THE BREEDING OF VARIOUS PERFORMANCE TYPES OF CATTLE IN IDENTICAL TECHNOLOGICAL CONDITIONS

CHOV RŮZNÝCH UŽITKOVÝCH TYPŮ SKOTU VE STEJNÝCH TECHNOLOGICKÝCH PODMÍNKÁCH

JEŽKOVÁ* A., DŘEVO V.

SOUHRN

V práci byl posuzován vliv intenzity odchovu na mléčnou užitkovost stáda holštýnského (H) a českého strakatého (C) skotu v zemědělském družstvu ve středních Čechách. Byl vyhodnocen vliv vybraných faktorů (plemenná příslušnosti, pořadí laktace, věk při prvním zapuštění, hmotnosti ve věku 3, 6, 9, 12 a 15 měsíců) na ukazatele mléčné užitkovosti a reprodukce (množství mléka a obsah složek mléka, věk při prvním otelení, délka mezidobí, inseminační index). Měřili jsme 8 tělesných rozměrů charakterizujících růst telat - jaloviček (kohoutková výška, výška v kříži, přímá délka trupu, obvod hrudníku, délka zádě, přední, střední a zadní šířka zádě) a zjišťovali hmotnost v tříměsíčních intervalech během odchovu. Zjištěné výsledky byly statisticky vyhodnoceny lineárním modelem programu SAS, s korelační analýzou pro posouzení závislosti mezi jednotlivými tělesnými rozměry.

U sledovaného souboru dojnic plemene C (136 ks) a H (72 ks) byl zjištěn statisticky vysoce významný vliv plemene a pořadí laktace na množství a obsah složek mléka (kg mléka za laktaci, kg tuku a kg bílkovin). Byl zjištěn vysoce průkazný vliv plemene na věk při prvním otelení, věk při prvním otelení byl shledán jako významný faktor ovlivňující následnou mléčnou užitkovost. Výsledky korelační analýzy potvrdily vysoce průkaznou ($P \leq 0{,}001$) závislost mléčné užitkovosti a inseminačního indexu ($r = 0{,}391$) a středně významnou závislost ($P \leq 0{,}01$)mléčné užitkovosti a délky mezidobí ($r = 0{,}274$).

Součástí práce bylo sledování životních projevů dojnic holštýnského a českého strakatého skotu. Při etologických pozorováních v produkčních stájích bylo zjištěno klidné chování dojnic bez agresivity a se zachováváním stereotypů. Zvolenou technologie ustájení a ošetřování dojnic obou užitkových typů (volné boxové stáje) lze z hlediska etologických pozorování posoudit jako vhodnou.

KLÍČOVÁ SLOVA: české strakaté plemeno, holštýnské plemeno, odchov jalovic, růst, mléčná užitkovost, reprodukce, etologie, životní projevy

ABSTRACT

The work assess the effect of the quality of rearing on milk production of a herd of Holstein (H) and Czech Pied (C) cattle. An evaluation was made of the impact of selected factors (breed, lactation sequence, age at first mating, live weight at the ages of 3, 6, 9, 12 and 15 months) on indices of milk production and reproduction (quantity of milk and contents of the milk components, age at first calving, length of calving interval, insemination index). We measured 8 bodily dimensions to characterize the growth of calves-heifers (height at withers, height at sacrum, direct body length, chest circumference, length of pelvis, front, middle and rear width of the pelvis). The results were evaluated statistically using a linear model in SAS software, with a correlation analysis for evaluating dependencies between the individual bodily measures.

The work included monitoring the behaviour of dairy Holstein and Czech Pied cows. In the course of ethological monitoring the dairy cows were found to behave calmly, without manifestations of aggressiveness while maintaining stereotypical behaviour. The chosen technology of housing and treating the dairy cows of both performance types (open cubicle-type stable) can be considered appropriate based on ethological observations.

KEY WORDS: Czech Pied breed, Holstein breed, rearing of heifers, growth, milk yield, ethology, life manifestation

Manuscript received: 20 October, 2002.
Accepted for publication: 25 November, 2002.

JOURNAL
Central European Agriculture
ISSN 1332-9049

DETAILED ABSTRACT

The effect of the quality of rearing was observed on the milk production of a herd of 72 Holstein (H) and 136 Czech Pied (C) cattle in an agricultural cooperative farm in Central Bohemia. An evaluation was made of the impact of selected factors (breed, lactation sequence, age at first mating, live weight at the ages of 3, 6, 9, 12 and 15 months in 86 C heifers and 84 H heifers) on indices of milk production and reproduction (quantity of milk and contents of the milk components – fat and protein, age at first calving, length of calving interval, insemination index). We measured 8 bodily dimensions (in 32 C heifers and 24 H heifers) to evaluate the growth of calves-heifers (height at withers, height at sacrum, direct body length, chest circumference, length of pelvis, front, middle and rear width of the pelvis) and the live weight at three-month intervals in the course of rearing of these herds. The results were evaluated statistically using a linear model in SAS software, with a correlation analysis for evaluating the dependence of the individual bodily measures.

The dependence of breed and the height at the withers and height at sacrum in heifers in age of 12 months was found to be statistically highly significant ($P \leq 0{,}001$). Correlation analysis was used to test the high statistical ($P \leq 0{,}001$) dependence of body measures in C heifers at the age of 6, 9, 12, 15 months ($r = 0{,}56 – 0{,}94$). The high statistical significant dependence of body measurements was found only at the age of 6 months.

The breed and lactation sequence was found to have a statistically highly significant ($P \leq 0{,}001$) influence on the quantity and content of the milk components (kg of milk per lactation, kg of fat and kg of proteins). The effect of the breed on age at first calving was found to be a very relevant factor influencing the coming milk efficiency. The results of correlation analysis confirmed the high significant dependence ($P \leq 0{,}001$) of milk efficiency on the insemination index ($r=0{,}391$) and medium ($P \leq 0{,}01$) significant dependence of milk efficiency on the length of breeding interval ($r=0{,}274$).

The work included monitoring the behaviour of dairy cows of the Holstein cattle and the Czech Pied cattle. In the course of ethological monitoring the dairy cows were found to behave calmly, without manifestations of aggressiveness while maintaining stereotypical behaviour (with a period of prevalent manifestations of feeding and standing at 8:00 to 10:00 a.m.; and the period at about 10:00 a.m. to 1:00 p.m. with prevalent manifestations of lying and ruminating-lying). The chosen technology of housing and treating the dairy cows of both performance types (open cubicle-type stable) can be considered appropriate based on ethological observations.

