Limits of on-the-Farm progeny testing of crossbred calves commercialized shortly after the birth, for beef sire evaluation.
Les limites d'un contrôle de la descendance réalisé sur des veaux croisés commercialisés précocément après la naissance pour évaluer la valeur bouchère des taureaux de races à viande.

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INTRODUCTION

Since the last few years, French selection units have been confronted with many difficulties in selecting beef bulls for terminal crossing (FOULLEY, 1981). One of the main difficulties is to control a key-step such as progeny testing at the station or on the farm. There are not only technical problems, but also financial ones which increase every year by the steady lowering in the number of inseminations for crossbreeding with beef bulls.

Furthermore, the production of crossbred calves marketed very early (generally between 3 and 4 weeks), is developing. These calves are mainly intended for the Italian market. They are characterized by a very good beef conformation score and accordingly a very high commercial value (3-4 times higher than the value of a purebred Friesian calf). In these particular market conditions it is very difficult to gather a representative sample of the progeny of each bull so as to control it at the station until slaughter. It should also be pointed out that to satisfy this particular demand, the bulls used have a heavy muscle development and may even be double-muscled.

We therefore examined the possibilities of obtaining an early evaluation of beef value of these bulls using on-the-farm progeny information with weighing and beef conformation scoring done before the calves are sold.

MATERIAL AND METHODS

A first set of 22 bulls was started in 1981 in South-Eastern France where almost all calves are commercialized in the condition described above. About 200 inseminations per bull were performed in non specialized dairy-herds including cows of various breeds especially the Montbeliarde and Friesian breeds. An average number of 109 progenies were tested per bull, i.e. 87 % of the calves registered at birth. The calves which had not been tested were : the twins (6 %), calves dead at birth or before conformation scoring (4 %) and those sold before testing (3 %).

The traits studied were the following.

- birth weight of calves (60 % of the calves were weighed the other birth-weights were estimated by the farmers).

- the subjective birth condition score varying from 1 to 4 according to increasing calving difficulties.

- the weight at fixed age (17 days) calculated by intrapolation or extrapolation from birth weight and from the weight measured before the calves were sold.

- beef conformation scores : muscular development, bone thinness and development (size) of the calves.

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we performed an analysis using HENDERSON'S method 2. The data were first corrected for systematic environmental factors of variation using least squares estimates. The heritability coefficients as well as genetic and phenotypic correlations were then estimated on the corrected data from paternal and residual components of variance and covariance of the traits involved.

RESULTS AND DISCUSSION

The values and significance of the effects of the factors of variations are given in table 1. All traits were significantly affected by the sex, dam breed, rank of calving and evaluator. The estimates of the genetic and phenotypic parameters reported in table 2 show that :

- birth weight was an excellent predictor of birth conditions. Indeed, the genetic correlation between birth weight and the score or rate of difficult births was equal to 1. The heritability coefficient of birth weight : 0.33 was substantially higher than those estimated by POUJARDIEU & VISSAC (1968) : 0.24 or by FOULLEY & al. (1978) : 0.17 but similar to that recorded by RENAND & GAILLARD (1982) : 0.32. Accordingly, it is possible to accurately estimate the bulls on the birth conditions using the weight as sole estimator or combined with birth difficulty criteria.

- the heritability of weight at 17 days (h^2 = 0.25) was similar to that of birth weight. However, it did not give any further genetic information than that supplied by the birth weight of the bulls. The genetic correlation between the two weights was in fact close to 1 and selection on weight at 17 days would unavoidably lead to increasing birth difficulties.

- the heritability coefficient of muscle development is not negligible ($h^2 = 0.28 \pm 0.09$) and selection for this trait is therefore possible. However, are so early measurements reliable and what is the correlation between sire rankings based on progeny testing with 3-week old calves and progeny testing based on finished calves ? The presence of double-muscled bulls among those used in this type of production fully justifies that reservation. Indeed, it has been well established that the degree of expression of muscle hypertrophy varies according to the age of the animals (MENISSIER, 1982) ; thus, hypertrophy may be observed already at birth, but most frequently it appears when the animal is some weeks old, and becomes very marked when they are in the intensive fattening period . Accordingly, it is possible that some calves do not fully express their muscle growth potential at the moment of testing.

