SHORT NOTES:
MARDI Res. Bull. 5, 1: (114 – 116)

RUMINANT FAECAL FAT OF TROPICAL SHEEP

C. DEVENDRA

Accepted for publication on 10 May, 1977.

RINGKASAN

Pengeluaran lemak di dalam tahi kambing biri-biri tempatan pada tiap-tiap hari apabila diberi makan makanan yang mengandungi sedikit lemak (0.9 peratus ether extract) berjumlah 234.0 mg bagi tiap kg. berat badan. Ini berbanding dengan 274.7 g bagi tiap-tiap berat badan kambing biri-biri Barbados Blackbelly sheep.

Oleh sebab jumlah kedua-duanya ini lebih tinggi dari jumlah kambing biri-biri berhawa sejuk, ada cadangan yang menyatakan bahawa kambing biri-biri tropika mengeluarkan lemak tahi yang lebih banyak, terutama sekali yang berasal dari dalam badan (endogenous origin). Cadangan ini dikukuhkan lagi dari pendapat penyelidikan lain yang menyatakan bahawa jumlah asid palmitic dan asid stearic yang dikeluarkan juga tinggi.

INTRODUCTION

The digestibility of fats by the ruminant can be measured by the formula developed by ANDREWS and LEWIS (1970):

$$\text{Corrected digestibility of the fat supplement \%} = \frac{\text{T.L.I.} - \text{L.I.B.} - \text{T.L.O.} - \text{T.L.O.B.}}{\text{T.L.I.} - \text{L.I.B.}}$$

where T.L.I. = Total lipid intake
L.I.B. = Lipid intake on the basal diet
T.L.O. = Total lipid output and
T.L.O.B. = Total lipid output on basal diet.

Of the components that make up the equation, clearly, the estimation of T.L.O.B. or faecal fat is fundamental in determining the digestibility of the fat component. This faecal fat is made up of two fractions: (a) dietary fat which has not been absorbed, and (b) endogenous fat which is not of dietary origin. The latter is made up of intestinal secretions, bacterial synthesis, bacterial residues of sloughing off of the mucosal cells.

For temperate sheep, weighing 40 kg live weight each, and fed a low-fat diet containing 1.5 per cent ether extract, ANDREWS and LEWIS (1966) reported that faecal fat production was 7.5 g/sheep/day. Similarly, DEVENDRA (1969) reported a value of 10.1 g/sheep/day for animals weighing 57.9 kg and receiving a diet containing 1.9 per cent ether extract. On per unit live weight basis, the values for temperate sheep fall within the range 174.4 to 187.5 mg/day.

By comparison, in experiments on the determination of palm oil digestibility using indigenous sheep, each weighing approximately 23.5 kg live weight, it was found that the daily faecal fat production on diets with 0.9 per cent ether extract was 5.5 g. This value compares with the report of 6.4 g per day for Barbados Blackbelly sheep (DEVENDRA, 1973) of average live weight 23.3 kg fed a low-fat diet. These values are equivalent to 234.0 and 274.7 mg/kg

live weight/day respectively. Both values are higher than those reported for temperate sheep, and it is suggested that tropical sheep produced relatively higher faecal fat, mainly of endogenous origin, compared to temperate sheep.

In view of the fact that there are, as far as the author is aware, no reports on the magnitude and nature of faecal fat from tropical sheep, the opportunity was taken to simultaneously also assess the pattern of fatty acids in the faecal fat. *Table 1* presents this analysis.

