Int.J.Curr.Microbiol.App.Sci (2019) *8*(4): 2062-2065

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 8 Number 04 (2019)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2019.804.242

Estimation of Inbreeding Coefficient in Corriedale Sheep

Nusrat Nabi[1*], N.A. Ganai[1], S. Shanaz[1], Safeer Aalam[1], Saba Bukhari[1], Mir Shabir[1], Ruksana Majid[1], Ambreen Hamdani[1], Najimaana Wani[2] and Heena Jalal[3]

[1]Division of Animal Genetics and Breeding, SKUAST-K, India
[2]Division of veterinary public health and epidemology, SKUAST-K, India
[3]Division of Livestock Production and Technology, SKUAST-K, India

**Corresponding author*

Keywords

Inbreeding coefficient, Corriedale sheep

Article Info

Accepted:
15 March 2019
Available Online:
10 April 2019

A B S T R A C T

The present study was undertaken to the estimate inbreeding coefficient in Corriedale sheep under different agro-climatic conditions of Jammu and Kashmir. The pedigree file of 6,874 records of Corriedale sheep, maintained at Mountain Research Centre for Sheep & Goat (MRCSG), F.V.Sc & A.H, SKUAST-K Shuhama, for a period of 49 years (1969-2017) was used to calculate inbreeding coefficients. The individual inbreeding coefficients were measured by Wright's formula and was computed from the pedigree containing 6,874 animals using CFC software package and expressed as percentage. Average inbreeding coefficient (F) of the lambs generally increased over the periods. The mean inbreeding coefficient (F), proportion of population inbred (per cent), for Corriedale sheep were 18.3 and 43.3 respectively. During initial periods, inbreeding coefficient was 9.67 and it increased upto 27.7 during the last period. During the initial period (P1, (1969-1975) about 12.2% were inbred and gradually increased upto 80.19% during the last period (P7, (2011-2017). The coefficient of inbreeding ranged from 0 to 37.5 in inbred lambs. It was concluded that by avoiding the mating between related individuals and by the introduction of breeding rams, unnecessary and undesirable increase of inbreeding in the flock can be minimized.

Introduction

The assessment of population structure aims to investigate the occurrence of possible changes in genetic variability distribution between and within subpopulations that form it and the proportions in which these changes occur. Populations subjected to selective pressure over time tend to present changes in their initial structure. Such changes can be evaluated through pedigree information.

Populations under high selection intensity tend to have reduced genetic variability and a consequent increase in the inbreeding rates (Mokhtari *et al.*, 2015). The negative effect of inbreeding, such as lower productive and reproductive indices within the herds, is related to the fact that inbred individuals often

possess less flexibility to face environmental changes, becoming more fragile and susceptible. Inbreeding is the probability that two alleles at any locus are identical by descent and occur when related individuals are mated to each other (Falconer and Mackay, 1996). Given the predominantly non-vegetarian food habits, the cold climatic conditions in the north Himalayan state of J & K and the poor growth potential of the local breeds of sheep with pigmented and rough fiber, the policy makers since pre-independence have opted for introduction of promising exotic breeds (Tasmanian Merino, 1942; Rambouillet, 1952; Corriedale and Polldorset, 1962) for crossbreeding with the local sheep in order to boost mutton and wool production in the state.

Corriedale sheep which is known for its good mutton conformation, excellent wool characteristics, relatively early maturity and having good range characteristics was imported in the state during sixties for use in improvement of local sheep at Mountain Research Centre for Sheep & Goat, Shuhama (MRCSG) which is one of the organized sheep farms found in the valley. Since the time of its establishment in late 1960's, the animals of the station over the years were allowed to mate within the selected animals of the flock as there were no fresh importation of exotic animals from last 49 years due to which closed flock population was established within the farm

This unavoidable mating of related animals within a closed population reduces the genetic variability and increases the rate of inbreeding (Norberg and Sorensen, 2007; Barczak *et al.*, 2009). Inbreeding is the mating of individuals whose relatedness is greater than the average degree of relationship that exists in the population and capable of changing the genotypic frequencies of a population without modifying the gene frequencies.

The most straight- forward approaches for measuring inbreeding utilize the inbreeding coefficient "*f*" (Wright, 1922): defined as the probability that two alleles at a locus are identical by descent (ibd). In context of above mentioned facts, the present study was carried out to estimate the inbreeding coefficient in Corriedale sheep under different agroclimatic conditions of Jammu & Kashmir.