- the heritability coefficients of bone thinness (h^2 = 0.57) and of the development (h^2 = 0.53) were high. However, these two criteria were not very interesting since in the present conditions of evaluation their respective relationship with birth weight appeared to be very large, so that the information supplied was not original. However, it would be interesting to determine the relationships between bone thinness and some carcass value components, in particular carcass conformation and dressing percentage.

TABLE 1 : Values and significance of the effects of the various factors of variation

Criteria / Factors	Birth weight EFF (1)	Values	"F" (2)	Weight at 17 days Values	"F"	Birth condition score EFF	Values	"F"	Rate of difficult births Values	"F"	Muscle development EFF	Values	"F"	Bone thinness Values	"F"	Development of calves Values	"F"
Sex (male-female)	1 178	4.4	**	5.0	**	1 286	0.26	**	8.8	**	1 086	1.4	**	- 0.8	**	0.6	**
	1 063					1 147					997						
Region 1	1 284	- 0.2	ns	- 0.4		1 460	0.03	*	1.2	ns							
Région 2	957	0.2		0.4		973	-0.03		- 1.2								
Dam breeds																	
Friesian	940	- 0.7		- 2.6		1 019	0.08		0.6		878	- 0.3		0.5		- 0.3	
Montbeliarde	1 184	1.2	**	2.0	**	1 276	-0.02	**	- 0.1	ns	1 091	- 0.3	*	- 0.3	**	0.2	**
Others	117	- 0.5		0.6		138	-0.06		0.5		114	0.6		- 0.2		0.1	
Birth month 1	380	- 0.4		- 0.4		398	0.01		- 1.1		337	- 0.5		- 0.2		0.0	
2	468	- 0.5		- 0.7		507	0.04		- 0.7		443	- 0.3		- 0.2		0.0	
3	507	- 0.1		- 0.5		565	0.02		0.1		485	0.2		- 0.1		- 0.1	
8	203	0.1	ns	0.0	ns	230	-0.03	ns	0.1	ns	209	0.2	**	0.1	**	0.1	ns
10	164	0.5		1.3		179	-0.10		- 1.6		159	0.5		0.1		0.0	
11	204	0.9		0.9		222	-0.00		1.1		168	0.2		0.1		0.0	
12	315	- 0.3		- 0.5		332	0.06		2.2		282	- 0.3		0.1		0.0	
Calvingorder 1	59	- 1.4		- 2.5		71	0.09		3.9		56	- 0.2		0.0		- 0.2	
2	399	- 0.4		- 1.6		444	0.01		1.0		377	- 1.0		0.2		- 0.2	
3	450	0.5	*	1.5	**	486	-0.02	ns	- 2.4	ns	423	0.6	**	0.0	*	0.1	**
4	545	0.6		0.8		576	0.01		0.3		490	0.1		0.0		0.1	
5	332	0.8		0.8		353	-0.05		- 1.3		304	0.1		0.0		0.1	
5	456	- 0.1		1.0		503	-0.03		- 1.5		433	0.4		- 0.2		0.1	
Birth weight weighed	1 366	0.9	**	0.7	**	1 366	0.01		- 0.5								
estimated	875	- 0.9		- 0.7		1 067	-0.01	ns	0.5	ns							
Evaluator 1											1 251	1.5	**	0.6	**	- 0.1	**
2											832	- 1.5		- 0.6		0.1	
Mean ± σ	45.7 kg ± 7.0			62.7 kg ± 8.2		1.75 ±0.64			10.6 % ± 29		15.8 points ± 3.60			5.40 points ±1.13		6.20 points ± 1.02	

