Electronic and visual identification for sheep and goats in Brazil

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Summary

Intra-ruminal devices and plastic ear tags were evaluated in sheep and goats (01-08 years old) in different systems of production in Brazil, where there is no mandatory legislation on traceability for small ruminants. Four electronic devices and two commonly used ear tags were studied in 283 animals distributed in five experiments, in the medium and long terms. The time required for application, the retention rate and the readability of the devices were determined. In Experiment 1, we assessed the long-term retention of plastic ear tags (4.25 g) and mini-bolus (20.0 g) applied on 35 Suffolk male lambs. The retention rate of both devices was 100% after 6 months. At 12 months, the boluses presented 100% retention and the ear tag was 96.9%. The readability for both devices was 100%. In Experiment 2, 57 Suffolk ewes were used. Three intra-ruminal devices (mini-bolus of 21.65 g, n=21; small bolus of 29.52 g, n=18 and standard bolus of 74.4, n=18) were evaluated for ease of application, readability and retention rate. The time of application varied ($P<0.05$) depending on the devices. The standard bolus showed longer time for application (32.8 ± 6.9 s) compared to the mini-bolus (9.5 ± 2.7 s) and small bolus (8.27 ± 2.0 s), which did not differ ($P>0.05$). After 6 months, retention rate and readability for all devices was 100%. In Experiment 3, 127 Ile de France ewes reared in semi-intensive systems were used to evaluate three intra-ruminal boluses (mini-bolus of 21.65 g, n=43; intermediate bolus 40.23 g, n=42 and standard bolus of 74.4, n=42). Standard and intermediate boluses showed 100% readability after 6 months. The readability of the mini-boluses was 97.1%. In Experiment 4, 42 Ile de France ewe lambs were used to evaluate the performance of two intra-ruminal bolus (mini-bolus, 21.65 g, n=23; small bolus 29.52 g, n=19) and an ear tag (5.2 g, n=42). The time required for the application, the readability and retention rate of all devices were determined after 6 months. The time of application for the devices ($P<0.05$) depended on the type of device, and was higher ($P<0.05$) for the mini-bolus (6.34 ± 2.36 s) compared to small bolus (4.45 ± 1.83 s). The intra-ruminal boluses showed 100% of retention and the ear tag, 94.5%. The estimated readability did not change ($P>0.05$) according to the type of device. In Experiment 5, standard bolus (74.4 g), small ear tag, 50 mm x 15 mm (width x height) and big ear tag (42 mm x 48 mm) were evaluated in 22 crossbreed

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Boer female goats for six months, in pastures. The mean time required for the application was 21s and did not differed (P>0,05) among the devices. The loss of one big ear tag was registered, and the retention rate was 95.5%. The readability was 100%. All electronic devices have proven to be highly efficient (100% RR) and could be recommended for sheep and goats. Readability failures and losses of visual devices were registered and it should be often highlighted to the producers. Also, an economic analysis performed along with the electronic devices industry can contribute to the farmers' choice.

Keywords: animal identification, intra-ruminal bolus, ear tag, Brazil, sheep, goats.

Introduction

The need for reliability and accuracy in identifying animals in production systems for recording animal performance (e.g., body weight, inventory, weight gain, births) is one of the key points for traceability (Cappai *et al.*, 2014).

The conventional identification systems of small ruminants like plastic ear tags, necklaces and tattoos are not reliable due to the possibility of violation, exchange and loss of devices. In addition, difficulties in readability of ear tags are observed (Pina *et al.*, 2005).

In Brazil, the use of electronic identification in small ruminants is not yet required by the national legislation. Nevertheless, the farmers have been improving animal control (Hentz *et al.*, 2014), in order to receive the subsidy offered by the meat co-ops, which appreciate better control of herd information.

The objective of this study was to evaluate four electronic ruminal boluses and two commonly used plastic ear tags in five experiments, in medium and long terms, in semi-intensive systems in Brazilian sheep and goat herds.

Material and methods

283 animals were evaluated - 261 Ile de France (n=169) and Suffolk (n=92) sheep and 22 crossbreed Boer goats - in five experiments in the medium and long terms (Hentz *et al.*, 2014; Kowalski *et al.*, 2014). The Suffolk sheep belonged to Sheep and Goat Production and Research Center (Federal University of Paraná, Pinhais, PR, Brazil), Ile de France ones belonged to a private farm (Tangará Ranch, Reserva, PR, Brazil) and the Boer goats to Cabanha do Espanhol private farm (Colombo, PR, Brazil).

A metal applicator with size adjustment (Gesimpex®, Barcelona, Spain) according to the dimensions of the boluses was used for administration in all the experiments. Bolus were manufactured by Certag® Saint Gobain - Ceramics and Plastics - and plastic ear tags by Allflex®. A completely randomized design was used and the animals were the experimental units.

In experiment 1, 35 weaned Suffolk male lambs (22.4 ± 2.6 kg body weight (BW) and 77.5 ± 12.9 days) were used. Mini-boluses of 20.0 g (n = 35), inserted at the weaning, and ear tag of 4.25 g (n=35) inserted on the first day of life, were evaluated. Readings to determine the retention rate of the devices were performed weekly until 6 months and monthly until 1 year.

