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in

Lindberg J.E. (ed.), Gonda H.L. (ed.), Ledin I. (ed.).
Recent advances in small ruminant nutrition

Zaragoza : CIHEAM

Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 34

1997

pages 113-119

Article available on line / Article disponible en ligne à l'adresse :

<http://om.ciheam.org/article.php?IDPDF=97606125>

To cite this article / Pour citer cet article

Abijaoudé J.A., Tessier J., Morand-Fehr P. **Recording methods of goat feeding behaviour.** In : Lindberg J.E. (ed.), Gonda H.L. (ed.), Ledin I. (ed.). *Recent advances in small ruminant nutrition.* Zaragoza : CIHEAM, 1997. p. 113-119 (Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 34)



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Recording methods of goat feeding behaviour

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SUMMARY - The feeding behaviour of goats involves 2 main behavioural activities: ingestion and rumination which have effects on the levels of nutrient intake and the efficiency of digestive utilization. To quantify the ingestion and rumination activities of stall-housed goats fed on complete diets, 2 complementary methods were used to record jaw movements and the weight of the ingested quantities simultaneously, and thus, provide a complete and exact distribution of intake and rumination over a period of 48 hours. The feeding behaviour of Saanen and Alpine goats was studied with 4 goats simultaneously. The recording apparatus is composed of a portable electronic device (IPERD-INRA Theix) connected by a soft tube to another softer tube fixed on the inside part of the lower strap of the halter, between the halter and the mouth of the animal. The portable device is placed on the back of the animal, fixed on a basal plastic part which does neither disturb the animal nor change its feeding behaviour. The air pulses coming from the compression of the softest tube are transformed by the portable device to electrical signals which are recorded every 2.5 seconds. The ingested quantities were recorded by placing the feeding pans of 4 goats on weighing machines which transmit the weights to an adapted electronic memorizer. The recordings are made every 2 minutes for 48 hours. This portable apparatus seems to be well-adapted to stall-housed animals.

Key words: Feeding behaviour, goats, recording method, electronic recorders.

RESUME - "Méthodes d'enregistrement du comportement alimentaire des caprins". Le comportement alimentaire des caprins fait intervenir 2 grandes activités comportementales : l'ingestion et la rumination, qui influencent les niveaux d'ingestion des nutriments et l'efficacité de l'utilisation digestive. Afin de quantifier les activités d'ingestion et de rumination de caprins en stabulation individuelle recevant des régimes complets, 2 méthodes complémentaires ont été utilisées pour enregistrer les mouvements des mâchoires et le poids des quantités ingérées simultanément, pour ainsi montrer une distribution exacte et complète de l'ingestion et de la rumination sur une période de 48 heures. Le comportement alimentaire de caprins de races Saanen et Alpine a été étudié sur 4 animaux simultanément. L'équipement enregistreur est composé d'un appareil électronique portable (IPERD-INRA Theix) connecté par un tube souple à un autre tube plus souple encore fixé sur la partie intérieure de la courroie inférieure du collier, entre le collier et la bouche de l'animal. Cet appareil portable est placé sur le dos de l'animal, fixé sur une base en plastique qui ne dérange pas l'animal et ne modifie pas non plus son comportement alimentaire. Les impulsions d'air qui proviennent de la compression du tube le plus souple sont transformées par l'appareil portable en signaux électriques qui sont enregistrés toutes les 2,5 secondes. Les quantités ingérées sont enregistrées en plaçant les plateaux d'alimentation des 4 animaux sur des machines de pesée qui transmettent les poids à un enregistreur électronique adapté. Les enregistrements sont pris toutes les 2 minutes pendant 48 heures. Cet équipement portable semble bien adapté à des animaux en stabulation individuelle.

Mots-clés : Comportement alimentaire, caprins, méthode d'enregistrement, enregistreur électronique.

Introduction

There are several methods to study the feeding behaviour of animals. They vary from direct observation (Bourbouze, 1980; Schwartz *et al.*, 1985) to the utilization of sophisticated electronic and computerized equipments. The direct observation needs complete presence and supreme attention during all the period in spite of the weather conditions. The choice of the animals can be evaluated and the ingested quantities of food can be estimated but with a considerable approximation. This method is difficult and it can rarely be adopted on a 24-hour period. Other methods propose to sort out all vegetable species in a rumen sample (Cordesse *et al.*, 1992) or in a feces sample (Raymond, 1954). Extraction of rumen samples needs fistulated animals and in feces the plant parts found are almost unrecognizable. These methods are used to evaluate the alimentary choice but don't provide

any information on the intake level, rumination and resting periods. Electronic data recordings appear to be the most adapted methods. They have been tried on cows and used on sheep (Brun *et al.*, 1984). Weighing machines have also been used by Baumont (1989) with sheep carrying the recorder. A new ambulatory data logger was recently developed in Japan (Matsui, 1994). Very few data are available on goats. These animals have been less studied than sheep and cows mainly because they have a very complex behaviour and accept scarcely any apparatus especially if they are free in the bushes.

