

PRELIMINARY RESULTS OF NATURAL TWINNING ABILITY IN A SELECTED SAMPLE
OF CHAROLAIS AND MAINE-ANJOU COWS AND THEIR HEIFER PROGENY.

RESULTATS PRELIMINAIRES DE L'APTITUDE NATURELLE A LA GEMMELLIPARITE
D'UN ECHANTILLON DE VACHES CHAROLAISES ET MAINE-ANJOU
SELECTIONNEES ET DE LEUR DESCENDANCE.

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Improvement of the production efficiency of beef cattle in intensive systems with suckling cows is directly related to the number of marketed calves per breeding cow. Among the factors affecting this variable, prolificacy represents a main one which may be improved by genetic means (JOHANSSON et al., 1974; MAIJALA and SYVAJARVI, 1977; PIPER and BINDON, 1979).

After having estimated the frequency of twinning, via on-the-farm records of cows from different French beef breeds, it seemed of interest to create a herd of females with good twinning ability (MENISSIER and FREBLING, 1974) and to examine the performance of the foundation cows (G_0) and of their daughters (G_1) in the same herd.

The purpose of this paper is to report the results obtained from 9 (G_0) and 7 (G_1) calving periods.

I - MATERIAL AND METHODS.

I.1 - Animals.

From 1971 to 1975 we bought cows and created a herd at "La Minière" with a total of 45 animals [27 MAINE-ANJOU (MA) and 18 CHAROLAIS (CH)] whose characteristics are given in table 1 (45% twinning). The main characteristics of these cows were : natural twinning at least 2 times, as young as possible but "ready" for reproduction or, even better, pregnant (78%). For sanitary (brucellosis) and financial reasons, purchases of G_0 were interrupted from 1975 to the end of 1981.

I.2 - Experimental conditions.

The females were managed in a suckling cow herd kept in loose housing conditions during the winter (1/15 november to 15/30 april) and grazed the rest of the year on a small sized permanent pasture, supplemented with hay. Each cow raised its calf or calves and weaning took place around 7 months of age (210 days + 1 week). The cows were artificially inseminated by bulls of the same breed, with natural heats detected when the animals were grazing. The bulls (4-5 per breed and per year) used to inseminate G_0 were mainly chosen among those of each breed used in A.I, and for G_1 , among G_1 males selected for twinning ability on the basis of ancestral and sib information.

The culling rate of G_0 was very high because of their high mean age when they were purchased (table 1), and because of brucellosis abortions which disturbed 3 calving periods (1973, 1974, 1975 with abortion rates of 17, 40 and 18 p.cent, respectively).

All G_1 females were kept for reproduction (first calving at 3 years of age) and G_1 males were fattened and slaughtered around 16-18 months of age.

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I.3 - Criteria measured or observed. Statistical analysis of data.

The following observations or measures were made at calving time : preparation of the cow, condition at parturition, maternal behaviour, delivery, presentation and vigour of the calves, weights of calves and dams and gestation length. After calving : anoestrus length, calving - fertilization interval.

G₁ calves were weighted at weaning, G₀ and G₁ females at diet changes, G₁ males before slaughter (at the age of 16-18 months).

Twinning pregnancies will be expressed in 2 ways : number of twinnings/total number of calvings, number of animals having given twins at least once/number of animals having calved.

The factors of variation affecting weight and growth rate were studied by generation with the least squares method using a model involving the effects of type of birth (single, twin), breed (MA, CH), sex, year, calving order (1,2,3,4 and + for G₁, 3-4-5, 6-7, 8-9, 10 and + for G₀), and breed x type of birth interaction.

The incidence of retained placenta was compared in connection with type of birth and type of pair (sex combination) using a X² test; mortality percentage in relation to type of birth was analyzed in a similar manner.

II - RESULTS.

II.1 - Twinning frequency. (table 1).

The results of gestations and twinnings per generation (MA and CH grouped together) are given in table 1. For G₀, results concerning calvings resulting from fertilization in the herd of origin are separated from the others, and for G₁ results are presented according to calving order.

Both with respect to percentage of calvings and percentage of animals, the results of G₁ were about a half as those of their dams (11% versus 23% of the gestations - 24% versus 46% of the animals), including calvings after purchase of the cows. If the latter data are excluded, the results from the daughters, despite an underestimation due to their age, represent about 2/3 of the performance of the dams (11% versus 18% of the gestations, 24% versus 32% of the animals).

