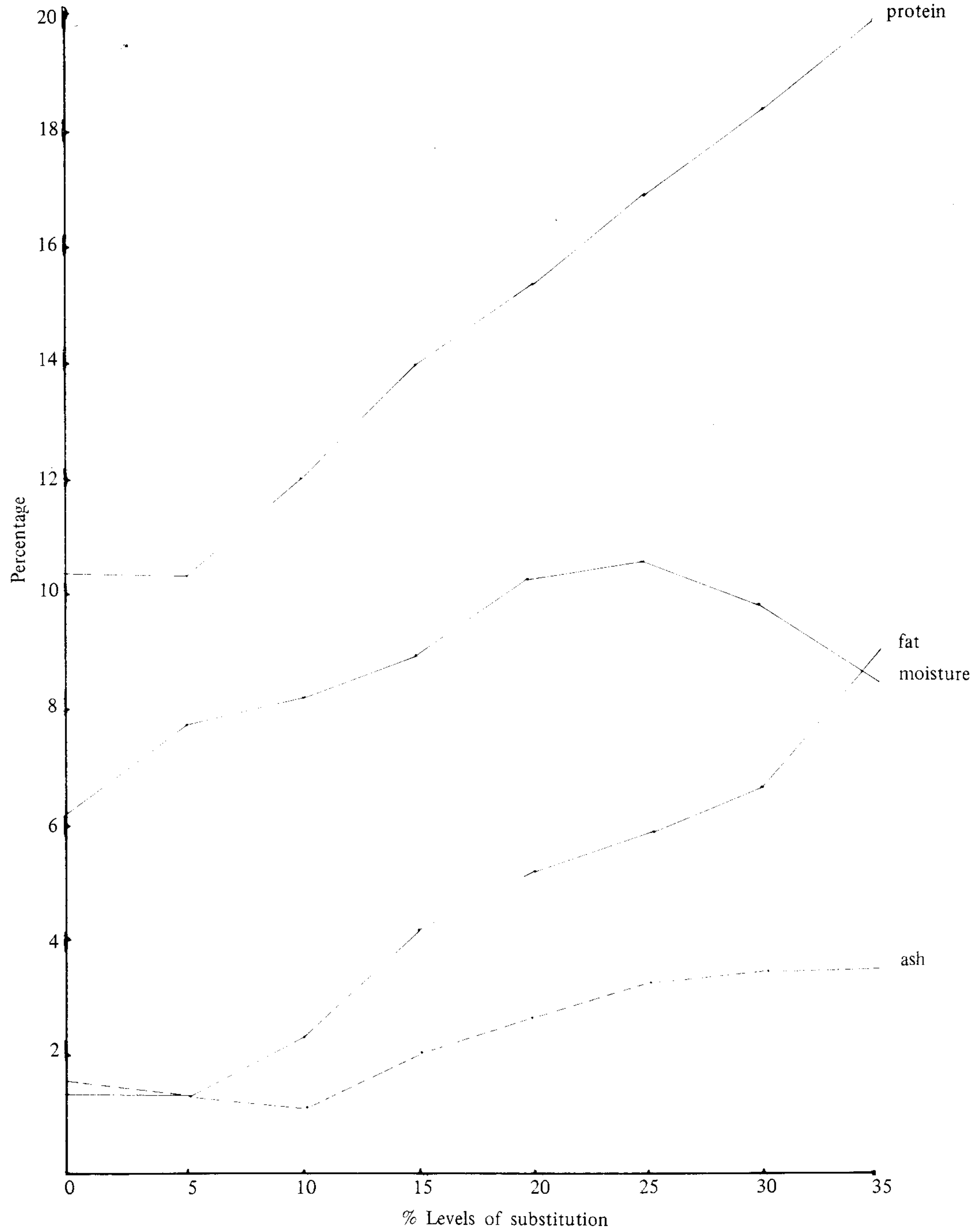

Figure 6. Relationship between percentage of moisture, fat, ash and protein and different levels of soya substituted noodles.

Figures 7–8 shows the cost of producing the soya substituted noodles. The cost of ingredients used per 100g was (MR) $0.08 for 5% and 10% level of substitution. The cost increased as the level of substitution was increased. At 30% and 35% substitution the cost was (MR) $0.12 *(Figure 7).*

The cost of protein per gram showed a decreasing trend of (MR) $0.008 at 5% to (MR) $0.006 at 35% substitution *(Figure 8).* The results thus indicate that it is more expensive to produce a highly substituted noodles (up to 35% in the present trials). However, due to the lower cost of protein per gram and higher protein content in the higher substitution, from the nutritional stand point, it is worthwhile to produce soya substituted noodle even up to 35% substitution.

