Int.J.Curr.Microbiol.App.Sci (2017) *6*(8): 3698-3704

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 6 Number 8 (2017) pp. 3698-3704**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2017.608.446

Non-Genetic Factors Effecting Reproduction Traits in Rambouillet Sheep

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Keywords

Non-genetic factors, Reproduction, Rambouillet Sheep.

Article Info

Accepted:
29 June 2017
Available Online:
10 August 2017

A B S T R A C T

A total of 4186 records of Rambouillet sheep maintained at Government Sheep Breeding and Research Farm, Reasi, Jammu, India for 10 years (1998-2007) were analyzed to estimate the reproduction traits in relation to non-genetic factors *viz.*, season of lambing and year of lambing on Age at first fertile service, Age at first lambing, litter size at birth and interlambing period. The overall mean for Age at first fertile service (AFFS), Age at first lambing (AFL), litter size at birth (LS) and interlambing period (ILP) were 727.17±2.03 days, 877.04±2.01 days, 1.05±0.00, and 368.34± 0.22 days with corresponding coefficient of variations 12.40%, 10.21% 21.51% and 2.67%, respectively. In present study, year and season had non- significant effect on AFFS, AFL, LS and ILP.

Introduction

Rambouillet is well known breed due to its excellence in maternal ability. It is the largest fine wool breed adaptable to wide variety of arid range conditions, has a well-developed flocking instinct and is long lived. The breed, although originally developed in France as a wool breed, after importation in the mid 1800s (Dickson *et al.*, 1933), was developed into a dual-purpose breed in the U.S. (Hultz *et al.*, 1931). The breed is also well known for its meat. Rambouillet is intensively used for cross breeding programme in India for improving the productivity of native sheep. Reproductive characteristics have been recognized as main factors affecting profitability of sheep breeding systems (Matos *et al.*, 1997). Therefore, improvement in ewe productivity is a key target in sheep breeding and could be attained to some extent by increasing the number of lambs weaned and weight of lambs weaned per ewe within a specific year (Duguma *et al.*, 2002). The

major part of the income in any sheep production system is supplied through lamb production (Ekiz *et al.,* 2005). Profitable wool and mutton production and faster genetic progress of sheep flock are mainly dependent on higher degree of reproductive efficiency of breedable ewes. The economics of sheep farming is based not only the characters of wool and mutton production alone but also on ewes efficient reproduction performance. Failure to maintain sufficiently higher degree of reproductive efficiency is the major economic loss to the sheep husbandry.

Materials and Methods

The data were obtained from the records of 4186 Rambouillet sheep maintained at Government Sheep Breeding and Research Farm, Reasi, Jammu, India. The data were spread over a period of ten years *i.e.* from 1998 to 2007. The reproduction traits studied were age at first fertile service, age at first lambing, litter size at birth and interlambing period. The mean, standard errors and coefficient of variations (CV) were computed statistically. The effects of non-genetic factors such as years and seasons on these reproduction traits were analyzed by least squares analysis using the technique developed by Harvey (1990). The following model was used for present investigation with assumptions that the different components being fitted into the model were linear, independent and additive.

$$Y_{ijklm} = \mu + R_i + Y_j + S_k + e_{ijkl}$$

Where,

Y_{ijklm} = m^{th} record of individual of i^{th} Ram lambed in j^{th} year, k^{th} season and

μ = Overall population mean

R_i = Random effect of i^{th} ram

Y_j = Fixed effect of j^{th} year of lambing

S_k = Fixed effect of k^{th} season of lambing

e_{ijkl} = Error associated with each observation and assume to be normally and independently distributed with mean zero and variance (0, σ^2_e)

The least square means of significant effects were compared using Duncan's multiple range test (DMRT) as modified by Kramer (1957).

Results and Discussion

The average estimates of reproduction traits viz. AFFS, AFL, LS, and ILP along with standard errors (S.E), standard deviations (SD) and coefficient of variation (CV%) are presented in table 1. The least square means for AFFS, AFL, LS, and ILP along with their standard errors are presented in table 2 and ANOVA in table 3. The overall mean of age at first fertile service in present investigation was estimated as 727.17±2.03 days and falls within the range of 707.00±42.0 days reported by Arora *et al.,* (1978) in Malpura and Chokla breed of sheep. Lower estimates ranged from 583.02±1.05 days to 639.1± 15.94 days were reported by Bohra (1993), Khan *et al.,* (2002), and Babar and Javed (2009) in Rambouillet breed of sheep. Higher estimate of 819.68± 70.52 days was reported by Jain *et al.,* (2001) in Rambouillet breed of sheep. The coefficient of variation of AFFS was low (12.40) indicating that the trait had low variability. The overall mean of age at first lambing in present investigation was estimated as 877.04±2.01 days. It is in close agreement with the findings (967.3± 25.5 days) of Bohra (1993) in Rambouillet breed of sheep. Lower estimate of 735.67±1.13 days was reported by Khan *et al.,* (2002) in Rambouillet breed of sheep. Higher estimates of 1009±38 and 1030±20.07 days were reported by Arora *et al* (1978) in Malpura and Chokla. The coefficient of variation of AFL was low (10.21) indicating that the trait had low variability. The overall mean of litter size