Among breeds, results of G₀ were comparable for percentage of animals (48% = MA, 44% = CH), higher in MA for percentage of gestations (27% versus 17%); MA cows showed trends of a higher repeatability (3 MA cows but no charolais cow had more than 2 twin calvings in the experimental herd).

For G₁, results were higher in MA both for calvings (19% versus 7%) and for animals (42% versus 17%). Percentages observed for calvings in G₁ daughters were definitely higher than those observed in the 2 breeds |3%(CH), 4%(MA)| despite the age handicap of our sample of animals.

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TABLE 1 - Twinning in the foundation cows (G₀) and their daughters (G₁) from 1972 to 1981.

Characteristics of foundation cows (G ₀) purchased between 1971 and 1975	Generation	Place of A.I.	Number (MA+CH)				Reproductive performance									
			calving n*	Number	Twinning calvings		calving n*	Number (c)	gestations				calvings			
					n(a)	% (d)			n (f)	% (e)	n(g)	% (e)	n(h)	% (e)		
27 Maine-Anjou, 7 1/2 years old, (5-10 years) exhibiting 56 twinnings out of 117 (48%) (2/6 à 2/2)	Go	Initial herd	Adults	35	12(b)	34	Adults	45	35	78	12	34	33	73	10	30
		Experimental herd		36	12(b)	33		128	87	68	16	18	68	53	9	13
		Total		41	19	46		173	122	71	28	23	101	58	19	19
18 Charolais, 9 years old, (7-11 years) exhibiting 46 twinnings out of 111 (41%) (2/11 à 3/3)	G ₁	Experimental herd	1	33	2	6	1	39					33	85	2	6
			2 and +	22	6	27	2 and +	70				56	80	8	14	
			total	33	8	24	total	109				89	82	10	11	

- (a) Number of cows having given birth to twins at least once.
 (b) 5 common animals.
 (c) Number of animals in breeding cows (cows x years).
 (d) Frequencies relative to number of breeding cows.
 (e) Frequencies relative to number of gestations.
 (f)-(g) : Brucellosis and accidental abortions.
 (h) : 2/33 (1st calf) - 3/22 (2nd calf) - 5/34 (3rd calf and more).

TABLE 2 - Effects of type of birth, breed and sex on performance corrected for n° calving and year.

Gene-ration	Variables	Birth weight (kg)		Daily gain 0-210 days (g)		weight to 210 days (kg)		Daily gain 210-500 days (g)		weight to 500 days (kg)		Daily gain 210-700 days (g)		weight to 700 days (kg)		Daily gain 210-900 days (g)		weight to 900 days (kg)	
		D	F	D	F	D	F	D	F	D	F	D	F	D	F	D	F	D	F
Go	Overall mean	43,9	(b)	1021	(67-24)	258	(67-24)	854	(53-18)	507	(53-18)	417	(28-7)	454	(28-7)	450	(28-7)	560	(28-7)
G1	Overall mean	43,6	(60-15)	874	(60-15)	227	(60-15)	956	(48-14)	515	(48-14)	426	(16-2a)	460	(16-2)	402	(16-2)	529	(16-2)
Go	Effects	D	F	D	F	D	F	D	F	D	F	D	F	D	F	D	F	D	F
	Type of birth	12,5	++	20	NS	17	NS	61	NS	30	NS	108	NS	58	NS	44	NS	36	NS
	Breed	2,7	NS	32	NS	10	NS	-18	NS	-5	NS	8	NS	26	NS	10	NS	30	NS
Sex	2,5	NS	101	++	24	++	96	++	232	++									
G1	Type of birth	13,8	++	206	++	57	++	26	NS	66	++	-36	NS	-5	NS	15	NS	23	NS
	Breed	6,5	++	42	NS	15	NS	48	NS	4	NS								
	Sex	2,2	NS	12	NS	4	NS	24	++	208	++								

- (a) Only 2 MA twins.
 (b) Animals : singles-twins.
 D : Absolute difference towards : Singles-twins
 " " MA - CH
 " " Males-females.
 F : NS : non significant.
 + : significant 5%
 ++ : significant 1%

II.2 - Influence of type of birth on performance.

