PS 14: OIL PALM BREEDING POPULATION SELECTED FOR HIGH PROTEIN KERNEL

NOH, A; RAJANAIDU, N; KUSHAIRI, A; MOHD DIN, A and WAN NOORAIDA, W M

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The livestock industry in Malaysia is growing in importance. Due to lack of local production, the industry relies heavily on the import of raw feed ingredients such as maize, soyabean and other grains. Monogastric animals such as cattle and poultry (*Figures 1* and *2*), the main consumers of these feed grain, suffer high production cost (Dahlan, 1996). This is mainly due to the high importation cost of the raw feed ingredients. In 2010, Peninsular Malaysia imported RM 4.55 billion worth of feedstuff mainly maize (52%) and soyabean meal (23%) to meet the local demand (Abu Hassan, 2013). The high cost of feedstuff will increase the cost of production and in turn increase the price of animal products. Animal protein is a very important food source in the country and the demand keeps increasing annually.

In view of this situation, the quality and quantity of locally produced feedstuff need to be developed and enhanced. Palm kernel cake (PKC) (*Figure 3*) is a by-product from palm oil production. It is the solid residue from the extraction of oil from palm kernel. It has long been known to be an important ingredient for the formulation of animal feeds (Collingwood, 1958). In 2013, Malaysia exported 2.7 million tonnes of PKC as feedstuff worth RM 1.3 million mainly to EU countries (MPOB, 2013). Several researchers had studied and confirmed its value as animal feed (Dahlan, 1996; Davis and Zainur, 1995; Mustafa *et al*., 1991; Yeong *et al*.,

Figure 1. Cattle industry.

Figure 2. Poultry industry.

Figure 3. Palm kernel cake (PKC).

1983). However, analysis of PKC showed that it can only be classified as energy feed. Its low protein content of only 14%-19% excludes it as protein feed (*Table 1*) (Alimon, 2004). In addition, its protein content also lacks in certain amino acids such as lysine, methionine, cystine and tryptophan (Alimon, 2004). It is therefore important to improve the protein content and amino acid composition of PKC to enable it to compete comfortably with other feedstuff in the market. MPOB reported high variation of kernel to bunch ratio in the germplasm populations (Rajanaidu *et al*., 1996) and as potential source of lauric oils for the oleochemical industry (Rajanaidu and Jalani, 1994; Kushairi, *et al*., 1996). Hence, future challenges in oil palm breeding, *inter alia* would be on selection and breeding for high quality and quantity of protein in the kernel (Kushairi, 2005).

SCREENING AND SELECTION

A total of 11 *Elaeis guineensis* and eight *E. oleifera* germplasm populations from MPOB Research Station, Kluang were screened for crude protein content using the Kjedahl method (AOAC, 1995) (*Figure 4*). Earlier on, five MPOB *E. guineensis* germplasm populations have also been screened for crude protein content using the same method (Noh *et al*., 2008). For crude protein content determination, only 1 g of the fine moisture-free sample was used, which was then mixed with two 3.5 g copper Kjeltec tablets and 12 ml of sulphuric acid (H_2SO_4) for digestion. The copper tablets act as a catalyst for the reaction. The mixture in the extraction tube was then inserted into the Foss digestor

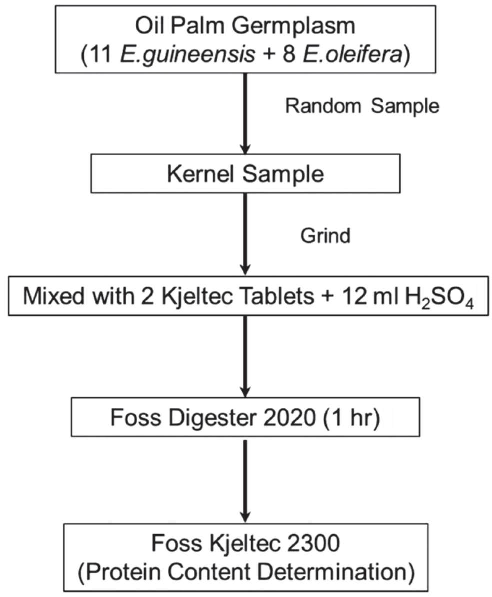

Figure 4. Determination of crude protein content in palm kernel (Kjedahl Method, AOAC, 1995).