Our aim is to quantify the levels of nutrient intake, the rumination and the resting periods in goats by utilizing an electronic apparatus to record jaw movements and the weight of the ingested quantities.

Description of the method

The feeding behaviour of Saanen and Alpine goats was studied with 4 goats at a time. The animals were stall-housed and fed on different complete diets. Complementary methods were adopted to record the jaw movements of the animals and the weight of their ingested quantities simultaneously. Data were recorded continuously over a period of 48 hours for each series of goats.

The apparatus for recording jaw movements is composed of a portable electronic device (IPERD: INRA Portable Electronic Recording Device). It has been used with cows and sheep and we have adapted it to goats. It is characterized by its light weight (350 g) and its small dimensions (155 mm long, 90 mm wide and 45 mm height). It needs 4 batteries (1.5v-size AA) which provide it with autonomy for 8 days. Data storage capacity is approximately 4 days in optimal conditions of sampling. It can be connected to a microcomputer by a cable (RS232). Recording can be started and stopped either by a microcomputer program or by passing a small magnet in front of labels found on both sides of the device.

This device is designed to be carried by the animal. We have decided to fix it on a plastic base on the back of the goats to permit them to move freely without damaging it or being disturbed (Fig. 1). The animals have to carry the basal part all over the experiment duration but the device only in the period of tests. The device, when fixed on the back of the animal, is connected by a soft plastic tube to another softer tube fixed on the inside part of the lower strap of the halter, between the halter and the mouth of the goat (Fig. 2). When the jaw moves, the compression of the softest tube generates air pulses. These pulses are transmitted via the second tube to the device where they are transformed to electrical signals which will be stored in memory until downloading.

Sampling is intermittent. Sampling intervals can vary from 500 to 2500 milli-seconds. The shorter the sampling interval is, the smaller the storage capacity becomes.

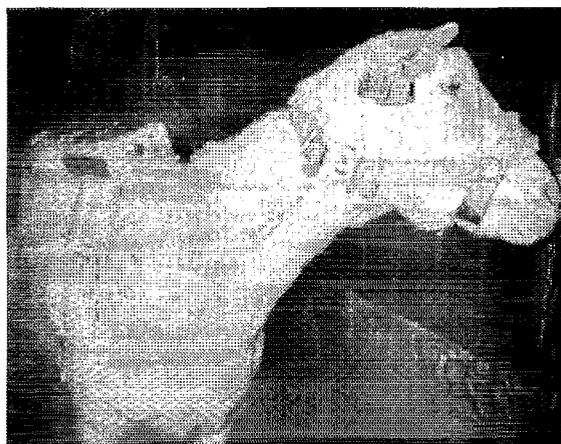


Fig. 1. Goat with the jaw movements recorder fixed on its back. The tube connecting it to the halter can also be seen.



Fig. 2. Halter with the tube that transmits air pulses to the recorder.

The ingested quantities were recorded by placing the feeding pans of the 4 goats carrying the jaw movement recorder, on weighing machines. The weights are transmitted to an adapted electronic memorizer (Fig. 3). Sampling intervals (in minutes) can be varied beginning from a minimal value of 1. We have chosen to record data every 2 minutes for 48 hours. The data recorded can be transferred to a microcomputer afterwards.

