

Palm kernel cake (PKC) is the by-product from the production of palm kernel oil - the residue of the palm kernel after its oil has been expressed. It is commonly used as animal feed for its protein and energy content.

Little is known about the protein which constitutes 14% to 17% of PKC. Therefore, it has been little used in both food and non-food products. The protein can, however, be extracted for evaluation by isoelectric precipitation. This uses alkali to extract the protein, followed by precipitation at its isoelectric point.

MATERIALS AND METHODS

PKC was ground to pass an 80-mesh screen. The protein was then extracted by alkali followed by precipitation with hydrochloric acid (*Figure 1*). The extraction was carried out at 50°C by agitating the PKC in a water bath for 2 hr using a solvent: meal ratio of 50:1 (v/w). The suspension was then centrifuged at 10 000 g for 10 min at 10°C followed by filtering through Whatman No. 41 filter paper. The proteins in the supernatant were precipitated by adjusting the pH to the isoelectric point (pH 3.5) with 1 N HCl, and then centrifuged out at 5000 g for 10 min. The precipitated curd was washed with distilled water and dried.

RESULTS AND DISCUSSION

Protein concentrate from PKC can be obtained by using isoelectric precipitation with 64% recovery and 61% protein content. More than 80% of the N can be extracted from the cake when a 4% v/w suspension in 1 N NaOH was agitated for 2 hr in a water bath shaker at 230 rpm.

The amino acid composition of PKC protein concentrate is shown in *Table 1*. Eighteen amino acids

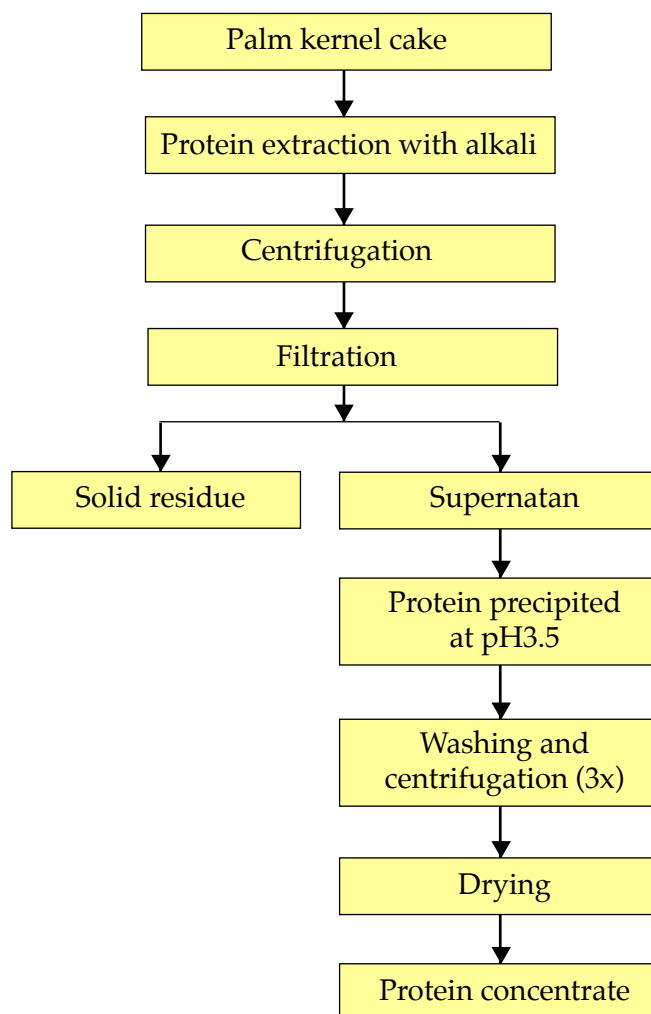


Figure 1. Process flow of alkali precipitation for preparation of protein concentrate from PKC.

were detected and quantified. The concentrate was found to be rich in arginine and glutamic acid.

