Effect of a Middle-Term Flushing in Chilota and Suffolk Down Sheep Breeds in Chiloé Archipelago

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Abstract

In Chiloé Archipelago, traditional and short-term flushing are not usually feasible for small-scale sheep farms due to economic and logistic reasons, and cheaper/easier alternatives are needed. The effects of flushing on the reproductive performance of sheep can vary depending on the breed; nevertheless, this effect has never been compared between Chilota and other breeds in Chiloé. The objective of this study was to assess the effect of the application of a middle-term flushing in fertility, prolificacy and lamb mortality in two sheep breeds in Chiloé archipelago, Chile. Under the conditions of this study, the supplementation (300g of concentrate per sheep per day) for ten days before and after the introduction of the ram in the flock was an efficient tool to improve the fertility and prolificacy on Chilota and Suffolk Down ewes, becoming an alternative to traditional and short-term flushing in low technology sheep farms in Chiloé Archipelago.

Key words: Chilota Sheep Breed, Ruminants, Supplementation, Prolificacy

Introduction

Flushing is the generic name of a productive tool consisting on raising the nutritional level of ewes prior to joining in order to improve lambing percentage through a rise in the ovulation rate and embryo survival, and consequently improving the reproductive indices, especially prolificacy (Gunn, 1983; Somchit et al., 2007). The food input can be carried out in several ways, i.e. allowing the sheep to graze on good pastures and/or providing silage, conserved high quality forage or concentrate.

The nutritional boost must be carried out in some very concrete days of the oestral cycle to be effective in order to obtain the desired effect in reproductive indices. In the traditional (so-called long-term) flushing, ewes are not usually synchronized, and sheep receive the supplement along various oestral cycles along the reproductive season and continue receiving it for some additional weeks; it involves the supplementation during at least the four weeks before and the two-three weeks after mating. This modality usually generates a rise in the live weight (Scaramuzzi et al., 2006; Ambereen et al., 2014). If ewes are in a very poor or very high Body Condition Score (BCS) before mating, flushing will not...
significantly improve the ovulation rate since it is known to have optimal effect in animals with an intermediate BCS (2.5) (Parr et al., 1992; Dudouet, 2003). The traditional flushing is an expensive productive tool, since high amounts of supplementary food are needed, and can imply also logistic difficulties (shipping and storage of the feedstuff) for small-scale producers in isolated areas.

There is a variation, the short-term flushing, where the nutrient input is performed only for some days around luteolysis, without changes in body weight or body condition score of the sheep (Stewart and Oldham, 1986, Martin et al. 2004). In the short term flushing, the amount of feedstuffs needed is lower, but a very strict control of the estrous cycle is required to be effective. Therefore, this kind of flushing is often accompanied by hormonal synchronization of the ewes, which involves material costs, labor hours and skilled workforce that, in most cases, the small-scale sheep producers can neither afford. The alternative to hormonal synchronization is the natural synchronization of the ewes when the ram is introduced into the flock (male effect), but, in this case, is very difficult to determine the exact time of ovulation since ewes can show individual variation.

It is clear that both modalities of flushing are expensive and/or logistically difficult to carry out by sheep smallholders, either for the extra feeding or the technology to carry out the artificial synchronization of the ewes. This productive tool cannot be afforded by sheep smallholders in Chiloé, and the study of clean, green and ethical alternatives for the use of this practice (involving lower amount of food and/or technology) are needed (Matin and Kadokawa, 2006; Scaramuzzi and Martin, 2008).

There are some background in the literature about the fact that a middle-term flushing (10 days before the beginning of mating) can lead to increased ovulatory rate and multiple birth without spending big amounts of food (Fernández et al., 2007; Banchero and Quintans, 2008). In this experiment, a twenty-day intermediate form of flushing was tested, under the usual productive conditions of smallholders in Chiloé, i.e. low technology inputs and absence of winter supplementation (Peña et al., 2015).

It is also known that the effects of flushing on the reproductive indices can show variations depending on the breed (Lassoued et al., 2004). In Chiloé, two breeds are mainly used by sheep smallholders: Chilota (CH) and Suffolk Down (SD) (De la Barra et al., 2015) but little is known about the effects of flushing in these breeds under the environmental and management conditions of the archipelago.

The objective of this study was to assess the effect of the application of middle-term (intermediate) flushing in fertility, prolificacy and lamb mortality in two sheep breeds in the Chiloé Archipelago, Chile.

**Material and Methods**

The study was conducted between February and September at the INIA Butalcura Research Center, located in Chiloé, Chile. Two flocks composed by 34 ewes and one ram each were used, the first belonging to CH and the second to SD breeds. All sheep were 3 years old and were in homogeneous body
condition scores (2,5). Before the beginning of the trial, males and females on each flock had no visual or olfactory contact for several months. On day one, the two rams were introduced into their respective flocks. The animals were allowed to free grazing in two 5 ha naturalized pastures with the same botanical composition and separated by a fence. The stocking rate was adjusted to meet and the usual stocking rate in the area of study. Each night, the flocks were enclosed at 9:00 pm in separated sheds, with free access to fresh water but no access to food, being released at 9:00 am in the morning.

In this experiment, an intermediate modality of flushing (twenty days in length) was tested. Ten days before and ten days after the introduction of the rams into the flocks, half of the sheep on each flock were given 300g/animal of concentrate (2,52 Mcal EM/Kg, 16,8%PC) on individual feeders (Flushing treatment) before being released in the morning. This amount of concentrate increase in about 45% the EM and 73% the CP required by a 50 Kg LW sheep in maintenance. All the concentrate was eaten by sheep. The rest of the sheep did not receive concentrate (Control treatment). Once finished the supplementation period, sheep and rams on each flock continued grazing together, and natural mating continued until three full estrous cycles of 17 days each were completed.