Materials and Methods

For present investigation, the data sets were collected from history sheets of Corriedale sheep maintained at Mountain Research Centre for Sheep & Goat (MRCSG), F.V. Sc & A.H**,** SKUAST-K Shuhama, for a period of 49 years (1969-2017) Pedigree information were collected on the basis of Ram/Ewe Number**,** Date of birth**,** Sire Number and Dam Number. The individual inbreeding coefficients were measured by Wright's formula and was computed from the pedigree containing 4186 animals using CFC software package and expressed as percentage.

Results and Discussion

The average inbreeding coefficient (F) during different periods is presented in table 1 and Figure 1. Average inbreeding coefficient (F) of the lambs generally increased over the periods. The overall inbreeding coefficient of the lamb was 18.1%. During initial periods, inbreeding coefficient was 9.67 and it increased upto 27.7 during the last period. The overall percentage of inbred animals over the periods was 43.3. During the initial period (P1, (1969-1975) about 12.2% were inbred and gradually increased upto 80.19% during the last period (P7, 2011-2017).

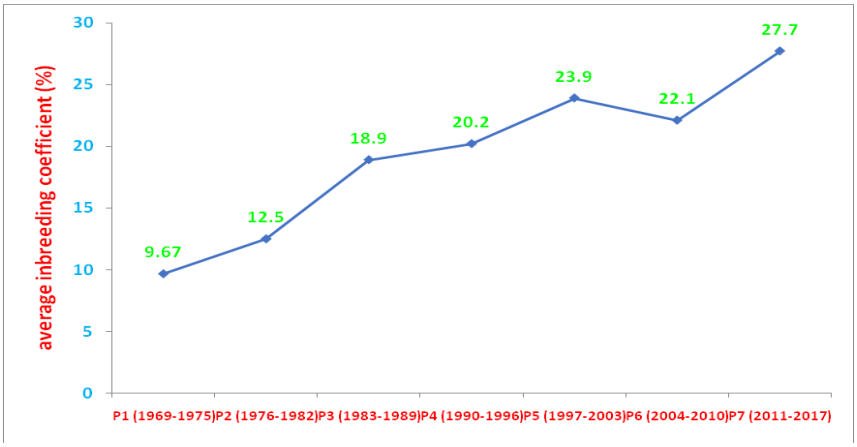
The value for inbreeding coefficient of the present study is lower than the values reported by Wiener *et al.*, (1992) in local sheep and Boujenane and Chami (1997) in Sardi sheep. On the other hand, results of the present investigation are in agreement with 15% for

Rambouillet, Columbia and Targhee (Ercanbrack and Knight, 1991) and 15.2% for local sheep (Li *et al.*, 2011).

Table.1 Average Inbreeding coefficient of Corriedale sheep during different periods

Period of birth	Average Inbreeding coefficient (%)	Proportion of inbred animals (%)
P1 (1969-1975)	9.67	**12.2**
P2 (1976-1982)	12.5	**20.53**
P3 (1983-1989)	18.9	**23.0**
P4 (1990-1996)	20.2	**32.73**
P5 (1997-2003)	23.9	**59.02**
P6 (2004-2010)	22.1	**76.03**
P7 (2011-2017)	27.7	**80.19**
OVERALL	**18.1**	**43.3**

Fig.1 Average of inbreeding coefficient (F) during different periods (1969-2017



However lower estimates were reported by Akhtar *et al.*, (2000) in Hissardale sheep, Mackinnon (2003) in Dorset, Rambouillet & Finnsheep, Alsheikh (2005) in Barki sheep, Shushil *et al.*, (2008) in Chokla sheep, Arora *et al.*, (2009) in Malpura sheep, Gowane *et al.*, (2010) in Bharat Merino sheep, Eteqadi *et al.*, (2014) in Guilan sheep, Mokhtari *et al.*, (2015) in Moghani sheep, Naghavian *et al.*, (2016) in shirvan Kordi sheep and Patiabadi *et al.*, (2017) in Iranian shal sheep.

It was observed that the average inbreeding coefficient (F) increased due to small population size and mating of inbred males and female individuals belonging to the closed flock of Corriedale sheep are mated together.

References

Akhtar, P., M.S., Khan, G. Mohiuddin and M. Abdullah, 2000. Effect of inbreeding on different performance traits of Hissardale sheep in Pakistan. *Pakistan Veterinary Journal*. 20: 169-172.

