

## CAUSES OF VARIATION IN BIRTH WEIGHT OF FRIESIAN CALVES.

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### SUMMARY

The effect of sex of the calf, season of birth, gestation period, weight of dam and age of dam at calving, on birth weight was studied. This Study included 302 Friesian calves.

The average birth weight of all the calves studied was 35.86 Kg. Male calves were 3.04 Kg. heavier than female calves. These differences were statistically highly significant.

Season of birth had no significant influence on birth weight. However, it does appear that the average birth weights of calves born in autumn were heavier than those dropped in the other seasons.

There was a general tendency that, as the gestation period for calves increased, their birth weight also increased slightly. Birth weight increased gradually as the dams weight increased. The correlation coefficients between weight of dam in different ages (2—3 years, 3—4 years and 4 years old and over) and birth weight of the calf were 0.399, 0.648 and 0.438 respectively. The average birth weight of calves increases with the increase of age of dam up to six years old.

### INTRODUCTION

The environmental effects on birth weight of a calf comprise the sum of all the influences to which the calf is subjected from the moment of conception until birth.

The birth weight of calves is of interest to breeders, because differences in birth weight between calves may indicate differences between them at a later age. Consequently it is important to the cattle breeder to know the effects of the various factors causing differences in birth weight. This work studies the relation between sex, season of birth, gestation period, weight of dam and age of dam at calving, and on birth weight of Friesian calves.

### MATERIAL AND METHODS

A study was made on this work was made on the birth weight of 302 live Friesian calves, born during the period of 1959 to 1962 at six Experimental farms in the Netherlands.

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The weight of the calves were taken within twenty four hours after birth when they were nearly dry. The dams were divided into groups according to their ages at calving, the age groups of the dams studied were 2-2<sup>6</sup>, 2<sup>6</sup>-3, 3-4, 4-5, 5-6 and over 6 years old.

The correlation between the dam's weight at calving and the birth weight of their calves was studied separately, because the number of calves available with known weight for their dams after calving was small.

The gestation period was taken as the number of days from the date of insemination to the date of calving.

Birth weights of calves were classified according to the season of calving.

Winter : January, February and March.

Spring : April, May and June.

Summer : July, August and September.

Autumn : October, November and December.

In this investigation 148 males and 154 females were involved. All calves used were considered single-born. The number of twins was too small, so that it was left out of consideration.

## RESULTS AND DISCUSSION

Sex :

The average birth weight of all the calves studied was 35.86 Kg. Male calves were heavier than females. The average difference between males and females at birth was 3.04 Kg (Table 1).

TABLE I.—Means, standard deviation, and coefficients of variability for birth weights of male and female calves. (Friesian).

Sex	No.	Mean	S. D.	C. V. %
Males . . . .	148	37.41	4.45	11.89
Females . . . .	154	34.37	4.79	13.93
Total . . . .	302	35.86	4.86	13.55

These differences were statistically highly significant (Table 2). The results obtained in these investigations between male and female calves were similar to those recorded by many workers, viz. that males were heavier than females in different breeds of cattle (Asker and Ragab, 1952, Nelms and Bogart, 1956, and Haines, 1962).

#### *Season of birth.*

The results given in figure 1 show that there are variations from season to season. From this figure it is clear that calves born in autumn were heavier at birth than those dropped in the other seasons. These differences, within age of dam and sex, were nearly significant (Table 2). In this respect the experience of Stegenga (1964) that there is a sharp increase of difficult calving in autumn, is interesting. Also the finding of Kortstee (1963) that gestation periods are longer in autumn, is of interest.

The results obtained in this respect were in agreement with those found by many workers, e.g. Tyler et al. (1947), Braude and Walker (1949) and Asker and Ragab (1952), it was shown that there is variation in birth weight between one season and another, but that these variations are not significant. Those who found significant variations in birth weights with respect to season of calving, attributed these variations to management, condition, food, gestation periods and weather, particularly in hot climates.

TABLE 2.—Analysis of variance for birth weights.

Source of variation	D. F.	Mean Square
Total . . . . .	301	23.64
Sex . . . . .	1	699.94**
Age of dam within sex . . . . .	2	505.29**
Season of birth within age and sex . . . . .	11	26.81
Within season . . . . .	287	17.81

\*\* Highly significant ( $P < 0.01$ )

#### *Gestation period.*

There was a general tendency of the gestation period for calves being increased as their birth weights increased slightly (Table 3). There is a slight indication that female calves are later maturing than males.

