

## SHORT COMMUNICATION:

# The influence of the prolificacy gene Fec B on the reproductive biology of 3/4 Romney Marsh x 1/4 Merino Booroola ewes

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## ABSTRACT

Some aspects of estrous were evaluated during the reproductive season in 72 3/4 Romney Marsh x 1/4 Merino Booroola ewes. Daily distribution of onset of estrous, length of estrous and incidence of anovulatory cycles for carrier and non carrier females of the prolificacy gene FecB was studied. For these parameters the genotypes were statistically similar. Ovulation rate was greater in FecB gene carriers than in non carriers. This shows that the Fec gene acts mainly on the ovulation rate, without changing aspects of estrous behavior.

## INTRODUCTION

Though prolific sheep strains are not a good alternative for productivity improvement of sheep industry under extensive breeding conditions (Bradford, 1985), they are useful models to study reproductive biology in sheep (Haresign, 1985). Among the prolific strains, Merino Booroola presents high ovulation rates due to the action of a major gene (Piper and Bindon, 1982) named FecB by the Committee on Genetic Nomenclature of Sheep and Goats (GOGNOSAG, 1989), nowadays with world-wide distribution (Thimonier *et al.*, 1991). However, there is little information concerning natural estrous in breeds introgressed with this prolificacy gene. The aim of this study was to determine

the effect of the Fec gene on some aspects of estrous behavior within a Romney crossed flock.

## MATERIAL AND METHODS

A total of 72 3/4 Romney Marsh x 1/4 Merino Booroola ewes were teased with at least 4% vasectomized rams to detect and evaluate their estrous behavior during the reproductive season (March-June). Those ewes, being 26 FecB Fec<sup>+</sup> and 46 Fec<sup>+</sup> Fec<sup>+</sup>, had genotypes classed according to progeny and/or ovulation rates at 18 months of age (Moraes *et al.*, 1991). This sample included 56 ewes with progeny records from one to seven parturitions and 16 hoggets. The mean probability is 0.59 to class adequately a carrier ewe and only 0.22 in young females in the same flock. In the present data set 17 ewes were sided by four FecB Fec<sup>+</sup>

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rams, 49 ewes sired by three Fec+ Fec+ and six by three rams whose genotypes were not assigned due to the small number of daughters.

The ewes were monitored hourly for onset of oestrous from 7:00 a.m. to 7:00 p.m. Five to seven days after estrous detection a laparoscopic examination (Thimonier and Mauléon, 1969) was performed to verify ovulation rate. These procedures were repeated at each estrous cycle for both genotypes, which were analysed for oestrous cycle length, ovulation rate, daily distribution of onset of oestrous and incidence of anovulatory estrous during the breeding season. Data with a continuous distribution were submitted to analysis of variance and frequency data to chi-square or Mann-Whitney test (Snedecor and Cochran, 1967).

## RESULTS AND DISCUSSION

There was no genotype influence on the distribution of onset of estrous within day ( $\chi^2 = 0.0438$ ; 1 D.F.;  $P > 0.75$ ), and also the onset of estrous on diurnal period was similar in both genotypes ( $Z = 0.004$ ;  $P > 0.99$ ) (Table I). The onset of estrous showed a uniform distribution during the day, as reported by MacKenzie and Terril (1937) in non prolific ewes.

**Table I** - Relative frequency of onset of oestrous by period of day in both genotypes.

| Genotype  | Diurnal |     | Nocturnal |    |
|-----------|---------|-----|-----------|----|
|           | %       | n   | %         | n  |
| Fec+ Fec+ | 61.9    | 148 | 38.1      | 91 |
| FecB Fec+ | 63.3    | 88  | 36.7      | 51 |

Among the estrous cycles observed, ovulation rate was determined in 82.5%, among which 12.5% (39) were anovulatory estrous. The data (Table II) did not show significant effects of genotype or month of observation ( $\chi^2$  heter. = 1.449; 1 D.F.,  $P > 0.20$ ).

Actual frequencies of anovulatory cycles in sheep are poorly documented, probably due to an overlap of fertilization failure and/or embryo loss (Mies Filho, 1975); however, it could be expected at low frequencies in general populations. The observed value (12.5%) in this peculiar group of females is considered high, as neither genotype nor month affects the occur-

