EFFECTS OF HEAT STRESS AND PRODUCTIVE LEVEL ON THE MAIN REPRODUCTION INDICES AND INCIDENCE OF DYSTOCIA IN BROWN BREED COWS

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Abstract

The study was carried out on 98 Brown dairy cows from Research and Development Station for Bovine Arad. The following traits were analysed: the voluntary waiting period (from calving to first A.I.), interval between calving and new pregnancy, the number of artificial inseminations (A.I.), incidence of dystocia and dystocia scoring, according to the season and productive level. Thus, in the winter, the voluntary waiting period was 77.45 and 96.32 days to the new gestation, requiring a number of 1.71 AIs per pregnancy. In spring, the voluntary waiting period was 75.26 and 97.64 days for a new gestation, with 2.03 AIs per pregnancy. In the summer, time to first service was 88.16 days, requiring 113.18 days for the new gestation and using 2.16 AIs per pregnancy. Autumn, favoured reduced time to first service 82.66 days, while 104.44 days were required for installation of a new gestation, requiring only 2.11 A.I.s. According to the productive level, cows with a production level between 5000-6000 kg milk, needs 56.67 and 81.44 days, cows between 6000-7000 kg milk needs 81.16 and 103.27 days and those over 7000 kg milk needs 100.75 and 122.97 days for voluntary waiting period and interval needed for installation of a new gestation, respectively. Number of A.I.s needed for a new pregnancy according to the productive level, was 1.71 A.I.s in winter season, 2.03 A.I.s in spring, 2.16 A.I.s for the summer and 2.11 A.I.s for the autumn months. The incidence of total dystocia was 21.42% from total number of calving. The most severe dystocia was recorded in summer, at the 5000-6000 kg milk interval.

Key words: dairy cows, heat stress, reproduction indices, incidence of dystocia

INTRODUCTION

Study of reproductive parameters is very useful in assessing the welfare of cows-mothers, offering valuable clues about the individual and collective metabolic status, framework in which the products of conception will be born and will have to survive and perform. Knowing all this information, farmers will be able to form an overview about the efficiency of their work, about the conditions for growth and maintenance of animals, but most importantly provides indications about what should be changed or improved in technological chain in order to reduce losses and implicitly in order to improve farm business. Through the deployment of profitable operation, an important accent must be put on the reproduction activity, especially as it have a greatly influences about production and labour efficiency. However, the reproduction activity is subject to the influence of various factors, among which the genetic individuality and environment factors, which the techniques applied can not shape sufficiently. Specifically, environmental temperature has the ability to influence both, yields and good conduct of reproductive function, positively or negatively. Cows react intensely to changes of heat factor. Studies of Neamt R. et al. [3,4,5] and Cziszter L. [2], are suggestive in this regard, highlighting a deterioration of the reproduction indices under the influence of high temperatures far outside from optimal thermal limits of the species.

High temperatures during the summer season, are great extent responsible for increasing the percentage of abortions due to increased the incidence of hypoxia [6] but also a reduction of the endocrine glands activity, followed by embryonic hypoxia [1].

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MATERIAL AND METHOD

The aims of this study was to quantify the parameter values of the three reproduction indices (the interval between calving and first AI, interval between calving and AI fertile, no. required to obtain a new gestation) and the incidence of dystocia according to calving season and the productive level. Data were collected from 98 births, spread over the four seasons, between August 2011 and December 2013. Ambient temperature was measured in the cows resting space area, in a fixed point at a height of 200 cm from the ground. Temperatures records were made every 72 hours, at 12:00 AM. Brown breed dairy cows, were divided into three productive levels, 5000-6000 kg milk / lactation, 6000-7000 kg milk / lactation and over 7000 kg milk / lactation. After monitoring, data of reproduction activity were recorded: calving date, first A.I. date, fertile A.I. date, based on controls to determine pregnancy and the number of A.Is need to install a new gestation. The data collected, were statistically analysed in order to of determining the absolute values, the average values, the differences occurred between seasons and between the three productive levels. Significance of differences, where they occur, were statistically tested. The incidence of births dystocia was carefully monitored and recorded according both calving season and the productive level. The gynaecological meaning of births dystocia was highlighted about three levels of severity classification:

- Easy dystocia - prolonged calving without human intervention;
- Medium grade dystocia - births requiring manual removal of the calf;
- Severe dystocia - births requiring mechanical extraction of the calf.