At lambing, in September 2012, data about number of born lambs and birth type were collected and used to analyze the effect of breed and treatment in the fertility (lambing sheep/ mated sheep), prolificacy (born lambs/lambing sheep) and mortality (dead lambs/born lambs). Analysis of data was carried out by means of the SAS (SAS Institute, Cary, NC) statistic program. The effect of the presence/absence of supplementation and the breed in fertility, prolificacy and mortality was submitted to analysis of variance. Breed/treatment interaction neither was nor tested. A logistic regression was also performed, where the probability of multiple lambing (two or more lambs) was modeled.

**Results and Discussion**

Regardless of the breed, the 20 days flushing significantly increased prolificacy of the ewes (P=0.017) (Table 1). The logistic regression brought an odd-ratio of 2.8 for flushed sheep (data not shown), indicating that the flushing group had 2.8 times more probability of multiple lambing compared to control group. It is difficult to compare these results since, to the best of our knowledge, no experiments using natural synchronization and a 20-day concentrate flushing have been carried out, and most of them are focused in ovulation rates more than fertility and prolificacy rates. Viñoles et al. (2009) found that grazing *Lotus corniculatus* for 12 days prior to mating tended to increase the number of twin lambs born (prolificacy) in Corriedale ewes. These authors also found increases in ovulation rate to 7 days feeding with a concentrate rich in energy and protein (corn grain and soybean meal). Robertson et al, 2014 reported that unsynchronised Merino ewes that grazed lucerne pasture for 7 days before joining and for the first 7 days of a 5–6-week joining produced up 21% extra fetuses compared with ewes grazing cereal
stubble with minimal live herbage. In addition, these authors found that grazing lucerne in the peri-conceptual period did not increase the fertility rate (proportion of non-pregnant ewes); nevertheless, in our study, a 10-day before and 10-day after joining flushing significantly increased the the fertility (P=0.005) of the ewes. When all sheep were considered together, mortality was not affected by the treatment (P=0.359).

Table 1: Effect of flushing (20 days in length) on reproductive indices and lamb mortality

<table>
<thead>
<tr>
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<th>Control</th>
<th>Flushing</th>
<th>Pr&gt;F</th>
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<tbody>
<tr>
<td>Fertility (%)</td>
<td>79.4</td>
<td>100</td>
<td>0.005</td>
</tr>
<tr>
<td>Prolificacy (%)</td>
<td>140.7</td>
<td>167.6</td>
<td>0.017</td>
</tr>
<tr>
<td>Mortality (%)</td>
<td>28.9</td>
<td>15.8</td>
<td>0.359</td>
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Regarding to the breed effect (Table 2), CH showed higher fertility values than SD (91.2% vs. 88.2%), and SD presented increased prolificacy compared to CH (160% vs. 151.6%). Differences were not significant between breeds for these two parameters. On the other hand, CH breed showed significantly lower mortality percentage (P=0.026) than SD did (12.8% and 29.2% respectively). SD showed percentages of fertility that match the range for this breed found in the literature, and higher prolificacy compared to previously reported values (Crempien and Avendaño, 1988). Reproductive indices cannot be compared for CH, since no data about fertility or prolificacy have been published until now. This breed showed a significantly lower mortality than SD, probably due to its hardiness and higher maternal ability (Martínez et al., 2012).

Differences in the effect of the flushing have been previously reported for different sheep breeds by Lassoued et al. (2004). British sheep breeds such as Suffolk Down have a very short breeding season in the fall, while the breeds coming from Mediterranean climates, such as Spanish breeds, have a longer breeding season, more susceptible to food availability than other variables. In this sense, CH breed descent from the Spanish ancestors which were introduced to the Archipelago 450 years ago (De la Barra et al., 2009), and the different genetic origin may determine differences between these two breeds in the response to flushing. Nevertheless, in this study no differences in fertility and prolificacy were found between breeds, probably because both have undergone a process of adaptation to the environmental conditions, even known that SD has been introduced in the early 70`s in Chiloé. Despite the lack of similar studies to compare, Robertson et al. (2014) found that Merino and First Cross ewes had the same negative response to flushing, due to the fact that First Cross ewes could have not responded to the treatment at the commencement of the breeding season. In our study, the only parameter that showed differences between breeds was the mortality percentage, which was expectable, since CH has been proved to be more resilient and competitive in adverse conditions and lack of management (Martínez et
al., 2012), and known that the winter, specially the days around the lambing date, was especially harsh, and the sheep did not receive subsequent supplementation after the experiment.

**Table 2:** Effect of flushing (20 days in length) on reproductive indices and lamb mortality of Chilota and Suffolk Down sheep

<table>
<thead>
<tr>
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<th>Chilota</th>
<th>Suffolk Down</th>
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<tr>
<td>Fertility (%)</td>
<td>91.2</td>
<td>88.2</td>
<td>0.695</td>
</tr>
<tr>
<td>Prolificacy (%)</td>
<td>151.6</td>
<td>160</td>
<td>0.310</td>
</tr>
<tr>
<td>Mortality (%)</td>
<td>12.8</td>
<td>29.2</td>
<td>0.026</td>
</tr>
</tbody>
</table>

**Conclusions**

Under the conditions of this study, the supplementation with 300 g/ewe/d of commercial concentrate for twenty days around the beginning of mating is an effective tool to improve the fertility and prolificacy on Chilota and Suffolk Down breeds, and can be a cheaper and easy alternative to traditional and short flushing in low technology sheep farms in Chiloé Archipelago. Further studies are required to go in depth about these results, in order to analyze the effect of other supplements in these and other reproductive parameters.

**References**


