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Alternative feed supplement resources for sheep and goats in Egypt

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SUMMARY - A 90-day feeding trial, followed by a 15-day digestibility trial was conducted using 2 groups of sheep and 2 groups of goats (6 animals/each group) to evaluate the feeding value and utilization of two kinds of pelleted feed supplements: a commercial concentrate feed mixture (CFM) and an organic waste feed mixture (OWFM), as a non-conventional feed, in addition to barley straw. During the feeding trial, constant voluntary DM intakes of CFM and OWFM were achieved at the same time after the first 3 weeks of feeding for both sheep and goats. All feed ingredients and rations were free of aflatoxins and bacterial toxins. No digestive disorders occurred during the study. Goats consumed OWFM more than CFM whereas sheep consumed comparable amounts of both diets. Animals fed the OWFM diet (S2 and G2) utilized and digested the nutrients more efficiently and retained more N (379 and 317 mg/kgW$^{0.75}$, respectively) than those fed the CFM diet (S1 and G1). The nutritive values of the OWFM diet were much better in terms of TDN and DCP. Values of GPT, GOT and GGT enzymes were in normal ranges. Such results recommend that the non-conventional feed supplements (OWFM) could be efficiently used as nutritious, palatable and low-cost feed resources for small ruminants in Egypt.

Key words: Non-conventional feeds, organic wastes, sheep and goats, feeding value.

RESUME - *"Ressources alternatives de supplémentation alimentaire pour ovins et caprins en Egypte". Un essai d'alimentation de 90 jours, suivi d'un essai de digestibilité de 15 jours, a été mené en utilisant 2 groupes d'ovins et 2 groupes de caprins (6 animaux/chaque groupe) afin d'évaluer la valeur nutritionnelle et l'utilisation de deux types de suppléments granulés : un mélange de concentré commercial (CFM) et un mélange de sous-produits organiques (OWFM), comme aliment non conventionnel, en addition à de la paille d'orge. Pendant l'essai d'alimentation, des ingestions volontaires constantes de matière sèche des aliments CFM et OWFM ont eu lieu en même temps après les premières 3 semaines d'alimentation chez les ovins ainsi que les caprins. Tous les ingrédients alimentaires et les rations ne contenaient ni aflatoxines ni toxines bactériennes. Il n'y a pas eu de troubles digestifs pendant l'essai. Les caprins ont consommé plus d'aliment OWFM que CFM tandis que les ovins ont consommé des quantités comparables des deux régimes. Les animaux recevant le régime OWFM (O2 et C2) ont utilisé et digéré les nutriments de façon plus efficace et ont retenu plus de N (379 et 317 mg/kgP^{0,75}, respectivement) que ceux recevant le régime CFM (O1 et C1). Les valeurs nutritionnelles du régime OWFM ont été bien meilleures en termes de TDN et DCP. Les valeurs des enzymes GPT, GOT et GGT étaient dans un spectre normal. Ces résultats suggèrent que les suppléments non conventionnels (OWFM) pourraient être utilisés efficacement comme ressources alimentaires de bon niveau nutritionnel, bonne palatabilité et peu onéreux, pour les petits ruminants en Egypte.*

Mots-clés : *Aliments non conventionnels, sous-produits organiques, ovins et caprins, valeur nutritionnelle.*

Introduction

There is a growing interest in most countries in the use of organic wastes, particularly agricultural wastes, agro-industrial by-products, as a low-cost alternative feed source for animals. Intensive efforts are being made in Egypt aiming at solving the problem of feed shortage through providing some alternative feed ingredients from such organic wastes. Sizeable amounts of organic wastes are produced annually but some of these organic wastes are being used at small scale in animal feeding (El Shaer *et al.,* 1986; Abd El Gawad *et al.,* 1994). The potential contribution and utilization of agro-industrial by-products and other organic wastes in animal feeding was reviewed earlier by Chenost and Mayer (1977). The organic wastes can provide the basis for nutritious animal feeds if they are properly utilized.

The present study aimed to evaluate the feeding values and utilization of conventional and non-conventional feed supplements by sheep and goats.

