Factors Influencing Reproductive Performance in Norduz Ewes (Local Ewes) in Turkey

[1]Kadir Karakus and [2]Hamit Mirtagioglu
[1]Yüzüncü Yıl Üniversitesi Ziraat Fakultesi, Zootekni Bölümü Hayvan Yetiştirme ve Islahı Ana Bilim Dalı,
65080, Van; [2]Yüzüncü Yıl Üniversitesi Ziraat Fakultesi,
Zootekni Bölümü Biyometri ve Genetik Ana Bilim Dalı, 65080, Van

Abstract: The objective of this study is to analyze by generalized linear mixed modeling technique with binomial structure data for reproductive characteristics in Norduz local ewes in Turkey. The data were collected from Yuzuncu Yil University, Animal Science Breeding Farm in Turkey. A total of 83 ewes and their 94 lambs at born 2004 season were included in the analysis born over a period of one year. Five Norduz rams were analyzed for sperm characteristics before artificial insemination (AI). AI is applied according to sperm performance of rams. Reproductive characteristics were included birth weight (BW), birth type, sex and return or non-returning (RNR) performance for two successive estrus cycles of ewes and age of dam (2, 3, 4 and 5). As regards of the criteria for Goodness of Fits for investigated traits, the values of the fitting results indicated that using models are good fit for all traits. Effecting birth type and sex of lamb have been importance effects on the BW. On the other hand, effect of age of the dam, ram and returning have not been significantly on the BW. According to the results, lambs' ram produced medium (3 or 4 mass activity score) quality of the sperm have been higher BW than others. Male and single born lambs have been also highest BW. In the analysis a GENMOD procedure for an unequal design was used in order to account for the effect of some reproduction traits. In this study, GENMOD procedure accounts for the effect of these traits on the estimates of parameters, if all information upon which the culling decisions were made included in the data.

Key words: Binomial data, GENMOD, Norduz ewe, ram effect, reproduction trait

Introduction

The development of artificial insemination (AI) and the consequent genetic improvement of farm animals have led to a remarkable increase in the productivity of livestock. Although, the AI in sheep has been poorly implemented and because of the low fertility results obtained, recently, AI in sheep has been widely using (Halbert *et al.*, 1990 and Anel *et al.*, 2005). Therefore, ewe reproductive traits have been carried out same economically importance as ram reproductively performance or traits.

Fertility traits are commonly investigated on livestock as separating fixed effects in mixed models (Simianer and Schaeffer, 1989). Generally, fertility traits are observed as threshold or binomially distributed traits. If binomial traits such as threshold reproductive characters are regarded as resulting from classifying an underlying normal variable into two classes related to some threshold. A generalized linear model (GENMOD) is most useful models for fitting in these data (Gilmour *et al.*, 1985 and Karakuş *et al.*, 2004).

Predicting methods in threshold data, random effects on the underlying scale are presented by Foulley *et al.* (1990) and Harville (1990) following the suggestion of Thompson (1990). These methods maximize the likelihood jointly for both fixed and random effects using Bayesian arguments. They produce identical results when used with normally distributed data (Foulley *et al.*, 1990).

The Norduz is a breed of native sheep that is a variety of Akkaraman sheep in Turkey. The breed is raised in an area called Norduz Valley in East Anatolian Region, Turkey. The husbandry is typically extensive; sheep are feed natural conditional and crops. Feeding systems are not nutritionally balanced to stage of lactation as well as all breeding stages such as lambing, lactation period or pregnant periods (Bingöl, 1998). Effecting environmental factors on reproductive characteristics for Akkaraman and their varieties were not widely investigated in literature. The objective of this study is to analyze effecting factors on reproductive characteristics by generalized linear mixed modeling technique with binomial structure data in Norduz local ewes in Turkey.