There were no registered calving dystocia requiring surgery (caesarean).

The incidence of dystocia births were studied by the terms of relative share according with calving season and the productive level, both the absolute value (total of dystocia / season / production level) and the level of severity (e.g. no. Medium Dystocia / season / productive level.

RESULTS AND DISCUSSIONS

Regularly recording of the environmental temperatures has allowed their tabular representation, representing the starting point of the study.

Table 1 The thermal values according to calendar months

Calendar month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Temperature (t°C)	5.8	7.1	9.3	9.7	12.1	18.9	22.7	26.4	19.4	16.2	11.8	5.4

Table 2 Distribution of seasonal calving herd and employment in the productive level

Season	Winter			Spring			Summer			Autumn		
Birth month	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun	Jul	Aug	Sep	Oct	Nov
No. of births	9	14	8	11	10	6	7	5	7	5	9	7
Total of births	31			27			19			21		
Percentage from total births (%)	31.63%			27.55%			19.38%			21.44%		
5000-6000 kg milk	15			13			10			14		
6000-7000 kg milk	12			11			7			5		
〉7000 kg milk	4			3			2			2		

Table 2 shows the distribution of births according to the season and the productive level. We observe the high percentage of cows with production in the range of 5000-6000 kg milk, followed by the percentage of cows from range between 6000-7000 kg. milk, the lowest weigh being assigned to cows with more than 7000 kg milk.

Depending on the production level awarded the intervals for voluntary waiting period of 60, 80, 100 days, the first A.I. being performed at the nearest boundary of oestrus.

Table 3 shows the average and dispersion indices afferent to the voluntary waiting period, according to the season of calving and productive level.

Table 3 Average and dispersion indices regarding voluntary waiting period, according to the season of calving and productive level

Productive level	Dispersion indices	Winter	Spring	Summer	Autumn	Average and dispersion indices /productive level
5000-6000 kg milk	X	54.53	56.69	59.7	55.78	56.67
	± s	±1.62	±1.94	±3.27	±2.65	±2.37
	V%	11.57%	12.37%	17.37%	17.77%	14.77%
6000-7000 kg milk	X	77.08	77.09	86.28	84.2	81.16
	± s	±2.25	±2.53	±6.36	±6.64	±4.44
	V%	10.11%	10.9%	19.51%	17.64%	14.54%
〉7000 kg milk	X	100.75	92	118.5	108	104.81
	± s	±4.53	±3.78	±5.5	±9	±5.7
	V%	9%	7.12%	6.56%	11.78%	8.61%
Average and dispersion indices /season	X	77.45	75.26	88.16	82.66	
	± s	±2.8	±2.75	±5.04	±6.09	
	V%	10.22%	10.13%	14.48%	15.73%	

From the analysis of the data from table 3, results that the voluntary waiting period allocated for the cows in the first productive level (5000-6000 kg milk) stood at the average level of 56.67 days, fitting perfectly within 60 days interval allocated.

Slight exceeded of this period (81.16 days) was recorded at cows classified in level 2 (6000-7000 kg milk) and 3 (over 7000 kg milk - 104.81 days), but the differences were not significant statistically, as shown in table 4. Time overruns, even insignificant, were recorded in the summer months, to cows with high milk production, which urges us to be careful with these animals, especially when establishing the periods for physiological and / or metabolic recovery.

Table 4 Differences and statistical significance of voluntary waiting period, according to the season of calving

Productive level/season	Winter	Spring	Summer	Autumn
5000-6000 kg milk	*	*	*	*
6000-7000 kg milk	*	*	-6.28NS	-4.2NS
〉7000 kg milk	-0.75NS	*	-18.5NS	-8NS

NS – non significant (p>0.05), S – significant (p<0.05), DS – distinctly significant (p<0.01), VS – very significant (p<0.001)

The longest voluntary waiting period was recorded for cows that calved in the summer months, which strengthens our conviction that the high temperatures in the latter part of pregnancy and the postpartum period negatively influence the reproduction activity and delay the resumption of physiological cycle, comparative with the cows calved in other seasons. The voluntary waiting period related to the cows calved in the spring, represents the physiological response of dairy cows across the tendency of increasing temperatures, especially in the terminal part of the season. The shorter intervals were recorded from cows calved in winter and autumn seasons, whose temperatures allow proper functioning of reproductive function, both by the value and by their downward trend.

