

## GENETIC ASPECTS OF BEEF PRODUCTION IN DUAL PURPOSE CATTLE

### Genetische Aspekte der Produktion vom Fleischrind doppelter Absicht

### Aspectos genéticos de la producción de vacuno de carne de doble propósito

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The increasing demand of lean beef of high quality combined with increasing prices of grassland and decreasing areas available for food production will favour a combined production of milk and beef in the same herd. It will actualize the dual purpose type of cattle.

By including beef characters in the breeding schemes for dairy and dual purpose cattle breeds it will be possible to reduce the costs of food, labour and investment in the production of fattening bulls, surplus heifers and replacement heifers, and it will be possible to increase the carcass value of young bulls, surplus heifers and culled cows. Such breeding programmes are also established in different European countries (PETERSEN *et al.*, 1974).

#### RELATIONSHIPS BETWEEN MILK AND BEEF CHARACTERISTICS

Several scientific papers have documented that the genetic correlation between beef production and milk yield does not differ significant from zero (MASON, 1964; DINKLAGE, 1965; PETERSEN, 1974). Consequently is should be possible to improve milk and beef in the same breed without adverse effect on the other.

#### GENETIC PARAMETERS FOR BEEF PRODUCTION CHARACTERS

In beef cattle there are many measurements of genetic parameters for beef production traits, viz. growth capacity, carcass quality and meat quality (for

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review see PRESTON and WILLIS, 1970). But in dairy and dual purpose cattle there are published relatively few calculations on growth characters, only few on carcass quality and very few on meat quality.

Results from calculations on data from the Danish progeny test for beef production are shown in Table 1. The data comprise growth and dissection data from 462 skimmilk calves and 361 young bulls equal distributed on 49 sires of the RDM breed (Red Danish Breed).

All calves were born in January and February; they started at the test 2 weeks old, feeded *ad lib.* and then slaughtered at a living weight of 250 Kg (skim milk calves) and 450 Kg (young bulls). The carcass was dissected in meat, fat and bone, and samples for meat quality examinations were taken.

TABLE 1

BREED AVERAGE, COEFFICIENT OF VARIATION (C.V.) AND HERITABILITY ( $h^2$ ) FOR BEEF TRAITS IN DUAL PURPOSE CATTLE (462 SKIMMILK CALVES AND 361 YOUNG BULLS)

		Daily gain (g/days)		Muscle area (cm <sup>2</sup> )		Pistol meat (%)		Meat/Bone		Tenderness (WOLODKIEWITSCH, Kg)	
Calves	A. V. ....	1069		48.3		33.2		3.47		10.4	
	C. V. ....	5.2		8.9		3.4		6.2		33.7	
	$h^2$ and s. e. ....	0.46	0.16	0.80	0.20	0.77	0.19	0.67	0.18	0.57	0.17
Young bulls	A. V. ....	1141		66.0		30.4		4.03		11.5	
	C. V. ....	5.8		9.0		3.8		6.3		33.0	
	$h^2$ and s. e. ....	0.52	0.19	0.60	0.20	0.40	0.18	0.65	0.20	0.45	0.18

\* Amount of meat in pistol cut in per cent of total carcass weight.

