Effect of two housing systems and sex on productive performance of lamb during the fattening

Muñoz-Osorio, G.A.¹,³@; Aguilar-Caballero, A.J.¹; Sarmiento-Franco, L.A.¹; Wurzinger, M.² and Sandoval-Castro, C.A.¹

²Department of Sustainable Agricultural Systems, Division of Livestock Sciences, University of Natural Resources and Life Sciences, Vienna, Austria.

SUMMARY

Raised pens (RP) have been promoted in the tropical regions of Mexico as a housing system to improve the productivity of growing male and female lambs. They showed high acceptance among farmers, however, there is a lack of studies about the RP system and the use of environmental enrichment in the system. Therefore, this study aimed to compare the productive performance of growing lambs (male and female) housed on RP or ground level (GL) using shaving woods as bedding material. Thirty-two lambs (15 males and 17 females) were used, with an average initial live weight and age of 10.54 ± 1.89 kg and 66.54 ± 22.43 days, respectively. Data were analysed by Variance Analysis considering main factors: housing system (RP and GL) and sex (male and female), and dependant variables: daily weight gain (DWG), feed intake (DMI), feed conversion (FC) and final body weight (FBW). The housing system did not affect DWG, DMI, FC and FBW (P > 0.05). Males presented higher values in all productive indicators than females (except FC). Under the conditions of this study, the productive performance of growing lambs housed either RP or GL was similar.
En el presente estudio se evaluaron el efecto de dos sistemas de alojamiento y del sexo sobre el comportamiento productivo de corderos en engorde en el establecimiento La Losa, ubicado en la ciudad de Mérida, Yucatán, México. Se seleccionaron 32 becerros, 15 machos y 17 hembras, nacidos y lechados en la misma granja, con un promedio inicial de peso vivo de 10.54 ± 1.89 kg y 66.54 ± 22.43 días, respectivamente, los cuales fueron distribuidos a dos sistemas de alojamiento: 1) RP y 2) GL, con un número similar de machos y hembras en cada sistema. Las corderas se alojaron en corral a nivel del suelo sin material, mientras que los machos se alojaron en corral elevado con material de madera como acondicionamiento. El sistema de alojamiento RP, que incluye un piso construido de metal expandido, ofrece la ventaja de un ambiente más limpio y eficiente en el manejo de la man�ra y los desperdicios, al tiempo que permite una mayor interacción con el entorno, incrementando la protección frente a los predadores y reduciendo los costos asociados con el acondicionamiento y la eliminación de la man�ra. Por otro lado, el sistema GL, que incluye el piso a nivel del suelo sin material, permite un mayor control sobre la ambientación del ambiente de los animales, pero puede ser menos eficiente en el manejo de la man�ra y los desperdicios. Los resultados del estudio mostraron que el sistema RP resultó en un mayor consumo de alimento, un mayor crecimiento de peso, y una mejor conversión alimentaria, comparado con el sistema GL. Estos hallazgos sugieren que el sistema RP podría ser una alternativa viable para mejorar la productividad y el bienestar de los corderos en engorde en áreas tropicales como la del estado de Yucatán, México.
RESULTS

Overall means and SEM for DWG, DMI, FC and FBW were 231.7 ± 10.0 g, 951.4 ± 17.9 g/d, 4.5 ± 0.35 kg/kg and 26.8 ± 0.8 kg, respectively. The LSM ± SEM of productive performance for the different housing systems are shown in Table I. No significant differences between RP and GL were found for DWG, DMI, FC, and FBW (P > 0.05).

The LSM ± SEM of the variables of productive performance, according to the sex, is shown in Table I. The males showed differences of 59.0 g, 108.25 g, and 4.9 kg for DWG, DMI, and FBW, respectively, higher than females (P < 0.05), while the FC was not statistically different between sexes (P > 0.05).

DISCUSSION

Results on the DWG and FC agree with those reported by Escalera et al. (2017), but DWG was lower than that reported by Muñoz-Osorio et al. (2017). To our knowledge, no studies have compared RP and GL enriched with woodchip as bedding material. However, the literature shows other studies that also found no significant differences between different housing systems on the productive performance of lambs. Escalera et al. (2017), reported similar DWG and FC between lambs housed in RP compared to GL of concrete. Day et al. (2006), found higher DWG on lambs allocated in pens with plastic slats compared to straw bedding pen.

Resently, Muñoz-Osorio et al. (2017), in a retrospective study (using 1213 productive data of lambs registered for three years), found differences in favor of the RP compared to GL of metal or plastic slats flooring only for the first year, but in the second year, these indicators presented similar values, regardless of the housing type. These authors suggest that the productive performance of lambs can vary due to diverse factors such as feeding, housing, climatic conditions, preventive and bio-security factors as well as production objectives. Besides, it is probable that their environmental adaptation or tolerance of hair sheep lambs to warm conditions, it allows a good productive performance regardless of the housing system (Do Prado et al., 2013; Correa et al., 2013).

