

## Research Concerning the Reproduction Seasonality in Carpathian Buffalo

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### Abstract

Fertility in buffalo is low. That could be a question of species adaptation in new climate or a genetic trait. Scientists think buffaloes entered the South-est of Europe on two ways one with the Hune and Avar people coming trough the North of Black Sea up to the intra Charpathian Hills and a later one more prolonged with penetratio trough Egypt, Small Asia and Greece at the time when some people migrated up to the Danube River. Buffaloes which originated from Egypt were domesticated before the ones that came through the North of Black Sea. That means in Romania there are two different buffalo populations: the Carpathian Buffalo adapted to reproduce in a cold and wet climate, outside the area of its wild ancestors and a Danube Buffalo that underwent more influence domestication apart. These two populations reproduced separately by territorial state insulation. All buffalo breeds including the ones in the native domestication area show grouped calving. The present paper has to answer if grouped calving in buffalo is due to photoperiodic exchange along the year or to the poor feeding in some seasons. The answer to this question will decide the actions needed to improve buffalo cows' fertility.

**Keywords:** buffalo, farm animal reproduction, photoperiodic, seasonality

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### 1. Introduction

Fertility in buffalo is low. According to S. Berge [1]" *fertility is the animal organisms' property to generate viable progeny*". On this basis M. Paraschivescu [2-- 4] quantifies the fertility by the number of progenies organisms are given during a known period of time or by the interval between parturitions.

Low fertility of the buffalo species could be due to some genetically traits of the organism or to the need of their accommodation in the new environment resulted from domestication or farming.

Concerning the genetically determined traits all authors of scientific papers are mentioning

photoperiodicity as a factor incriminated in the neuroendocrine control of gonad activities. But the same authors stress on the fact that they have registered parturition acts in any month of the year. Pregnancy length, silent heat and embryonic mortality are the traits suspected for decreasing fertility.

At the same time the research papers underline the importance of farm management and of the feeding level on the ovary function. Nevertheless acclimatization has to be a main factor of the fertility level in buffalo.

Regarding to the existing buffaloes in Romania we must say that they are pertaining to two different populations. In a book published probably in 1926, or something like that, M. Vaida [5] said referring to the buffaloes present along the Danube River in the Romanian Old Kingdom they originate from the early domesticated buffaloes

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getting Egypt. They have got the Danube vicinity from Bulgaria where came with the Turkey invaders. Most owners of buffaloes are Turkey or Bulgarian inhabitants of the zone. The Carpathian Buffalo, as he calls it, has been later domesticated and got the intra Carpathian area with the Hun and Aver migration. This population acclimatized by closed reproduction to the new cold and humid environment of the area, rather different from the warm and humid climate of their ancestors. These two buffalo population have been reproductively isolated by the territorial insulation given by the state boundaries in that time and by the poverty of the buffalo owners. M, Vaida [5] said any dairyman around Bucharest could distinguished between cows of these two buffalo populations.

Now days a real revolution is taking place in buffalo breeding. It issued in Italy a country what is promoting the intensive farming in buffalo production completed with a keen processing of farm products. The Italian program had a great success. A new breed, the Mediterranean Buffalo, has been created. The number of buffaloes increased over 300000 heads, each farm has around 90 buffalo cows; artificial insemination is largely spread, buffalo bulls are progeny tested for dairy traits, animals' precocity is better and so are the milk production and the fertility of herds as well.

At the same time the breeding of buffaloes in Romania is going from worse to worst. The number of buffaloes in both populations decreased tremendously. The Carpathian Buffalo is now in vulnerable state and the Danube Buffalo is in danger of extinction.

In order to save these buffalo breeds Romania has to follow similar programs to the Italian ones. But the program for the Carpathian Buffalo must differ from the program for the Danube Buffalo because of their different origin. The risk of impelling on the Carpathian Buffalo fertility, what has resulted from a long acclimatization process, must be avoided. Thus the aim of this paper is to contribute to understanding how the sexual activity in Carpathian Buffalo females is physiologically controlled in order to preserve or improve their actual fertility by genetically means. Calving distribution is more difficult to be changed if sexual activity is controlled by photoperiodicity. On the other hand there is a genetically control of organisms' metabolism that might be modified easier but not immediately.

Zicarelli reported [6] decreasing the age of the first insemination in buffalo heifers each four years to get to the actual 36 month of age.

## 2. Materials and methods

The present research was done by the Research and Development Institute for Cattle Breeding – Balotești, the Research and Development Station for Buffalo Breeding - Șercaia and the Farm Animal Section of the Academy of Agriculture and Forestry Sciences – Bucharest, Romania. Calving data concerning 9 years of reproduction activity in the Station's herd the have been used. The Station is located outside of all other buffalo populations' areas at the latitude  $46^{\circ}$  north of Equator. No other buffalo population got over  $32^{\circ}$  north latitude or  $12^{\circ}$  of south latitude. The medium size of the herd for this period was 140 heads. A total of 780 calving data have been registered. In table 1 calving data are grouped each year and as all over means of the total period by monthly distribution. In the third column the herd size and the fertility of each year are presented. The last column contains the number of calvings.

