

EFFECT OF VARIOUS ADJUSTMENTS FOR NON-GENETIC FACTORS
ON SIRE RANKING

Einfluss der verschiedenen Angleichungen für nichtgenetische
Faktoren auf Bullenrangordnung

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For unbiased ranking of sires on the basis of their breeding values it is desirable to adjust the daughters' milk records for differential effects of non-genetic factors. For non-orthogonal data such adjustments are desired to be done by least-squares methods. This method is assumed to adjust the records for non-genetic effects without disturbing the genetic differences. Sometimes it is experienced that due to large non-orthogonality of data the adjustments for non-genetic effects tend to remove a portion of genetic differences. Therefore, it was considered useful to evaluate the extent to which the adjustments for various non-genetic factors affect the sire ranking.

The available data on Tharparkar and Sahiwal breeds of cattle at this Institute for the period of 50 years (1928-1977) for Tharparkar and 34 years (1943-1976) for Sahiwal were collected. For the Tharparkar breed the data were available on 918 daughters of 53 sires and for Sahiwal it was available on 561 daughters of 34 sires. The data was classified into periods of calving which were approximately of 5 years duration each. Three seasons of calving considered were as follows:

Season I : November to February
Season II : March to June
Season III : July to October

The breeding value of sires was estimated by the formula given by Robertson (1955) under following five models:

Model I : No adjustment of data for non-genetic effects;
Model II : Least-squares adjustment of daughters first lactation milk production records for differences in periods, seasons, regression of first lactation production on age at first calving and on first lactation length;
Model III : Least-squares adjustment of daughters first lactation milk production records for period, season of calving and regression of first lactation milk yield on age at first calving;
Model IV : Least-squares adjustment of daughters first lactation milk production records for differences in periods and season effects;
Model V : Least-squares adjustment of daughters first lactation milk production records for differences in season effects.

The rank correlations among breeding value of sires under different
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Table-1: Rank correlation between breeding value of sires of Tharparkar and Sahiwal breeds under five models involving adjustments for various non-genetic factors.

Comparison of breeding values under models	Rank correlation	
	Tharparkar	Sahiwal
I and II	0.8875**	0.8390**
I and III	0.9710**	0.9480**
I and IV	0.9802**	0.9560**
I and V	0.9997**	0.9988**

** Statistically significant ($P < .01$).

- Model I : No adjustment of daughters' records.
- Model II : Adjustment of daughters' milk records for period and season of calving, age at first calving and first lactation length.
- Model III : Adjustment of daughters' milk records for differences in period and season of calving and age at first calving.
- Model IV : Adjustment of daughters' milk records for differences in period and season of calving.
- Model V : Adjustment of daughters' milk records for season of calving.

models with breeding value under Model I were calculated by the method given by Snedecor and Cochran (1961).

The rank correlations between the breeding value of sires under Model I with that under the other four Models for two breeds are given in Table-1. It is seen from this table that the rank correlation between breeding value of sires gets decreased as the factors for which adjustments are made, are increased. The highest rank correlation which is approximately equal to 1.0 was obtained for comparison of breeding value under Model I and Model V i.e., when adjustment for seasons only was made. Further adjustment for period differences and for differences in age at first calving slightly reduced the rank correlations. But when the adjustments for differences in lactation length also were made there was much reduction in rank correlations. In zebu cattle there is large variation in lactation length. Also, there is variation in sires for lactation length. Therefore, the adjustment for differences in lactation length could affect the genetic differences to some extent among sires for their transmitting ability for milk production during standard lactation of 305 days. Therefore, it may not be desirable to make any adjustment for differences in lactation length for records which are naturally completed before 305-days.

It may be concluded from this analysis that for this type of data the adjustment for various non-genetic factors may not seriously affect the accuracy of evaluation of breeding value of sires.

SUMMARY

Least square analysis was conducted to obtain constants for sires, periods, seasons, regression on age at first calving and regression on first lactation length under different models for two zebu breeds. The ranking of the sires was done under each model before and after adjustment of data for period, season, regression of milk yield on age at first calving and lactation length using constants obtained under different models. The effect of sire, period, regression of milk yield on age at first calving and lactation length were significant in both Tharparkar and Sahiwal breeds. The season effect was significant in Tharparkar (under two models) while it was statistically non-significant in Sahiwal. The dramatic increase in sire variance by the exclusion of period from the model suggested confounding of period and sire effect. The adjustment by regression of milk yield on age at first calving and lactation length for the purpose of sire evaluation may not be desirable as these traits are themselves affected by sires. Use of sires evaluated on the basis of adjustment of those traits may genetically increase milk yield per day rather than increasing the milk yield for a lactation of 305 days. The effect of various adjustments on sire rankings was small as generally high correlations were found to occur between sire rankings on the basis of adjusted and unadjusted data.

ZUSAMMENFASSUNG

Eine Kleinstquadratanalyse wurde durchgeführt, um Konstante für Bullen, Perioden, Jahreszeiten, Regression über Erstlaktationsdauer unter verschiedenen Modellen für zwei Zeburassen zu gewinnen. Die Rangordnung von Bullen wurde unter jedem Modell vor und nach Angleichung der Angaben für Periode, Jahreszeit, Regression der Milchleistung über Erstabkalbungsalter und Laktationsdauer durchgeführt, indem die unter verschiedenen Modellen gewonnenen Konstante verwendet wurden. Die Einflüsse von Bullen, Periode, Regression über Erstabkalbungsalter und Laktationsdauer waren sowohl in Tharparkar als auch in Sahiwal bedeutend. Der Einfluß von Jahreszeit war in Tharparkar bedeutend (unter zwei Modellen), wohingegen war er in Sahiwal statistisch unbedeutend. Eine zu große Zunahme in Bullenvarianz, indem die Periode von dem Modell ausgeschlossen wurde, zeigte eine Verwirrung von Periode und Bulleneinfluß. Die Angleichung durch Regression der Milchleistung über Erstabkalbungsalter und Laktationsdauer für Bullenbewertung ist nicht nötig, weil diese Erbmerkmale selbst von Bullen beeinflußt werden. Die Verwendung von Bullen, die auf Grund der Angleichung von diesen Merkmalen bewertet wurden, kann die tägliche Milchleistung erhöhen, eher als die Milchleistung für eine Laktationsdauer von 305 Tagen zu erhöhen. Der Einfluß der verschiedenen Angleichungen auf Bullenrangordnungen war klein, weil gewöhnlich hohe Korrelationen kamen zwischen Bullenrangordnung auf Grund der angeglichenen und nichtangeglichenen Angaben vor.

References

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