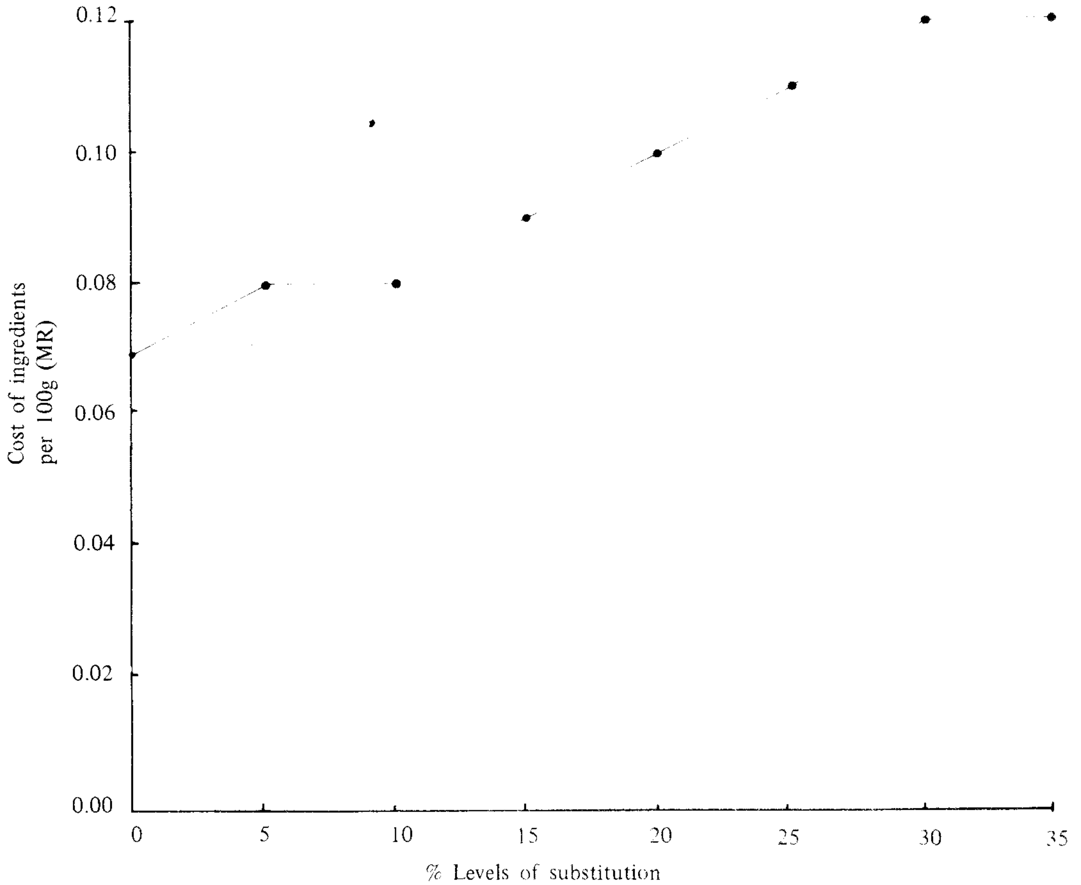

Figure 7. Relationship between cost of ingredients used per 100 g and different levels of soya substituted noodles.