CONCLUSION

Over 2 million tonnes of PKC are produced annually in Malaysia. Assuming that it has 17% protein, and that 55%-60% of it can be extracted, almost

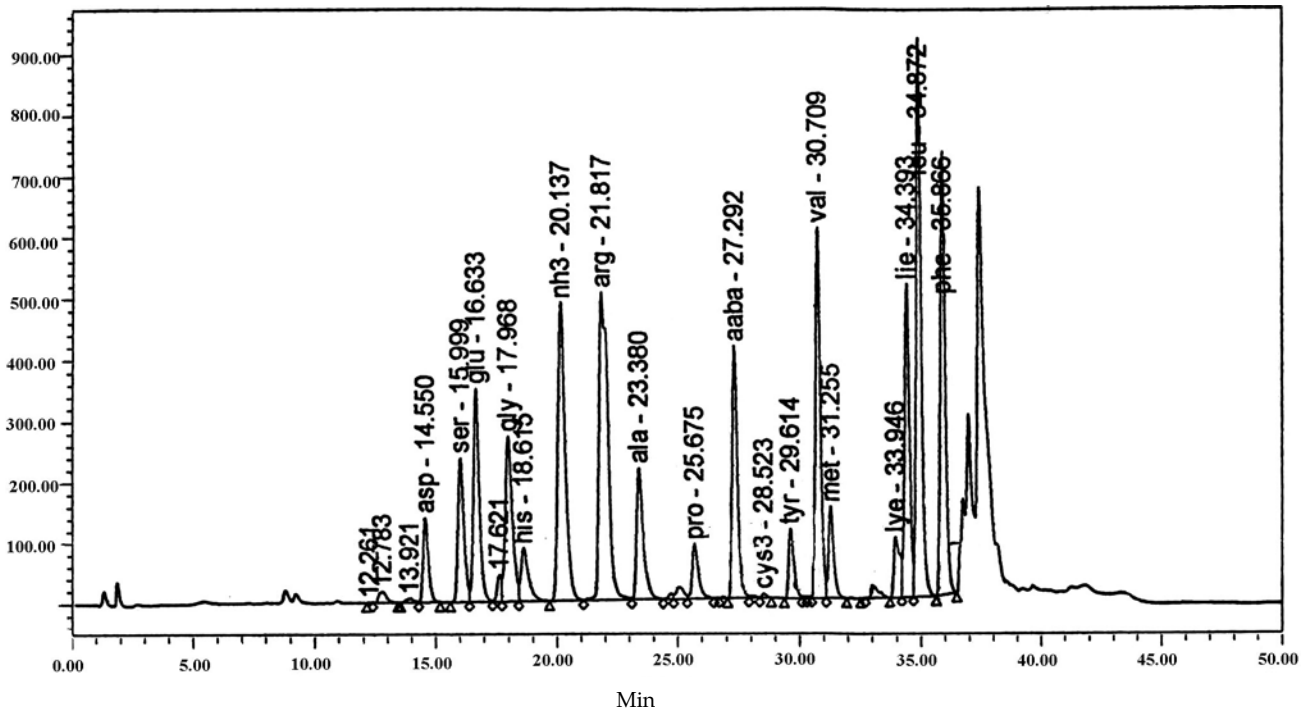


Figure 2. Amino acid chromatogram for PKC.

