Development of Oil Palm Fronds for Ruminant Feed in Thailand: Influences of Fronds Components and Ensilage Methods on Voluntary Intake and on Dry Matter and Organic Matter Digestibility in Goats

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Summary

The research was conducted to evaluate the influences of the components of oil palm fronds (OPF) ensiled with different methods on voluntary intake and on dry matter and organic matter digestibility in goats. Six male goats weighing 14.2 ± 1.67 kg were used. Both of the total fronds and only the leaf blade of OPF were prepared for goat feed in 3 forms, fresh (control), common ensilage and ensiled with 5% of molasses as additives. The animals received 6 different feed types in sequence in 6 periods according to a 2x3 Factorial experiment in a 6x6 Latin square design. Each period lasted for 15 days with 10 days adaptation, 5 days for data collection. The animals were fed *ad libitum*. The feeds offered and refused were recorded daily. Feed samples and the dung were collected daily during the collection period and analyzed for dry matter and organic matter content. The impact of the OPF components did not affect the dry matter intake expressed as g/d or as g/kg metabolic body weight ($g/kgBW^{0.75}$) as well as on the organic matter intake and the digestibility ($P>0.05$). The influences of ensilage methods, however, affected both the dry matter and organic matter intake and on the dry matter and the organic matter digestibility ($P<0.01$). This research result implied that to enhance the potential use of OPF for ruminant feed might be focused on the development of the preservative technology of the OPF.

Key words: *Oil palm frond, Ruminants feed, Voluntary intake, Digestibility, Goat*

Introduction

Since the year 2005, the government of Thailand planned to increase the plantation of the oil palms continuously and expected to reach 1.6 million hectares by the year 2029/30 with the plan to reach 2.4 million hectares in the future. (DOAE, 2005). The increase of oil palm plantation will increase the amount of OPF cut from the tree after harvesting the oil palm bunches. The fronds consist of two main components, the petioles or leaf bases and the leaflets that can be used for ruminant feeds. Due to the differences in both the physical properties and the chemical contents of each part of the OPF components, it may be needed to evaluate the impact on intake and digestibility of these biomass resources before using as a roughage source for ruminants. The objective of this research was to evaluate the influences of the components of OPF ensiled with different methods on voluntary intake and on dry matter and organic matter digestibility in goats.

Materials and methods

Feed: Cut the OPF after harvesting the oil palm bunches and chop into 1-2 inches long with chopping machine either the leaflet or the total frond. Ensile the chopped OPF in a 30*40 inches black plastic bags with 3 different methods i e fresh (control) normal ensilage and ensilage with molasses at 5% level (w/w) for 21 days to be used as the experimental feed.

Animals: Six male Anglo Nubian-Thai indigenous crossbred goats of an average 14.20± 1.67-kg life body weight were used. The animals were administrated with A,D_3 E vitamins and drenched before the beginning of the experiment.

Experimental procedures: The animals were allocated individually in a 1 x 2 m metabolism cage which is equipped with a roughage trough and a water bucket as well as a dung collecting tray. Six different types of feeds derived from 2 different parts and 3 different ensilage methods of the OPF were offered to animals alternately in 6 periods according to a 2x3 factorial experiment in a 6x6 Latin square design. Each period was extended for 15 days with 10 days for the preliminary period and 5 days for the collecting period. The animals were fed *ad libitum*. Offered and refusal feeds were measured daily using for calculation of net feed intake. Feed samples and animal's dung were collected daily during the collecting period using for analysis and calculation for the dry matter and the organic matter content. The data obtained was analyzed using the analysis of variance procedure (Steel and Torrie, 1981).

Results and discussions

Intake and digestibility data of either the dry matter or the organic matter expressed as gram/day (g/d), percent of live body weight (% BW) and as gram/kilogram metabolic body weight (g/kg $BW^{0.75}$) were presented in table 1. There were no significant interactions (P>0.05) in any of analyses and so only main effects are reported. The part of leaf components had no influence (P>0.05) on intake and digestibility of both the dry matter(DM) and the organic matter (OM), except for the dry matter intake expressed as %BW which the goat offered the leaflets had more (P<0.05) intake than that of the total fronds. The ensilage method, however, affected (P<0.01) both of the intakes and the digestibility of either the dry matter or the organic matter as well as on the digestible organic matter in the dry matter (DOMD or the D-Value). The higher dry matter intake of the leaflet portion of the OPF than that of the total frond portion when expressing on percentage of body weight (%BW) might ground on the fact that the leaflet contains higher (P<0.01) crude protein content (11.58% DM basis) than that of the total frond(8.64% DM basis) (Aim-oeb, 2008). It is well recognized that intake of higher protein diet was higher than that of the lower protein diets. The leaflet portion, therefore, had more dry matter intake expressing as %BW.