INTRODUCTION

Cattle breeding in the Czech Republic is a prominent and irreplaceable sector of agricultural production. It is also a sector with the highest demand of financial resources, labour, materials and organization. The economic results of cattle breeding are in many cases the decisive factor in the economic results of an agricultural company. The close linkage to agricultural land and the positive impact on its fertility (the production of high-grade animal fertilizers, the utilization of permanent grasslands in the foothills of mountain ranges and in mountainous areas, etc.) are very important. Dairy cow breeding also has a significant influence on the maintenance of relatively constant income in the course of the year and on the conservation of jobs. Along with the entire agricultural sector, cattle breeding has been undergoing significant structural, economic and organizational changes over the last ten years. The series of measures is being adopted and implemented at the present time (e.g., the introduction of milk quotas), which should contribute to an improvement in the current situation and to the best possible conditions for the Czech Republic's accession of the to the European Union.

Modern breeding and technological methods are being used in order to achieve the requisite efficiency and economic profitability. The development of these methods leads to specialization of production. The results of standard researches in zootechny, nutrition and feeding as well as mechanization of production are no longer sufficient in large-scale cattle raising operations. In a technically advanced environment with low labour intensity and great concentration of animals per unit of surface it is necessary to be cognizant of the laws of innate animal behaviour, their biological, ethological and technological requirements in the specific conditions of cattle raising.

The effects of many genetic as well as environmental factors influence milk efficiency. The level of efficiency attained is always limited by factors at the lowest levels [15]. Among the external influences we can include the influence of years, seasons, breeding, the herd, the housing, the placement, the type of nutrition, the sheltering technology, the microclimate, the milking technology, etc., which exert a constant influence on the animal. These can be collectively designated as the influence of the cattle breeder, since their effect on the animal is subject to breeder influence [14]. Among the internal influences is the breed classification, the individual nature of the animal, heredity, the genetic value of the individual animal within the breed, the manner of cross-breeding, the manner of selection within the herd, the genotype of the individual given by the breed value of the parents. Other internal factors also have an influence on milk production, including the physiology of the milk udder, the activity of the respiratory and digestive systems and glands with inner secretions, blood circulation, the state of health and age of the dairy cow [21].

One of the influences of the breed mentioned is early maturing, i.e., age and weight at first calving [2]. According to [22] heifers calving at the age of 23 or 24 months attain lower efficiency upon the first as well as subsequent lactations in comparison with heifers calving later. The profitability for the entire productive period is better, however. The basic pre-requisite for the attainment of favourable production results in the breeding of dairy cows is a regular fertility of the cows. Fertility is the decisive biological, but also performance type feature of cattle, more important than milk and meat efficiency. As a consequence of this it significantly influences the economics of cattle breeding. The economic significance of fertility does not consist only in the value of the calf birth, but also in the hormonal stimulation and the consequent lactation. The results achieved with respect to reproduction determine the level of milk and meat production and thus indirectly influence the profitability of the breeding operation. For this reason reproduction represents one of the most closely watched aspects of cattle breeding [20]. The heritability of fertility indices is very low, and thus the herd's reproductive results depend primarily on the cattle breeder [12]. A good level of reproduction is thus the result of perfect management of the breeding herd, particularly in the case of high-efficiency dairy cows. Nutrition and feeding thus constitute the basis of metabolic processes, the robustness of the animals and the fertility indices [9].

There is a degree of antagonism between milk efficiency and reproductive properties, which is evident above all in the case of phenotype correlations. In the production cow sheds with high-

efficiency dairy cows, despite the observance of the biological requirements of the animals, fertility dysfunctions appear in 10-15% of the animals. Despite the relatively small number of identical results it is generally the case that herds with lower efficiency have better reproductive results [6]. Some results indicate a negative genetic correlation between milk efficiency and reproductive indices of dairy cows, which would imply that successful selection aimed at high milk production can lead to a reduction in their reproductive capacities [13]. The reproduction indices reported in the Czech Republic cannot be evaluated positively also in a comparison with other advanced cattle breeding countries. The percentage level of repeated insemination indicates a low level of heat detection, or low interest and motivation by the staff of cow raising operations concerned with these issues [18]. According to [1] an unfavourable development was noted in gravidity indices following the first and all subsequent inseminations in the case of imported dairy cows. The reason was imperfect determination of heat, caused by the quiet course of the heat due to insufficient adaptation by cows calving for the first time. The faulty management of the reproduction of herds (faulty nutrition, unfavourable conditions in the cow shed, imperfect specification of heat, inadequate hygiene at parturition) causes the unsatisfactory state of the results of cow reproduction in the Czech Republic. Possible ways of improving the reproduction indices of breeding cows are confirmed by a number of results in native and foreign cattle breeding operations.

According to [5] a prerequisite for a successful breeding operation, i.e., reproduction and production, is the choice of the appropriate housing system, free housing is of course much preferred. It meets the requirements referred to above for the microclimate, has been sufficiently tested in our conditions and furthermore, free housing conducive to better production results. In the case of milk cows stalled in a fixed position in insulated stalls, a higher rate of reproductive dysfunction was noted, besides other deficiencies. It was necessary in their case to employ artificial induction of heat up to four times more frequently [3].

The harmony of the external environmental conditions with the biological demands of animals is creating the prerequisites for their health and good efficiency. The milk efficiency of cows is also affected by the technological system of the cattle raising operation - the housing system, the manure removal system and the milking procedure [4]. A high level of milk production depends on the appropriate construction arrangement, the size of the stall – bedding, place at the trough, the microclimate in the shed, the air temperature, relative humidity and air circulation [10].

Under the conditions of industrial cattle breeding technologies, the animals are completely dependent on the conditions provided by man (nutrition and feeding, stalling, microclimate, feeding regimen, etc.) [8]. [5] considers the basic factors to be nutrition, feeding and human influence; according to [12] nutrition is the decisive factor.

The behaviour of the animals is defined as an external expression of their psychological state in connection with their physiological condition at the given moment [16]. The life manifestations of the animals and changes in their behaviour are instigated and affected by external (environmental) factors. The behaviour of an animal may depend on the animal's morphology. All live organisms behave in such a way so as to maintain their internal balance. The life manifestations of every type and breed have their regularities that are governed by the daily regimen, season and the individuality of each specimen. This ability is given by the physiological and anatomical properties, the breed type and age. Frequent and intensive interventions into the animal's regular regimen result in changes in its behaviour and subsequently also in a decline in its efficiency. If, however, the living conditions are too constant, the animal's organism loses the ability to successfully resist unfavourable external influences [16].

There have been frequent the discussions of the theme of general welfare and conditions of the external environment in recent years to satisfy both the animal's biological and ethological requirements. It was shown that the most natural conditions do not satisfy these requires (e.g., source of feed in the winter season). According to [12] the conclusive indicator is the degree to which the feeling of welfare is evidenced by the natural behaviour of the animal.

Ethology is also defined as a study of the habitats and customary behaviour of animals. The objective of applied ethology is to discover the regularities of behaviour typical for the individual species, breeds or categories of domestic animals, to study their

daily mode and to determine the measure of their ability to adjust to environmental changes. Modern ethology looks for ways to affect animal behaviour and attempts to employ the results to improve production and make it more effective. Furthermore, it seeks to discover those influences of the external environment to which animals are unable to adjust and which lead to their physiological disequilibrium [16].