TABLE 1. FATTY ACID COMPOSITION OF DIETARY AND FAECAL LIPIDS ON A LOW–FAT DIET

(Each acid is expressed as a percentage of the total fatty acids. The value for faecal lipids is the mean of six sheep)

Fatty acid	Dietary lipid	Faecal lipid
10:0	0	0.3
12:0	1.0	5.8
14:0	2.2	3.9
14:1	0	4.1
16:0	44.2	28.9
16:1	0	0
18:0	34.9	40.8
18:1	16.9	10.4
18:2	0.2	4.8
18:3	0	0
20:0	0.6	1.0
Total :	100.0	100.0

The lipids in the basal diet consisted mainly of palmitic acid (44.2%) and unsaturated isomers of stearic acid (17.1%) together with a relatively large amount of stearic acid (34.9%). In the faecal lipids, stearic acid represented the largest proportions (40.8%) together with palmitic acid (28.9%). These proportions are high compared to the palmitic and stearic acid contents of faecal fat from temperate sheep (ANDREWS and LEWIS, 1966; DEVENDRA, 1969) and is consistent with the observation that faecal fat excretion appears to be higher in tropical sheep.

Table 2 presents the intakes and outputs of total lipids and component fatty acids by sheep receiving the basal (low-fat) diet. The digestibility of each acid is also indicated. Despite the low level of fat, there was a tendency to digest saturated fatty acids particularly well. The hydrogention of the isomers of C18:0 is also demonstrated.

The reasons for the relatively higher production of faecal fat of tropical sheep are not clear, but it would appear that endogenous fat which is not immediately of dietary origin is somewhat higher. It follows therefore that this is due to those factors that influence the excretion of endogenous faecal fat.

TABLE 2. APPARENT DIGESTIBILITY COEFFICIENTS FOR TOTAL LIPIDS AND COMPONENT FATTY ACIDS OF THE LOW–FAT BASAL DIET

(Each value is the mean of six sheep)

Total lipids and fatty acids	Food intake (g/day)	Faeces output (g/day)	Digestibility (%)
Total lipids	4.61	1.19	74.2
10:0	0	0	0
12:0	0.05	0.07	–ve
14:0	0.10	0.05	50.0
14:1	0	0.05	–ve
16:0	2.04	0.34	83.3
16:1	0	0	0
18:0	1.61	0.49	76.7
18:1	0.78	0.12	84.6
18:2	0.01	0.05	–ve
18:3	0	0	0
20:0	0.02	0.02	0

ACKNOWLEDGEMENTS

The author is grateful to Cik Enson Haji Abdul Rahman for technical assistance, and Dr. Y.H. Chong and Mr. E.S. Tee of the Institute of Medical Research for the fatty acids analysis.

SUMMARY

The daily faecal fat production of indigenous sheep of Malaysia fed a low-fat diet (0.9 per cent ether extract) was found to be 234.0 mg/kg live weight, which compares with 274.7 mg/kg live weight for Barbados Blackbelly sheep. Since both values are higher than those reported for temperate sheep, it is suggested that tropical sheep produce relatively higher faecal fat, mainly of endogenous origin. This point is also consistent with the finding that relatively higher proportions of palmitic and stearic acids were also excreted.

REFERENCES

ANDREWS, R.J. and LEWIS, D. (1966). Ruminant faecal fat. *Proc. Nutr. Soc., 25,* 28 (Abstr.).

ANDREWS, R.J. and LEWIS, D. (1970). The utilisation of dietary fat by ruminants. I. The digestibility of some commercially available fats. *J. Agric. Sci. Camb., 75,* 47–53.

DEVENDRA, C. (1973). The digestibility of pork lard and coconut oil by sheep. *Mal. Agric. Res., 2,* 59–76.

DEVENDRA, C. (1969). The interaction between dietary fat and fibre in ruminant nutrition. *Ph.D. Thesis,* University of Nottingham.

NOTES FOR CONTRIBUTORS

(Research Bulletins of the Malaysian Agricultural Research and Development Institute published biannually in June and December)

Contributions will be welcomed from scientists of all nations particularly those working in tropical and sub-tropical countries. Contributions must be written in English and should be addressed to the Director of MARDI, Malaysian Agricultural Research and Development Institute, P.O. Box 208, Sungei Besi, Serdang, Selangor, Malaysia.

