

## Low doses of gonadotropin chorionic equine (GCe) to Pelibuey and Pelibuey x Romanov ewes

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A study was developed including low doses of gonadotropin chorionic equine (GCe), the ewes' genotype and the production value of the lambs at weaning which were the offspring of hair sheep ewes. Thirty nine multipara ewes of the genotype Pelibuey purebred and the Pelibuey x Romanov cross, were synchronized using intravaginal sponges impregnated with flurogestone acetate (FGA) for 12 d. At the eleventh day of treatment, ewes of each genotype were divided in two groups and injected with 140 or 280 immunizer units (IU) of GCe. A total of two matings corresponded to each female, with 12 h interval between each one. A completely randomized design with a 22 factorial arrangement was applied to analyze the information. None of the variables was affected ( $P > 0.05$ ) by the interaction dose x genotype or by the main effect of GCe dose. The production value was 25% higher in Pelibuey ewes than in Pelibuey x Romanov. Likewise it was in 32% of ewes treated with 280 IU regarding those receiving 140 IU of GCe. It is concluded that production value of the lamb at weaning is the same in Pelibuey and Pelibuey x Romanov ewes, treated with doses of 140 or 280 IU of GCe.

**Key words:** *hair ewes, cross, oestrus synchronization, economical analysis, lamb kilograms, economical income*

Hormonal treatment based on synthetic progestogens and one injection of 400 IU of GCe (Barret *et al.* 2004) is the synchronization protocol mostly used worldwide, including in Mexico. The application of this procedure has shown improvements in the fertility, prolificacy and productivity of hair sheep ewes (Quintero *et al.* 2011) and wool (Wildevus 2000 and Zeleke *et al.* 2005) ewes. However, this protocol is presently expensive, since it reduces the net economical incomes of the producers. Really, the addition of GCe is what makes expensive this protocol, since each 100 IU costs, approximately, \$ 36.00. The recommended dose is of 400 IU, which involves an extra cost per treated ewe with intravaginal sponge of \$144.00 (Ponce 2011). Applying doses below the 400 IU could be an alternative, provided that these doses do not reduce ewe productivity. There are evidences that the application of 200 or 300 IU to hair sheep ewes can propitiate similar lamb production at birth than the application of 400 IU (Macías-Cruz *et al.* 2009 and Quintero-Elisea *et al.* 2011). Some researchers (Ataman *et al.* 2006, Martínez *et al.* 2007, Avendaño *et al.* 2007 and Luther *et al.* 2007) coincide in stating that protocols of oestrus synchronization, progestogen mixes and GCe, increase the production of lambs during the anestrus period and the reproductive season. The rate of ovulation, fertility, prolificacy and multiple lambing percentage increase significantly. However, there are no results in the literature regarding the economical characteristics of the production in hair sheep breeds as effect of the GCe dose. The objective of this study was to evaluate the effect of low doses of GCe and of the ewe's genotype on the production value of the lamb at weaning in purebred Pelibuey ewes and their crosses with Romanov synchronized with progestogen.

### Materials and Methods

The experiment was carried out in the sheep facility of the CBTa No 42, located in Ejido Benito Juárez, Mexicali Valley, B.C. Mexico. The region is characterized by arid climatic conditions, with maximum temperatures in summer ( $> 40^{\circ}\text{C}$ ) and minimum in winter ( $0^{\circ}\text{C}$ ) (García 1987). Mean annual rainfall is 84.5 mm occurring in November and December.

Thirty nine multipara ewes (from three to four years of age) were distributed in two groups (19 Pelibuey and 20 Pelibuey x Romanov) according to live weight ( $42 \pm 9.82$  kg) and body condition ( $3.0 \pm 0.42$ ). All ewes were synchronized using an intravaginal sponge impregnated with 20 mg of FGA (Chronogest, Intervet) for 12 d. Twenty four hours before the withdrawal of the sponges, ewes of each genotype were randomly divided in two groups for applying one of the two GCe doses: 1) 140 IU and 2) 280 IU.

Once completed the synchronization protocol, females were regrouped according to GCe dose and 12 h post withdrawal of the sponge they were exposed to two adult males (Dorper and Pelibuey) for 48 hr, one per group. There were a total of two matings for each female, with a 12 h interval between each one. Mated ewes and lambings were recorded. From mating until lambing, ewes were maintained together in an open corral (6 x 6 m) provided with shadow, water and feeding troughs. Male and female feeding before and during the experimental period, was based on Sudan hay and alfalfa grass *ad libitum*. Water availability was constant and with free access.

Additionally, at birth and at weaning the number of lambs alive per lambing ewe and the individual live weight of these lambs were recorded. From this information the

weight and price of weaned lambs, the production value per ewe at weaning based on the live weight and size of the litter, gross value of the production based on the volume and number of lambs, value of the production for each 100 ewes per treatment with production costs added and cost-benefit ratio, were calculated. It was considered the price per kilogram of lamb alive of \$28.00, and that of the lamb between birth until weaning of \$450.00. Expenses generated per ewe from mating until weaning of their lambs were of \$610.50 (feed, synchronization protocol and one worker). A completely randomized design with a 22 factorial arrangement was used. The model included fixed effects of GCe dose, genotype and interaction between factors. All analyses were made using the statistical package SAS (2004).