In the experiment 2, 57 Suffolk ewes (6.0 years and 85.07 kg BW) were monitored for six months in a semi-intensive production system. The animals were raised in Tifton-85 (*Cynodon* spp.) and ryegrass (*Lolium multiflorum* Lam.) and concentrate supplementation was fed daily. The mini bolus of 21.65 g (n=21), small bolus of 29.52 g (n=18) and standard bolus of 74.4 g (n=18) were evaluated.

In experiment 3, 127 Ile de France ewes (3.43 years old and 62.7 kg BW) were monitored for six months in a semi-intensively grazing system of Tifton-85 (*Cynodon* spp.) and Aruana (*M. maximum* cv. Aruana). The mini bolus of 21.65 g (n=43), small bolus of 40.23 g (n=42) and standard bolus 74.4 g (n=42) were evaluated.

In experiment 4, 42 Ile de France ewe lambs (24.2 kg BW) were evaluated in pasture of Aruana grass *(M. maximum* cv Aruana) and ryegrass (*L. multiflorum* Lam.). The devices evaluated were a 5.2 g (n=42) ear tags placed on the first day of life, a mini bolus of 21.65 g (n=23) and a small bolus of 29.52 g (n=19), applied at 82 days of age. The time required to apply the devices was determined. Readings were made between 1-7 days and monthly to determine device retention and readability for 6 months.

In the experiment 5, 22 crossbred Boer goats (4 years old and 52.6 kg BW) were evaluated in a semi-intensive system in limpograss (*H. altissima* cv. Florida) pastures. Standard bolus (74.4 g), small ear tag, 50 mm x 15 mm (width x height) and big ear tag (42 mm x 48 mm) were evaluated since the first week to six months. The time spent for administration / application, readability and retention rate were evaluated.

The readability (Re) and the retention rate (RR) were calculated as described by Caja *et al.* (1999). Data on time for device administration/application were analyzed by ANOVA using the general linear model (GLM), considering the randomized effect associated with the animals. Device retention rate data were submitted to survival analysis by the chi-square test. Statistical analyses were performed using the R Project for Statistical Computing version 2.10.1.

Results and discussion

In experiment 1, no electronic faults were observed and the boluses presented 100% reading capacity. There were also no difficulties in reading the number on the ear tags that could compromise reading ability. Carné *et al.* (2009) suggested that the loss of ear devices could be associated with the detachment of the male and female parts since they observed differences in the coupling diameter between parts of the devices. The retention rate at the end of the evaluation was 97.6% and the mini-bolus presented a 100% retention rate. Thus, after 12 months of evaluation, only the intra-ruminal bolus met the requirements of the ICAR ($\geq$ 98% of TR at 12 months) (ICAR, 2007).

For experiment 2, after six months, 98.2% of the animals initially identified were monitored. Effective retention (100%) at 1 day and 1 week after application is indicative of adequate device design, and after 1 month of evaluation no device was lost. The mean retention rate was 100%. Also, no electronic faults were observed or another problem that compromised the identification of the number of transponders, and, therefore, the estimated reading capacity between the devices was 100%. During the study approximately 5% of the animals lost the ear tag. At the 6-month evaluation, all the devices had 100% retention and thus met the requirements of ICAR ($\geq$ 99% TR at 6 months). The estimated reading capacity for the different boluses was 100%. Because no device losses or failures were observed, statistical differences could not be established for the variables.

At the end of experiment 3, 95.2% were still being monitored. No early losses (1st day of the 1st week) were observed for any of the devices used. This reinforces the idea that their characteristics were adequate and that their retention rates could be maintained along the time. The percentage of electronic failures observed in this study was 0.78%. During the evaluation period, approximately 13 animals (10.23%) lost their ear tags. Most animals that lost the ear tags were older than 2 years, suggesting that visual devices do not allow identification of the animal throughout its life. The results obtained for the mini-bolus and standard bolus are according to the reported in adult sheep (Ghirardi *et al*., 2007).

In experiment 4, after six months, 36 lambs (94.2%) remained monitored. For the mini-bolus, the mean time of application was 6.34 ± 2.36s, being higher (P <0.05) than the time for the application of the small bolus (4.57 ± 1.83s). Ghirardi *et al.* (2007) suggested that the size of the bolus, especially its diameter, are determinant for the swallowing of the animal at the application. The estimated reading capacity of all devices was 100% and the boluses had 100% retention rate, and did not change (P >0.05) according to the device. After two losses in the second month, the retention rate for ear tags was 94.5%.

Finally, in experiment 5, the time spent in the application of all the devices was, in average, 21 s (P = 0.7084) and corroborates the time reported by Carné *et al.* (2010). One big ear tag was lost after one month, reducing the retention rate to 95.5%, and it did not meet the requirements of ICAR (2007). The small auricular ear tags and intra-ruminal boluses had retention rate of 100%, but no difference (P = 0.3170) among the devices was noted.

In general, we may consider that the physical characteristics of the devices were adequate for the effective pre-stomach retention of sheep and goats and the time for application was acceptable. Readability failures and losses of visual devices were registered and it should be often highlighted to the farmers. Also, an economic analysis performed along with the electronic devices industry can contribute to the Brazilian farmers' choice.

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