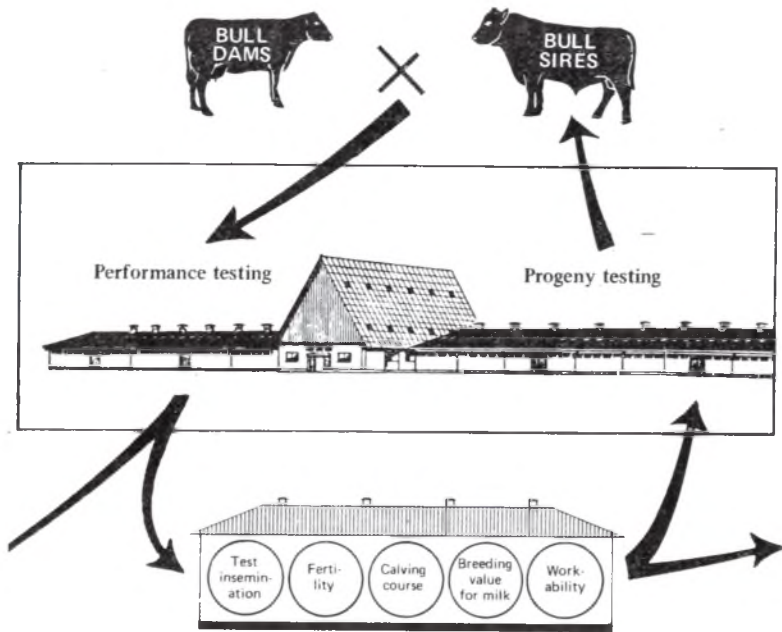
The coefficient of variation for growth and carcass qualities it tells about an effective control of the environment at the test station, slaughter house and cutting center. The heritabilities found are on same or higher level than in other analysis of data from dairy and dual purpose cattle populations (LANGLET, 1967; GRAVERT, 1963).

The results emphasize that also in dairy and dual purpose cattle it is possible to improve the capacity and quality of beef production.

#### BEEF IMPROVEMENT IN DANISH BREEDING PLANS

The Danish cattle breeding work is carried out by A.I. organizations, breed organizations and the independent organisation EGTVED, as cover performance test and progeny tests for beef production in co-operation with the National Institute of Animal Science and the Meat Research Institute.

EGTVED's place in the breeding programme is illustrated in the following figure:



The best bulls are returned to the A. I. stations, and a limited number of cows inseminated with semen from them. Then it is necessary to wait for the results of the bulls' influence on fertility, calving course, the progeny test results for milk production (P- and R-index) and workability.

The best cows are registered as prospective bull dams in the EDB stocks of the Milk Recording Societies.

The selected bull dams are inseminated with semen from bull sires and the bull calves after these selected parents are placed at the performance test station of EGTVED, where they are tested for growth capacity, feed efficiency and carcass quality (ultra-sonic) (See NEIMANN-SORENSEN, 1972, and ANDERSEN und ERNST, 1972).

The breeding value of a bull's growth capacity is expressed by the following *T*-index:

$$T = h^2 (P_x - \bar{P}) + \bar{P}, \text{ where.}$$

$h^2$  = The coefficient of heritability for daily gain = 0.6.

$P_x$  = The gain of the bull in percentage of the breed's average at the station.

$\bar{P}$  = The breed's average at the station (= 100).

The best bulls are returned to the A. I. centers and there tested for fertility, calving course, milk production and workability. Then the absolutely best bulls are progeny tested for beef production on EGTVED, which has the capacity for 30 bulls per year.

Bulls of RDM, SDM and DRK with satisfactory breeding value for milk pro-

duction and some beef-bulls, who are used for cross-breeding. In October 10 bull calves from each one of the nominated A.I. bulls are placed at EGTVED.

The calves are weighed at the age of 4 weeks, and then every 28 days. It is thus possible to follow the gain of each individual calf through the test period.

The calves placed at the station are slaughtered at a live weight of 300 Kg. A dissection of the slaughtered animal is done, and both the composition of the carcass and the quality of the meat are carefully examined.

The most important results are group averages for:

Daily carcass gain  
Percentage of pistol meat  
Consistency of meat

Those three characters are summarized into a *K*-index, which has the average of 100. The *K*-index may vary from 85 to 115.

$K = b_1 \cdot NT + b_2 \cdot PK + b_3 \cdot Kons.$ , where.

*NT* = Is the average carcass gain of the progeny group - measured as differences from the breed's average at the station.

*PK* = Is the average percentage of pistol meat of the progeny group - measured as differences from the breed's average at the station.

*Kons.* = Is the average consistency of meat of the progeny group - measured as differences from the breed's average at the station; and

$b_1$ ,  $b_2$  and  $b_3$  is weighing factors for the three characters - calculated on basis of the heritability of the characters, their correlations and their relatively economic importance.

The *K*-index plays an important role by selecting of the new generation of bull sires.