METHODOLOGY AND MATERIAL

The work evaluates the influence of rearing intensity on the milk efficiency of a herd of Holstein (H) and Czech Pied cattle (C) in identical technological conditions. We measured the basic bodily parameters (height at withers, height at sacrum, direct body length, chest circumference, length of pelvis, front, middle and rear width of pelvis) for heifers of both efficiency types (32 C heifers, 24 H heifers) in the course of rearing and ascertained their weight at the ages of 3, 6, 9, 12 and 15 months (in 86 C heifers, 84 H heifers).

We also evaluated the influence of breed type, milk efficiency and rearing intensity on reproductive indices (age at first calving, length of calving interval, insemination index). The data was acquired from a group of 72 purebred Holsteins and 136 dairy cows of the Czech Pied breed.

The data was processed by SAS software and assessed using the least squares method, the GLM procedure on the basis of modelling equations with fixed effects.

$$y_{1jk} = \mu + a_i + e_{ijl}$$

$\mathbf{y_{ij}}$ evaluated variable (characteristics of milk efficiency, of reproduction; body measure; live weight)

$\boldsymbol{\mu}$ average - fixed effect

$\mathbf{a_i}$ influence of i-th breed, i = 1,2;

influence of first calving age, i = 1,…,3;

influence of lactation number, i = 1,…,3

influence of milk efficiency, i = 1,…,3

$\mathbf{e_{ijk}}$ residuum

Legend of tables: n.number of observations, x.average, s_x standard error

P≤0,001 *** P≤0,01 ** P≤0,05 *

The work included the monitoring of the life manifestations of the dairy cows. The observation of the basic life manifestations was performed using the descriptive ethology method (evaluation in a chosen time interval - 15 minutes). The following life manifestations were recorded in the ethograms: feeding, standing, ruminating-standing, walking, drinking, ruminating–lying, lying).

Ethological monitoring was carried out in production stables with the identical technology (free housing in cubicles) and feeding (mixing feeding vehicle) twice every season, simultaneously for both performance types of cows. In view of the system of animal handling used, the life manifestations of the animals were recorded in the period between the morning and the afternoon milking (from 8 a.m. to 4 p.m.).

The agricultural cooperative is operating in an articulated terrain with an average elevation above sea level of 450 m. Within the territory it is predominantly the hilltops that are forested. The total annual precipitation is approx. 500 mm and the average temperature is 6.7 ºC. On most of the territory of the agricultural cooperative the prevalent soil type is brown, with occasional gravel and a lower content of humus, in terms of graininess medium and light, with a tendency to desiccation.

The area of agricultural soil is 3,124 ha, of which 2,018 ha is arable soil, and meadows account for 539 ha and pasture 504 ha. Number of livestock (in 2001 year) is 1 986 heads in total, number of dairy cows 761 heads.

Table 1 shows selected indices of cattle production in the agricultural enterprise.

Table 1: Selected indices of cattle production

Average efficiency of livestock	1999	2000	2001
Milk yield per year (l) – C cows	5 514	6 689	6 191
Milk yield per year (l) – H cows	7 230	8 679	8 940
Daily gain of calves in milk nutrition (kg)	0,878	0,999	1,019
Daily gain of heifers in plant nutrition (kg)	0,809	0,879	0,735
Daily gain of heifers in rearing house (kg)	0,456	0,685	0,645

RESULTS AND DISCUSSION

It was found that breed and number of lactation had a highly significant influence on efficiency of lactation expressed in kg of milk and furthermore in kg of fats and kg of proteins. The breed had a highly significant influence on the composition of the milk with respect to its fat and protein content, with lactation sequence having a medium significant effect. The highly significant influence of the breed is also shown in the index of age at first calving (Table 2-5).

Table 2: Average milk efficiency of observed cows per 1st – 3rd lactation

Breed		Milk (kg)		Fat (%)		Fat (kg)		Protein (%)		Protein (kg)	
	n	x	s_x	x	s_x	x	s_x	x	s_x	X	s_x
C	136	6767,7	122,5	4,13	0,04	278,8	4,78	3,52	0,01	236,7	4,03
H	72	9277,1	164,3	3,81	0,05	351,9	6,61	3,34	0,02	310,3	5,57
P		***		***		***		***		***	

Table 3: Average milk efficiency of observed C cows per 1st – 3rd lactation

		Milk (kg)		Fat (%)		Fat (kg)		Protein (%)		Protein (kg)	
Lactation	n	x	s_x	x	s_x	x	s_x	x	s_x	x	s_x
1	63	5350,8	147,17	4,21	0,04	224,3	6,21	3,58	0,02	191,4	5,08
2	55	7036,6	157,51	4,14	0,05	288,9	6,65	3,52	0,02	247,5	5,44
3	18	7997,5	275,33	4,11	0,08	331,2	11,63	3,45	0,04	274,6	9,51
P		1-3***				1-3***				1-3**	
		2-3**				2-3**					

Table 4: Average milk efficiency of observed H cows per 1st – 3rd lactation

		Milk (kg)		Fat (%)		Fat (kg)		Protein (%)		Protein (kg)	
Lactation	n	x	s_x	x	s_x	x	s_x	x	s_x	x	s_x
1	41	7606,6	218,55	3,91	0,06	295,7	7,33	3,43	0,02	260,8	6,78
2	27	10036,8	269,32	3,83	0,08	376,2	9,08	3,32	0,03	331,9	8,35
3	4	9716,7	699,22	3,49	0,22	339,2	23,61	3,28	0,07	318,7	21,67
P		1-2***				1-2***		1-2**		1-2***	
		1-3*						1-3*		1-3**	

Table 5: The dependence of first calving age and milk efficiency C and H cows

		C	H	kg of milk - C cows		kg of milk - H cows	
Group	Age	n	n	x	s_x	x	s_x
1	24-26 months	23	40	4892,9	387,92	7215,2	246,49
2	27-28 months	31	24	5002,7	228,72	7714,9	335,38
3	29-34 months	33	20	5666,2	186,47	7634,5	584,97
P				1-3* 2-3**		1-2*	

Statistically observable differences were found in the live weight of the group of heifers studied at ages of 3, 6 and 9 months, influenced by breed type (Table 6-7); it is also statistically significant that the average daily gain was influenced by breed type in the case of younger categories of heifers - up to 6 months of age.

In evaluating the bodily measures of heifers at the age of 6 months it was found the statistically significant influence of breed on the rear width of the pelvis. At the age of 12 months it was found the breed highly statistically significant influence on the height at the withers and on the height at sacrum (Table 8a, 8b, 9a, 9b).