Testing the statistical significance of differences appeared regarding the voluntary waiting period according to the productive level, differences were not statistically significant, except for spring-summer range of the 3-rd productively level cows, in which case the differences were statistically significant. The differences recorded for the

voluntary waiting period in the same season according the productively level were calculated, their statistical testing are shown in table 5.

Table 5 Differences and statistical significance of voluntary waiting period, according to the productive level

Productive level/season	Winter	Spring	Summer	Autumn
Level1/Level 2	-22.55VS	-20.4VS	-26.58DS	-28.42DS
Level 1/ Level 3	-46.22VS	-35.3DS	-58.8S	-52.22S
Level 2/ Level 3	-23.67DS	-14.91S	-32.22S	-23.8NS

NS – non significant (p>0.05), S – significant (p<0.05), DS – distinctly significant (p<0.01), VS – very significant (p<0.001)

The data presented in table 5 clearly shows that an increase of production, increase time necessary for physiological and metabolic recovery. Differences very significant, distinctly significant or only significant were recorded between the first level and the other two higher productively levels, in each season studied. The largest differences are found between level 1 and two other higher productively levels, especially in the months of calving with low temperatures (winter), when the environmental conditions has favored the externalization of available productive potential and cow body recovery time require extended. With the increasing of environmental temperatures, due to the parallel increase of the voluntary waiting periods from all cows, from all productive levels under the influence of heat stress, the differences are reduced, even if the values are increase as the number of days intervals.

The duration of the interval between calving and A.I. fertile, is itself an important welfare indicator of dairy cows. Analysis of values for this interval provides valuable clues about both the degree of readiness of cows for reproduction activity and on the degree of adaptation to environmental conditions. Values of the interval between birth and A.I. fertile, recorded within the herd under study, are provided below, in table 6.

Table 6 Average and dispersion indices for intervals between calving and A.I. fertile, according to the season of calving and productive level

Productive interval	Dispersion indices	Winter	Spring	Summer	Autumn	Average and dispersion indices/productive level
5000-6000 kg milk	X	71.46	78.46	94.2	55.78	81.64
	± s	2.44	1.83	2.41	2.8	2.37
	V%	13.23	8.44	8.11	12.86	10.66
6000-7000 kg milk	X	96.25	100.82	110.85	84.2	109.2
	± s	1.91	1.69	5.5	5.5	3.65
	V%	6.83	5.57	13.12	11.27	9.19
〉7000 kg milk	X	121.25	113.66	134.5	108	122.5
	± s	6.25	3.17	1.5	9.5	5.1
	V%	10.3	4.84	1.57	10.96	6.91
Average and dispersion indices/season	X	96.32	97.64	113.18	82.66	
	± s	3.53	2.23	3.13	5.93	
	V%	10.12	6.28	7.6	11.69	

From the analysis of table 6 is observed the Gaussian layout, of this interval, longer for cows calved in the summer months, when the average temperatures values was stressful and less for cows calved in winter with low temperatures or for cows that calved in spring and autumn months, with temperatures near the thermal optimum. We can say that cows whose births were preceded and followed by high temperatures will have an extended interval compared with those whose births occurs in the cooler periods of the year. Low intervals for cows calved in the autumn and winter are explained by the months preceding

or following months of calving. Decreasing trend interval is encountered at the beginning of the autumn months, a sign that dairy cows react intensely to thermal changes. The analysis of vertical exposed data shows that, within the same season, so under the identical influence of environmental temperatures, milk production is parameter which largely dictates the duration of interval necessary to restore hormonal balance, nutritional and metabolic needed to install a new gestation. Thus, cows from first productive level (5000-6000 kg milk), will need a shorter time (71.46, 78.25, 94.2, 55.78 days for the all seasons) compared of the third productively level cows (over 7000 kg milk) which will require a longer time, i.e. 121.25, 113.66, 134.18, 108 days for the all seasons. In first productively level, large differences occur between seasons, except for seasons with intermediate temperatures (spring and autumn), perceived very well by dairy cows. Significant and very significant differences occur between the months of winter with low temperatures and the spring and summer seasons, when temperatures are high or increasing trend either. Autumn with temperatures characterized by the tendency to reduce, to which animals react quickly and positively, were recorded distinguished significant differences compared to summer months temperatures. Table 7 shows the differences and their statistical significance, from the first productively level according to the season.