in present investigation was estimated as 1.05±0.00 which were very close to the average litter size reported by Ferda *et al.,* (2009) in Fat tailed sheep. Higher estimates were reported by Shaoqi Rao (1997) in Suffolk, Targhee and Polypay breeds of sheep. The overall mean of inter lambing period in present investigation was estimated as 368.34± 0.22 days which were very close to the average inter lambing period of 370.70±1.09 days reported by Jain *et al.,* (2001) in Rambouillet breed of sheep. Lower estimates were reported by Gonzalez *et al.,* (1986) in Merino, Lehnherr (1990) in Swiss White Alpine breed of sheep. Higher estimates were reported by Khan *et al.,* (2002) in Rambouillet, and Babar and Javed (2009) in Rambouillet breed of sheep. The coefficient of variation of ILP was low (2.67) indicating that the trait had low variability.

The effect of year of birth was non-significant on age at first fertile service. No literature was available as concerned regarding the non-significant effect of year on age at first fertile service. However significant effect of year on age at first fertile service was reported by Narayanswamy *et al.,* (1976) in Mandya sheep, Kabuga and Akowuah (1991) in Djallonke and Sahel sheep, Jain *et al.,* (2000) in Rambouillet, and Khan *et al.,* (2002) in Rambouillet and Kaghani sheep

The effect of season of birth was non-significant on age at first fertile service. Similar findings were reported by Babar and Javed (2009) in Rambouillet. On contrary significant effect of season of birth on age at first fertile service was reported by Sinha (1996) in Muzaffarnagri and their crosses with Dorset and Suffolk, Jain *et al.,* (2000) in Rambouillet, and Khan *et al.,* (2002) in Rambouillet and Kaghani sheep. The effect of year of birth was non-significant on age at first lambing. Similar findings were reported by Kaul (1979) in Muzaffarnagri, Tamu (1980) in Rambouillet, and Babar and Javed (2009) in Rambouillet. On contrary significant effect of season of birth on age at first lambing was reported by Malik *et al.,* (1978) in Rambouilet with chokla, Malpura and Jaisalmeri, and Narayanswamy (1978) in Bannur sheep, and Gabina *et al.,* (1990) in Lacha ewes. The effect of season of birth was non-significant on age at first lambing. Similar findings were reported by by Tamu (1980) in Rambouillet. On contrary significant effect of season of birth on age at first lambing was reported by Narayanswamy (1978) in Bannur sheep, and Sinha (1996) in Muzaffarnagri and their crosses with Dorset and Suffolk. The effect of year of birth was highly significant (P<0.01) on litter size. Similar findings were reported by Trejo *et al.,* (1990) in Chalma sheep, Molina *et al.,* (1991) in Manchega sheep, Shelton *et al.,* (1991) in Rambouillet and Mokhlari *et al.,* (2010) in Kermani sheep. The effect of season of birth was non-significant on litter size. No literature was available as concerned regarding the non-significant effect of season on litter size.

Table.1 Average estimates along with standard errors of reproduction traits

TRAITS	Number of observations	Mean ± SE	Standard deviation	CV (%)
AFFS(days)	1976	727.17±2.03	90.21	12.40
AFL(days)	1976	877.04±2.01	89.62	10.21
LS	4186	1.05±0.00	0.22	21.51
ILP(days)	1976	368.34± 0.22	9.84	2.67

Table.2 Analysis of variance for reproduction traits in Rambouillet sheep

Sources of variation	**MSS**			
	AFFS	**AFL**	**LS**	**ILP**
Season of lambing	2740.82 (1)	4097.04 (1)	0.0018 (1)	23.27 (1)
Year of lambing	6919.11 (9)	7374.98 (9)	0.22** (9)	46.78 (9)
Sex	-	-	0.03 (1)	-
Residual/ Error	8148.16	4097.04	0.05	97.27

Figures in parenthesis indicate degree of freedom ** indicate significant at 1% level