Table 6: The dependence of breed and live weight (kg) in rearing period

		Live weight in 3 month of age		Live weight in 6 month of age		Live weight in 9 month of age		Live weight in 12 month of age		Live weight in 15 month of age	
Breed	N	x	s_x	x	s_x	x	s_x	x	s_x	x	s_x
C	86	113,88	1,664	185,11	2,693	257,64	2,744	309,30	4,661	354,29	4,822
H	84	103,93	2,281	167,52	3,639	241,33	3,761	289,06	6,389	340,24	6,609
P		***		***		***					

Table 7: The dependence of breed and daily gain (kg) in rearing period

		The gain to age of 6 months		The gain in 6 - 12 months of age		The gain in 12-15 months of age	
Breed	n	x	s_x	x	s_x	x	s_x
C	86	0,861	0,014	0,690	0,025	0,449	0,036
H	84	0,763	0,020	0,703	0,034	0,469	0,049
P		***					

Table 8a: The dependence of breed and body measures of heifers in 6 months of age

Breed	n	Height at withers (cm)	s_x	Height at sacrum (cm)	s_x	Direct body length (cm)	s_x	Chest circum-ference (cm)	s_x
C	32	106,4	0,79	111,2	0,76	68,6	0,78	140,5	1,57
H	24	107,5	0,91	111,9	0,88	68,9	0,90	140,3	1,81
P									

Table 8b: The dependence of breed and body measures of heifers in 6 months of age

Breed	n	Front width of pelvis (cm)	s_x	Middle width of pelvis (cm)	s_x	Rear width of pelvis (cm)	s_x	Length of pelvis (cm)	s_x
C	32	39,6	0,47	40,8	0,44	21,7	0,34	44,1	0,40
H	24	39,9	0,54	41,6	0,51	26,2	0,39	45,2	0,46
P						***		*	

Table 9a: The dependence of breed and body measures of heifers in 12 months of age

Breed	n	Height at withers (cm)	s_x	Height at sacrum (cm)	s_x	Direct body length (cm)	s_x	Chest circumference (cm)	s_x
C	32	121,0	0,73	127,1	0,78	80,8	1,43	170,1	0,01
H	24	124,7	0,70	130,2	0,76	79,3	1,39	172,3	0,97
P		***		***					

Table 9b: The dependence of breed and body measures of heifers in 12 months of age

Breed	n	Front width of pelvis (cm)	s_x	Middle width of pelvis (cm)	s_x	Rear width of pelvis (cm)	s_x	Length of pelvis (cm)	s_x
C	32	47,6	0,39	47,9	0,43	26,6	1,27	50,6	0,46
H	24	48,7	0,38	48,9	0,41	29,5	1,23	52,3	0,45
P								*	

Further evaluated characteristics of the data are age at first mating, at first calving, and length of calving interval between the evaluated lactations (Table 10, 11).

Table 10: The reproduction characteristics of observed cows

		The age of first mating		The age of first calving		Calving interval (between lactation 1-2)		Calving interval (between lactation 2-3)	
Breed	n	x	s_x	x	s_x	x	s_x	x	s_x
C	136	592,9	7,76	878,1	7,76	383,1	5,96	394,3	10,42
H	72	518,3	9,63	803,0	9,63	404,2	11,68	394,5	30,35
P		***		***					

Table 11: The dependence of milk efficiency and calving interval and insemination index

Milk efficiency	Breed C	Calving interval (days)		Insemination index		Breed H	Calving interval (days)		Insemination index	
(kg)	n	x	s_x	x	s_x	n	x	s_x	x	s_x
to 5000	27	395,0	31,53	1,09	0,37					
5000-8000	88	382,9	6,24	2,05	0,15	32	353,0	28,70	2,12	0,32
above 8000	21	392,4	9,97	2,73	0,28	40	410,3	11,05	2,97	0,26
P									*	

Correlation analysis has confirmed a highly significant (P<0,001) dependence of milk efficiency on the insemination index and a medium significant dependence (P<0,01) of milk efficiency on the length of the calving interval. The correlations coefficients in interval 0,56-0,94 were found. [11] found the average age at 1st calving for Czech Pied cattle to be 28 months and 22 days. [17] recorded in the genotype of dairy cows with a higher proportion of Czech Pied cattle an unproven tendency for better results with respect to fertility indices; as one of the reproductive indices characterizing the early maturing of the breed as well as the quality of the heifer breeding operations they consider to be age at fist calving. Many authors in general consider one of the most prominent primary reproductive indices the length of the breeding interval, which is a function of the length of the period from calving to the ensuring of subsequent heat [19, 13]. The length of the breeding interval found for the set of dairy cows under consideration corresponds to the generally required average in the case of both performance types; no statistically significant influence of the breed type and efficiency was found. The economic importance of the length of the calving interval varies, according to [24] depending on its duration. The increase or reduction of the value of the calving interval in comparison with its optimum value of 395 days results in a reduction of profit. [13] have found in the case of Holstein cows calving for the first-time a breeding interval of 391 days. They indicate the maximum length of the calving interval to be 440 days. Cows with the longest calving interval demonstrably attain inferior reproductive results [7]. In both production stables the behaviour of the dairy cows in the course of ethological observations was found to be calm, without manifestations of aggressiveness, while maintaining stereotypical behaviour (the period with prevalent manifestations of "feeding" and "standing" after return from the milking parlour to the cow shed at 8:00 and 10:00 a.m.; the period with prevalent manifestations of "lying" and "ruminating - lying" at about 10:00 a.m. and 1:00 p.m. graphs 1-8). [16] include free housing movement in a herd among the essential precondition for calm and for the avoidance of mutual combat between animals. In the production stable of dairy cows of the Czech Pied breed, active life manifestations predominated throughout the year, i.e., the taking of food in the standing position, standing, walking, drinking, ruminating – standing (Table 12).

The duration of basic life manifestations in the herd of dairy cows of the Holstein breed under consideration, out of the total period of daytime monitored, was relatively balanced in all seasons of the year. In the spring active manifestations predominated; in other seasons of the year the proportion of passive life manifestations was higher (Table 13).

According to [23] and [10] high milk efficiency depends on the appropriate layout of the cowshed, the size of the cubicle and the microclimate within the cowshed; i.e., it depends on the fulfilment of the animals' biological needs and should be accompanied by a reduction in the physical and organizational efforts.