Table 7 Differences and statistical significance for interval between calving and fertile A.I., according to first productive level (5000-6000 kg milk) and seasons of calving

Productive level 5000-6000 kg milk/season of calving	Winter	Spring	Summer	Autumn
Winter		-7S	-22.74VS	-10.1S
Spring			-15.74VS	-3.18 NS
Summer				-12.56DS

NS – non significant (p>0.05), S – significant (p<0.05), DS – distinctly significant (p<0.01), VS – very significant (p<0.001)

Cows with high milk productively level belonging to level 2 (6000-7000 kg milk) are more affected by high temperatures, as seen from the data of table 8. Also, the effect of high temperatures in the summer months is remanent in the beginning of autumn, which leads to blurring of the differences between the seasons. The same thing happens when cows calved in spring months, that are sensible to the heat increases compared to cows calved in the autumn. The existence of large thermal differences between winter and summer and even autumn months lead to recording statistically significant differences.

Table 8 Differences and statistical significance for interval between calving and fertile A.I., according to second productive level (6000-7000 kg milk) and seasons of calving

Productive level 6000-7000 kg milk/season of calving	Winter	Spring	Summer	Autumn
Winter		-3.73NS	-13.7S	-11.92S
Spring			-10.04NS	-8.39NS
Summer				1.65NS

NS – non significant (p>0.05), S – significant (p<0.05), DS – distinctly significant (p<0.01), VS – very significant (p<0.001)

Sensitivity and intensity response of dairy cattle is increasing with increasing productive performance. Strong catabolic metabolism overworked through cumulating thermal effects and the need to support milk production does not allow resumption of reproduction activity. Thus, we are faced with high reproductive intervals in all seasons and the differences are relatively insignificant statistically. However, extreme gradients occurred between the temperatures of the summer months and the winter, leading to record differences statistically significant, as shown in table 9.

Table 9 Differences and statistical significance for interval between calving and fertile A.I., according to third productive level (〉7000 kg milk) and seasons of calving

Productive level 〉7000 kg milk/season of calving	Winter	Spring	Summer	Autumn
Winter		7.59NS	-13.25DS	-1.25NS
Spring			-20.84S	-8.84NS
Summer				12NS

NS – non significant (p>0.05), S – significant (p<0.05), DS – distinctly significant (p<0.01), VS – very significant (p<0.001)

In identical temperatures (in the same season), level of milk production is defining the terms of period necessary for a new gestation. Winter significant and distinguished significant differences appear between productively level 1 and two upper levels. Productive levels close (level 2 and level 3) correlated with temperatures close to the thermal optimum (winter, spring), allows relatively equal reproductive intervals, characterized by less differences (significant or distinguished statistically significant). In the summer months, differences remain elevated even in higher production levels (level 2 and 3), which strengthens our conviction that dairy cows performance are very sensitive to environmental heat increases. Residual effect and the impact of high temperatures in the summer months on reproductive intervals of cows calved in the autumn, is highlighted by the large differences existent between them and the cows calved in summer. Differences and their significance are shown in table 10.

Table 10 Differences and statistical significance for interval between calving and fertile A.I., according to seasons of calving

Productive level/season of calving	Winter	Spring	Summer	Autumn
Level1/Level 2	-25.62VS	-22.35VS	-16.65S	-27.56DS
Level 1/ Level 3	-49.79DS	-35.2DS	-40.3VS	-40.86VS
Level 2/ Level 3	-24.17S	-12.85S	-23.65DS	-13.3DS

NS – non significant (p>0.05), S – significant (p<0.05), DS – distinctly significant (p<0.01), VS – very significant (p<0.001)