Material and Methods

The data were collected from Yuzuncu Yil University, Animal Science Breeding Farm in Turkey. A total of 83 ewes and their 94 lambs at born 2004 season were included in the analysis born over a period of one year. Five Norduz rams were analyzed for sperm characteristics before artificial insemination (AI). AI is applied according to sperm performance of rams. Reproductive characteristics were included in birth weight (BW), birth type, sex and return or

non-returning (RNR) performance for two successive estrus cycles of ewes and age of dam (2, 3, 4 and 5). Reproductive characteristics e.g., RNR were analyzed by generalized linear model (GENMOD) using with linking function log scale and distributed as poisson. BW was also investigated by GENMOD with using normal distributions and linking for identity function. Using model parameters for μ is poisson mean parameter. Model is $\log(\mu) = X_i^1 \beta$, where, ß is unknown parameters to be estimated by the poisson model procedure (Park *et al.*, 1998). The logarithm of N is used as data set, that is, regression variables with a constant coefficient of 1 for each observation for example return for first estrus. A log linear relationship between the mean and the factors such as age, sire (rams), type of birth and sex of lambs by the log link function and distributed as poisson. The log link function ensures that mean number of lams for each ram and age group for ewes predicted from the fitted model will be positively defined. GEE analyses were executed by SAS (1998).

Results and Discussion

Goodness of fitting statistics is illustrated in Table 1 for BW and RNR from GENMOD of selection of explanatory variables in the model.

Table 1: Criteria for assessing Goodness of fitting statistics for models

Traits	Birth Weight (BW)			Return or non-return for AI service (RNR)		
	DF	Value	Value/DF	DF	Value	Value/DF
Deviance	80	44.78	0.55	82	2.601	0.032
Pearson Chi-Square	80	44.78	0.55	82	3.108	0.032
Log-Likelihood	-	96.91	-	-	92.755	-

As regards of the criteria for Goodness of Fit for BW and RNR, the values of the deviance divided by its degrees of freedom is less then 1. Results indicated that using models are good fit for BW and RNR.

Ulker *et al.* (2004) investigated on some reproductive traits in Karakaş and Norduz sheep. Results of Ulker *et al.* (2004) indicated that there were no differences in evaluated reproductive traits between two genotypes and these results also indicated that Norduz sheep could have a normal performance out of their natural habitat.

Analyzing results for BW and RNR were summarized in Table 2.

Table 2: Effecting factors on Birth weight (BW) and return or non-return (RNR) in Norduz ewes

Factors	Birth Weight (BW)			Return or non-return for AI service (RNR)		
	DF	χ^2 value	Pr>Chi	DF	χ^2Value	Pr>Chi
Ram Effect	5	7.466	0.188	5	0.075	0.999
Age of Dam	3	6.986	0.072	3	0.196	0.978
Birth Type	1	25.469	0.000	-	-	-
Sex	1	8.681	0.003	-	-	-
Returning	1	1.067	0.313	-	-	-

Table 3: Estimating parameters and confidence intervals for birth weight, return or non-return for AI service in Norduz ewes

Traits	Birth Weight (BW)			Return or non-return for AI service (RNR)		
	Lower	estimate	Upper	Lower	estimate	Upper
Ram Effect (3-4)[*]	0.211	0.721	1.080	-0.50	0.06	2.94
Birth Type (single)	0.568	0.895	1.22	-	-	-
Sex (male)	0.159	0.463	0.767	-	-	-
Age of Dam (5)	0.567	1.135	5.850	-0.52	0.12	0.63
Returning (1)	-0.360	0.375	1.111	-	-	-

* Sperm quality for rams was assessed and classified as 0-5 categories according to the their mass activity

According to Table 2, effecting of birth type and sex of lambs have been importance effects (p<0.01) on the BW. On the other hand, effect of age of the dams, ram and returning have not been significantly on the BW. There is only investigating to effect ram and age of the dam on the RNR. No significance effects were determined for these factors

on the RNR. There were obtained similar results for BW by Ulker *et al.* (2004). Aygun and Bingol (1999) were to compare birth weight of Karakas and Norduz lambs and, to investigate some environmental effects on birth weights. There was no important difference for birth weight between Karakas and Norduz lambs. Effects of sex, birth type and age of ewe on birth weight were significant. Same results were obtained from in present study. Type 3 analyzing results for was also summarized in Table 3. According to the Table 3, lambs' ram produced medium (3 or 4 mass activity score) quality of the sperm have been higher BW than others. Male and single born lambs have been also highest the BW. There are no differences for age of dam. However, lambs born from 5 ageing dams have slightly more born weights than others. In present study, there are no available indicator factors for RNR in investigating factors. However, good fertility in dams is important for keeping the lambing within acceptable limits (for herds level) reducing the number of inseminations and reducing culling owing to reproductive failure (Van Arendonk *et al.*, 1989).