Table 12: The representation of the life manifestation of the observe period (Czech Pied cows)

	Spring		Summer		Autumn		Winter	
Life Manifestation	min.	%	min.	%	min.	%	min.	%
Feeding	116,41	24,25	116,47	24,26	119,48	24,89	71,28	14,85
Standing	85,99	17,91	96,92	20,19	114,67	23,89	123,12	25,65
Ruminating-standing	56,92	11,86	69,66	14,51	68,73	14,32	73,77	15,37
Walking	5,86	1,22	18,46	3,85	4,84	1,01	8,74	1,82
Drinking	6,83	1,42	12,91	2,69	4,25	0,89	5,67	1,18
Ruminating-lying	63,55	13,24	75,43	15,72	43,45	9,05	60,61	12,63
Lying	144,44	30,09	90,14	18,78	124,58	25,95	136,82	28,50
Activity	272,01	56,67	314,42	65,50	311,96	64,99	282,57	58,87
Passivity	207,99	43,33	165,58	34,50	168,04	35,01	197,43	41,13
Total	480	100	480	100	480	100	480	100

Table 13: The representation of the life manifestation of the observe period (Holstein cows)

	Spring		Summer		Autumn		Winter	
Life Manifestation	min.	%	min.	%	min.	%	min.	%
Feeding	89,81	18,71	64,48	13,43	76,35	15,91	84,72	17,65
Standing	87,27	18,18	75,78	15,79	92,88	19,35	83,52	17,40
Ruminating-standing	59,42	12,38	46,95	9,78	54,04	11,26	48,07	10,01
Walking	11,49	2,39	18,12	3,77	10,00	2,08	6,48	1,35
Drinking	7,21	1,50	14,61	3,04	6,54	1,36	4,94	1,03
Ruminating-lying	88,83	18,51	105,19	21,92	87,69	18,27	99,72	20,77
Lying	135,97	28,33	154,87	32,26	152,50	31,77	152,56	31,78
Activity	255,19	53,17	219,94	45,82	239,81	49,96	227,73	47,44
Passivity	224,81	46,83	260,06	54,18	240,19	50,04	252,27	52,56
Total	480	100	480	100	480	100	480	100

CONCLUSION

For the set of dairy cows of the C and H breeds under consideration, a statistically highly significant impact of the breed and lactation sequence was found on the quantity and composition of the milk (kg of milk per lactation, kg of fat and kg of proteins). A highly significant influence of the breed was found in the case of first calving; the age at first calving was found to be a significant factor influencing the subsequent milk efficiency. Demonstrable differences between breeds were found also in weight at the ages of 3, 6 and 9 months. It was found that the breed had a statistically significant influence on the bodily measures at some age (measures of the pelvis, height at sacrum, height at the withers). Correlation analysis demonstrated a high statistical dependence between the individual bodily measures in the case of the C breed at the ages of 6 and 9 months and for the H breed at the age of 6 months.

The reproductive results of the set of cows under consideration are influenced by breed, or by milk efficiency (length of calving interval, insemination index) and the rearing is organized with an effort at achieving favourable results of the cows fertility and subsequent efficiency of the cows. In the production stables under consideration, ethological observations found calm behaviour by the dairy cows, without aggressiveness. The chosen technology of shelter layout (free housing in cubicles) and the feeding technology (mixing feeding vehicle), along with the removal of cowshed manure in the productive cowsheds under evaluation, are satisfactory from the ethological viewpoint with respect to the requirements of the livestock, allow the maintenance of stereotypical behaviour and secure calm in the stall between the morning and the afternoon milking, at the same time allows the attainment of a high degree of milk efficiency for both efficiency types.

Figure 1: The dynamics of the course of life manifestation in the observe daily period - SPRING (C breed)

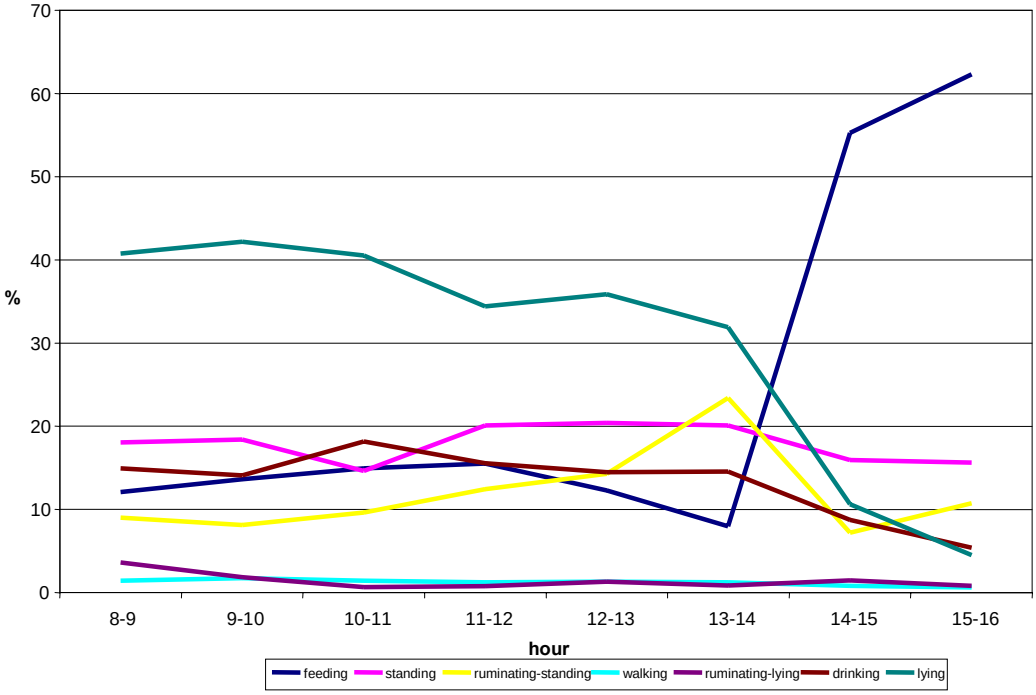


Figure 2: The dynamics of the course of life manifestation in the observe daily period - SUMMER (C breed)

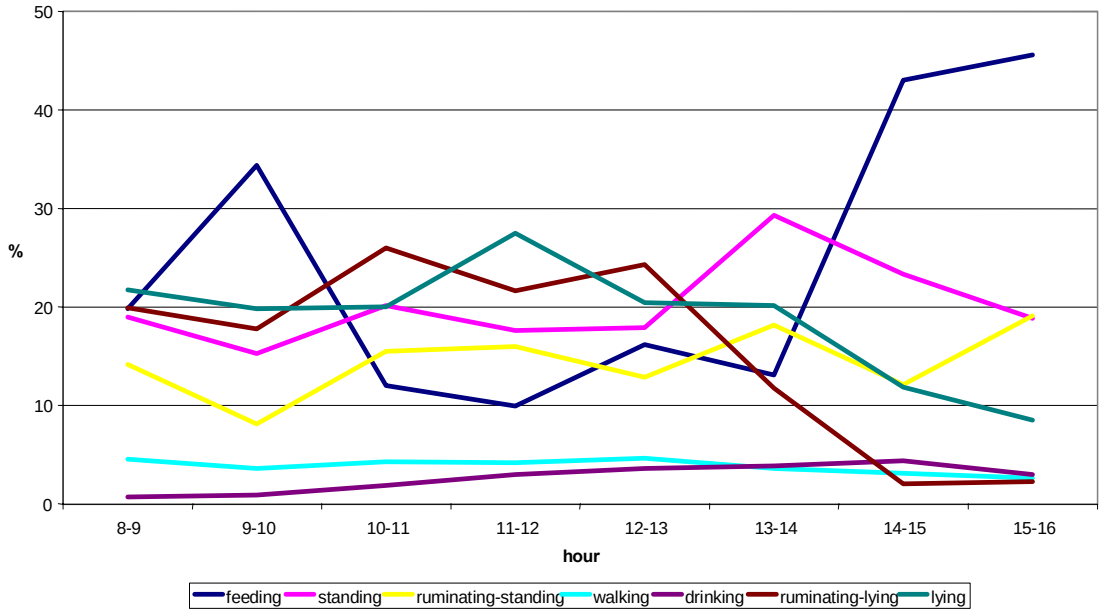


Figure 3: The dynamics of the course of life manifestation in the observe daily period - AUTUMN (C breed)