Extending the interval between calving and installation of a new pregnancy, involves an increased number of A.I.s. Number of A.I.s necessary to obtaining a new pregnancy, is the most often directly proportional to the length of the interval. We say most of the times, because in practice, there may be situations where there is none sexual manifestations or these are weak in intensity, situations in which A.I. is not required or cannot be timely made. Relating to calving season, we can say that the highest number of A.I.s. was necessary in hot summer season (2.16 A.I.s), followed by autumn (2.11 A.I.s) and seasons with low temperatures, spring (2.03 A.I.s) and winter witch required only 1.71 A.I.s for a new pregnancy. It seems evident negative influence of high temperatures on hormone and energy balance, needed for the installation in good condition of a new gestation. Lack of gestations during the hot season are due, on the one hand, to imbalance endocrine activity, affecting hormonal titter and implantations, but also on the production of embriotrof, and on the other hand, specific sexual manifestations of low intensity that often make impossible to detect cows in heat. Good results are obtained in the winter months, with low temperatures, easily supported by dairy cows. Spring, parallel with the trend of increasing temperatures, we observe a slight increase of necessary for A.I.s, as well as in the autumn due to remanence effect of heat stress from summer. Analysing the dynamics of A.I.s necessary for a new pregnancy, according to the productive level, we can see, no matter the season, an increase of it, closely linked to the productive performance. The cows belonging to the first productive level (5000-6000 kg milk) needed 1.56 A.I.s, those from the 2nd level (6000-7000 kg milk) 1.97 A.I.s and those with more than 7000 kg milk 2.47

A.I.s, for a new pregnancy. The number of A.I.s necessary is closely connected with the interval between calving and fertile AI. Summary data are given in table 11.

Table 11 Average and dispersion indices for A.I. number needed for a new gestation, according to the season and productive level

Productive interval	Dispersion indices	Winter	Spring	Summer	Autumn	Average and dispersion indices/productive level
5000-6000 kg milk	X	1.4	1.53	1.7	1.64	1.56
	± s	0.16	0.18	0.21	0.16	0.17
	V%	45.17	42.91	39.7	38.55	41.58
6000-7000 kg milk	X	1.5	1.9	2.28	2.2	1.97
	± s	0.19	0.25	0.18	0.48	0.27
	V%	44.94	43.53	21.34	49.79	39.9
〉7000 kg milk	X	2.25	2.66	2.5	2.5	2.47
	± s	0.25	0.66	0.5	0.5	0.47
	V%	22.22	43.3	28.28	28.28	30.52
Average and dispersion indices/season	X	1.71	2.03	2.16	2.11	
	± s	0.2	0.36	0.29	0.38	
	V%	37.44	43.24	29.7	38.87	

Even if from mathematical point of view we have a obvious increase of A.I.s necessary according to productive level, statistically, after calculating and testing the differences recorded, have not been found significant differences, except cows belonging to 2nd level, where significant differences occurred between calved cows in winter and those calved in spring and summer, as evident from tables 12, 13 and 14.

Table 12 Differences and statistical significance for A.I. number needed for a new gestation, according to the 1st productive level (5000-6000 kg milk) and seasons

Productive level 5000-6000 kg milk/season of calving	Winter	Spring	Summer	Autumn
Winter	-	-0.13NS	-0.3NS	-0.24NS
Spring	-	-	-0.17NS	-0.11NS
Summer	-	-	-	0.06NS

NS – non significant (p>0.05), S – significant (p<0.05), DS – distinctly significant (p<0.01), VS – very significant (p<0.001)

Table 13 Differences and statistical significance for A.I. number needed for a new gestation, according to the 2nd productive level (6000-7000 kg milk) and seasons

Productive level 6000-7000 kg milk/season of calving	Winter	Spring	Summer	Autumn
Winter	-	-0.4NS	-0.78DS	-0.7DS
Spring	-	-	-0.38NS	-0.3NS
Summer	-	-	-	0.08NS

NS – non significant (p>0.05), S – significant (p<0.05), DS – distinctly significant (p<0.01), VS – very significant (p<0.001)

Table 14 Differences and statistical significance for A.I. number needed for a new gestation, according to the 3rd productive level (〉7000 kg milk) and seasons

Productive level 〉7000 kg milk/season of calving	Winter	Spring	Summer	Autumn
Winter	-	0.41NS	-0.25NS	-0.25NS
Spring	-	-	0.16NS	0.16NS
Summer	-	-	-	0NS

NS – non significant (p>0.05), S – significant (p<0.05), DS – distinctly significant (p<0.01), VS – very significant (p<0.001)

Analysing the values of the number of A.I.s necessary to obtain a new pregnancy, according to calving season, we obtain the follows results, shown in table 15.

