Voluntary Intake and Digestibility of Treated Oil Palm Fronds

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1. Introduction

Oil palm frond (OPF) is one of the most abundant agricultural by-products in Malaysia. Almost all pruned fronds are discarded in the plantation, mainly for nutrient recycling and soil conservation. It has great potential to be utilised as a roughage source or as a component in compound feed for ruminants. Much research has been carried out by MARDI and JIRCAS to use OPF for animal feeding either fresh, or as silage or pellet (Abu Hassan *et al.* 1995). Detailed studies on the fermentation characteristics and palatability of OPF silage as well as on animal performance have been reported (e.g. Abu Hassan and Ishida 1991; Ishida and Abu Hassan 1997; Oshio *et al.* 1999). The objective of this trial was to study the effect of processing methods of OPF on its digestibility and voluntary intake.

2. Materials and Methods

Four processing methods of OPF (pelleting, dry chopping, silage, and NaOH treatment) were compared for *in vivo* digestibility and intake using 16 Kedah-Kelantan (KK) cross

yearling heifers (mean live-weight 160 kg). The fresh OPF collected from the UPM farm in Serdang, Selangor, Peninsular Malaysia, was chopped to 2-3 cm length and blended uniformly. A portion of the chopped OPF was directly packed in plastic drums (approximately 100 l) for making silage. The material was kept for one month before feeding to the animals.

Simultaneously, a portion of the chopped OPF was mixed with 10% NaOH solution at the ratio of 15 kg to 100 kg of fresh OPF. The material was packed similarly in the drums and kept for one month until feeding. For making dry chopped OPF, a portion of the chopped OPF was chopped again using the same machine, dried under the sun for one day, and then completely dried in an oven. OPF pellets were produced with a 12-mm diameter pelletiser after being dried the same way as chopped OPF, and were ground through a 4-mm screen grinder.

These four types of OPF were mixed with a basal ration comprising 50% palm kernel cake (PKC), 20% palm oil mill effluents (POME), 16% tapioca waste, 10% rice bran, 2% minerals and vitamin mixture, 1% salt, and 1% urea at various ratios. Rations consisting of 40% and 60% OPF pellets, 40% chopped OPF, 40% OPF silage and 40% NaOH-OPF were used to measure the apparent digestibility of each form of treated OPF at maintenance level with 3-4 animals for each ration. Each ration was fed for 14 days and faeces from each animal were collected for measuring the digestibility throughout the last 5 days. OPF pellets and chopped OPF were mixed at the ratio of 25, 40, 60 and 75% of the total feeds on DM basis with the basal ration as mentioned above. Each diet was voluntarily fed to the 3-4 heifers, respectively. OPF silage and NaOH-treated OPF were also mixed with the basal ration and were fed to the animals in the same ratios, except the 75% rations. Each ration was fed to the animals daily at 10-20% above the saturated level for 9 days. The weight and DM

content of the remainder were measured in the morning. Collection of faeces was carried out for the last 3 days to measure the digestibility.

3. Results and Discussion

Table 1 outlines the voluntary intake and digestibility of the treated OPF rations. At maintenance level, the digestibility of OPF pellets was the lowest. The intake of OPF pellets mixed with the basal ration was maintained even at the 75% inclusion level. While chopped OPF and OPF silage did not reveal much difference in digestibility, intake was higher for the chopped OPF ration than for OPF silage. Nevertheless, the intake at 75% level of chopped OPS was depressed to 58% of that at the 25% level .

Table 1. Voluntary intake and digestibility of treated OPF rations

Ratio of OPF	OPF pellets		Chopped OPF		OPF silage		NaOH-OPF	
	DM intake g.DM/kg$^{0.7}$	DM dig. %	DM intake g.DM/kg$^{0.75}$	DM dig. %	DM intake g.DM/kg$^{0.7}$	DM dig. %	DM intake g.DM/kg$^{0.75}$	DM dig. %
Voluntary intake level								
25%	104.5	63.7	97.8	61.8	89.7	61.2	104.3	62.1
40%	101.7	56.1	83.0	57.6	74.6	59.4	87.7	60.9
60%	107.9	47.4	65.4	56.2	59.0	57.3	77.1	59.6
75%	87.6	35.8	57.2	51.0				
DM digestibility (%) of each treated OPF at maintenance level								
Basal ration								
69.5		33.3		38.6		41.6		53.4

The digestibility and intake of NaOH-treated OPF were the highest. Although grinding and pelletising lowered the digestibility due to the faster rate of passage through the rumen, these

processes were more effective for enhancing the intake. On the other hand, NaOH treatment improved not only the digestibility but also the intake remarkably.

Therefore, this treatment has great potential for improving the OPF quality. However, as NaOH is caustic and dangerous, a safer and more cost-effective procedure for treatment is needed. Ammonia treatment, an alternative to NaOH treatment, was not carried out in this experiment. Although ammonia treatment could be adopted for improving the frond quality, there is a high possibility that reaction between soluble sugars in OPF and ammonia will produce toxic substances such as 4-methylimidazole. Thus, if ammonia treatment is adopted for improving the quality, it is important to identify the occurrence of the toxic materials.

3. Conclusion

The digestibility and intake of NaOH-treated OPF was higher than those of chopped OPF or OPF-silage were. More studies are needed to determine if NaOH treatment is suitable, or can be replaced with ammonia, for improving the OPF quality. Intake was lower for OPF silage than the chopped OPF but the digestibility was comparable. Compared to the fresh-chopped OPF, OPF silage has advantages for animal feeding, in terms of ease of handling, storage, less labour usage, easy to be transported etc. Fresh chopped OPF needs to processed daily. This is not only time consuming but in long-term it is not practical and not cost-effective.

Although pelletising of OPF is effective for improving intake, it depressed the digestibility. Therefore, an alternative processing method such as cubing is required to maintain the same level of digestibility as chopped OPF and simultaneously to improve the intake.

4. References

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