Turkish Journal of Agriculture - Food Science and Technology, 4(5): 407-410, 2016

Turkish Journal of Agriculture - Food Science and Technology

www.agrifoodscience.com,
Turkish Science and Technology

Readability of Electronic and Visual Ear Tags in Hair Goat Kids

Ferda Karakuş[1*], Ayşe Özge Demir[1], Suna Akkol[1], Adem Düzgün[2], Murat Karakuş[2]

[1]*Department of Animal Science, Agriculture Faculty, Yüzüncü Yıl University, 65080 Van, Turkey*
[2]*Van Directorate of Provincial Food Agriculture and Livestock, 65080 Van, Turkey*

A R T I C L E I N F O

Article history:
Received 03 February 2016
Accepted 30 March 2016
Available online, ISSN: 2148-127X

Keywords:

Animal traceability
Ear tag
Electronic identification
Transponder
Hair goat

* Corresponding Author:
E-mail: fkarakus@yyu.edu.tr

A B S T R A C T

This study aimed to evaluate the readability of electronic and visual ear tags in hair goat kids managed under extensive conditions. A total of 74 kids were identified with electronic and visual ear tags at birth. Readability of electronic and visual ear tags was 97.3% and 94.6% in static conditions at the end of 7 months, and 96.8% and 93.5% at the end of the first year after tagging, respectively. No breakages and electronic failures occurred during this study. Infected ear rate in electronic and visual ear tags was 45.9% and 17.6%, respectively. Under the conditions of this study, electronic and visual ear tags did not fulfill the International Committee for Animal Recording (ICAR) requirements (readability >98%) for an official animal identification device at the end of the first year after tagging. Therefore, low animal traceability with electronic and visual ear tags was determined by this study.

Introduction

Livestock identification and movement tracking systems play an important role in disease and residue control with respect to animal management and public health. However, the key to an efficient traceability system is to identify animals individually with an identifier that is unique, permanent, easy to apply and read, tamper-proof, and welfare appropriate. Electronic identification by using radio frequency passive transponders has the advantage of meeting most of these requirements (Caja et al., 2005). Electronic ear tags (e-ETs) have been proposed as a method for identifying and tracking individual animals in all species (Roberts et al., 2012).

Visual ear tags (v-ETs) are commonly used for identification purposes of goats. In the comparison of v-ETs and electronic boluses for the identification of different goat breeds, Carne et al. (2009a) reported the effects of morphological ear differences between breeds and different management practices on ear tag losses. In the study, it was observed that ear tag features were key factors to improve their retention rate. Another study conducted by Carne et al. (2011) had shown greater damage by biting and breaking of the flag pieces in flag button than in double flag ear tags.

Although rare, there have been studies on the performance of e-ETs and v-ETs for the identification of different goat breeds. Mean values of readability in e-ETs and v-ETs has shown remarkable variability, ranging from 92.3% to 100% in e-ETs (Carne et al., 2009b; Carne et al., 2010) and 82.9% to 100% in v-ETs (Carne et al., 2009a, b; Carne et al., 2010; Carne et al., 2011; Kowalski et al., 2014).

So far no scientific research on the use of e-ETs on kids in Turkey has been undertaken and literature on ear tags in hair goats was not available. Thus, this study aimed to evaluate the performance of e-ETs compared with v-ETs in kids under extensive conditions and to investigate their effectiveness in animal traceability.

Material and Methods

All experimental procedures were approved by Yüzüncü Yıl University Ethical Committee on Animal Experimentation (reference no 2012/06).

Animals and Management

This study was carried out in a rural area in Van province, located in the eastern region of Turkey. A total of 74 male and female kids of hair goat breed were used to study. Kids were kept with their dams in a barn for 20 days after parturition and separated from their dams during the daytime and kept together during the night-time until weaning. There was a separate pen for pregnant goats and kids, and concrete water troughs in the barn. The barn was surrounded by a large, wood-fenced yard, and there were wooden feeders in the yard. Kids and dams were kept separately during grazing on the pasture.