Table 15 Differences and statistical significance for A.I. number needed for a new gestation, according to the season of calving

Productive level/season of calving	Winter	Spring	Summer	Autumn
Level1/Level 2	-0.1NS	0.37NS	-0.58S	0.56NS
Level 1/ Level 3	-0.85S	-1.13NS	-0.08NS	-0.86DS
Level 2/ Level 3	-0.75S	-0.76NS	-0.22NS	-0.3NS

NS – non significant (p>0.05), S – significant (p<0.05), DS – distinctly significant (p<0.01), VS – very significant (p<0.001)

In case of cows calved in the cold winter months, statistically significant differences occur only due to production performance, requiring a different interval for reproductive system recovery.

Thus, differences occur between cows framed in first productive level and 3rd or between the intermediate level (2nd level) and performance level (3rd). Spring, the season whit temperatures very close to the thermal optimum, at least during to early period, offers to the dairy cows, good conditions for resuming of oestrus in time and even if mathematically we record an increase on number of A.I.s according to productive levels, they are not statistically significant. High temperatures during the summer months, negatively affects the reproductive activity of dairy cows at all levels, leading to excessive prolongation of this period, as service intervals and increase the required number of A.I.s, recording thus high values of these indices, which cancels the possible differences that may occurs. The period of reducing for the environmental temperatures (winter months), brings with it the occurrence of differences between opposite intervals (level 1/level 3), largely due to differences in productive performance recorded. In conclusion, we can say that installing a new gestation is a complex physiological process, which can take place only under special conditions that take into account the productive performance of the animal and its requirements for the environment conditions. Thus, the length of time between calving and first A.I. correlated with productive level and body condition, can increase the efficiency of reproduction activity and can cope in a certain measure in front of the environmental factors, witch can negatively influence (high temperature).

Dystocia, defined here as a prolonged calving, and calving that require interventions with varying degrees of difficulty from qualified staff, are a constant source of losses, both at the level of milk production and ensuring and maintaining welfare of the offspring. This study presupposes analysis a total of 98 births, which 21 framed into the category of dystocia, with varying degrees of difficulty, representing 21.42% from the total number of births. Incidence of dystocia total number, according to calving season and productive level is shown in table 16, averages and dispersion indices for this parameter are presented in table 17.

Table 16 Incidence of dystocia births according to the total number of dystocia, season of calving and productive level

Productive level/season of calving	Winter	Spring	Summer	Autumn	Share of total dystocia/productive level
1st level 5000-6000 kg milk	2	2	3	4	52.39%
2nd level 6000-7000 kg milk	1	1	3	2	33.33%
3rd level 〉7000 kg milk	1	0	1	1	14.28%
Total/season	4	3	7	7	
Share of total dystocia/season	19.06%	14.28%	33.33%	33.33%	

Table 17 Average and dispersion indices for dystocia incidence, according to the season of calving and productive level

Productive level	Dispersion indices	Winter	Spring	Summer	Autumn	Average and dispersion indices/productive level
1st level 5000-6000 kg milk	X	0.08	0.05	0.2	0.09	0.08
	± s	±0.04	±0.03	±0.07	±0.04	±0.045
	V%	-	-	-	-	
2nd level 6000-7000 kg milk	X	0.02	0.03	0.14	0.13	0.08
	± s	±0.02	±0.03	±0.07	±0.09	±0.05
	V%	-	-	-	-	
3rd level 〉7000 kg milk	X	0.08	-	0.16	0.16	0.11
	± s	±0.08	-	±0.16	±0.16	±0.11
	V%	-	-	-	-	
Average and dispersion indices/season	X	0.06	0.04	0.16	0.12	
	± s	±0.04	±0.03	±0.08	±0.09	
	V%	-	-	-	-	