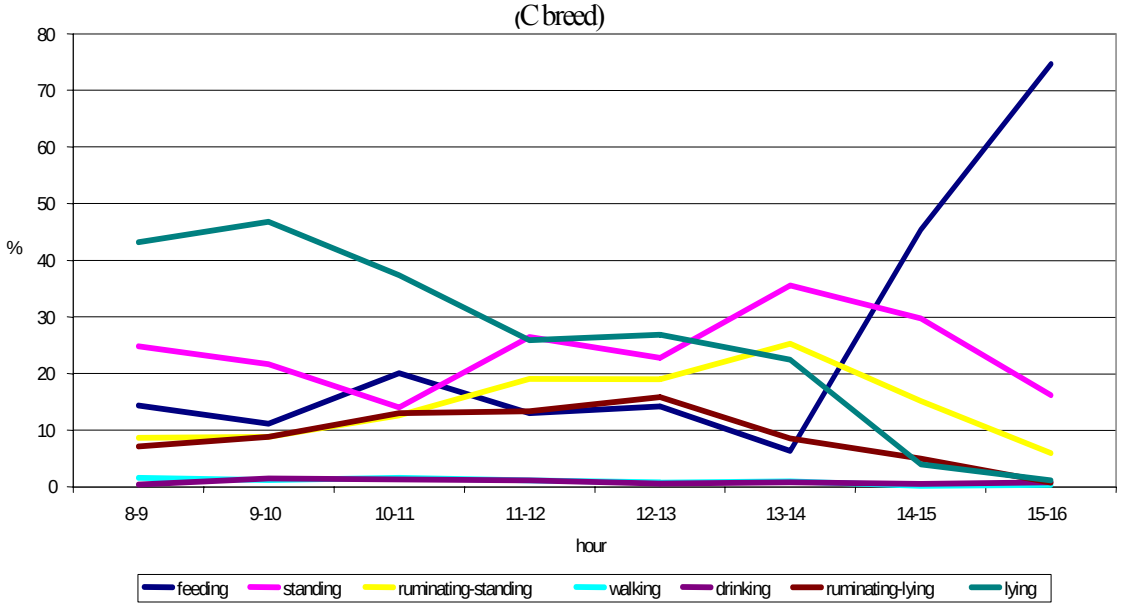


Figure 4: The dynamics of the course of life manifestation in the observe daily period - WINTER (C breed)

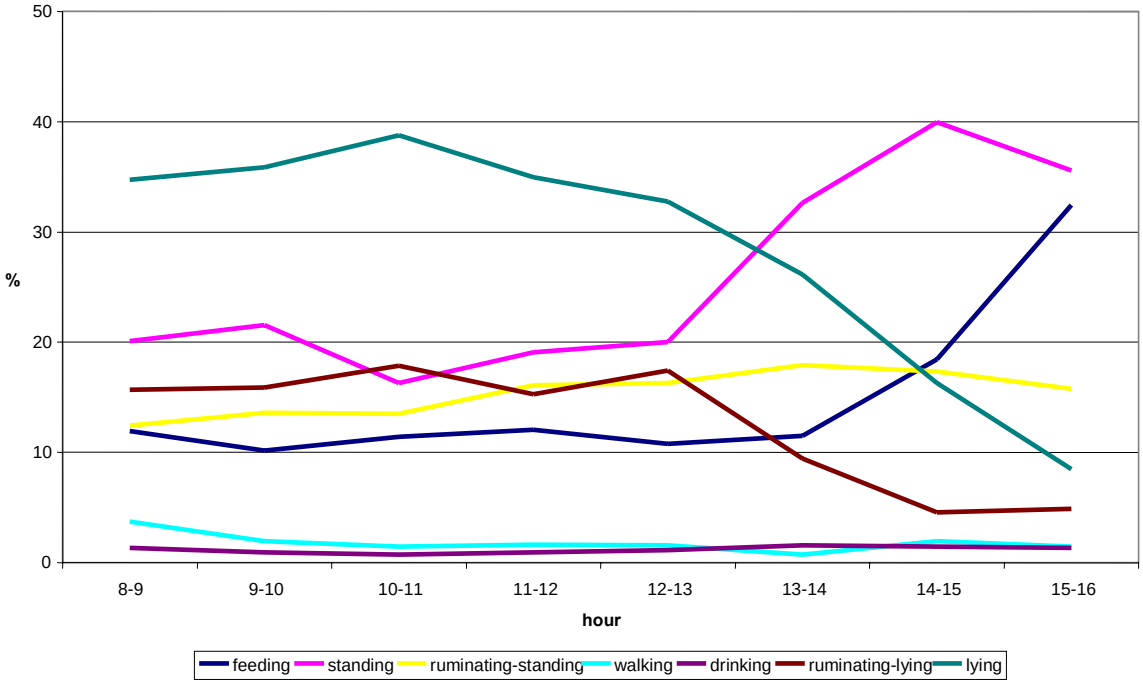


Figure 5: The dynamics of the course of life manifestation in the observe daily period - SPRING (H breed)

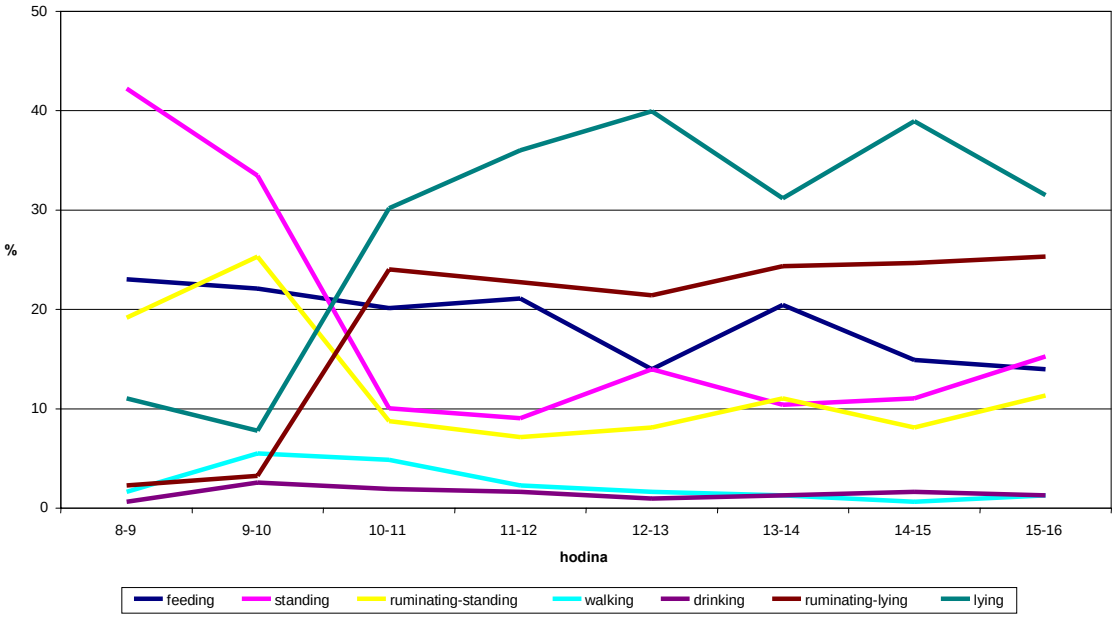


Figure 6: The dynamics of the course of life manifestation in the observe daily period - SUMMER (H breed)