Conditions of acceptance. Submission of a paper will be taken to imply that the material has not previously been published, and is not being considered for publication elsewhere. Papers published in MARDI Research Bulletin may not be printed or published in translation without the permiss.on of the Editor.

General Lay-out. Contributors should conform to the lay-out as practised by this Research Bulletin. Numerical data, which should only be included if they are essential to the argument, can be presented either in the form of tables or diagrams, but should never be given in both forms.

Typescripts. Three copies of the script should be submitted, typed with double spacing throughout, on one side only and with margins of about 1½ inches all round. Quarto size is preferred.

Title. It is essential that the title of each paper should be concise and contain the maximum of relevant information particularly, for example, where relevant, the crop, the nature of the investigation, the factors under review, climatic or geographic area in which the work was done.

Headings. The following details should be given at the head of the first sheet: the full title of the paper; a short title for running headlines, not exceeding 48 characters, counting each letter and space as one character; the name(s) of the author(s); the address at which the work was carried out; the present address(e)s of author(s), if different.

Summary. A short and accurate summary must be included. The preparation of the summary is not an Editorial responsibility. Papers received without adequate summaries will be returned to the author. Author(s) should also provide a summary in Bahasa Malaysia.

Experimentation. This Research Bulletin specialised in the presentation of data based on sound methods of experimentation. It is therefore important, where appropriate that papers should include: an adequate account of lay-out; full description of treatments and appropriate statistical significance treatment where relevant. Authors are urged to give the dates when experiments were carried out.

These should only be included where they are essential in the paper, and will only be accepted if of high quality. Photographs should be provided as unmounted glossly black and white prints. Lettering is to be indicated separately. Prints should not be damaged.

Diagrams. Diagrams should be drawn in Indian ink on white drawing paper, and the precise position of all lettering should be indicated. Each illustration should bear the name of the author(s) and the figure number, written clearly in the margin or on the back.

Legends. The legends for all illustrations should be given on a separate sheet of paper, clearly marked with the number of each plate or diagram. The ideal position for each diagram should be marked in the text, although it may not always be possible to put the illustration exactly in the positions indicated. Plates will normally be bound immediately after the end of the paper.

Tables. Each table should be typed on a separate sheet of paper, and its preferred position indicated on the typescript. Each table should be numbered and bear an appropriate title.

Units. Data should be presented in metric units.

References. The Harvard system of citation is used throughout as follows: name and initial(s) of author(s); year of publication in parentheses, further distinguished by the addition of small letters a, b, c, etc., where there are citations to more than one paper published by the same author(s) in one year; contracted title of periodical as given in the World List of Scientific Periodicals; volume number in arabic figures, page numbers. In the text, references should be denoted by giving the name of the author(s) with the date of publication in parentheses, e.g. Brown (1937) . . . , (Brown, 1937), (Brown, 1937a; (Jones and Smith, 1942a, b). In the list of references all names should be given in full, but where more than two collaboration authors are quoted in the text, only the first name is normally shown, followed by et al.

Referees. All manuscripts are refereed.

Proofs. Two sets of single-sided page proofs will be sent to each author, and it is the responsibility of the author(s) to submit corrections to the Editor, by returning to him the printers' marked proof (identified by the words 'marked copy') with all corrections. Corrections should be made using symbols in British Standard 1219: 1958, or its shortened version B.S. 1219c: 1958.

Reprints. Twenty five reprints will be sent free of charge to the author(s). Additional reprints can be made available on request.

All correspondence concerning subscriptions to the Research Bulletins and other business matters should be addressed to the Secretary, Publication Committee, MARDI, P.O. Box 208, Sungei Besi, Serdang, Selangor, Malaysia.

Diterbitkan oleh:
Institiut Penyelidikan dan Kemajuan Pertanian Malaysia (MARDI)
Peti Surat 208, Sungai Besi, Serdang, Selangor, Malaysia.

Dicetakan oleh Percetakan Lai Than Fong, 46-H, Jalan Lima, off Jalan Chan Sow Lin, K.L.