### Results

The group of purebred Pelibuey ewes weaned six lambs more than the crossbred group. This also led to more kilograms of lambs weaned (441 vs 360 kg/group of treated ewes). Additionally, the group of treated ewes with the highest dose recorded more lambs and consequently, 132 kg more of weaned lambs (table 1). The above mentioned results did not affect significantly ( $P > 0.05$ ) the production values/ewe served or lambled ewe ( $P > 0.05$ ) as effect of the ewe's breed or GCe dose. The kilograms of lamb and of weaned lamb were considered \$ 28.00 and \$ 450.00, respectively. However, there were numerical differences between

Pelibuey ewes and their crosses with Romanov, and between ewes treated with 140 and 280 IU of GCe. From the litter live weight, the production value per ewe served and lambled was of \$ 149.00 and \$ 72.60, respectively. This was higher in purebred Pelibuey than in crossbreds. Likewise, it was higher \$132.00 and \$162.00, respectively in ewes treated with 280 IU, regarding those receiving 140 IU of GCe. This situation was verified when the production value was estimated based on litter size. Namely, purebred Pelibuey ewes and those treated with 280 IU of GCe recorded higher incomes per ewe at weaning.

Crossbred Pelibuey x Romanov ewes and those treated with 140 IU showed lower economical incomes for the sale of their lambs at weaning, given that the survival rate showed a tendency to be lower in crossbred ewes, treated with 140 IU of GCe (table 2).

The economical analysis started from 100 ewes of each genotype and for each dose (table 1). All calculations were based on the reproductive and productive parameters previously obtained in this study as effect of the dose and the genotype of the ewe. Purebred Pelibuey ewes and those treated with 280 IU weaned higher number of lambs and thus, had greater amount of kilograms of lambs weaned. On considering a production cost of these lambs of \$ 582.50 per synchronized ewe, regardless the breed and of \$ 550.00 and \$ 615.00 for treated ewes with 140 and 280 IU of GCe, respectively, the cost-benefit ratio was positive for

Table 1. Economical characteristics of the production of Pelibuey and Pelibuey x Romanov ewes synchronized with low doses of GCe

Indicators	Ewe breed		PMSG dose	
	Pelibuey	Romanov	140 UI	280 UI
Number of weaned lambs, n	27.00	21.00	20.00	28.00
LW of weaned lambs, kg	441.04	359.91	334.54	466.41
Price per kg LW, \$	28.00	28.00	28.00	28.00
Price per lamb alive, \$	450.00	450.00	450.00	450.00
Production value per treated ewe, \$				
Based on litter weight	652.73±115*	503.86±115*	468.35±115*	688.24±115*
Based on litter size	640.00±102.7*	472.50±102.75*	450.00±102.7*	662.50±102.7*
Production value at weaning per lambled ewe, \$				
Based on litter weight	828.51±119.67*	756.11±119.67*	711.71±119.67*	872.90±119.67*
Based on litter size	881.25±88.31*	759.37±88.31*	731.25±88.31*	909.37±88.31*
Gross value of the production per treatment, \$				
Based on total volume, kg	12349.12	10077.48	9367.12	13059.48
Based on the number of lambs	12150.00	9450.00	9000.00	12600.00
Value of the production per each 100 ewes synchronized per treatment (based on litter weight)				
Number of weaned lambs, n	142.00	105.00	100.00	147.00
LW of weaned lambs, kg	2319.54	1799.55	1672.7	2343.65
Gross production value, \$	64947.12	50387.40	46835.60	65622.20
Production costs, \$	58250.00	58250.00	55000.00	61500.00
Cost-benefit ratio	1.12	0.87	0.85	1.08

\* $P > 0.05$

Table 2. Effect of low doses of GCe on the survival rate per lamb ed ewe

Days	Pelibuey		Pelibuey x Romanov	
	140 UI	280 UI	140 UI	280 UI
30	1.00±0.08*	0.86±0.08*	0.83±0.08*	1.00±0.08*
60	0.96±0.10*	0.87±0.10*	0.72±0.10*	0.96±0.10*
90	0.92±0.12*	0.79±0.12*	0.57±0.12*	0.90±0.12*

\*P &gt; 0.05

purebred Pelibuey ewes (1.12) and for treated ewes with 280 IU of GCe (1.08). However, crosses with Romanov (0.87) or treated with 140 IU (0.85) showed a negative cost-benefit ratio.

### Discussion

It is well-known that as lamb mortality increases in a commercial exploitation the economical incomes regarding this activity diminish. The highest mortality recorded in lambs of crossbred ewes could be possibly related to the adaptation of the litters and the ewe to the environmental conditions of caloric stress, if taken into consideration that animals were born in the summer.

In studies with lambs, Pineda *et al.* (1998) and Atsan *et al.* (2007) demonstrated that as the GCe dose is increased, the number of lambs at birth and at weaning increases, which leads to higher economical incomes. Macedo and Castillanos (2004) indicated that one of the key economical elements of this intensive system is the high prolificacy index, since the maintenance cost of the animal does not vary significantly, in case of decreasing the number of lambs born per female. Brown *et al.* (1999) reported that the weaning index represented the main productive variable influencing on the profits of a sheep exploitation, since the fixed cost per animal is basically the same, regardless its productive level.

With purebred Pelibuey ewes and treated with 280 IU, 10 cent per dollar invested were earned, while in the remaining groups 14 cent were lost as average for every dollar invested. The numerical differences established for the survival rates during the pre-weaning period account for these results.

Supplying an adequate feeding and the application of this oestrus synchronization protocols at different summer periods could favor the increase of fertility, prolificacy, survival rate and weaning live weight of lambs and consequently, increase the net economical incomes. Atsan *et al.* (2007) carried out an economical evaluation when different production systems are utilized, including the use of hormonal treatments with intravaginal sponges and GCe. These authors found that the use of GCe favored the increase in the number of weaned lambs per treated ewe, and thus, the economical incomes. In general, results of this paper show that the application of GCe increases the production costs, as well as lamb production, and improves thus, the economical incomes for producers.

From the conditions of this study, it is concluded that the use of doses of 140 and 280 IU of GCe showed similar economical production value of lamb at weaning in Pelibuey and Pelibuey x Romanov ewes.

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