Table 1 *Influences of oil palm frond components and ensilage methods on voluntary intake and on dry matter and organic matter digestibility in goats.*

Item	Part of leaf component (A)				Ensilage Methods (B)					A*B
	Leaf blade	Total frond	SEM	Significant levels	Fresh (Control)	Normal Ensilage	Ensilage with Molasses	SEM	Significant levels	
DM Intake (g/d)	390.12	360.01	10.93	P>0.05	483.05^{A}	291.59^{C}	350.56^{B}	13.38	P<0.01	0.29
DM Intake (%BW)	2.55^{a}	2.31^{b}	0.078	P<0.05	2.84^{A}	2.02^{C}	2.44^{B}	0.09	P<0.01	0.39
DM Intake (g/kg $BW^{0.75}$)	54.04	49.01	1.723	P>0.05	66.50^{A}	39.35^{C}	48.71^{B}	2.11	P<0.01	0.41
OM Intake (g/d)	359.62	332.98	10.21	P>0.05	446.92^{A}	268.79^{C}	323.20^{B}	12.50	P<0.01	0.38
OM Intake (%BW)	2.58	2.33	0.090	P>0.05	3.81^{A}	1.86^{C}	2.33^{B}	0.11	P<0.01	0.33
OM Intake (g/kg $BW^{0.75}$)	49.80	45.32	1.593	P>0.05	61.50^{A}	36.27^{C}	44.91^{B}	1.95	P<0.01	0.40
DM Digestibility (%)	76.76	77.17	1.507	P>0.05	83.15^{A}	73.05^{B}	74.69^{B}	1.85	P<0.01	0.301
OM Digestibility (%)	78.33	78.87	1.383	P>0.05	84.36^{A}	74.95^{B}	76.49^{B}	1.69	P<0.01	0.276
D-Value (%)	72.13	72.98	1.250	P>0.05	78.05^{A}	69.05^{B}	70.56^{B}	1.53	P<0.01	0.274

$^{A, B, C}$ = Means in the same row of the same comparison parameters with different superscript differ significantly (P<0.01)

$^{a, b}$ = Means in the same row of the same comparison parameters with different superscript differ significantly (P<0.05)

When the factor of ensilage method was considered, it is clearly indicated that intakes of the fresh OPF in any measurement criteria were higher ($P<0.01$) than that of ensiled OPF. This evidence is similar to several studies conducted in other ruminants. McDonald et al, (1991) reported that the ruminants offered with fresh forage had higher dry matter intake than those offered with ensilage roughage made from similar materials. Moreover, factors affecting feed intake of goats include age, size, stage and level of production of the animals, animal health, animal forage preference, weathers, palatability of feed, digestibility and maturity of forage. (Coffey *et al*, 2004). In the similar tendency with the intake, the digestibility of the DM, OM and the DOMD or the D-value of the ensilage OPF, therefore, was lower than that of the fresh OPF. This evidence was also similar with the previous conclusion reported by McDonald et al, (1991) that the feed with higher DM intake had the higher OM digestibility. However, although the ensiled OPF was lower in both of the intake and the digestibility than that of the fresh OPF, preserving the forage for the dry period that the forage resources are shortage was also necessary. This research result, therefore, implied that using ensilage OPF with additives for ruminant feeds is one of the most powerful alternatives for increasing forage resources for ruminant production in the south of Thailand.

Conclusions

Development of OPF by ensilage with additives for ruminants feed is a proper alternative for reducing the scarcity of forage crops for ruminants. Decreasing in both the intake and the digestibility of the ensiled products compared with the fresh OPF might not be the obstruction of the use of the OPF for feed. The development in methods and techniques for ensilage of this forage resource should be continued

References

Aim-oeb, J. 2008. *Potential of oil palm fronds for ruminants feed*. Master of Science Thesis. Kasetsart University, Thailand. 133 pp.

Coffey, L., M. Hale AND A. Wells. 2004. *Goats: Sustainable Production Overview, Live stock Production Guide.* Available Source: http://attra.ncat.org/attra-pub/goatoverview.html

Department of agricultural extensions of Thailand. 2005. Meeting report**.** Available Source: http://eoffice.doae.go.th:8080/CDMS2/viewimg.php?tid=6569&pageno=3

McDonald, P.; A. R. Henderson and **S.J. E. Heron**. **1991.** *The biochemistry of silage*. Chalcombe pubication, England. 340 pp.

Steel, R.G.D. and **J. H. Torrie**. **1981.** *Principle and Procedures of Statistics A Biometrical Approach 2nd. ed*. McGraw-Hill Book Company, Singapore. 633 pp.