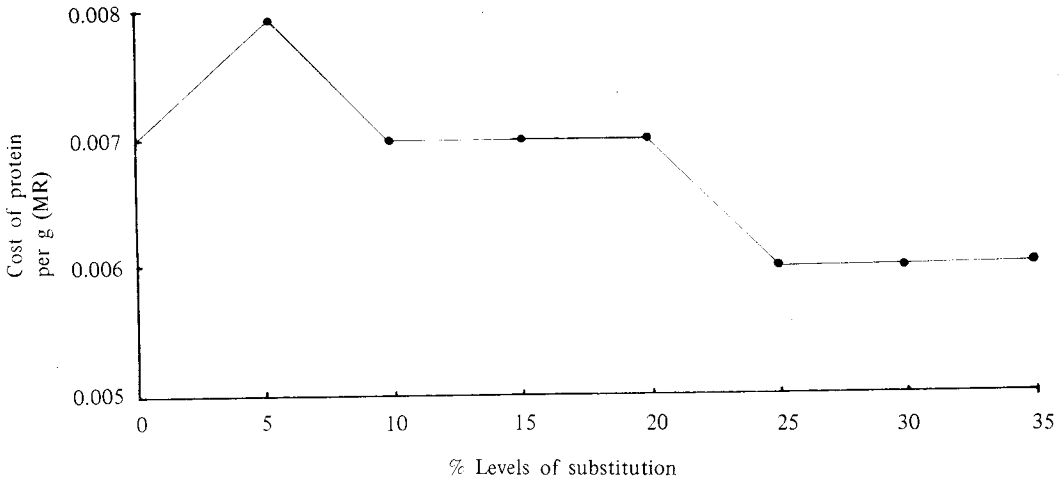

Figure 8. Relationship between cost of protein per g and different levels of soya substituted noodles.

Based on the results obtained from objective evaluation of soya substituted noodle, those that were substituted with 5% to 25% soya were selected for organoleptic evaluation, with 0% substitution as the reference sample. The standard cooking and draining time was taken as 4 and 2 minutes, respectively. The cooked products were evaluated for colour, flavour, firmness and overall preference.

The results showed that there were no significant difference in the scores for the colour, flavour and overall preference, but significant difference in the firmness *(Table 1)*.

The panelists preferred the colour and flavour for 15% and 10% soya substitution, respectively. For the overall preference, 15% substitution was most preferred.

The result on firmness indicated that substitution with soya flour affect the firmness of the products, which were found to be soft after 4 minutes cooking. The degree of softness increased with higher levels of substitution. An analysis of variance showed that firmness between different levels of substitution was significant at the 0.01 level. From the Multiple Range Tests, it was found that difference in firmness for 0% to 15% substitution to that of 25% substitution was significant at 0.01 level. The difference between 20% and 25% substitution was not significant *(Table 2)*.

TABLE 1. ANALYSIS OF VARIANCE FOR ORGANOLEPTIC EVALUATION OF SOYA SUBSTITUTED NOODLE

	Source	df	Sum Square	Mean Square	F Value
a.	**Colour**				
	Sample	5	3.91	0.78	0.22 n.s.
	Error	72	250.38	3.48	
	Total	77	254.29		
b.	**Flavour**				
	Sample	5	1.29	0.26	0.22 n.s.
	Error	72	84.00	1.17	
	Total	77	85.29		
c.	**Firmness**				
	Sample	5	20.10	4.02	3.62**
	Error	72	79.85	1.11	
	Total	77	99.95		
d.	**Overall preference**				
	Sample	5	6.37	1.27	1.92 n.s.
	Error	72	47.19	0.66	
	Total	77	53.56		

N.B. n.s. denotes not significant
** denotes significant at 0.01 level.

TABLE 2. MULTIPLE RANGE TESTS FOR FIRMNESS OF SOYA SUBSTITUTED NOODLES

F_{10}	F_5	F_0	F_{15}	F_{20}	F_{25}
———	———	———	———	- - - - -	
	———	———	———	———	
		———	———	———	
			———	———	- - - - -
					———

N.B. $F_0 - F_{25}$ represents the levels of substitution.
——— denotes no significant difference.
- - - - - denotes significant difference at 0.05 level.
No line denotes significant difference at 0.01 level.

CONCLUSION

Soya flour, prepared from soyabean *(Glycine max)* can be substituted into wheat in 'instant' noodle making. Substitution at increasing level (up to 35%) has increased the yellowness of the product as well as the water absorbed on cooking. The cooking loss, however, too has increased. Darker cooking water is obtained at higher levels of substitution.

The substitution, too has increased the protein content appreciably. Although it is more expensive to produce a soya substituted noodle at 35% (as compared to that of 5%), based on the cost of protein per gram, substitution can be said to be favourable, even up to 35% level of substitution.

However, the results from the organoleptic evaluation indicated that the panelists preferred the colour and flavour from the 15% and 10% soya substitution, respectively. For the overall preference, 15% soya substitution was most preferred.

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SUMMARY

A preliminary study was carried out on the use of soya flour, as a substitution for wheat, in the manufacture of 'instant' noodles.

For the basic formulation only wheat flour was used. This was later substituted with soya flour from 5% to 35% levels of substitution. Results from the objective evaluation and proximate analysis showed that a formulation from 65% wheat and 35% soya flour still gave acceptable results. Results from the organoleptic evaluation, however, indicated that substitution at 15% level was most preferred.

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