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THE EFFECT OF SELECTED FACTORS ON REARING PERFORMANCE OF CHAROLAIS CALVES

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Abstract. The aim of this study was to determine the effect of selected factors on rearing performance of Charolais calves to day 90 of life. The experimental material comprised 83 Charolais cows calving in the winter and spring seasons and calves they reared (84 head) to day 90 of life. All calves born by the experimental females were weighed at birth and then at days 30, 60 and 90 of life. Calves were also subjected to zoometric measurements. Their height at sacrum and width at hips were measured at days 10 and 30 of life. The increments for height at sacrum and width at hips between day 10 and 30 of life were calculated for the calves. Rearing indexes of the calves were assessed in terms of calf sex (heifer vs. bull calves), calving season (winter vs. spring), successive calving of the cow (1, 2, 3 and >3), parturition type (normal vs. dystocia), body condition of the cow after calving (good vs. poor). It was shown that rearing performance of Charolais calves to day 90 of life was significantly affected by their sex, calving season, parturition type and body condition of the dam during calving. The most advantageous results for the assessed rearing parameters of Charolais calves to day 90 of life were recorded for male animals born in the winter season coming from normal births and produced by dams in good body condition during parturition.

Key words: calf rearing parameters, Charolais cattle.

INTRODUCTION

Production of cattle on hoof is most profitable on farms having a considerable share of grassland in the total farm area, keeping beef cattle breeds. The Charolais breed is one of the most highly valued beef cattle breeds worldwide. This cattle breed originating from France is large-sized and it is characterised by high daily body weight gains (approx. 1200 g) as well as dressing percentage amounting to approx. 60–70%, at meat content in the carcass of approx. 80–85%. Animals of this breed have a deep and wide chest, a long and wide, well-muscled rump. Adult bulls are 1000 to 1200 kg in weight, while cows weigh from 700 to 900 kg at height at the withers of approx. 150 and 140 cm, respectively. The weight of calves at birth is high, for bull calves amounting to approx. 45 kg and for heifer calves approx. 40 kg.

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Meat coming from animals of this breed has a low fat content, it is juicy and tender. This cattle has an advantageous feed conversion rate and easily adapts to various climatic conditions; however, animals of this breed require intensive feeding and careful management.

The Charolais breed is frequently used as a paternal component in commercial crossing. However, fertility of Charolais cattle is lower compared to that in other breeds and dystocia is sometimes observed, although selection towards calving ease has considerably improved this trait. Nogalski and Wroński (2011) reported that in the case of the Charolais breed selection is maintained first of all to improve reproduction traits, while breeding and rearing of animals in this breed requires intensive feeding and care. In the opinion of Nkrumah et al. (2007) feed intake and growth efficiency are important parameters in beef cattle in terms of animal rearing economics.

In order to improve efficiency and competitiveness in production of premium beef it is advisable to provide recommendations leading to optimisation of calf rearing technology.

The aim of this study was to determine the effect of selected factors on rearing performance of Charolais calves to day 90 of life.

MATERIAL AND METHODS

Source data were collected from a farm in the Lubuskie province (Poland). The farm kept Charolais suckling cows and 2 bulls of the same breed as sires.

The cow herd under analysis was kept in free stall barns on deep litter, with access to outdoor runs, while in the period from mid-May to the end of September the animals were kept on pastures. Calved females with their calves were kept in separate pens for around a month. After that period the dam and the calf joined the herd. Calves were provided separate access to concentrates, which they started to consume around the third month of life. Animals were fed twice a day. The feed ration for cows was based on feeds produced on the farm. In the autumn-winter period it was composed of maize silage, haylage from grasses, hay, barley or oat straw as well as ground grain and mineral additives. During the period of pasture grazing ensiled roughage was replaced by herbage.