## SUMMARY

From 1967 till 1970 49 progeny groups of RDM (Red Danish Breed) were tested for growth capacity, carcass quality and meat quality. The date comprise results from 462 skimmilk calves and 361 young bulls, equally distributed on progeny groups. The calves were tested from an age of 2 weeks to a live weight of 250 and 450 Kg resp. The feeding was *ad lib*. The carcass was dissected, and meat quality examinations were carried out. The calculations showed a low coefficient of variation for growth and carcass quality traits. The heritabilities found are high. All the results emphasize that by breeding in dairy and dual purpose cattle it is possible to improve the capacity and quality of beef production.

In the Danish breeding programme the bull calves are performance tested on the breeding station EGTVED. The growth capacity is expressed by a *T*-index. Only the best bulls are progeny tested for milk production traits. The very best of these bulls are progeny tested for beef production, and the results are expressed by a *K*-index, summarized from daily carcass gain, percentage of pistol meat and consistency of meat. The capacity of milk production and the *K*-index are used by selection of bull-fathers.

## ZUSAMMENFASSUNG

In den Jahren 1967 bis zu 1970 wurden 49 Nachkommenschaftsgruppen von RDM (Rotes Dänisches Milchvieh) für Wachstumkapazität, Schlachtkörperwerte und Fleischqualität geprüft. Das Material umfasst Daten von 462 Magermilchkälbern und 361 Jungbullen gleichmässig an Nachkommenschaftsgruppen verteilt. Die Bullenkälber wurden bei einem Alter von 2 Wochen bis 250 bez. 450 Kg geprüft. Die Fütterung war *ad lib*. Die Schlachtkörper wurden aufgeschnitten, und Untersuchungen über Fleischqualität wurden durchgeführt. Berechnungen ergaben einen niedrigen Variationskoeffizienten für Zunahme und Schlachtkörper-eigenschaften. Die gefundenen Heritabilitäten waren hoch. Die Resultate stellen fest, dass es beim Zucht in Milch- und Kombinationsrassen möglich ist, die Kapazität und Qualität der Fleischproduktion zu vermehren.

Im dänischen Zuchtprogramm werden die Bullenkälber einer Eigenleistungsprüfung an der Zuchtstation EGTVED unterworfen. Die Wachstumkapazität ist durch einen *T*-Index ausgedrückt. Nur die besten Bullen werden für Milchleistungseigenschaften nachkommenschaftsgeprüft. Die am besten dieser Bullen werden für Fleischproduktion nachkommenschaftsgeprüft, und die Resultate werden durch einen *K*-Index ausgedrückt. Der *K*-Index ist über tägliche Zunahme, Prozent Pistolfleisch und Fleischkonsistenz summiert. Die Milchleistung und der *K*-Index werden in dem Auswählen von Bullenvätern angewendet.

## RESUMEN

Desde 1967 a 1970, se probaron 49 grupos de progenie de RDM (raza roja danesa) en cuanto a capacidad de crecimiento, calidad de la canal y calidad de la carne. Los datos comprenden resultados de 462 terneras criadas con leche desnatada y 361 terneros, igualmente distribuidos en grupos de progenie. Las terneras se probaron desde la edad de dos semanas a un peso vivo de 250 Kg; los terneros, hasta 340 Kg de peso vivo. La alimentación fue *ad libitum*. Se disecó la canal, llevándose a efecto determinaciones sobre la calidad de la carne. Los cálculos demostraron un bajo coeficiente de variación para los caracteres del crecimiento y de la calidad de la canal. Las heredabilidades encontradas fueron muy elevadas. Todos los resultados comprueban que la cría de ganado para producción de leche y para doble propósito es posible para mejorar la capacidad y calidad de la producción de carne.

En el programa danés de cría, los terneros se prueban en la estación EGTVED. La capacidad de desarrollo se expresa en un índice *T*. Sólo los mejores novillos se prueban para los caracteres lecheros. Los mejores aún de todos ellos se prueban por la prole para la producción de carne, y los resultados se expresan en un índice *K*, que resumen las ganancias diarias en peso, el porcentaje de la carne de primera y la consistencia de la carne. La capacidad para la producción láctea y el índice *K* se utilizan para la selección de los toros reproductores.

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