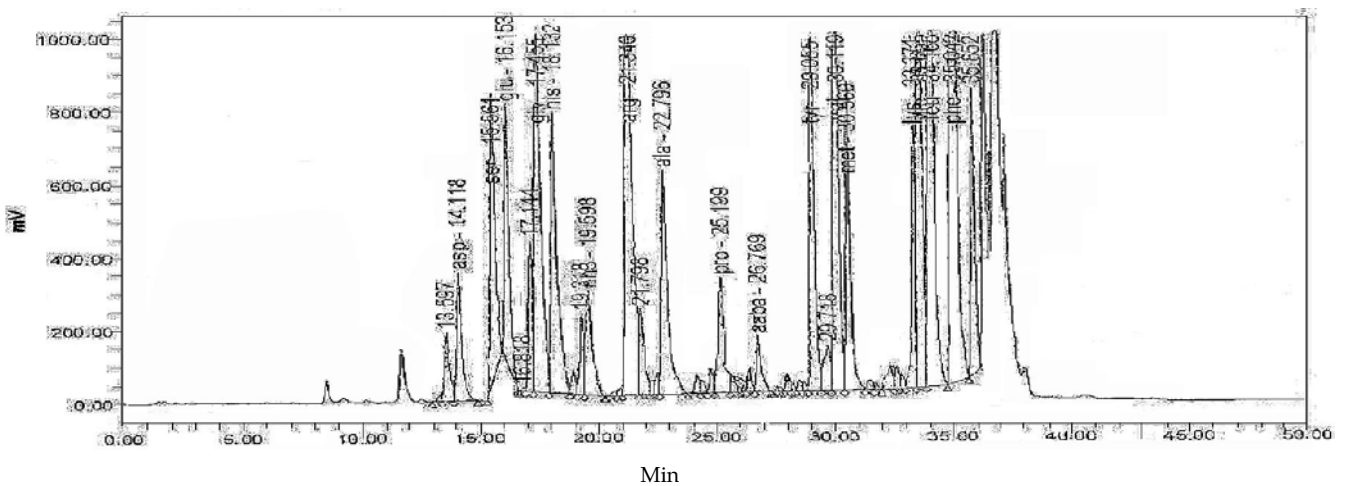


Figure 3. Amino acid chromatogram for protein concentrate from PKC.

200 000 t of protein can be produced annually. From this work, PKC protein is easily extracted by the isoelectric method. It can be used to make protein flour or concentrate to greatly increase its market value.

REFERENCES

ABBOTT, T P; NAKAMURA, L K; BUCHHOLZ, G; WOLF, W J; PALMER, D M; GASDORE, H J; NELSEN, T C and KLEIMAN, R (1991). Process for making animal feed and protein isolates from jojoba meal. *J. Agric. Food Chem.*, 39: 1488-1493.

ALIMON, A R (2004). The nutritive value of palm kernel cake for animal feed. *Palm Oil Developments No. 40*: 12-16.

ASSOCIATION OF OFFICIAL ANALYTICAL CHEMIST (1990). *Official Methods of Analysis*. 15th edition. Washington: Association of Analytical Chemist.

DONNA, M K; ROMEO, T and KEVIN, A S (1997). Isolation and characterization of defatted canola meal protein. *J. Agric. Food Chem.*, 45: 3867-3870.

TABLE 1. AMINO ACID COMPOSITION OF PROTEIN IN PKC AND IN THE PROTEIN EXTRACTED

Amino acid	Palm kernel cake	Protein concentrate
Protein content $\%(\text{N} \times 6.25)$	16.06	60.87
Alanine	0.92	1.19
Arginine	2.18	7.75
Aspartic acid	1.55	3.71
Cystine	0.20	0.25
Glutamic acid	3.01	3.96
Glycine	0.83	1.14
Histidine	0.29	2.49
Isoleucine	0.62	1.99
Leucine	1.11	3.45
Lysine	0.59	1.46
Methionine	0.30	1.87
Phenylalanine	0.73	6.46
Proline	0.63	1.32
Serine	0.69	0.89
Theorinne	0.55	2.41
Tyrosine	0.38	1.87
Valine	0.90	2.40

EL-NOCKRASHY, A S; MUKHERJEE, K D and MANGULD, H K (1977). Rapeseed protein isolate by countercurrent extraction and isoelectric precipitation. *J. Agric. Food Chem.*, 25: 193-197.

MASSOURA, E; VEREIJKEN, J M; KOLSTER, P and DERKSEN, J T P (1998). Protein from *Crambe Abyssinia* oilseed. 1. Isolation procedure. *J. Amer. Oil Chem. Soc.*, 75: 323-327.

TZENG, Y M; DIOSADY, L L and RUBIN, L J (1990). Production of canola protein materials by alkaline extraction, precipitation and membrane processing. *J. Food Sci.*, 55: 1147-1156.

For more information kindly contact:

Director-General
MPOB
P. O. Box 10620
50720 Kuala Lumpur, Malaysia.
Tel: 03-87694400
Website: www.mpob.gov.my
Telefax: 03-89259446