Alsheikh, S. 2005. Effect of inbreeding on birth and weaning weights and lamb mortality in a flock of Egyptian

Barkisheep. *Proceeding of 2nd Congress Animal Hygiene*, 187-197.

Arora, A.L., Mishra, A.K., Gowane, G.R. and Prince, L.L.L. 2009. Effect of inbreeding on lamb growth in a closed flock of Malpura sheep. *Indian Veterinary Journal*.86 (10): 1034-1036.

Barczak. E., Wolc. A., Wojtowski. J., Slosarz, P. and Szwaczkowski, T. 2009. Inbreeding and inbreeding depression on body weight in sheep. *Journal of Animal Feed Science*18, 42-50.

Boujenane, I., and A., Chami, 1997. Effects of inbreeding on reproduction, weights and survival of Sardi and BeniGuilsheep. *Journal of Animal Breeding & Genetics*.114: 23-31.

Ercanbrack, S.K., and A.D., Knight, 1991.Effects of inbreeding on reproduction and wool production of Rambouillet, Targhee and Columbia sheep. *Journal of AnimalScience*.69: 4734-4744.

Eteqadi, B., Ghavi, N., Zadeh, H. and, A. S. Abdol, 2015. Inbreeding effects on reproductive traits in Iranian Guilansheep. *Tropical Animal Health and Production*. 47(3): 533–539.

Falconer, D.S. and Mackay, T.F.C. (1996). Introduction to Quantitative Genetics. Longman Group, Essex, UK.

Gowane, G.R., Prince, L.L.L., and Arora, A.L. 2010.Effect of inbreeding on lamb growth traits in a closed flock of Bharat Merino Sheep. *Indian Veterinary Journal* 87(1): 42-44.

Li, M.H., Strande, I., Tiirikka, T., Liisa, M., Aimonen, S. and Kantanen, J., 2011. A Comparison of approaches to estimate the inbreeding coefficient and pairwise relatedness using genomic and pedigree data in a sheep population. *PLOSONE,* 6(11): 12.

MacKinnon, K.M., 2003. Analysis of inbreeding in a closed population of crossbred sheep. MS Thesis. Virginia Polytechnic Institute and State University, Blacksburg.

Mokhtari, M. S., Ashtiani. M. Jafaroghli, S. R. M. and Gutiérrez, J. P. 2015. Studying genetic diversity in Moghani sheep using pedigree analysis. *Journal of Agricultural Science&. Technology* 17: 1151-1160.

Naghavian, S., Hasani, S. M., Azari, A., Khan, A.R., Saghi, D.A. and Zade, N. M. 2016. Estimation of inbreeding coefficients using pedigree and microsatellite markers and its effects on economic traits of Shirvan Kordi Sheep. *Iranian Journal of Applied Animal Science*. 6(1): 133-141.

Norberg, E. And Sorensen, A.C. 2007. Inbreeding trend and inbreeding depression in the Danish populations of Texel, Shropshire, and Oxford Down. *Journal of Animal Science*85: 299-304.

Patiabadi, Z., Varkoohi, S., and Savar-Sofla, S., 2017. Inbreeding and Inbreeding Depression on Body Weight in Iranian Shal Sheep. *Iranian Journal of Applied Animal Science*. 6(4): 887-893.

Shushil, K., Lesilie, L.P., Mishra, A.K. and Arora, A.L. 2008. Estimation of inbreeding in Choklasheep. *Indian Veterinary Journal*85 (11): 1284-1286.

Wiener, G., G.J. Lee, J.A. Woolliams, 1992. Effects of rapid inbreeding and of cross breeding of inbred lines on the body weight growth of sheep. *Animal Production*. 55: 89-99.

Wright, S., (1922). Coefficients of inbreeding and relationship. *Am Nat*56: 330–339.

How to cite this article:

Nusrat Nabi, N.A. Ganai, S. Shanaz, Safeer Aalam, Saba Bukhari, Mir Shabir, Ruksana Majid, Ambreen Hamdani, Najimaana Wani and Heena Jalal. 2019. Techniques for Estimation of Inbreeding Coefficient in Corriedale Sheep. *Int.J.Curr.Microbiol.App.Sci.* 8(04): 2062-2065.
doi: https://doi.org/10.20546/ijcmas.2019.804.242