On the farm a harem mating system was adopted using the two bulls taking into consideration the age of the heifer as well as its development ad body weight, while in the case of multiparous dams it was the period after the previous calving. In the analysed herd calvings took place solely in the winter-spring period.

The experimental material for this study comprised 83 Charolais cows (14 heifers and 69 multiparous cows) calving in the winter and spring seasons as well as calves they reared (84 head) to day 90 of life. In view of the fact that one of the females calved twice a total of 84 calves were investigated. Source data concerning cows and their calves were collected over a period of 12 months.

All born calves coming from the experimental females were weighed at birth and at days 30, 60 and 90 of life. Calves were also subjected to zoometric measurements using a rigid. Height at the sacrum (from the mid-line connecting two points of the hips to the ground) and width at the hips (the spacing of the points of hips) were measured at days 10 and 30 of life. Each measurement was taken three times and then an arithmetic mean was calculated. The increment in height at the sacrum and width at the hips between days 10 and 30 of life was calculated for the calves.

Calf rearing indexes in that herd were assessed considering the sex of the calf (heifer and bull calves), season of calving (winter – covering the period from mid-December to mid-March, and spring – from mid-March to mid-June), successive calving of the cow (1, 2, 3 and >3), type of parturition (normal – with no assistance and easy, dystocia – using much greater effort than

normal and difficult birth), body condition of the cow at calving (assessment in a 9-point scale; two body condition types were distinguished: good – 5–7 points and poor – 2–4 points).

Collected data were analysed using the SAS ver. 9.4 statistical software package (2019). The MEANS and UNIVARIATE procedures were applied to calculate elements of descriptive statistics.

The GLM procedure was adopted to estimate the effect of analysed experimental factors on selected rearing indexes of calves based on the multivariate analysis of variance according to the following linear model:

$$Y_{ijkl} = \mu + s_i + w_j + p_k + e_{ijkl}$$

where:

Y_{ijkl} – values of analysed traits,
μ – grand mean,
s_i – fixed effect of calving season (i = 1, 2),
w_j – fixed effect of successive calving (j = 1, 2, 3, 4),
p_k – fixed effect of the sex of the calf (k = 1, 2),
e_{ijkl} – random error.

In the further analyses the basic linear model was supplemented with one of the effects describing the type of parturition or body condition of the cow (Table 1).

Table 1. Effects entered into the basic linear model

Model	Calving season	Successive calving	Sex of calf	Type of parturition	Body condition of cow
Model 1	✓	✓	✓	–	–
Model 2	✓	✓	✓	✓	–
Model 3	✓	✓	✓	–	✓

$$Y_{ijklm} = \mu + s_i + w_j + p_k + r_l + e_{ijklm}$$

where:

Y_{ijklm} – values of analysed traits,
μ – grand mean,
s_i – fixed effect of i-th calving season (i = 1, 2),
w_j – fixed effect of j-th calving (j = 1, 2, 3, 4),
p_k – fixed effect of k-th sex of calf (k = 1, 2),
r_l – fixed effect of l-th trait of type of parturition or body condition of cow: type of parturition (l = 1 – normal; l = 2 – dystocia) or body condition of cow (l = 1 – good/appropriate; l = 2 – satisfactory),
e_{ijklm} – random error.

Tukey's test was applied to provide a detailed comparison of means. The significance of differences was established at $P \leq 0.05$.

RESULTS AND DISCCUSION

In the conducted analyses it was shown that survival rates of Charolais calves by the end of the third month of their life amounted to 95.25% (Table 2). One case of calf wastage was recorded in each of the following time intervals after birth: within 24 h, in the first and second week, and next in the period from the third week to the end of the first month of life.