(1) Number (2) Significance of test "F" * : P<0,05 ** : P<0,01 ns : P≥0,05

TABLE 2 : Genetic and Phenotypic correlations, heritability coefficients of tested traits

h^2 \ rg / rp	1	2	3	4	5	6	7
Birth weight 1	0.33 ± 0.10	1.00	1.00	0.95	0.38	- 0.79	0.82
Birth condition score 2	0.40	0.10 ± 0.04	0.98	1.00	0.35	- 0.79	0.79
rate of difficult Births (a) 3	0.36	0.69	0.10 ± 0.04	1.00	0.22	- 0.99	0.97
Weight at 17 days 4	0.59	0.24	0.20	0.25 ± 0.11	0.36	- 0.79	0.85
Muscle development 5	0.30	0.19	0.15	0.54	0.28 ± 0.09	- 0.08	0.06
Bone thinness appraisal 6	- 0.43	- 0.21	- 0.17	- 0.39	0.01	0.57 ± 0.15	- 0.97
Development appraisal 7	0.52	0.26	0.20	0.60	0.28	- 0.68	0.53 ± 0.15

(a) Correspond to scores 3 and 4

CONCLUSION.

These results show the limits of on-the-farm progeny testing of 3-week old calves for estimating the beef value of bulls. Finally, an early evaluation of muscle development seems possible, but one may question the significance of such an early measurement for predicting that trait in beef calves or young cattle. Furthermore it is not possible to discriminate bulls for the growth potential other than on the basis of birth weigh which unfortunately is strongly associated with birth difficulty.

An increasing proportion of inseminations for crossbreeding with beef bulls is done in the context of production systems where the calves are marketed between 3 and 4 weeks of age. We studied the feasibility of obtaining an early evaluation of beef value of these bulls by utilizing on-the-farm progeny information with weighing and beef conformation scoring done before the sale of the calf.

Results from a first set of 22 Charolais bulls suggest limitations of this type of evaluation. Weights at 17 days of age do not provide any genetic information additional to that accruing from birth weight. In addition, the heritability of beef conformation scores is not negligible (h^2=0.28±0.09). Anyhow, one can question the significance of such an early measurement for assessing muscular development in beef calves or young cattle.

Une part croissante des inséminations artificielles réalisées en croisement avec des taureaux de races à viande sont faites chez des éleveurs qui commercialisent leurs veaux très tôt, généralement entre 3 et 4 semaines. Nous avons étudié la possibilité d'évaluer précocément la valeur bouchère de ces taureaux en utilisant une information recueillie en ferme, dans le cadre d'un contrôle de la descendance où des pesées et pointages sont planifiés avant la vente des veaux. Les résultats obtenus sur une première série de 22 taureaux Charolais montrent les limites de ce type de contrôle : On note que le poids à 17 jours n'apporte aucune information génétique supplémentaire par rapport à celle fournie par le poids à la naissance pour apprécier le potentiel de croissance des taureaux. Par ailleurs l'héritabilité de la conformation bouchère n'est pas négligeable (h^2=0.28±0.09). Toutefois on peut s'interroger sur la signification d'une mesure si précoce pour apprécier le développement musculaire de veaux de boucherie ou de jeunes bovins.

BIBLIOGRAPHY

FOULLEY J.L., MENISSIER F., GAILLARD J., 1978. Paramètres génétiques des races Blonde d'Aquitaine, Charolaise et Limousine utilisées en croisement pour la production de veaux de boucherie.

Ann. Genet. Sel. Anim., 10 (3), 377-390

FOULLEY J.L., MENISSIER F., 1981. Selection of beef bulls for terminal crossing in France. E.E.C. Seminar on "beef production from the dairy herd", Dublin, Ireland, 13-15 April 1981, 23 pp.

MENISSIER F., 1982. Present state of knowledge about the genetic determination of muscular hypertrophy or the double-muscled trait in cattle. C.E.C. Seminar on "Muscle hypertrophy of genetic origin and its use to improve beef production", Toulouse, France, EUR 6896 EN, Martinus Nijhoff, The Hague, 387-428.

POUJARDIEU B., VISSAC B., 1968. Etude biométrique de la valeur bouchère des veaux croisés charolais et limousins.

Ann. Zootech., 17, 143-158.

RENAND G., GAILLARD J., 1982. Variability of direct genetic effects on growth and slaughter performance in the charolais breed for production of young beef bulls. (proposed).