All results concerning reproductive performance show that the main effects of multiple births involve : a shortening of gestation length (7 days); similar dystocic calvings despite an increase in abnormal presentations (+ 10%); an increase in placental retentions (+ 52%), the latter being significantly higher for male-male couples; a significant lengthening of post-partum anoestrus (+ 34 days) without any consequences upon subsequent fertility. Indeed, the 1st oestrus-fertilization interval was constant (31 days), the percentage of pregnant animals after 1st A.I. was not affected by the type of birth, and the percentage of total gestations after twinning was even higher (+ 6%).

A better management of the animals after a diagnosed twin gestation should allow to reduce unfavourable effects of twinning (BOSC, 1978).

Results of the analysis of variance concerning weights and growth rates (corrected for year and calving n°) are reported in table 2.

The mortality of twins, which were significantly smaller at birth (73% of the weight of singles) was higher, i.e., 18 % versus 9%; the type of birth significantly affected the weight at weaning and the daily gain of G₁ offspring up to weaning. These differences were not significant for G₀ offspring. In the latter case it seems that the adult cows have enough milk to allow the expression of growth potential : this might account for between sex differences and weight recovery of the twins, contrary to G₁ cows whose milk production at a young age might be a limiting nutritional factor.

After weaning, type of birth did not significantly affect any more the gains whatever the age or generations considered. However, the number of animals was highly reduced after 500 days when the males were slaughtered. At that age (500 days) the only remaining difference was for weights in generation G₁. The large sex difference was due to differences in the management of young bulls and heifers.

These results generally confirm the observations reported by HENDY and BOWMAN (1970).

CONCLUSION.

The superiority of twinning frequency in the foundation cows (23%) and their daughters (11%) in the experimental herd as compared to those observed in the breeds (3-4%), confirms the repeatability and heritability of that character as well as the efficiency of the choice of foundation cows.

These results should allow to create an open selection nucleus.

With the aim of reducing the generation interval and of obtaining more progeny from the best females, our further studies should involve a search for early criteria for estimating that ability using hormonal analyses and embryo transfer.

SUMMARY

Fourty five suckling Maine-Anjou and Charolais cows were included in an experimental herd after having given birth to twin - calves at least two times before (in the farms). Their twinning ability as well as that of heifer progeny were studied from 1972 to 1981. Twin birth percentages were 23 % (124 gestations) and 11 % (89 gestations), respectively for the foundation cows and their daughters ; the superiority of these frequencies as compared to those observed in the farms confirms the hereditary transmission of that trait and the possibilities of creating an "open selection nucleus".

The main effects of multiple births were the following : shortening of gestation length (7 days), a marked increase in the number of placental retentions (+ 52 %) and a lengthening of post-partum anoestrus (+ 34 days) but subsequent fertility was not affected.

Twin-calves were lighter at birth (- 27 %), showed a 2-fold higher mortality rate (18 vs 9 %) and a lower pre-weaning growth (- 11 %). Weight gain differences were not significant after weaning.

RESUME

45 vaches allaitantes Maine-Anjou et Charolaise, ayant donné naissance à des veaux jumeaux au moins deux fois dans leurs élevages d'origine, ont été entretenues dans un troupeau expérimental. Leur aptitude ainsi que celle de leurs filles à donner des veaux jumeaux ont été observées de 1972 à 1981 : les pourcentages de vêlages gémellaires se sont élevés respectivement pour les vaches fondatrices et leurs filles à 23 % (124 gestations) et 11 % (89 gestations) ; la supériorité de ces fréquences par rapport à celles observées dans les élevages confirme la transmission héréditaire du caractère et les possibilités de créer un "noyau ouvert" de sélection.

Les principaux effets des naissances multiples concernent un raccourcissement des gestations (7 jours), un accroissement notable des rétentions placentaires (+ 52 %) et un allongement de l'anoestrus post-partum (+ 34 jours) sans effet sur la fertilité ultérieure.

Les veaux jumeaux plus légers à la naissance (- 27 %) ont une mortalité 2 fois plus élevée (18 % vs 9 %), une croissance avant sevrage plus faible (- 11%). Les différences de gain de poids ne sont pas significatives après sevrage.

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