# RELATIONSHIP BETWEEN BEEF PRODUCTION TRAITS AND CALVING PERFORMANCE IN TWO BREEDS OF DUAL PURPOSE CATTLE

## Relación entre los caracteres de producción de carne y rendimiento reproductor en dos razas vacunas de doble propósito

## Beziehung zwischen den Charakteren des Fleischproduktion und Abkalbüngsmerkmale in zwei Zweinützungsrindrassen

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### Defining the problem

Breeding dual purpose cattle, an eye must be kept also on other traits than those belonging to milk and beef production. The goal for this investigation was to examine, whether the selection for beef production, expressed as daily gain and slaughter quality brought along a rise in the frequency of difficult calvings.

As the two traits are most frequently measured on the different sexes, the method of correlating average results from half sib progeny groups of bull calves (beef production) and first calving heifers (calving performance) was used.

### Materials and methods

The material of the investigations, shown in Table 1, originates from the progeny testing station for beef production EGTVED (Andersen and Lykke, 1974) and from the progeny testing stations for milk production (Nielsen and Vesth, 1969). Over a four-year period the results for the bulls of the breeds Red Danish (RDM) and Black Pied Danish (SDM) which were tested both for milk and beef production were taken into the investigations. Approximately half of the bull calves in each group were slaughtered as veal calves (250 Kg) and the rest as young bulls (450 Kg).

For analyzing the method of least-squares and the programme LSMLGP (Harvey, 1960, 1968) was used, and the analyzing models are described by Hansen, 1972.

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TABLE 1

THE NUMBER OF BULLS TESTED, AVERAGE NUMBER PER GROUP AND TOTAL NUMBER OF ANIMALS

| | Red Danish | Black Pied Danish |
|---|---|---|
| No. of bulls | 43 | 36 |
| Total no. of progeny: | | |
| Beef production | 733 | 622 |
| Milk production | 788 | 696 |
| Average no. of progeny per group: | | |
| Beef production | 17,0 | 17,3 |
| Milk production | 18,3 | 19,3 |

RESULTS

The analyses were run for calving performance and beef production separately, the final analysis then using the results from the two separate ones.

a) *Calving performance*

The calving performance was scored according to the following system:

| Value | Class |
|---|---|
| 1 | Normal (No help at all) |
| 2 | Slightly difficult (Help from one man) |
| 3 | Very difficult (Help from two or more men) |

The distribution of the calvings on classes and breeds is shown in Table 2.

TABLE 2

THE DISTRIBUTION OF CALVINGS ON BREEDS AND CLASSES

| Breed | | Calving performance Normal (1) | Slightly diff. (2) | Very diff. (3) | Total No. |
|---|---|---|---|---|---|
| RDM | No. | 669 | 85 | 34 | 788 |
| | % | 84.90 | 10.79 | 4.31 | 100.00 |
| SDM | No. | 596 | 63 | 37 | 696 |
| | % | 95.63 | 9.05 | 5.32 | 100.00 |

The results in Table 2 show no great breed differences although the SDM breed tends to have a higher frequency very difficult calvings than the RDM

breed. 9.9 % of the calves in the RDM breed died at birth or were stillborn, this figure was better for the SDM breed, 6.0 %.

The values 1, 2 and 3 respectively were put on the three classes and used in the statistical analyses. The distribution of the calvings was very skew (Table 3). The heritability was calculated in two different ways, the usual method of four times the intraclass correlation between half sibs and the method of all-or-none traits (DEMPSTER and LERNER, 1950). Table 3 is a survey of the results from the analyses of calving performance.

TABLE 3

AVERAGE, STANDARD DEVIATION SKEWNESS AND HERITABILITY OF CALVING PERFORMANCE

| | Red Danish | Black Pied Danish |
|---|---|---|
| Average value ... ... ... ... ... ... | 1.194 | 1.200 |
| Standard deviation ... ... ... ... | 0.493 | 0.519 |
| Coeff. of skewness ... ... ... ... | 2.54 ** | 2.57 * |
| $h^2 \pm$ s. d. $(4 \cdot t)$ ... ... ... ... ... | 0.207 ± 0.098 | 0.155 ± 0.091 |
| $h^2$ (all-or-none) ... ... ... ... ... ... | 0.225 | 0.148 |

** $P < 0.01$.

There is a good agreement between $h^2$-estimates calculated in the two different ways. The heritability seems to be a little higher for RDM than for SDM, but in both breeds the heritability estimates is of a size near the heritability of milk yield.

b) *Beef production*

The beef production traits were daily gain, daily net gain and percent pistol lean (ANDERSEN and LYKKE, 1974). For the progeny groups investigated the results of the analyses are shown in Table 4.