TABLE 3.—Relation between length of gestation period and birth weight of male and female calves

Age of Dam	2—4 years						4 years and over						
	Males		Females		Both Sexes		Males		Females		Both Sexes		
	No.	Mean Kg.	No.	Mean Kg.	Mean Kg.	No.	Mean kg.	No.	Mean kg.	Mean kg.	No.	Mean kg.	
Length of gestation period (day)													
250-259. . . . .	2	32.0	—	—	—	—	—	—	—	—	—	—	—
260-269. . . . .	5	33.2	10	30.0	31.6	4	31.7	7	34.6	33.1	7	34.6	33.1
270-274. . . . .	22	36.2	17	32.2	34.2	6	38.8	8	35.1	36.9	8	35.1	36.9
275-279. . . . .	28	36.8	40	32.7	34.7	21	38.8	22	35.5	37.1	22	38.8	37.1
280-284. . . . .	15	36.8	17	33.4	35.1	26	39.8	22	38.3	39.0	22	39.8	39.0
285-289. . . . .	7	37.3	2	36.0	36.6	7	36.8	4	36.0	36.4	4	36.8	36.4
290-299. . . . .	1	34.0	2	34.5	34.3	4	40.2	3	40.7	40.4	3	40.2	40.4
Total :													
Birth weight in (Kg.)	—	35.2	—	33.1	34.1	—	37.7	—	36.7	37.2	—	37.7	37.2
Gestation period (day)	—	276.06	—	276.00	276.03	—	279.9	—	278.2	279.0	—	279.9	279.0



*Weight of dam after calving.*

The correlation coefficient between the weight of dams after calving and the birth weight of their calves was positive (Table 4). The results agree fairly well with those reported by previous workers. Dawson et al. (1947), Gregory et al. (1950) and Brinks et al. (1962). Thus the finding that the weight of the dam has a significant influence on the birth weight of her offspring is confirmed. This correlation shows that the heavier the weight of the mother, the heavier the weight of the calf at birth. It appears that size of the cow is reflected in this correlation, since weight and size are highly correlated.

*Age of dam.*

Table 5 shows that the average birth weights of calves increase with the increase of age of dam up to six years old. This is usually attributed to the changes in size, and to physiological functions which accompany the aging of dam. Results obtained in table 5 show that, within sex, the average birth weights of calves from older dams (2<sup>6</sup> year and over) were heavier than of those from dams between 2 and 2<sup>6</sup> years old. The differences within sex were statistically highly significant (Table 2).

These results are in general agreement with the observations made by Dawson et al. (1947), Burriss and Blunn (1952), Drewry et al. (1959), Stegenga (1961) and Donald et al. (1962).

TABLE 4.—Correlation between weight of dams at calving and weight of their calves at birth.

Age of dam	No. of calves	Average Weight		Correlations
		dams after calving	calves	
Dams 2-3 years old . . . . .	23	473.7	31.7	0.399
Dams 3-4 years old . . . . .	9	512.0	35.1	0.648*
Dams 4 years and over . . . . .	28	585.7	40.3	0.438†
Dams 2 years and over . . . . .	60	531.7	36.2	0.698§

\* Nearly significant.

† Significant (P. < 0.05).

§ Highly significant (P. < 0.01)

TABLE 5.—Means, Standard Deviations, and Coefficients of Variability for Birth Weights of Male and Female Calves on Different Ages of Their Dams.

Age of dam (year)	No.	Mean kg.	S.D.	C.V.	No.	Mean kg.	S.D.	C.V.
				%				%
*2-2 <sup>6</sup>	43	34.59	3.44	9.94	44	31.44	3.98	12.65
2 <sup>6</sup> -3	17	38.38	4.87	12.68	13	33.38	4.65	13.93
3-4	20	38.15	4.43	11.61	31	33.95	2.92	8.60
4-5	18	38.38	2.89	7.52	19	37.31	4.41	11.81
5-6	25	38.98	3.31	8.49	14	38.03	4.85	12.75
6 and over	25	38.76	5.63	14.52	33	35.80	5.13	14.32
Total	148	37.41	4.45	11.89	154	34.37	4.79	13.93

\* Includes 12 calving at 1.

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Printed in 1965

## أسباب التباين في وزن الميلاد لمشيية الفريزيان الهولندية

### المخلص

شملت هذه الدراسات ٣٠٢ عجلا وقد تبين أن متوسط وزن العجل عند الولادة ٣٥٨٦ كجم وكان متوسط الذكور يفوق متوسط الاناث بمقدار ٣٠٤ كجم وكانت الفروق بين الذكور والاناث معنوية جدا من الناحية الاحصائية .

ولم يظهر أثر معنوى لموسم الولادة على وزن الميلاد وان كانت العجول التي تولد في الخريف أقل وزنا من تلك التي ولدت في سائر فصول السنة كما تبين وجود اتجاه لزيادة مدة الحمل للعجول ذات الوزن الثقيل بالإضافة الى أن وزن العجول عند الميلاد كان يزيد كلما زاد وزن الأم . وكان التلازم بين وزن الأم ووزن العجل عند الميلاد في الأعمار المختلفة ( ٢ - ٣ سنة ، ٣ - ٤ سنة ، وأكثر من أربع سنوات ) ٣٩٩ر ، ٦٤٨ر ، ٤٣٨ر . على التوالي . كما تبين أيضا أن متوسط وزن الميلاد للعجول يزيد بزيادة عمر الأم الى ستة سنوات .