Administration and Monitoring of Identification Devices

At time of birth, all kids were identified on left ears with e-ETs (Allflex) and on the right ears with v-ETs used for compulsory official animal identification in Turkey. Electronic ear tags contained an FDX-B (full-duplex B) transponder, which worked at a frequency of 134.2 kHz, in accordance with ISO standards (ISO, 1996a, b). The button-button e-ET had a weight of 6.6 g and diameter of 27.5 mm. The flag-type v-ET's total weight was 4 g and the dimensions for female and male pieces were 38x40 and 38x35 mm, respectively. Both types of ear tags, which were tamper-proof, plastic (polyurethane), and yellow in color, also had a laser-printed unique identification number.

Retention and reading performance of e-ETs and v-ETs was evaluated on farm conditions for a period of 1 year, biweekly until the 3rd month, and thereafter monthly until the 12th month. The study was conducted on 31 goat kids until the 12th month, because 43 goat kids were sold at the end of 7 months. Each e-ET was read under static conditions in restrained animals using a hand-held transceiver (reader) (Agrident APR500) with a built-in keyboard and integrated antenna. Dynamic reading efficiency of e-ETs was also evaluated by using an ISO-compliant reader, which was connected to a 94x52 cm frame antenna installed on a plastic panel, which was able to read at a maximum distance of 100 cm for e-ETs. The panel reader was mounted on the left side of a runway (width 50 cm). When the kids passed in front of the antenna, each electronic identifier was read and the identification code from the panel reader was transmitted to the computer (Carne et al., 2010).

Electronic and visual ear tags were monitored for loss, damage, and ear tissue reactions at each reading control. An e-ET that was unreadable, but robust, was considered as electronic failure (Carne et al., 2009b). When tags were missing, the date was recorded and the animal was re-tagged. The readability (R) and dynamic reading efficiency (DRE) of ear tags were calculated using the following formulas:

R (%) = (*n* readable devices/*n* applied devices) × 100 (Caja et al., 2014);

DRE = (*n* read transponders/*n* readable transponders) x 100 (Caja et al., 1999).

Statistical Analysis

Losses, electronic failures, and readability of ear tags were analyzed with Cox Proportional Hazard (Cox, 1972) procedure. Non-significant effects (gender, birth type, and birth weight) were removed from the model. A non-parametric Kaplan–Meier survival analysis and log-rank tests of equality across strata were performed for the ear tags with the LIFETEST procedure (Carne et al., 2009a, b). All analyses were performed in SAS (2005) and SPSS (2002) Statistical Software.

Results and Discussion

Results on the performance of e-ETs and v-ETs in kids are shown in Table 1. Two losses of e-ETs were registered at the second and seventh months after tagging. With regard to v-ETs, lost tags were recorded in the first (three tags) and third months (one tag). Readability was 97.3% and 94.6% in e-ETs and v-ETs, respectively, in static conditions (restrained animals) on 74 animals at the end of 7 months. No statistically significant difference between the performances of e-ETs and v-ETs was found. Readability of e-ETs and v-ETs did not reach the ≥99% value recommended by the International Committee for Animal Recording (ICAR) at the sixth month after tagging (ICAR, 2012). Carne et al. (2009a) reported a retention rate of 98.1% for rumen bolus and 91.7% for visual ear tags in different goat breeds at 6 months. In addition, Abecia and Palacin (2014) determined lower retention (63%) and readability (78.2%) rates when compared with the findings in this study for goats identified with electronic leg tags at 6 months after tagging.