Conclusion
In the analysis a GENMOD procedure for an unequal design was used in order to account for the effect of some reproduction traits. This procedure accounts for the effect of these traits on the estimates of parameters, if all information upon which the culling decisions were made included in the data. Using these values the correlated response in fertility reduced the profit of selection on the other economic yields such as milk production. Artificial insemination determining the optimum breeding strategy and female fertility, the relationship between fertility at different ages and cost of collecting fertility data should be accounted for. Herd management has a big influence on fertility and should therefore be taken into account in deciding how much emphasis to put on fertility in a breeding program.

References
Anel, L., M. Kaabi, B. Abroug, M. Alvarez, E. Anel, J.C. Boixo, L.F. de la Fuente and P. de Paz, 2005. Factors influencing the success of vaginal and laparoscopic artificial insemination in churra ewes: A field assay. Theriogenology, 63: 1235-1247

Aygün, T. and M, Bingöl, 1999. Comparison of the birth weights of Karakas and Norduz lambs. In: Intl. Animal Breeding Congr. 21-24 Sep. 1999- Izmir, Turkey, pp: 738-742

Bingol, M., 1998. Reproductive and milk yield with growth-development and morphological traits of Norduz sheep. Ph.D. Dissertation. YYU Sci Graduate Inst., Van, Turkey, pp: 96

Foulley, J.L., D. Gianola and S. Im, 1990. Genetic Evaluation for Discrete Polygenic Traits in Animal Breeding. In: Gianola, D. and Hammond, K. (Eds.) Advances in Statistical Methods for Genetic Improvement of Livestock. Ed:, Springer-Verlag, Berlin Heidelberg, Germany, pp: 361-409

Foulley, J.L., D. Gianola, M.S. Cristobal and S. Im, 1990. A Method for Assessing Extent and Sources of Heterogeneity of Residual Variances in Mixed Linear Models. J. Dairy Sci., 73: 1612-1624

Gilmour, A.R., R.D. anderson and Al. Rae, 1985. The analysis of binomial data by a generalized linear mixed model. Biometrika. 72: 593-599

Halbert, G.W., H. Dobson, J.S. Walton and B.C. Buckrell, 1990. The structure of the cervical canal of the ewe. Theriogenology, 33: 977-992

Harville, D.A., 1990. BLUP (Best Linear Unbiased Prediction) and Beyond. In: Gianola, D. and Hammond, K. (Eds.) Advances in Statistical Methods for Genetic Improvement of Livestock. Ed:, Springer-Verlag, Berlin Heidelberg, Germany, pp: 239-276

Karakus, K., F. Cengiz, H. Mirtagioğlu, S.S. Tuncer and S. Arslan, 2004. The analysis of binomial data for reproductive performance by a Generalized Linear Mixed Model (GENMOD) in Karakas (Local Ewes) in Turkey. J. Animal and Vet. Advances, 3: 824-827

Park, T., D.W. Shin and C.G. Park, 1998. A Generalized Estimating Equations Approach for Testing Ordered Group Effects with Repeated Measurements. Biometrics, 54: 1645-1653

SAS, 1998, SAS/SATAT Software: Changes and Enhancements. SAS Inst., Cary, NC

Simianer, H. and L.R. Schaeffer, 1989. Estimation of Covariance Components between One Continuous and One Binary Trait. Genet. Sel. Eval., :303-315

Thompson, R., 1990. Generalized Linear Models and Applications to Animal Breeding. In: Gianola, D. and K. Hammond (Eds.) Advances in Statistical Methods for Genetic Improvement of Livestock. Ed:, Springer-Verlag, Berlin Heidelberg, Germany, pp: 312-328

Ulker, H., Ö. Gokdal, T. Aygun and F. Karakus, 2004. Comparison of some reproductive traits of Karakas and Norduz sheep. Y.Y.U. Fac. Agr. Cult. Agric. Res. Sci., 14: 59-63

Van Arendonk, J.A.M., R. Hovenier and W. De Boer, 1989. Phenotypic and Genetic Association between Fertility and Production in Dairy Cows. Livest. Prod. Sci., 21: 1-12