Materials and methods

This study was conducted at Ras Sudr Research Station, DRC, South Sinai and lasted for 105 days. Twenty-four adult male sheep and goats weighed 38.9±0.18 and 26±0.16 kg body weight, respectively, were each (12 animals) randomly distributed in two groups (6 animals each) and given one of two pelleted feed supplements in a 2x2 factorial design. Both sheep and goats in the first group (S1 and G1) were offered the commercial concentrate feed mixture (CFM), which formed from conventional feed ingredients, i.e., 10% yellow corn, 10% undecorticated cotton meal, 22% wheat bran, 38% rice bran, 10.5% roughage, 5% molasses and 4.5% minerals and vitamins. The second group (S2 and G2) were given the organic waste feed mixture (OWFM). It was formulated basically from 50% vegetable and fruit wastes (VFW), 25% kitchen and restaurant organic wastes (KRW), 15% ground date seeds (DS) and 10% molasses. The VFW contained discarded crops of vegetables and fruits during summer season. Barley straw was added to both diets, in separate troughs. During the feeding trial (90 days) animals in each group were housed in pens, being allowed 20% more feed than the previous day consumption to ensure *ad libitum* intake. Each group was fed and watered twice daily and refusals were collected just before offering the next day's feed. Daily voluntary intake was recorded for each group. Animals were weighed biweekly.

Immediately after the end of the feeding trial, four animals from each group were randomly selected and housed in individual metabolism crates for 2 weeks and fed the experimental rations at 90% of the voluntary intake measured previously. On the last 7 days total fecal and urine excretion and feed offered and refusals, if any, were measured and sampled for chemical analysis. Feed ingredients, rations, feces and urine samples were analysed according to the procedures of the AOAC (1970). Fiber constituents analysis were also done (Goering and van Soest, 1970). Blood plasma samples were collected from each animal 2 h post feeding at the end of the collection period to determine gama glutamine transferase (GGT), glutamate oxalo-acetate transaminase (GOT), glutamate pyrovate transaminase (GPT), and urea-nitrogen using the colorimetric methods (Bio Merieux Laboratory Reagent and Instruments). Aflatoxins and zearalenone in feed ingredients and rations were evaluated (AOAC, 1970). In addition, microbial toxins were determined according to the procedures of the APHA (1978). The data were analysed using ANOVA procedures of SAS (1990); Duncan's multiple range test was used.

Results and discussion

The proximate analyses (Table 1) indicated that the OWFM ration contained reasonable level of crude protein (11.9%), high energy and fat contents which could be attributed primarily to incorporating KRW into the ration. The inclusion of the KRW at 25% only of the total ration was due to its high content of EE (13.5%). The chemical composition of such organic wastes may be varied from season to season and subjected to several factors (Chenost and Mayer, 1977). However, the nutrient composition of date seeds, KRW and VFW was slightly similar to those provided by El Shaer *et al.* (1986); Abaza *et al.* (1987); Abd El Gawad *et al.* (1994). Voluntary intakes of the OWFM and CFM rations by sheep and goats during the feeding trial (Table 2) were increased gradually, then became stable at the third week of feeding up to the end of trial, indicating that both rations had the same acceptability. Goats in G2 consumed higher amounts of OWFM diet (approximately 20%) than those fed CFM diet (G1), resulting in a significant ($P<0.01$) increase in body weight gain (72.2 *vs* 64.4 g gain/day). On the other hand, sheep in S1 and S2 consumed comparable amounts of OWFM and CFM rations (107 *vs* 109 g DM/kg$W^{0.75}$) and gained slightly similar weight. Feeding the OWFM ration reduced daily feed costs (*LE*/100 kg body weight) by approximately 38% according to the local current prices of feed ingredients. Similar figures were obtained by El Shaer *et al.* (1986); Khamis *et al.* (1989) on sheep and goats fed combination of some agro-industrial by-products.