From analysis of the data expose above, we can observe a high incidence of dystocia in the high temperatures season (summer) but also in the beginning of autumn months in which also still records relatively high temperatures that overlap with the latter part of pregnancy. Low incidence of dystocia is recorded in the cold months (winter) but also in the ones with intermediate temperatures (spring). The discomfort caused by the high temperatures from summer and their residual effect manifested in the early months of autumn, leading to an increase of dystocia, due, in large part, by a lack of energy (consumed largely in the processes of thermoregulation) and installation of hypoxia. High incidence of dystocia has been especially in the case of cows belong to 1st productive level (5000-6000 kg milk). Cows with higher milk production (over 7000 kg milk) had a lower incidence of dystocia. A possible explanation could be, their strong catabolic metabolism, which does not allow an excessive development of the offspring, which was associated with the lack of energy resources and the entire state of discomfort caused by heat stress, to favor the appearance of heavy births. The difficulty degrees of dystocia births vary from easy dystocia (prolonged calving) to heavy dystocia (calving requiring mechanical extraction of the calf). The incidence of dystocia births according to their degree of difficulty is shown in table 18.

Table 18 Incidence of dystocia according to the difficulty degree

Productive level/season of calving	Winter			Spring			Summer			Autumn		Total/ productive level	
	Easy dyst.	Middle dyst.	Heavy dyst.	Easy dyst.	Middle dyst.	Heavy dyst.	Easy dyst.	Middle dyst.	Heavy dyst.	Easy dyst.	Middle dyst.	Heavy dyst..	
1st productive level 5000-6000 kg milk	1	0	1	1	1	0	1	1	1	2	1	1	11
2nd productive level 6000-7000 kg milk	1	0	0	1	0	0	1	0	2	1	1	0	7
3rd productive level 〉7000 kg milk	1	0	0	0	0	0	0	1	0	0	1	0	3
Total/degree	3	0	1	2	1	0	2	2	3	3	3	1	
Total/season	4			3			7			7			

The share of dystocia births according to their difficulty degree is shown in table 19.

Table 19 The share of dystocia births according to their difficulty degree

Difficulty degree/productive level	1st productive level (5000-6000 kg milk)	2nd productive level (6000-7000 kg milk)	3rd productive level (〉7000 kg milk)	Total of dystocia	Share from total dystocia
Easy dystocia	5 (50%)	4 (40%)	1 (10%)	10	47.61%
Middle dystocia	3 (50%)	1 (16.66%)	2 (33.34%)	6	28.57%
Heavy dystocia	3 (60%)	2 (40%)	0	5	23.82%

The largest share have dystocia births with low calving difficulty degree, calving evidenced by prolonged duration (47.61%) and observed mainly in the case of cows belong to 1st level (5 dystocia) and 2nd productive level (4 dystocia). The medium difficulty calving were recorded in greater numbers at cows belong to the 1st productive level (3 dystocia) and at those belong to the 3rd productive level (2 dystocia). Dystocia with high difficulty degree, those requiring mechanical extraction of the calf, showed a high percentage into the 1st productive level (3 dystocia), their incidence decreases with increasing productive performance.

CONCLUSIONS

Voluntary waiting period provided, according to productive level, was complied in case of cows belong to the 1st productive level (5000-6000 kg milk). Heat stress exerted by the high temperatures but also high productive level lead to the extension of this period.

The interval between calving and A.I. fertile, know a longer duration in the case of cows which births were recorded in the summer months, this interval adopting different durations correlated with dynamic of environment temperatures. There is also, a strong positive correlation between the length of this interval and the productive level; so, in case of cows belong to 3rd productive level we record a prolonged interval.

The number of A.I.s necessary to obtain a new gestation has the highest values during the hot season for cows with high milk production, its dynamics being in close connection with the time required to obtain a new gestation.

The incidence of dystocia is increased for cows that calved in summer months but also for those that calved in the autumn months, witch have a later part of pregnancy in the end of summer, under the influence of heat stress.

High incidence was recorded in case of cows belong to 1st productive level (5000-6000 kg milk). Large share had easy dystocia (calving with prolonged duration). Performance cows, belong to the 3rd productive level, recorded a few dystocia, among them there were no dystocia with a high difficult degree.

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