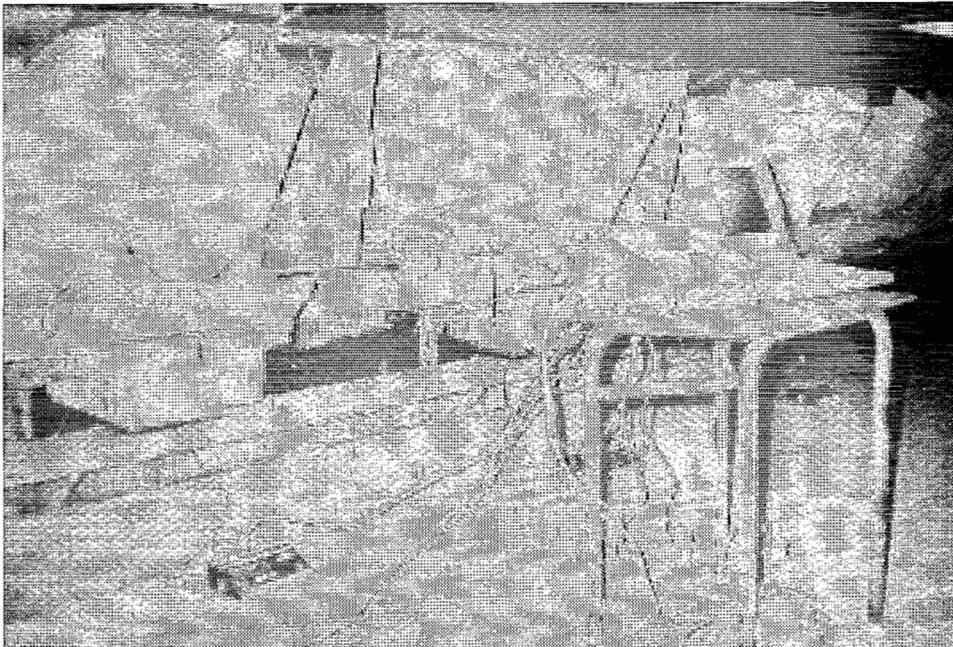


Fig. 3. Intake determination equipment.

Results

The jaw movements recordings results are shown in Fig. 4 where intake, rumination and resting periods are represented over a 24-hour period.

The 24-hour intake curves are shown in Fig. 5. The distribution of 2 meals per day can clearly be seen.

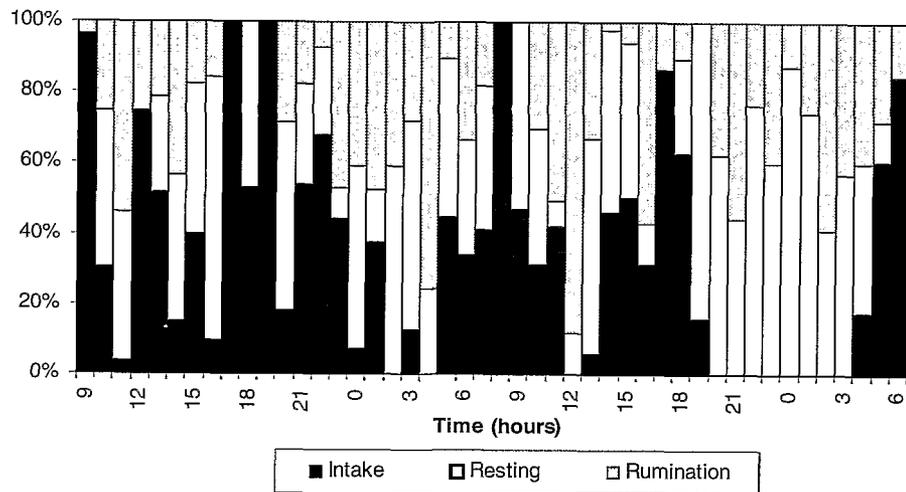


Fig. 4. Activity of 1 goat over a period of 24 hours. Meals were offered at 08:00 a.m. and 05:00 p.m.

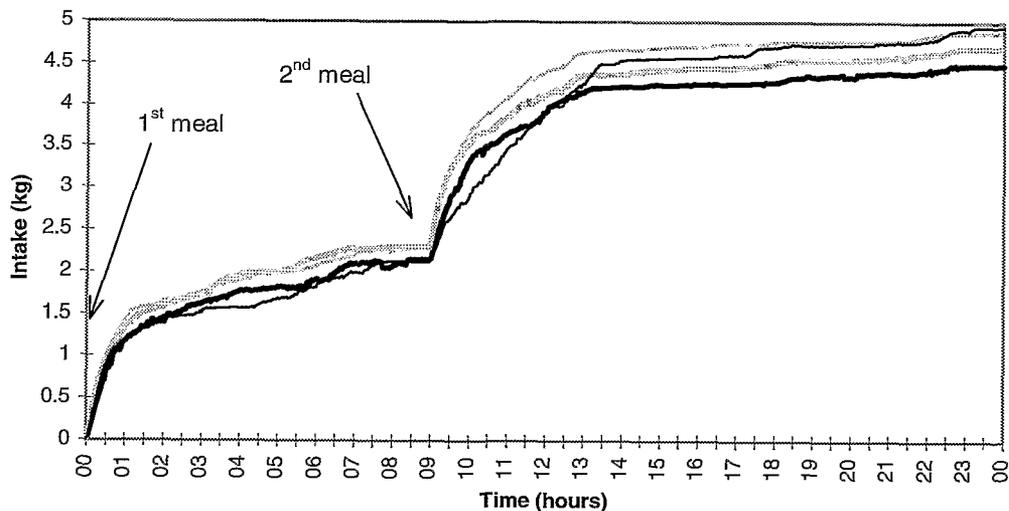


Fig. 5. Ingested quantities during 24 hours by 4 goats receiving 2 meals per day.

Conclusion

The portable device seems to be well adapted to stall-housed goats. Complemented with the intake data recorder, the apparatus provides a complete and exact distribution of intake, rumination and resting periods all over the day.

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