Table 2. Survival of Charolaise calves at different ages

Specification	N	%	N cumulative	% cumulative
Died within 24 hours	1	1.19	1	1.19
Died within 1 week	1	1.19	2	2.38
Died to 2 weeks	1	1.19	3	3.57
Died to 1 month	1	1.19	4	4.76
Living over 3 months of age	80	95.24	84	100.00

Table 3 presents mean values as well as minimum and maximum values of the analysed calf rearing indexes. The greatest difference between the minimum and maximum values for the investigated parameters was recorded for daily weight gains in the studied periods of calves' lives. Mean values of daily weight gains in the individual periods of life for the calves were slightly over 1000 gram except for the time interval between days 30 and 60 of life, in which they were smaller. However, standard deviations for all the discussed parameters did not exceed 1/3 of the arithmetic mean, which shows a small scatter of values for the analysed traits.

Table 3. Charolaise calf rearing indices in the examined herd

Traits	Measurement period [day/days of life]	N	Min.	Max.	$\bar{x}$	SD	CV
Body weight [kg]	1	84	29.0	67.0	47.2	7.3	15.6
	30	80	54.0	90.0	76.5	7.1	9.3
	60	80	80.0	125.0	105.3	9.7	9.2
	90	80	103.0	165.0	137.3	14.4	10.5
Daily weight gain [kg]	1–30	80	0.138	1.207	1.006	0.158	15.709
	30–60	80	0.467	1.800	0.945	0.265	28.048
	60–90	80	0.600	1.567	1.067	0.244	22.871
	1–90	80	0.652	1.382	1.012	0.159	15.675
Height in the cross [cm]	10	82	75.0	85.0	81.4	2.2	2.7
	30	80	86.0	91.3	88.6	1.4	1.6
Height increase in the cross [cm]	10–30	82	2.0	14.0	7.1	2.0	28.2
Hip width [cm]	10	82	16.7	19.7	18.2	0.7	4.0
	30	80	18.2	21.7	20.3	0.7	3.4
Growth in width in the hips [cm]	10–30	82	1.1	2.8	2.0	0.4	20.9

Wieczorek-Dąbrowska et al. (2013) were of an opinion that one of the key factors determining efficiency of cattle breeding and management is related to rearing of healthy and physiologically well-developed calves. Feeding is the most important aspect in the course of calf rearing. However, a significant role is also played by the course of parturition, the colostrum feeding period and animal management. In the opinion of Kenny et al. (2018), improved feed conversion rate in beef cattle may potentially increase profitability of producers and at the same time it may reduce the environmental effect of beef production. Feed conversion is a multifactorial and complex trait in beef cattle and variability in its trait between individual animals results from interactions of many biological processes, which in turn is influenced by the physiological condition of animals and herd management.

At present feed use by animals is most frequently measured based on the so-called residual feed intake (RFI). It is a trait which may be used to investigate physiological mechanisms un-

derlying variability in feed conversion (Oprządek and Rutkowska 2017). This index constitutes a difference between the actual and expected feed intake by the animal, determined based on the obtained body weight and growth in the period of analysis. Animals with a low RFI are efficient in feed conversion, as indicated by their good production potential despite lower feed intake (Trevizan et al. 2021). According to Jiu et al. (2020), the advantageous effect of such animals on the environment with no deterioration of meat quality and palatability is also significant. Martin et al. (2021) showed that carcasses coming from animals with low RFI were generally characterised by greater muscling and lower carcass fatness.

In view of the effect of calf sex on the analysed calf rearing parameters in the Charolais calves (Table 4) in this study it was shown that body weight of bull calves at birth, at days 30 and 60 of life was significantly greater ($P \leq 0.05$) than that of heifer calves. Similarly, a significantly greater ($P \leq 0.05$) height at the sacrum at day 30 of life was found for male animals compared to females. In the case of the other analysed parameters bull calves showed higher values of the investigated traits, though these means statistically did not differ significantly from average values recorded for heifer calves. Slósarz et al. (2010a) indicated that viability of Charolais calves is lower than that of Limousine calves due to the greater frequency of parturition complications. Moreover, those authors showed that calf sex affects survival rates of calves. A greater percentage of calves with inferior viability was found for bull calves. In terms of RFI depending on calf sex in a study by McKenna et al. (2020) it was found that heifers and bulls with a high RFI consumed by 10% and 15% more feed, respectively, than their counterparts with a low RFI. According to Harvey et al. (2020), feed intake and daily weight gains are heritable and they are genetically correlated between the female sex and their dams.