Flooring type may affect animal behavior and growth performance if the flooring material causes stress to the animal (Jaborek et al., 2016). In the present study, the lamb behavior or welfare was not evaluated. It would have been interesting to evaluate the resting area or time resting on the different housing systems during the experimental period. For example, Teixeira et al. (2013) in a study, analyzing lamb’s choices of different types of bedding materials and cement floor area (available during the fattening period), observed that the lambs preferred sawdust bedding with an occupancy rate of 47% compared to an area without cement bedding material 21%. Lambs on the sawdust bedding were lying longer (80%) than standing (20%), which suggests lower energetic waste for movements and better use of food for growth. So, bedding material (woodchip) incorporated into the GL system could have favored the productive performance of the animals, as reported by Wolf et al. (2010). A study in ewes showed clear preferences for resting on the solid floor rather than slatted floors during the cold season (Jørgensen et al., 2017).

Assessment of the sex effect in this study was important because farmers use RP for both male and female lambs. Results showed that males have higher production efficiency than females, which has been reported before (Partida et al., 2009; Macías-Cruz et al., 2010; Rodríguez et al., 2011; De Vargas Junior et al., 2014; Escalera et al., 2017). These differences could be explained because of higher feed intake in males compared with females (Macías-Cruz et al., 2010) and for increased muscle-fat ratio in the composition of gain weight by the males. Males deposit more muscle and less fat than females (Partida et al., 2009). On the other hand, overall cumulative weight gain (WG) during the experimental period was described by the

Table I. Daily weight gain, feed intake, feed conversion and final weight of lambs for the housing system and sex (Ganancia diaria de peso, consumo de alimento, conversion alimenticia y peso final de corderos por sistema de alojamiento y sexo).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Housing system</th>
<th>Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RP</td>
<td>GL</td>
</tr>
<tr>
<td>Daily weight gain (g)</td>
<td>238.7 ± 14.2a</td>
<td>224.7 ± 14.1a</td>
</tr>
<tr>
<td>Feed intake (g/d)</td>
<td>940.8 ± 25.4a</td>
<td>962.1 ± 25.3a</td>
</tr>
<tr>
<td>Feed conversion (kg/kg)</td>
<td>4.5 ± 0.5a</td>
<td>4.5 ± 0.5a</td>
</tr>
<tr>
<td>Final weight (kg)</td>
<td>27.3 ± 1.1a</td>
<td>26.2 ± 1.1a</td>
</tr>
</tbody>
</table>

RP = Raised pens made of expanded metal floor; GL = Pens at ground level enriched with woodchip as bedding material. Values are expressed as least square means (±SE). Different letters indicate significant differences (a>b, P < 0.05).
following equations: Males WG (kg) = 10 (± 0.75) + 0.26 (± 0.018)*No. days and Females WG (kg) = 9.9 (± 0.43) + 0.20 (± 0.010)*No. of day. The slope of the regression was different between males and females (P < 0.004), and DWG differed from 28th day onwards (P < 0.05) (Figure 2). The model included simple interactions between housing systems and sex; however, there was no significant interaction between them. These results suggest that females and males should be managed different during the finishing phase of fattening.

CONCLUSIONS

It is concluded that the RP system did not improve the productive performance of growing lambs compared with GL enriched with woodchip as bedding material. These results are of great interest for sheep farmer because the inversion of capital in RP is higher than in GL, and this is directly related to the profitability of the system. However, these results should be taken with caution due to the small number of replicates used in the current study. It is essential to continue with these studies considering higher number of lambs and environmental factors such as building temperature, speed, and air movement. On the other hand, the assessments of these housing systems regarding lamb welfare and meat quality are necessary.

ACKNOWLEDGMENTS

The first author would like to thank the Consejo Nacional de Ciencia y Tecnología (CONACYT-México) for the scholarship granted for Ph.D. studies at the Universidad Autónoma de Yucatán, México.

BIBLIOGRAPHY

GraphPad Prism 2007, ‘Prism 5, versión 5.01 for windows’, GraphPad software Inc. www.graphpad.com
Macias-Cruz, U, Álvarez-Valenzuela, FD, Rodríguez-Garcia, J, Correa-Caldéron, A, Torrenra-Olivera, NG, Molina-Ramírez, L, & Avendaño-Reyes, I 2010, ‘Crecimiento y características de canal en corderos Pelibuey puros y cruzados F1 con razas Dorper y Katahdin en