TABLE 4

AVERAGE, STANDARD DEVIATION, SKEWNESS AND HERITABILITY OF BEEF PRODUCTION TRAITS

| Trait | Breed | Average | s. d. | Skewness | $h^2 \pm$ s. d. |
|---|---|---|---|---|---|
| Daily gain, grammes | RDM | 1092 | 69 | 0.17 | 0.48 ± 0.14 |
| | SDM | 1125 | 73 | 0.08 | 0.52 ± 0.16 |
| Daily net gain, grammes | RDM | 593 | 43 | 0.05 | 0.45 ± 0.13 |
| | SDM | 623 | 45 | — 0.16 | 0.34 ± 0.13 |
| Pistol lean % | RDM | 31.2 | 1.3 | — 0.13 | 0.51 ± 0.14 |
| | SDM | 32.6 | 1.6 | — 0.02 | 0.46 ± 0.15 |

The heritability was calculated as 4 times the intraclass correlation between half sibs. Evidently there is a breed difference, the SDM breed being the better

beef producer. The difference is, however, not very big and as to milk production the RDM breed is the superior.

c) *Correlations between calving performance and beef production*

The aforementioned analyses were made on data from each animal, whereas the analysis of covariance needed to be carried out on groups averages. When the heritabilities of the traits and the correlations between group averages are known it is possible to calculate the genetic correlations, if no environmental correlations exist (HANSEN, 1972). An environmental correlation could be neglected here, as the bulls were placed at one station, the heifers at some other stations. In Table 5 the results of the analysis of covariance are shown.

TABLE 5

PHENOTYPIC CORRELATIONS BETWEEN GROUP AVERAGES AND GENETIC CORRELATIONS BETWEEN CALVING PERFORMANCE AND BEFF PRODUCTION TRAITS

| Correlation between calving performance and | Type of correlation | Red Danish | Black Pied Danish |
|---|---|---|---|
| Daily gain ... ... ... ... ... ... ... .. | Phenotypic | — 0.089 | — 0.023 |
| | Genetic | — 0.149 | — 0.041 |
| Daily net gain ... ... ... ... ... ... | Phenotypic | — 0.116 | — 0.047 |
| | Genetic | — 0.197 | — 0.091 |
| % pistol lean ... ... ... ... ... .. | Phenotypic | — 0.025 | — 0.042 |
| | Genetic | — 0.042 | — 0.077 |

The sign of the correlation coefficients indicate that better calving performance (low values) are followed by higher daily gain, net gain and percent pistol lean. Nevertheless none of the correlation coefficients are statistically significant different from zero.

## DISCUSSION AND CONCLUSIONS

In the Israeli-Friesian breed BAR-ANAN (1971) found a phenotypic correlation between growth rate of bull calves and frequency of difficult calvings of their female half sibs of 0.29 ($P < 0.05$) under field conditions. This result was not verified in this investigation on Danish material. It might be because of different breeds or because this investigation was not carried out on field material. The coefficients of correlation are, however, lower for the SDM-breed, i. e. closer to the Israelian one than those of the RDM-breed.

It would have caused some trouble in the breeding of dual purpose cattle, if this undesired correlation between the main beef production traits and calving performance had existed. However, there does not seem to be risk for increasing calving difficulties in the two dual purpose breeds Red Danish and Black Pied Danish when selecting for beef production, this selection being based upon the traits daily gain, daily net gain and per cent pistol lean.

## ZUSAMMENFASSUNG

Die Heritabilität der Frequenz von schwierigen Kalbungen bei den beiden Rassen Rote Dänische und Schwarzbunte Dänische wurde auf 43 bezw. 36 Nachkommengruppen (durchschnittlich 19 Erstkalber pro Gruppe) zu 0.207 ± 0.098 bezw. 0.155 ± 0.091 berechnet. Für die Berechnungen wurden die Klassen 1 = normal, 2 = etwas schwierig und 3 = sehr schwierig angewendet.

Halbbrudergruppen dieser Erstkalber wurden in der Nachkommenprüfung für Mastleistung eingesetzt. Für die Eigenschaften tägliche Zunahme, tägliche Nettozunahme und Prozent Pistol Fleisch ergaben sich Heritabilitätsschätzungen auf 0.34 bis 0.52. Hier war auch nicht zwischen den Rassen sehr grosse Differenz. auf 0.34 bis 0.52. Hier ar auch nicht zwischen den Rassen sehr grosse Differenz.

Zunächst wurden die phänotypischen und genetischen Korrelationskoeffizienten zwischen der Frequenz von schwierigen Kalbungen und den drei Fleischproduktionsmerkmalen berechnet. Die Koeffizienten waren niedrig und nicht signifikant verschieden von Null.

Es scheint, als ob es keinen Zusammenhang zwischen den zwei Typen von Eigenschaften gibt, und dass die Selektion für bessere Fleischproduktion nicht von einer Steigerung in der Frequenz von schwierigen Kalbungen gefolgt wird.



## RESUMEN

La herencia de la frecuencia de partos difíciles en las razas Danesa roja y Danesa berrenda en negro ha sido calculada, respectivamente, sobre 43 y 36 grupos de descendientes (como media, 19 primeros partos por grupo), en 0,207 ± 0,098 y 0,155 ± 0,091, respectivamente. Para los cálculos fueron empleadas las clases 1 = normal, 2 = algo difícil y 3 = muy difícil.

Grupos de medio hermanos de estas primerizas se sometieron a la prueba de descendencia para el engorde. En los caracteres de ganancia diaria en peso, ganancia neta diaria y porcentaje de carne de pistola se observaron heredabilidades desde 0,34 hasta 0,52. Tampoco existió aquí una gran diferencia entre ambas razas.

Se calcularon posteriormente los coeficientes de correlación fenotípicos y genotípicos entre la frecuencia de partos difíciles y las tres características citadas de producción de carne. Los coeficientes fueron bajos o no significativamente distintos de cero.

Parece que no existe relación alguna entre ambos grupos de caracteres y que la selección para una mejor producción de carne no trae como consecuencia un aumento en la proporción de partos difíciles.


## LITERATURE


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