Table 4. Charolaise calf rearing indexes taking into account the sex of the calf

Traits	Measurement period [day/days of life]	Sex of the calf				P
		female N = 37		male N = 47		
		$\bar{x}$	SD	$\bar{x}$	SD	
Body weight [kg]	1	44.2[a]	5.5	49.3[b]	7.9	0.0300
	30	72.7[a]	7.1	79.4[b]	5.8	0.0013
	60	101.5[a]	9.9	108.2[b]	8.6	0.0433
	90	133.7	14.7	140.0	13.7	0.3102
Daily weight gain [kg]	1–30	0.982	0.212	1.024	0.098	0.2531
	30–60	0.927	0.219	0.958	0.298	0.8809
	60–90	1.073	0.244	1.062	0.249	0.5195
	1–90	1.008	0.140	1.015	0.174	0.8331
Height in the cross [cm]	10	81.0	2.3	81.7	2.2	0.5781
	30	87.9[a]	1.1	89.1[b]	1.5	0.0058
Height increase in the cross [cm]	10–30	7.0	2.3	7.3	1.8	0.2090
Hip width [cm]	10	18.1	0.7	18.3	0.7	0.6509
	30	20.0	0.7	20.4	0.7	0.1078
Growth in width in the hips [cm]	10–30	1.9	0.5	2.1	0.4	0.1215

a, b – statistically significantly ($P \leq 0.05$).

Table 5. Rearing rates of Charolaise calves depending on the calving season

Traits	Measurement period [day/days of life]	Calving season				P
		winter N = 59		spring N = 25		
		$\bar{x}$	SD	$\bar{x}$	SD	
Body weight [kg]	1	48.5[a]	7.0	43.2[b]	7.2	0.0149
	30	77.5	7.2	73.7	6.5	0.9060
	60	107.2[a]	9.1	100.4[b]	9.8	0.0215
	90	140.0[a]	15.2	130.2[b]	8.8	0.0460
Daily weight gain [kg]	1–30	0.989	0.180	1.050	0.056	0.0555
	30–60	0.966	0.283	0.890	0.210	0.3896
	60–90	1.094	0.273	0.995	0.126	0.0613
	1–90	1.025	0.180	0.978	0.077	0.1754
Height in the cross [cm]	10	82.0[a]	1.9	79.9[b]	2.4	0.0204
	30	88.6	1.6	88.6	0.7	0.1744
Height increase in the cross [cm]	10–30	6.5[a]	1.5	8.8[b]	2.3	0.0004
Hip width [cm]	10	18.3[a]	0.8	17.9[b]	0.6	0.0427
	30	20.3	0.7	20.1	0.5	0.5069
Growth in width in the hips [cm]	10–30	1.9[a]	0.4	2.2[b]	0.4	0.0108

a, b – statistically significantly ($P \leq 0.05$).