Table 1. Chemical composition of ingredients and rations (DM basis)

%	Feed ingredients			Rations		
	VFW	KRW	DS	OWFM†	CFM††	BS†††
Dry matter	38.9	36.9	91.3	95.4	92.3	92.1
Crude protein	8.82	27.4	6.23	11.9	10.8	1.3
Crude fiber	20.8	10.2	7.76	14.0	18.2	30.5
Ether extract	3.61	13.5	6.76	6.1	3.3	0.9
NFE	51.96	40.96	77.24	58.4	53.6	55.8
Ash	14.8	7.93	2.1	9.6	14.1	11.5
NDF	66.4	49.3	58.9	51.2	59.3	69.9
ADF	47.0	32.6	34.3	34.8	31.6	49.2
ADL	10.7	5.8	8.89	6.36	5.64	9.0

†Organic waste feed mixture
††Commercial concentrate feed mixture
†††Barley straw

Table 2. Means of voluntary intake (VFI) and body weight changes during the feeding trial

Items	Sheep		Goats		±SE
	S1	S2	G1	G2	
No. animals	6	6	6	6	
Initial body weight (kg)	38.8^{a}	39.0^{a}	24.5^{b}	27.5^{b}	2.0
Final body weight (kg)	45.8^{a}	46.2^{a}	30.3^{b}	34.0^{b}	2.3
Average daily gain (g)	77.8^{a}	80.0^{a}	64.4^{b}	72.2^{ab}	3.4
Daily VFI (g DM/kg$W^{0.75}$)					
Barley straw	8.80	9.00	12.3	10.0	
Supplement	109	107	83.6	100	
Total	118	116	95.9	110	
Daily feed cost *(LE*/100 kg BW)†	2.01	1.26	1.96	1.20	

†Ton barley straw= *LE* 250; 1 ton OWFM= *LE* 280; 1 ton CFM = *LE* 450
a,b: Values with the different superscripts on the same line differ at P<0.01

Data of the digestibility trial (Table 3) indicated that daily DM intakes of diets varied significantly among animal groups. The DMI (4% of body weight) in this trial was higher than that reported by Kearl (1982) as the intake of adult sheep and goats is nearly 3% of their body weight. The higher intake is of great importance especially from such inexpensive feed ingredients because generally, animals that eat more will gain more and thus improve their efficiency (Adeloye, 1992).

Animals given the OWFM (S2 and G2) appeared to digest most nutrients (CP, CF, EE and NFE) much better (P<0.01) than those in S1 and G1 (CFM ration), which resulted in higher (P<0.01) nutritive values (TDN and DCP). All animals were in positive N balance, indicating that the N content of rations was enough to meet the N requirements of adult sheep and goats. Animals in S2 and G2 retained N averaged 13 and 57%, more than those in S1 and G1, respectively, which could explain the noticeable body gain in goats. Similar trends were obtained by Abaza *et al.* (1987); Abd El Gawad *et al.* (1994). It is worth mentioning that no harmful effects on nutrition status and liver function were detected during this study. All feed ingredients and rations were free of aflatoxins (B1, B2, G1, G2),

zearalenone and bacterial toxins (Salmonella and fecal coliforms). The biochemical constituents (glucose and urea-N) and enzymes (GOT, GPT and GGT) of blood serum were within the normal ranges (Rakha, 1988; Abd El Gawad *et al.*, 1994).

Table 3. Dry matter intake, digestibilities, nitrogen retention and nutritive value