**Table II** - Frequency of estrous according to type and genotype within months of observation.

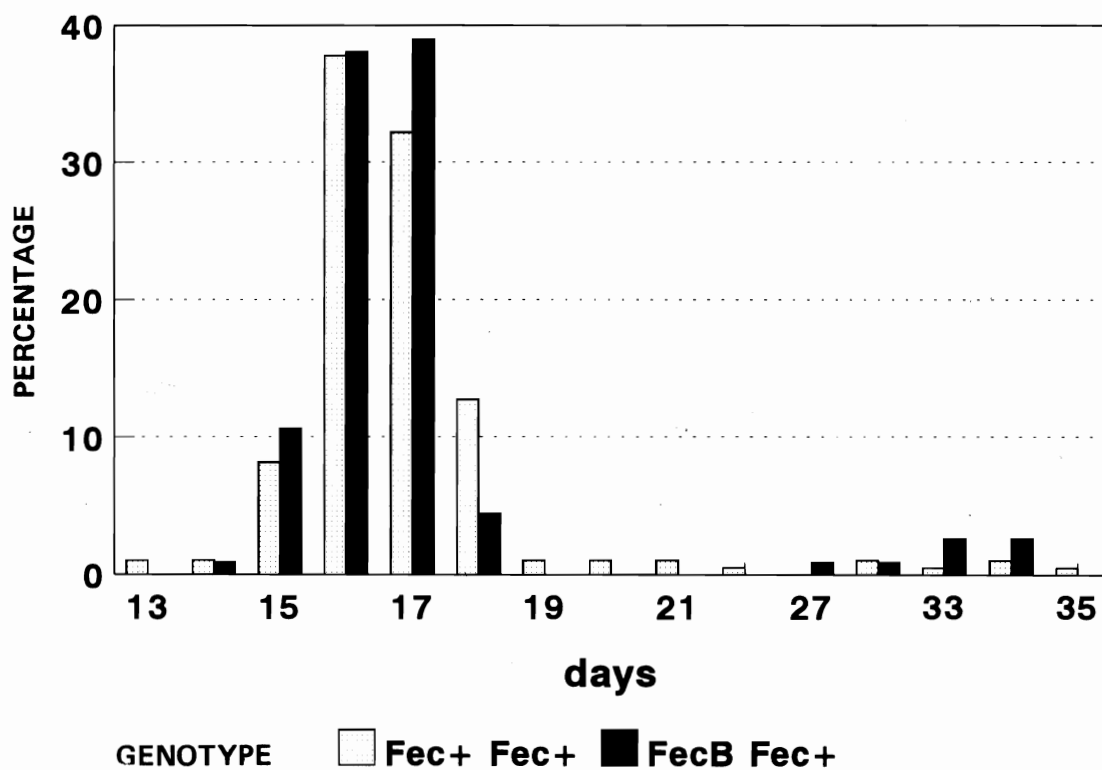
| Month | % of anovulatory estrous | Fec+ Fec+    | FecB Fec+    | $\chi^2$ | P      |
|-------|--------------------------|--------------|--------------|----------|--------|
|       |                          | n = 194<br>% | n = 118<br>% |          |        |
| March | 13.1                     | 12.5         | 13.8         | 0.028    | > 0.75 |
| April | 6.7                      | 8.8          | 2.7          | 1.443    | > 0.10 |
| May   | 15.2                     | 18.3         | 9.8          | 1.460    | > 0.10 |
| June  | 23.1                     | 26.7         | 18.2         | 0.261    | > 0.50 |

rence of anovulatory estrous in this flock. This may be related to individual factors since the anovulatory cycles were repeated in some ewes. One possible explanation would be low liveweights at 18 months of age. Though liveweights were not scored during the experimental period, anovulatory estrous was more frequent ( $\chi^2 = 4.82$ ; 1 D.F.;  $P < 0.05$ ) in hoggets than in older ewes, being 62.5% and 28.6%, respectively.

The estrous length was verified in 287 opportunities, 181 in Fec+ Fec+ and 106 in FecB Fec+ ewes, ranging from 13 to 35 days, with an overall mean of  $17.1 \pm 3.2$  days. There was a modal distribution, with 92.2% of the females showing cycles from 15 to 18 days (Figure 1). The genotype of ewes did not significantly affect the estrous length ( $P > 0.29$ ), but the month within the breeding season did ( $P < 0.05$ ). These results corroborate the observations of Bindon *et al.* (1982) that the Booroola Merino (mixed genotypes) had a length of oestrous cycle similar to that of other breeds. The distribution of oestrous cycle lengths had a peak around 17 days and a smaller peak around 34 days. This suggests that some oestrous may not have been detected or that some ovulations may occur without estrous signs. The latter is plausible as at least 4% of vasectomized rams were fitted with mating harnesses during the experimental period and there were hourly observations of the sheep in the diurnal period.

The ovulation rate was significantly affected by genotype ( $P < 0.05$ ), without interaction with the month of observation (Table III).

Estrous in 3/4 Romney Marsh x 1/4 Merino Booroola ewes carrying or not the gene Fec, was similar for timing of first estrous signs, estrous length and frequency of anovulatory estrous. These results imply that there is no phenotypic expression of Fec B in these aspects. Only ovulation rate was assigned as an important criterion to class females for the presence of this major fertility gene.



**Figure 1** - Estrous cycle length in 3/4 Romney Marsh x 1/4 Merino Booroola sheep.

**Table III** - Relative frequency in percent of type of ovulation, and ovulation rates = OR according to the genotype of the ewes.

| Genotype  | Simple | Double | Triple | Quadruple | OR mean      | Total N |
|-----------|--------|--------|--------|-----------|--------------|---------|
| FecB Fec+ | 43.9   | 30.8   | 20.6   | 4.7       | 1.85 ± 0.087 | 107     |
| Fec+ Fec+ | 89.8   | 10.2   | -      | -         | 1.10 ± 0.023 | 166     |

## RESUMO

Durante a estação reprodutiva foram avaliados alguns aspectos da biologia reprodutiva do ciclo estral em 72 ovelhas 3/4 Romney Marsh x 1/4 Merino Booroola. Foram estudados o momento de início do cio, a duração do cio estral e a frequência de cios anovulatórios durante a temporada reprodutiva em ovelhas portadoras e não portadoras do gene Fec, condicionante de maiores taxas de ovulação. Os genótipos foram similares quanto a estes parâmetros, apenas tendo sido constatada diferença entre eles quanto a taxa de ovulação, demonstrando que a atuação do gene FecB se concentra sobre esta característica aparentemente não modificando os demais aspectos do ciclo estral.

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