In this study it was found that calving season of calves had a significant ($P \leq 0.05$) effect on the obtained body weight of animals in individual periods of their rearing, height at the sacrum and width at the hips at day 30 of life as well as the increment in height at the sacrum and width at the hips between days 10 and 30 of life (Table 5). A greater body weight at birth as well as days 60 and 90 of life was observed for calves born in the winter season in relation to those born in the spring. In a study conducted by Przysucha and Grodzki (2004) showed a greater body weight for Charolais calves born in the winter compared to those born in the summer. In this study calves born in the winter also had greater height at the sacrum and width at the hips at day 10 of life. In turn, greater values of increments between days 10 and 30 of life for the two above-mentioned measurements were recorded for calves born in the spring season. It is believed that the most advantageous calvings should come in the winter-spring season (i.e. from January to the end of May) and this results from the fact that calves are better adapted to pasture use, typically have greater body weight gains in that period, while cows are characterized by greater milk yields, which will meet the needs of calves and ensure restoration of body reserves of the cow before the mating period coming in the spring-summer period. In turn, calves born in the summer-autumn season use pastures to a limited extent. In this study calvings came solely in the winter-spring season and this period was divided into two subperiods, i.e. winter and spring. Obtained study results indicate that winter was the most advantageous calving period in terms of rearing of Charolais calves compared to the spring period. Such findings most probably result from better adaptation and a longer period when calves were kept on the pasture with their dams.

The greatest body weights in the analysed periods, i.e. days 1, 30, 60 and 90 of life, were recorded in calves coming from the first calving compared to progeny from successive births (Table 6). However, for this parameter considering all the investigated periods of life the conducted statistical analysis showed no specific significant dependencies between groups of calves. It was also shown in this study that calves coming from the first calving were characterised by

the greatest height at the sacrum at day 10 of life. In terms of this trait they differed significantly (P ≤ 0.05) only from the group of calves coming from the fourth and further calvings.

Table 6. Charolaise calf rearing rates taking into account the next calving in a cow

Traits	Measurement period [day/ days of life]	Number of calvings								P
		1 N = 14		2 N = 23		3 N = 22		>3 N = 25		
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	
Body weight [kg]	1	57.0^{a}	8.9	45.6^{b}	5.1	48.5^{ab}	7.1	45.0^{b}	7.2	0.0454
	30	83.3^{a}	5.9	75.1^{b}	6.9	78.7^{ab}	5.5	73.9^{b}	7.9	0.0457
	60	114.7^{a}	6.4	101.9^{b}	9.6	107.7^{b}	9.3	102.9^{b}	9.5	0.0415
	90	149.3^{a}	3.8	130.0^{b}	13.6	141.0^{ab}	16.7	134.9^{ab}	11.4	0.0496
Daily weight gain [kg]	1–30	0.908	0.105	1.000	0.124	1.034	0.098	0.996	0.215	0.2960
	30–60	1.044	0.069	0.892	0.181	0.967	0.353	0.930	0.218	0.8205
	60–90	1.156	0.337	0.938	0.249	1.109	0.275	1.067	0.189	0.1624
	1–90	1.037	0.142	0.942	0.143	1.037	0.202	1.013	0.115	0.3884
Height in the cross [cm]	10	83.7^{a}	1.6	81.1^{ab}	1.6	81.9^{ab}	2.0	80.7^{b}	2.4	0.0334
	30	89.4	1.7	88.4	1.0	88.9	1.7	88.3	1.3	0.2984
Height increase in the cross [cm]	10–30	5.7	1.6	7.3	1.3	6.7	1.3	7.7	2.7	0.2933
Hip width [cm]	10	18.6	0.7	18.1	0.5	18.2	0.8	18.2	0.8	0.4401
	30	20.7	0.8	20.2	0.5	20.2	0.8	20.2	0.6	0.7456
Growth in width in the hips [cm]	10–30	2.1	0.5	2.1	0.2	1.9	0.5	2.1	0.4	0.4329

a, b – statistically significantly (P ≤ 0.05).