Items	Sheep		Goats		±SE
	S1	S2	G1	G2	
Initial body weight (kg)	44.7^{a}	46.7^{a}	29.7^{b}	34.7^{b}	2.12
Digestion coefficients (%)					
Dry matter	60.0^{b}	63.1^{a}	63.1^{a}	62.3^{a}	0.39
Crude protein	59.8^{b}	68.4^{a}	61.9^{b}	70.4^{a}	1.36
Crude fiber	56.5^{c}	58.3^{b}	58.4^{b}	61.5^{a}	0.57
Ether extract	58.7^{b}	72.4^{a}	55.3^{b}	70.7^{a}	2.98
DM intakes (g/kgW$^{0.75}$)					
Barley straw	5.26^{c}	6.20^{c}	10.1^{a}	8.1^{b}	0.56
Supplement	108^{a}	106^{ab}	80.5^{c}	98.0^{b}	3.36
Daily DDMI (g/kgW$^{0.75}$)	68.4^{ab}	71.2^{a}	57.2^{c}	66.1^{b}	1.03
N intake (mg/kgW$^{0.75}$)	1889^{a}	2055^{a}	1413^{b}	1883^{a}	71.8
N retention (mg/kgW$^{0.75}$)	335^{ab}	379^{a}	202^{c}	317^{b}	19.5
Nutritive values					
TDN intake (g/kgW$^{0.75}$)	58.9^{c}	73.1^{a}	49.2^{d}	68.1^{b}	1.45
DCP intake (g/kgW$^{0.75}$)	7.08^{b}	8.80^{a}	5.45^{c}	8.30^{a}	0.35
Blood metabolites					
Urea-N (mg/100)	8.17^{b}	11.7^{a}	8.11^{b}	13.6^{a}	0.71
Glucose (mg/100)	63.4^{b}	66.9^{a}	60.7^{b}	70.1^{a}	1.10
GPT (IU/L)	37.6^{d}	40.3^{c}	44.0^{b}	47.2^{a}	1.11
GOT (IU/L)	20.5^{d}	23.7^{c}	26.2^{b}	30.2^{a}	1.01
GGT (IU/L)	15.5^{c}	21.1^{b}	19.1^{bc}	24.7^{a}	1.35

a,b,c,d: Values with different superscripts on the same line differ at P<0.01

In conclusion, the non-conventional feed ingredient combination of 50% VFW; 25% KRW; 15% DS and 10% molasses can economically and effectively substitute for the conventional feedstuffs for small ruminants as they are available all year round, cheap and nutritious. However, more research is still required on materials so for been poorly tested as there is a dearth of information on processing and manufacturing lots of by-products, particularly KRW and VFW materials.

References

Abaza, M.A., Nour, B.E., Birganu, B.E. and El Shazly, K. (1987). Nutritive value of vegetable and fruit wastes as animal feeds. *Alex. J. Agr. Res.*, 32: 57-83.

Abd El Gawad, A.M., Abd El Malik, W.H., Allam, M.S. and El Sayed, I.M. (1994). Utilization of banana, tomato and potato by-products by sheep. *Egyptian J. Anim. Prod.*, 31: 215-230 (Supplement Issue).

Adeloye, A. (1992). Efficiencies of conversion of some lignocellulosic waste materials by goats. *Bioresource Technol.*, 40: 167-169.

AOAC (1970). *Official Methods of Analysis.* 11th Ed., Association of Official Analytical Chemists, Washington, DC.

APHA (1978). *American Public Health Association. Standard methods for the examination of dairy products.* 14th Ed., 10102, Eighteenth St. NW, Washington, USA.

Chenost, A. and Mayer, L. (1977). Potential contribution and use of agro-industrial by-products in animal feeding. In: *Proc. of a Technical Consultation,* Rome, Nov. 22-24, 1976, FAO Animal Production and Health paper, 4: 87-110.

El Shaer, H.M., Kandil, H.M. and Farid, M.F.A. (1986). Agro-industrial by-products as feeding supplement for pregnant and lactating sheep and goats in Southern Sinai. In: *Proc. of 2nd Egyptian-British Conf. on Animal and Poultry Production,* Bangor, UK, August, 26-28.

Goering, H.K. and van Soest, P.J. (1970). *Forage Fiber Analysis.* ARS Handbook No. 3790, U.S. Dept. Agric., Washington, DC.

Kearl, L.C. (1982). *Nutrient requirements for ruminants in developing countries. International feedtuffs utilization.* Utah Agric. Exp. St. Utah State Univ. Logan, Utah, USA.

Khamis, H.S., El Shaer, H.M., Farid, M.F.A., Shalaby, A.S. and Salem, O.A. (1989). Utilization of date seeds, and olive pulp as supplementary feeding for lactating ewes in Sinai. In: *Proc. 3rd Egyptian-British Conf. on Animal and Poultry Production,* Alexandria, Egypt., Oct. 7-10.

Rakha, G.M. (1988). *Studies on the effect of using agro-industrial by-product on health and production of some farm animals.* PhD Thesis, Fac. of Vet., Med., Cairo University, Egypt.

SAS (1990). *SAS User's guide: Statistics.* SAS Inst. Inc., Cary, NC, Releigh.