Table 1 Performance of identification devices in goat kids

Item	Electronic ear tags	Visual ear tags
Birth to 7 mo of age		
Administered, n	74	74
Lost, n (%)	2(2.7)	4(5.4)
Electronic failures[1], n (%)	0	-
Readable, n	72	70
Readability, %	97.3	94.6
DRE[2], %	100	-
Ear tissue reactions, n (%)	34(45.9)**	13(17.6)**
8 to 12 mo of age		
Previous[3], n	31	31
Administered, n	0	0
Lost, n (%)	0	0
Electronic failures, n (%)	0	-
Readable, n	31	31
Readability, %	100	100
DRE, %	100	-
Birth to 12 mo of age		
Administered, n	31	31
Lost, n (%)	1(3.2)	2(6.5)
Electronic failures, n (%)	0	-
Readable, n	30	29
Readability, %	96.8	93.5
DRE, %	100	-

** $P<0.01$; [1] The number of unreadable transponder with the hand-held reader.; [2] Dynamic reading efficiency (= *n* read devices/*n* readable devices x 100); [3] Forty-three goat kids were sold at 7 mo of age.

Breakages and electronic failures were not observed during this study. Consistent with these findings, no breakages and electronic failures for electronic ear tags were detected during the entire study by Carne et al. (2009b). In the dynamic reading performed under field conditions, corridor width and distance from the base of antenna are mandatory. For sheep and goats, based on the IDEA in-field experiments, the mandatory reading distance for dynamic reading using stationary readers can be reduced to 50 cm with a tolerance of –10% depending on the size of the animals and corridor type (Ribo et al., 2002). DRE of e-ETs in the kids passing through a runway (width 50 cm) using the panel reader was 100% in the duration of the whole study. This result for DRE complied with those reported by Caja et al. (1999), Carne et al. (2011), and Abecia and Palacin (2014) for electronically identified goats. Carne et al. (2009a) reported that the use of small transponders causes poor dynamic reading efficiency due to their short reading distance.

Ear tags may result in an inflammatory response due to the wound created when they were inserted into the ear. Ear wounds should be considered in terms of ear tag losses and welfare implications, since re-tagging of an animal result in increased cost and animal stress. Electronic ET caused more problems than visual ET in this study. Infected ear rate in electronic and visual ET was 45.9% and 17.6%, respectively (P<0.01). Signs of infection were observed in the form of swelling of the ear, irritation under the ear tag, inflammation, and discomfort or pain when touched. All infected ears healed within 10 weeks of insertion of the ear tag based on lesion severity. Carne et al. (2009b) reported 3.3% infection and 6.5% tissue reaction rates for e-ET in goat kids. On the other hand, Kowalski et al. (2014) observed only bleeding in one goat during application of the big visual ear tag. It is thought that the problems in ears with e-ET may be caused by the greater weight due to the presence of a transponder.

No electronic and visual ear tags were lost between 8 and 12 months of age. The readability was 100% for both ear tag types. Carne et al. (2009b) found that button-button and flag-button type e-ET had a significantly higher readability (100 and 100%) than different v-ET types (82.9 and 94.0%) at 6-12 months of age in dairy goats.

The retention and readability of e-ETs and v-ETs was monitored for 1-year with kids kept until the end of the study (Table 1). One loss of e-ETs (3.2%) and 2 losses of v-ETs (6.5%) were registered at 1-year. No difference between e-ETs and v-ETs readability was detected at 1-year of age (96.8 and 93.5%, respectively; P>0.05). As a consequence, readability of e-ETs and v-ETs were found to be under the 98% required by ICAR for official use at the end of the 1-year period after tagging (ICAR, 2012). Carne et al. (2009b) observed 100% readability, fulfilling the ICAR requirements, with no electronic failures or losses in e-ETs at 1-year. However, different types of v-ETs showing 82.9% and 94.0% readability did not meet the ICAR requirements for official use (Carne et al., 2009b). In another study conducted by Carne et al. (2010), loss of 4.3% for double button e-ETs was reported in dairy goats at 1-year, which was higher than the value obtained in this study. Visual ear tag losses displayed high variability depending on the ear tag type and goat breed, ranging from 1.4 to 17.1% (Caja et al., 1999; Carne et al., 2009a; Carne et al., 2010; Carne et al., 2011). Visual ear tag loss rate (6.5%) observed in this study were in the range of the aforementioned values.