According to Nogalski and Mordas (2008) dystocia occurs when there are problems with expulsion of the fetus and the evacuation of the placenta by the dam, or when assistance is required, the fetus needs to be pulled out or cesarean section has to be performed. According to Goonewardene et al. (2003), such parturitions result in significantly lower milk production by the dam and ower body weight of weaned calves. It needs to be stressed that each difficult parturition is connected with potential health hazard both for the calf and the dam. There is a risk of calf wastage, retained placenta or metritis (Meyer et al. 2001; Benzaquen et al. 2007). It was found in this study that calves coming from normal births had significantly lower (P ≤ 0.5) body weights at birth and at day 30 of life as well as a lower increment in width at the hips in the period from days 10 and 30 of life, whereas their daily increment in body weight between days 30 and 60 of life was greater compared to the group of calves coming from difficult births (Table 7). Dystocia frequently occurs when the calf is too large or the birth canal of the dam is too narrow preventing normal calving. In heifers it is the primary cause for difficult parturition (dystocia). In the case of the Charolais breed calves frequently have large heads, which considerably hinders delivery. In turn, calves of smaller size as a rule also have lower body weight at birth, resulting in easier delivery. This thesis is confirmed by the results of this study. In practice dystocia occurs often, which may result from the fact that feeding in the dry period or the final stage of lactation is too intensive – leading to excessive

growth of the fetus during this period, or from the bull being inadequately selected for a given cow. In the opinion of Bellows et al. (2002), minimisation of prevalence of dystocia may contribute to a marked improvement of profitability for the beef purpose production of cattle.

Table 7. Charolais calf rearing rates. taking into account the type of birth

Traits	Measurement period [day/days of life]	Birth type				P
		normal N = 63		difficult N = 21		
		$\bar{x}$	SD	$\bar{x}$	SD	
Body weight [kg]	1	46.5[a]	6.8	62.0[b]	4.2	0.0050
	30	76.0[a]	6.9	88.0[b]	2.8	0.0484
	60	105.4	9.9	104.0	4.2	0.2863
	90	137.3	14.4	137.0	18.4	0.4766
Daily weight gain [kg]	1–30	1.010	0.160	0.897	0.049	0.1403
	30–60	0.963[a]	0.256	0.533[b]	0.047	0.0120
	60–90	1.065	0.239	1.100	0.471	0.9861
	1–90	1.019	0.156	0.843	0.159	0.0624
Height in the cross [cm]	10	81.3	2.2	83.3	1.1	0.4197
	30	88.6	1.4	90.3	0.4	0.2766
Height increase in the cross [cm]	10–30	7.1	2.0	7.0	1.4	0.8729
Hip width [cm]	10	18.2	0.7	18.0	0.0	0.5564
	30	20.2	0.7	20.7	0.2	0.5550
Growth in width in the hips [cm]	10–30	2.0[a]	0.4	2.7[b]	0.2	0.0107

a, b – statistically significantly (P ≤ 0.05).

Table 8. Rearing indexes of Charolaise calves. Taking into account the condition of the cow at calving

Traits	Measurement period (day/days of life)	Cow body condition (on the BCS scale)				P
		good (5–7 point) N = 68		weak (2–4 point) N = 16		
		$\bar{x}$	SD	$\bar{x}$	SD	
Body weight [kg]	1	47.7	6.1	42.0	14.6	0.4565
	30	77.1	6.4	71.4	11.8	0.2977
	60	106.8[a]	8.6	92.6[b]	9.8	0.0075
	90	138.5[a]	14.1	127.0[b]	13.9	0.0380
Daily weight gain [kg]	1–30	1.005	0.164	1.014	0.102	0.7386
	30–60	0.973[a]	0.257	0.707[b]	0.220	0.0472
	60–90	1.057	0.247	1.147	0.221	0.2052
	1–90	1.018	0.164	0.955	0.087	0.5376
Height in the cross [cm]	10	81.6[a]	1.8	79.5[b]	4.2	0.0329
	30	88.6	1.5	89.0	1.0	0.3417
Height increase in the cross [cm]	10–30	6.9[a]	1.6	9.5[b]	3.7	0.0438
Hip width [cm]	10	18.3	0.7	17.7	0.9	0.3788
	30	20.3	0.7	20.1	0.7	0.8443
Growth in width in the hips [cm]	10–30	2.0	0.4	2.3	0.3	0.1907

a, b – statistically significantly (P ≤ 0.05).