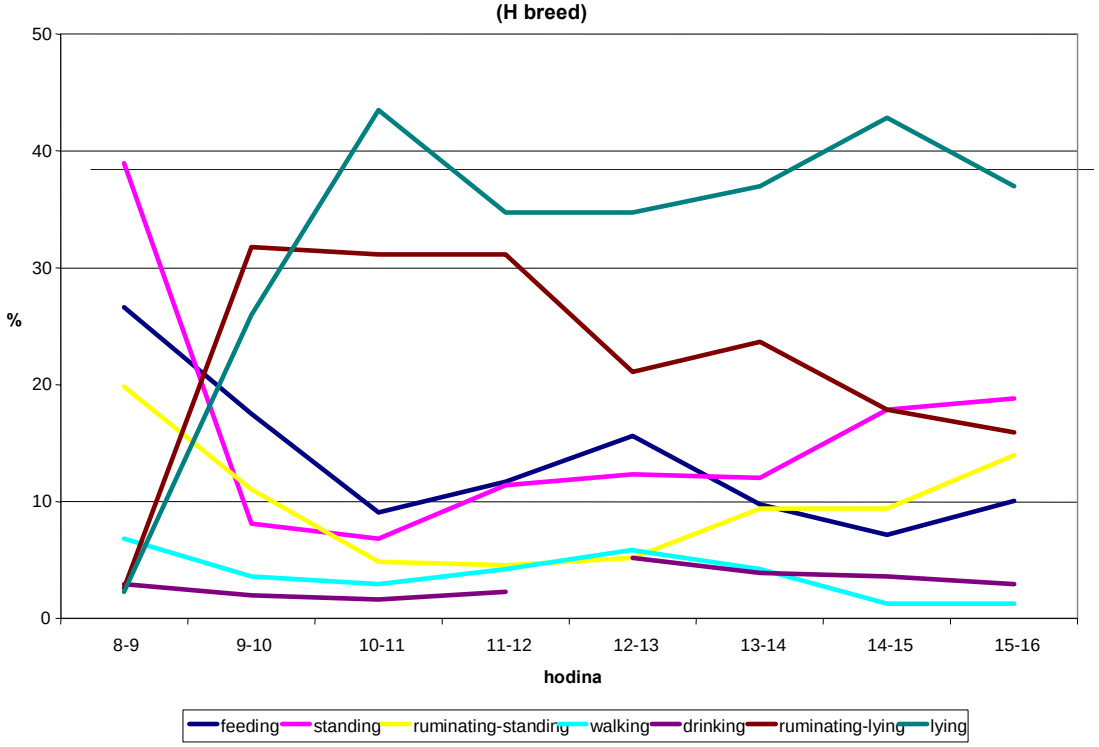


Figure 7: The dynamics of the course of life manifestation in the observe daily period - AUTUMN (H breed)

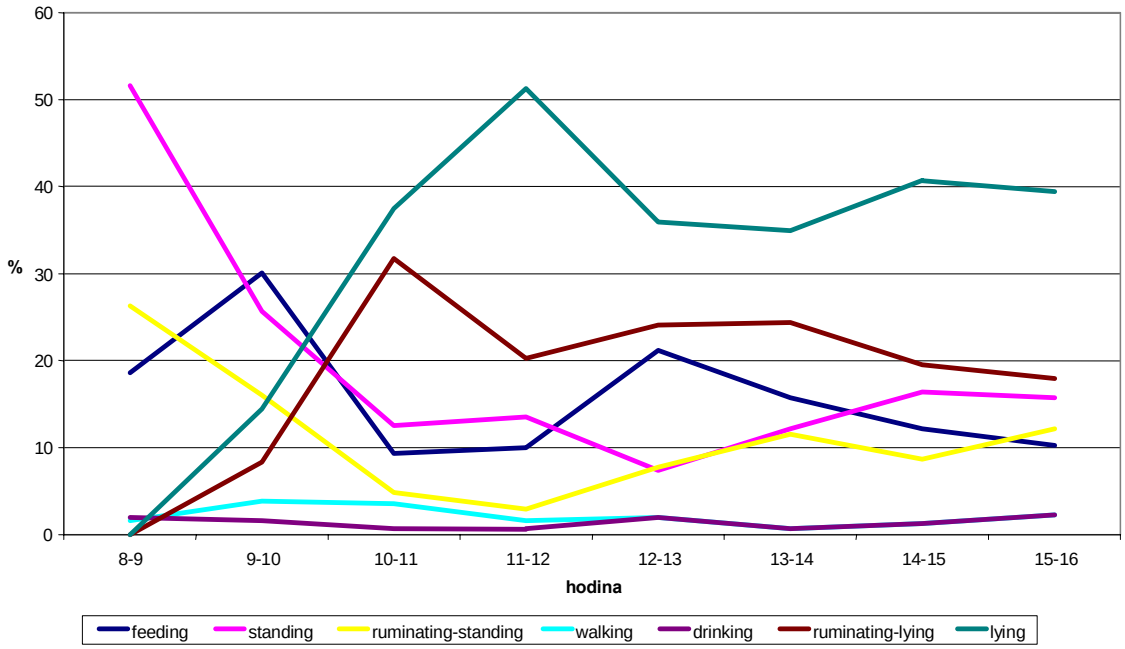
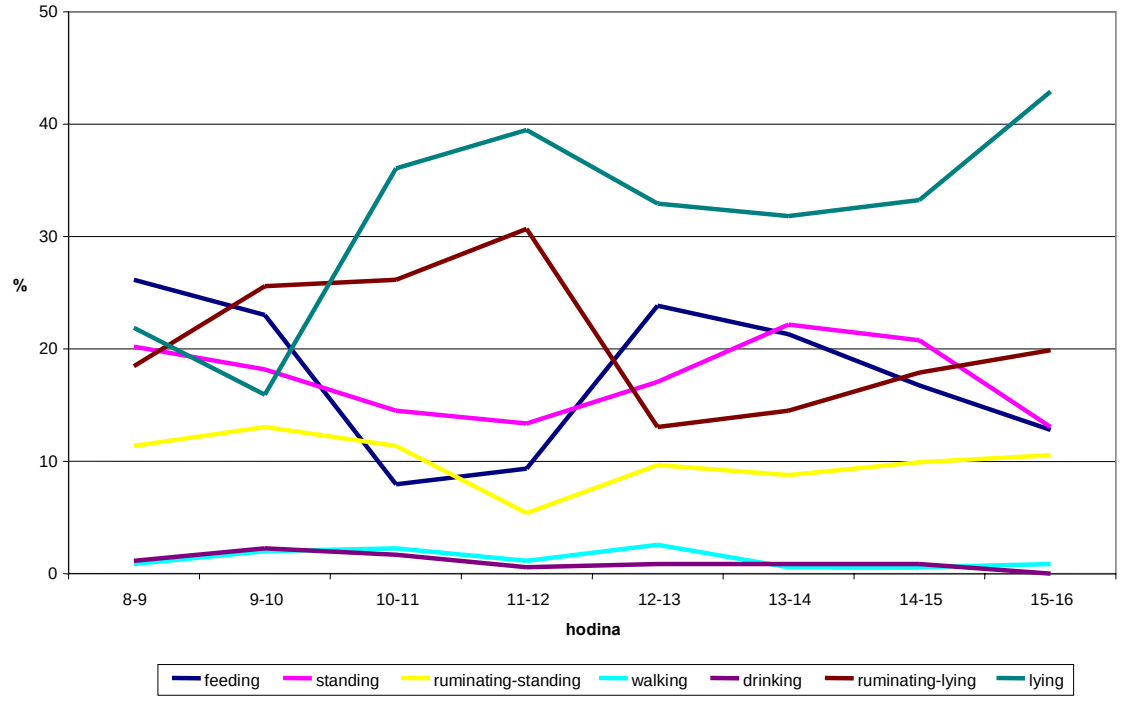