Table.3 Least squares mean for various non-genetic factors influencing reproduction traits in Rambouillet sheep

Particulars	**AFSS mean±SE(x)**	**AFL mean±SE(x)**	**LS mean±SE(x)**	**ILP mean±SE(x)**
Overall mean	724.02±4.96(1976)	873.40±4.92 (1976)	1.05±0.00 (4186)	368.48±0.54 (1976)
Year	**NS**	**NS**	******	**NS**
1998	723.44±7.56(208)	871.73±7.51 (208)	1.07 ± 0.01^{cd} (503)	368.99±0.82 (208)
1999	730.80±6.65 (269)	880.69±6.60 (269)	1.06 ± 0.01^{bcd}(556)	368.93±0.72 (269)
2000	726.59±7.24 (260)	875.09±7.19 (260)	1.09 ± 0.01^{d} (518)	368.51±0.79 (260)
2001	714.37±8.01 (196)	862.65±7.96 (196)	1.02 ± 0.01^{a} (388)	369.15±0.87 (196)
2002	722.04±7.61 (211)	871.80±7.56 (211)	1.04 ± 0.01^{abc} (428)	368.04±0.83 (211)
2003	719.91±11.63 (73)	870.31±11.54 (73)	1.02 ± 0.01^{a} (232)	367.47±1.27 (73)
2004	719.84±7.68 (217)	869.54±7.63 (217)	1.05 ± 0.01^{abc} (405)	368.08±0.83 (217)
2005	734.87±7.63 (212)	884.16±7.57 (212)	1.03 ± 0.01^{a} (418)	369.06±0.83 (212)
2006	723.39±7.69 (190)	873.84±7.64 (190)	1.05 ± 0.01^{abc} (411)	368.52±0.84 (190)
2007	724.96±9.04 (140)	874.15±8.98 (140)	1.03 ± 0.01^{ab} (327)	368.08±0.98 (140)
Season	**NS**	**NS**	**NS**	**NS**
winter (Dec-Feb)	726.84±2.20 (1883)	876.84±2.18 (1883)	1.05±0.00 (3984)	368.22±0.24 (1883)
spring (March-May)	721.20±9.57 (93)	869.95±9.50 (93)	1.05±0.01 (202)	368.74± 1.04 (93)
Sex			**NS**	
Male	-	-	1.04±0.00 (2213)	-
Female	-	-	1.05±0.00 (1973)	-

Figures in parenthesis indicate number of observations
Means with same superscript do not differ significantly

However significant effect of season on litter size was reported by Molina *et al.,* (1991) in Manchega sheep, Shelton *et al.,* (1991) in Rambouillet and Ferda *et al.,* (2009) in Fat tailed sheep. The effect of sex was non-significant on litter size. No literature was available as concerned regarding the non-significant effect of sex on litter size. However significant effect of sex on litter size was reported by Trejo *et al.,* (1990) in Chalma sheep, Molina *et al.,* (1991) in Manchega sheep and Shelton *et al.,* (1991) in Rambouillet. The effect of year of birth was non-significant on inter lambing period. Similar findings were reported by Sinha (1996) in Muzaffarnagri and its crosses with Dorset and Suffolk. On contrary significant effect of year of birth on inter lambing period was reported by Narayanswamy (1978) in Bannur sheep, Iniquez *et al.,* (1991) in Sumatran sheep, Kabuga and Akowuah (1991) in Djallonke and Sahel sheep, Khan *et al.,* (2002) in Rambouillet and Kaghani sheep, and Babar and Javed (2009) in Rambouillet.

The effect of season of birth was non-significant on inter lambing period. Similar findings were reported by Sinha (1981) in Muzaffarnagri and their crosses with Dorset and Suffolk. On contrary significant effect of season of birth on inter lambing period was reported by Trejo *et al.,* (1990) in Chalma sheep, Iniquez *et al.,* (1991) in Sumatran sheep, and Khan *et al.,* (2002) in Rambouillet and Kaghani sheep.

Acknowledgements

Authors are thankful to the in-charge and staff of Government Sheep Breeding and Research Farm, Reasi, Jammu for providing facilities and help for the present study.

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How to cite this article:

Khan, N.N., N. Assad, Nishant Kumar, D. Chakraborty, Aadil Ayaz, Aarif Ali, Mashooq Ahmad Dar and Suheel Yousuf Wani. 2017. Non-Genetic Factors Effecting Reproduction Traits in Rambouillet Sheep. *Int.J.Curr.Microbiol.App.Sci.* 6(8): 3698-3704.
doi: https://doi.org/10.20546/ijcmas.2017.608.446