In the winter period the body condition of suckling cows deteriorates, as it is assumed that a cow loses approx. 50–65% fat and 5–10% protein. In contrast, during the pasture grazing period cows rapidly restore their body condition and increase their body weight. Malnutrition of cows is a dangerous phenomenon, particularly in the case of heifers in calf in the last three months before parturition, which may result in a lower body weight of calves at birth, their lesser survival rates and lower growth rates. It is recommended for future dams after impregnation to be fed adequately so that at calving they are in good body condition. Slósarz et al. (2010b) showed that easy parturitions in Charolais cows are promoted by BCS of 5–7 points (in a 9-point scale), whereas problems with parturition and those requiring assistance were recorded in cows with BSC of 1 to 3 points. It was shown in this study that the body condition of cows at calving had a significant effect at $P \leq 0.05$ on selected calf rearing parameters (Table 8). Progeny, which mothers at calving were in good body condition in relation to females with poor BSC were characterised by greater body weight at days 60 and 90 of life, as well as higher daily body weight gains in the period from days 30 to 60 of life. Calves from this group were also characterised by greater height at the sacrum at day 10 of life and lower increment for this parameter in the period from days 10 to 30 of life. Results recorded in this study indicate that cows being in an inferior body condition most probably after calving produced less milk, which led to a lower growth rate and slower development of calves. In this study no cows were found to have excessively high body condition during calving, although it is commonly believed that in excessively fattened females the length of pregnancy may be extended, which leads to an increased fetus body weight it may result in dystocia.

CONCLUSION

It was shown that rearing results of Charolais calves up to day 90 of life was significantly influenced by the following factors: sex, calving season, type of parturition and body condition of the dam at calving.

The most advantageous results for the evaluated rearing parameters in the case of Charolais calves to day 90 of life were observed for male animals, born in the winter season during normal births and those born by dams being in good boy condition at the time of parturition.

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WPŁYW WYBRANYCH CZYNNIKÓW NA WYNIKI ODCHOWU CIELĄT RASY CHAROLAISE

Streszczenie. Celem pracy było zbadanie wpływu wybranych czynników na wyniki odchowu cieląt rasy charolaise do 90. dnia ich życia. Materiał doświadczalny obejmował 83 krowy rasy charolaise cielące się w sezonie zimowym i wiosennym oraz odchowane przez nie potomstwo (84 szt.) do 90. dnia życia. Wszystkie urodzone cielęta pochodzące od samic doświadczalnych zostały zważone w dniu urodzenia oraz w 30., 60. i 90. dniu życia. Zwierzęta poddano także pomiarom zoometrycznym. Wykonano pomiar wysokości w krzyżu oraz szerokości w biodrach w 10. i 30. dniu ich życia. Cielętom obliczono przyrost wysokości w krzyżu oraz szerokości w biodrach między 10. a 30. dniem ich życia.

Wskaźniki odchowu cieląt oceniono, uwzględniając: płeć (cieliczka, byczek), sezon wycielenia (zimowy i wiosenny), kolejne wycielenie krowy (1, 2, 3 i >3), typ porodu (normalny i ciężki), stan kondycji krowy przy wycieleniu (dobra i słaba). Wykazano, że na wyniki odchowu cieląt rasy charolaise do 90. dnia ich życia istotny wpływ miały następujące czynniki: płeć, sezon wycielenia, rodzaj porodu oraz stan kondycji matki podczas wycielenia. Najkorzystniejszymi rezultatami w zakresie ocenianych parametrów odchowu cieląt rasy charolaise do 90. dnia ich życia charakteryzowały się zwierzęta: płci męskiej, wycielone w sezonie zimowym, pochodzące z porodów normalnych oraz urodzone przez matki będące podczas porodu w dobrej kondycji.

Słowa kluczowe: parametry odchowu cieląt, bydło charolaise.