2020 for an hour before transferred into the Foss Kjeltec 2300 for protein detection. All analyses were carried out at the Energy and Protein Centre (EPC) MPOB Keratong, Pahang. From each germplasm source, 30 samples were taken at random at the initial stage of screening. Subsequently from the screening results, palms with interesting levels of crude protein and amino acids were selected for further screening. Palms with crude protein more than 20% and rich in essential amino acids were identified for further selection. A total of 132 palms with kernel protein content of more than 20% were identified, of which 14 palms with fresh fruit bunch (FFB) yield more than 100 kg palm^{-1}

TABLE 1. PROXIMATE ANALYSIS OF PALM KERNEL CAKE

Category	Content (%)
Dry matter	88.0 - 94.5
Crude protein	14.5 - 19.6
Crude fibre	13.0 - 20.0
Ether extract	5.0 - 8.0
Ash	3.0 - 12.0
Nitrogen-free extract	46.7 - 58.8
Neutral detergent fibre	66.8 - 78.9

Source: Alimon (2004).

year-1 were selected for further breeding (*Table 2*). These 14 palms are referred as PS14. The high protein kernel *dura*s can be selfed and progeny tested with high combining ability *pisifera*s (such as AVROS and Yangambi) and also with high protein kernel *pisifera*s (derived from TxT selfs). The progeny test results would be useful in determining potential parental palms for production of high protein kernel *dura* x *pisifera* (DxP). The high protein kernel *tenera*s can also be cloned.

COMMERCIALISATION POTENTIAL

The high cost of imported feedstuff will increase the cost of production and in turn increase the price of livestock products. The high protein kernel will reduce our dependency on imported feedstuff and hence lower the cost of production. This will help the growth of the livestock industry in Malaysia and eventually lower the price of animal products in the country.

CONCLUSION

The production of PS14 oil palm planting materials with high protein kernel is an alternative to help boost the feed industry and reduce dependency on imported ingredients for animal feed.

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TABLE 2. PS14 PALMS WITH HIGH PROTEIN KERNEL

No.	Palm number	Fruit type	Country of origin	Progeny code	Protein	FFB yield (2006-2009)	
					(%)	(kg palm^{-1} yr^{-1})	(t ha^{-1} yr^{-1})
1	0.397/27	*Tenera*	Ghana	GHA02.07	26.21	142.63	21.11
2	0.397/372	*Dura*	Ghana	GHA11.01	24.04	112.49	16.65
3	0.219/684	*Dura*	Cameroon	CMR20.02	23.77	110.40	16.34
4	0.219/519	*Dura*	Cameroon	CMR29.01	23.49	155.12	22.96
5	0.398/47	*Dura*	Gambia	GAM05.09	23.42	148.64	22.00
6	0.397/21	*Tenera*	Ghana	GHA02.07	23.37	185.46	27.45
7	0.398/69	*Dura*	Gambia	GAM03.07	23.04	104.19	15.42
8	0.352/22	*Dura*	Senegal	SEN04.03	22.93	127.25	18.83
9	0.256/115	*Dura*	Tanzania	TZA02.03	22.41	150.25	22.24
10	0.256/152	*Dura*	Tanzania	TZA06.02	22.39	144.00	21.31
11	0.397/1	*Dura*	Ghana	GHA02.03	22.29	154.42	22.85
12	0.221/1590	*Dura*	Congo*	ZRE27.05	22.06	113.13	16.74
13	0.397/300	*Dura*	Ghana	GHA09.02	22.00	150.92	22.34
14	0.397/28	*Tenera*	Ghana	GHA02.07	21.09	157.63	23.33
15	Commercial	DxP	-	-	16.67	145.30	21.50

Note: * Formerly known as Zaire.

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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