Figure 8: The dynamics of the course of life manifestation in the observe daily period - WINTER (H breed)



REFERENCES

[1] Bílek M., Kunc P., Doležal O.: Farma s přístřeškovým ustájením dojnic. Náš chov, LV, (7): 9–10, 1995.

[2] BLAHO R.: Vplyv roznej živej hmotnosti jalovic při prvom zapuštení na plodnosť, rast a užitkovosť. Poľnohospodárstvo, 9: 823 – 827, 1997.

[3] Brouček J., Arave C.W., Nakanishi Y., Mihina Š., Hetényi L.: Vliv hypotermického stresu na složení mléka a zdravotní stav krav. Živočiš.výr., 40 (5): 193–201, 1995.

[4] COLLINS J.D.: Animal welfare on dairy farms. Irish Veterinary Journal, 48, (4):145 – 147, 1995.

[5] DOLEŽAL O.: Správná volba ustájení skotu je předpokladem pro úspěšný chov. Nové poznatky v chovu skotu. Sborník referátů, Praha, 1999, s. 43 - 49.

[6] Eicker S.W., Gröhn Y.T., Hertl J.A.: The Association Between Cumulative Milk Yield, Days Open, and Days to First Breeding in New York Holstein Cows. J. Dairy Sci., 79: 235–241, 1996.

[7] Gnyp J., Litwinczuk Z., Malyska T., Kowalski P.: Effectiveness of utilising Black-and-White cows depending on intercalving period. 51st Annual Meeting of the EAAP, 21.-24. August 2000, The Hague, Book of Abstracts No. 6 (2000): 254.

[8] HANUŠ O., BENDA P., TICHÁČEK A.: Inundační stres u stáda dojnic. Veterinářství, 48 (2): 50 – 51, 1998.

[9] ILLEK, J., JAGOŠ, P., PECHOVÁ, A.: Poruchy metabolismu a produkční choroby dojnic. Farmář, 3 (3): 26 – 29, 1997.

[10] KIC P.: Nové trendy v zemědělské technice. Část 2, Technika na farmách pro chov skotu. ČZU, Praha, 1998.

[11] Kučera J., Hyánek J., Mikšík J., Čermák V. : Vliv období ptelení na mléčnou užitkovost dojnic Českého strakatého skotu. Czech J.Anim.Sci., 44 (8): 343–350, 1999.

[12] LOUDA F., STÁDNÍK L., JEŽKOVÁ A., MIKŠÍK J., PŘIBYL J.: Chov skotu (přednášky), ČZU Praha, 2000, 187 s., ISBN 80-2130542-8.

[13] Pryce J.E., Royal M.D., Garnsworthy P.C., Mao I.L.: Fertility in the high producing dairy cow. 51st Annual Meeting of the EAAP, 21.-24. August 2000, The Hague, Book of Abstracts No. 6 (2000): 123.

[14] PŘIBYL J.: Šlechtění skotu a jeho vliv na jednotlivé chovy. IVZ MZE, Praha, 1997.

[15] PYTLOUN J. a kol.: Chov hospodářských zvířat I. VŠZ, Praha, 1994.

[16] RIST J. a kol.: Přirozený způsob chovu hospodářských zvířat. Rubico, Olomouc, 1994.

[17] Říha J., Soutor J., Havlíček Z.: Úroveň mléčné užitkovosti a plodnosti ve vybraných šlechtitelských chovech Českého strakatého skotu. Živ. výroba, 40 (1): 41–47, 1995.

[18] Říha J.: Využití biotechnologií u reprodukčně problémových plemenic skotu. Sborník: XVIII. Genetické dny, České Budějovice, ZF JČU,8.-9.9.1998: 82-83.

[19] ŘÍHA, J. a kol.: Reprodukce v procesu šlechtění skotu. Rapotín, 2000, 144 s.

[20] Snijders S.E.M., Dillon P.G., O´Farrell K.J., Diskin M., Wylie A.R.G., Oćallaghan D., Rath M., Boland M.P. : Genetic merit for milk production and reproductive success in dairy cows. Anim. Rep roduction Sci., 65, (1-2): 17-31, 2001.

[21] SUCHÁNEK B. a kol.: Užitkové typy skotu v ČSSR. Zeměděl ec, 1982, č. 61, s. 9.

[22] VACEK M.: Optimalizace plemenářské práce a techniky chovu ve stádech dojeného skotu. Sborník referátů. VÚŽV Uhříněves, 1995.

[23] VEGRICHT J., MACHÁLEK A., PECHAČ, F.: Vliv technických systémů na ekonomiku výroby mléka. VÚZT, Mechanizace zemědělství, 49 (12,): 4 – 7, 1999.

[24] Wolfová M.; Wolf J.: Citlivost ekonomických vah na změny podmínek v chovu skotu. Živočišná výroba, 42 (3): 97–105, 1997.

Alena Ježková, jezkova@af.czu.cz.,
Vladimír Dřevo, drevo@af.czu.cz,
Czech University of Agriculture in Prague, Faculty of Agronomy,
Dept. of Cattle Breeding and Dairying,
165 21 Prague, Czech Republik
tel. +42 02 2438 3070