Readability values estimated by using the Kaplan-Meier nonparametric survival analyses are displayed in Fig. 1 for birth to 7 months of age and Fig. 2 for birth to 12 months of age. When the survival distribution of the ear tags on 74 goat kids was compared (Figure 1), it was observed that retention of e-ETs was 100% until 2 months of age. Then, 98.6% of e-ETs were retained on the ears from the 2nd month to the 7th month. At 7 months, retention rate was 97.3% for e-ETs. However, retention rates of v-ETs were estimated as 95.9% and 94.6% depending on their losses at 1 and 3 months of age, respectively. Thus, 94.6% of v-ETs were retained on the ears at 7 months of age.

Based on the data for the survival distribution of the ear tags on 31 goat kids (Figure 2), 100% retention in e-ETs was observed until 7 months of age. Then, 96.8% of e-ETs were retained on the ears from the 7th month to the 12th month. However, retention of v-ETs was 93.5% from the 1st month to the 12th month.

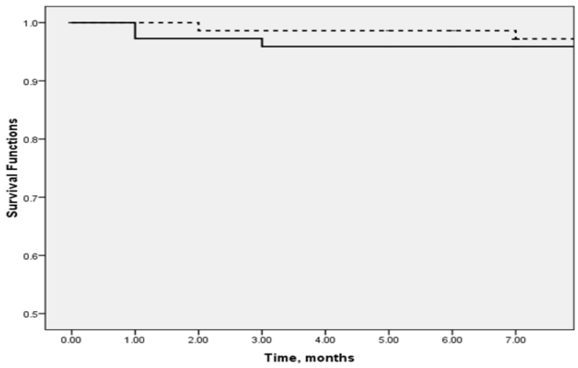

Figure 1 Kaplan-Meier survival distribution functions for electronic (----) and visual ear-tags (—) at birth to 7 mo of age in goat kids

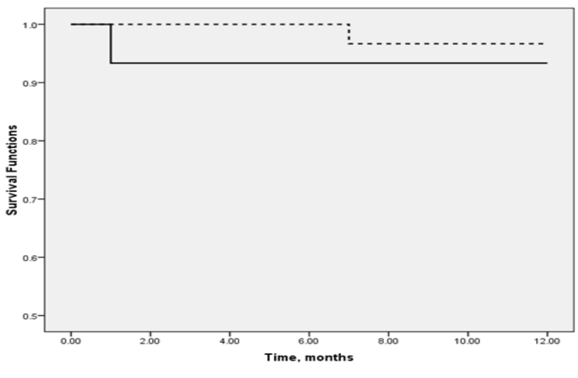

Figure 2 Kaplan-Meier survival distribution functions for electronic (----) and visual ear tags (—) at birth to 12 mo of age in goat kids

In conclusion, in accordance with the requirements of the traceability system, housing conditions and fencing systems in farms should be examined and improved to reduce ear-tag losses and damage caused by snags and traps on farms, because ear tags can be easily pulled from the ear when the animal tucks its ear into fencing, feeder frames, overhangs, and other obstacles in its environment. In addition, the tagging site on the animal's ear is critical for its retention (Karakus et al., 2015). Under the conditions of this study, electronic and visual ear tags did not fulfill the International Committee for Animal Recording (ICAR) requirements (readability >98%) for an official animal identification device at the end of the first year after tagging. Therefore, low animal traceability with e-ETs and v-ETs was determined by this study.

Acknowledgements

The work was supported by the Yüzüncü Yıl University Scientific Research Projects Directorate (project no. 2013-ZF-B072).

References

Abecia JA, Palacin I. 2014. Use of electronic leg tags for identification of small ruminants. Rev Sci Tech Off Int Epiz, 33(3): 783-790.

Caja G, Conill C, Nehring R, Ribo O. 1999. Development of a ceramic bolus for the permanent electronic identification of sheep, goat and cattle. Comput Electron Agric, 24(1-2): 45-63. DOI: 10.1016/S0168-1699(99)00036-8

Caja G, Hernandez-Jover M, Conill C, Garin D, Alabern X, Farriol B, Ghirardi J. 2005. Use of ear tags and injectable transponders for the identification and traceability of pigs from birth to the end of the slaughter line. J Anim Sci, 83(9): 2215-2224. DOI: /2005.8392215x

Caja G, Carne S, Salama AAK, Ait-Saidi A, Rojas-Olivares MA, Rovai M, Capote J, Castro N, Argüello A, Ayadi M, Aljumaah R, Alshaikh MA. 2014. State-of-the-art of electronic identification techniques and applications in goats. Small Ruminant Res, 121: 42-50. DOI: 10.1016/j.smallrumres.2014.05.012

Carne S, Gipson TA, Rovai M, Merkel RC, Caja G. 2009a. Extended field test on the use of visual ear tags and electronic boluses for the identification of different goat breeds in the United States. J Anim Sci, 87(7): 2419-2427. DOI: 10.2527/jas.2008-1670

Carne S, Caja G, Ghirardi JJ, Salama AAK. 2009b. Long-term performance of visual and electronic identification devices in dairy goats. J Dairy Sci, 92: 1500-1511. DOI: 10.3168/jds.2008-1577

Carne S, Caja G, Rojas-Olivares MA, Salama AAK. 2010. Readability of visual and electronic leg tags versus rumen boluses and electronic ear tags for the permanent identification of dairy goats. J Dairy Sci, 93(11): 5157-5166. DOI: 10.3168/jds.2010-3188

Carne S, Caja G, Ghirardi JJ, Salama AAK. 2011. Modeling the retention of rumen boluses for the electronic identification of goats. J Dairy Sci, 94(2): 716-726. DOI: 10.3168/jds.2010-3210

Cox DR. 1972. Regression models and life tables (with discussion). J Roy Stat Soc B, 34(2): 187-220.

ICAR (International Committee for Animal Recording). 2012. International agreement of recording practices. Guidelines approved by the General Assembly held in Cork, Ireland.

ISO (International Organization for Standardization). 1996a. Radio-frequency identification of animals-code structure, ISO 11784:1996 (E), 2nd Ed., Geneva.

ISO (International Organization for Standardization). 1996b. Radio-frequency identification of animals-technical concept, ISO 11785:1996 (E), 1st Ed., Geneva.

Karakus F, Demir AÖ, Akkol S, Düzgün A, Karakus M. 2015. Performance of electronic and visual ear tags in lambs under extensive conditions in Turkey. Arch Anim Breed, 58: 287-292. DOI: 10.5194/aab-58-287-2015

Kowalski LH, Monteiro ALG, Hentz F, Prado OR, Kulik CH, Fernandes SR, da Silva CJA. 2014. Electronic and visual identification devices for adult goats reared in semi-intensive system. Rev Bras Zootecn, 43(2): 100-104. DOI: 10.1590/S1516-35982014000200008

Ribo O, Cuypers M, Korn Chr, Meloni U, Centioli G, Cioci D, Ussorio A, Veran JL. 2002. Large-scale Project on livestock electronic identification IDEA PROJECT. Final Report, version 3.0, April 2002. Available from: http://www.rfidintegrator.pt/rfidintegrator/Relatorios_files/General%20IDEA%20Project_Final%20report_2002%20.pdf [Accessed 21.03.2016].

Roberts AJ, Wallace LE, Harbac M, Paterson JA. 2012. Case study: retention and readability of radio frequency identification transponders in beef cows over a 5-year period. The Professional Animal Scientist, 28: 221-226.

SAS. 2005. SAS/STAT User's Guide: Version 9.3. SAS Institute Inc., Cary, NC, USA.

SPSS. 2002. SPSS for Windows advanced statistics release 11.5v, Chicago, IL, USA.