The type of calving distribution was appreciated by R. C. Manea [15] classification. He used, in cattle, to divide the year in four periods and to count the rate between the least number of calving to the largest of calvings in the established periods. The resulted 5 classes have next rate values: high grouping = 0- 0.01 induced by photoperiodicity or severe management (e. g. AI in New Zealand dairy cattle), strong grouping = 0.02 – 0.10 caused by climate effect on feeding resources, mild dispersion 0.11 – 0.50 resulted from extensive farming, moderate dispersion = 0.51 – 0.70 as in commercial dairy farms and controlled dispersion = 0.71 – 1.00 promoted in intensive dairy farming. In this buffalo herd the period of least number of calvings was December – February and the period of largest number of calvings was June – August. The dispersion rate of calvings was used to distinguish between factors controlling sexual activity in the herd.

In order to help discussing results graphic representations have been used.

### 3. Results and discussion

Table 1 Monthly distribution of calvings

Year	Fed cows		Month (number of calvings / % from the year's total)												Total	
	M	U	F%	I	II	III	IV	V	VI	VII	VIII	IX	X	XI		XII
1998	No.	146			1	1	9	9	32	9	19	15	4			99
	%	0.68			1.01	1.01	9.09	9.09	32.32	9.09	19.19	15.15	4.04			100
1999	No.	146	1	1				8	21	32	24	13	2		1	103
	%	0.71	0.97	0.97				7.76	20.38	31.06	23.3	12.62	1.94		0.97	100
2000	No.	153	1			2	1	4	7	4	9	1	12	7	3	51
	%	0.33	1.96			3.92	1.96	7.84	13.72	7.84	17.64	1.96	23.52	13.72	1.96	100
2001	No.	153		5	14	9	9	8	10	12	5	2	3	1		78
	%	0.51		6.41	17.95	11.54	11.54	10.26	12.82	15.38	6.41	2.56	3.85	1.28		100
2002	No.	138	2			1	4	11	27	17	13	5			1	81
	%	0.59	2.47			1.23	4.94	13.58	33.33	20.99	16.05	6.18			1.23	100
2003	No.	141	1				9	16	22	17	12	7	2		1	87
	%	0.62	1.15				10.35	18.39	25.28	19.54	13.79	8.05	2.3		1.15	100
2004	No.	126	2			1	5	17	15	19	23	7	2		1	92
	%	0.73	2.17			1.09	5.44	18.48	16.3	20.65	25.00	7.61	2.17		1.09	100
2005	No.	120	2	1		4	5	14	21	15	25	14				101
	%	0.84	1.98	0.99		3.97	4.95	13.86	20.79	14.85	24.75	13.86				100
2006	No.	136				1	12	13	13	18	17	14				88
	%	0.65				1.13	13.63	14.78	14.78	20.45	19.32	15.91				100
All over	No.	140	1,00	0.89		2.67	6.00	11.22	18.44	15.67	17.11	9.00	2.67	1.11	0.89	86.67
	%	0.62	1.15	1.03		3.08	6.92	12.95	21.28	18.08	19.74	10.38	3.08	1.28	1.03	100

In the table above (last row of the third column) the overall fertility of the period is shown to be 62%. Accepting that the ideal fertility in buffalo is to have 1 calf per year (365 days) and the pregnancy length is 315 days the medium calving interval of the herd may be estimated as:

$$1 - 0,62 = \frac{CI - 365}{315} \text{ where}$$

CI= 0.38x315+365= 485 days.

Both indices the 62% of fertility and the 485 days calving interval are usual for buffalo herds but have to be improved.

In fig.1 the monthly percentage of calving distribution is presented.

The resulted curve has 2 peaks placed in June and August. The total percentage of calvings taking place in this 3 months interval has got to 59.10%. Few calvings have taken place between December and February. The total percentage of calvings used to be 3.21%. The R. Manea index of calving distribution is 0.05. This indicates a strong grouping of calvings determined, perhaps, by the climate effect on the feed production.

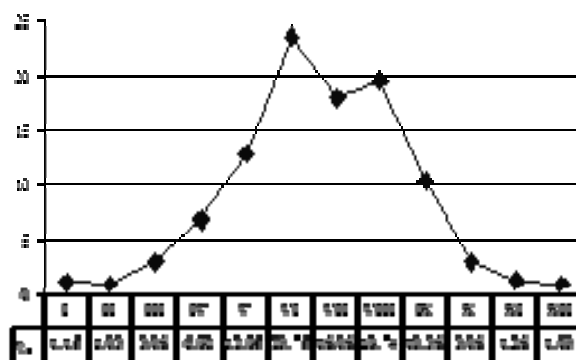


Figure 1 Global calving distribution in Carpathian buffalo

In order to judge about photoperiodicity implication let's compare this calving distribution curve with the curves registered in 2 buffalo farms from Venezuela (fig.2.). Both Venezuela farms are located at about 10° latitude North with equatorial climate. One of them is disposing only of natural feed stuff in a floodable area and the other one uses a drained soil and disposes of feed cultivars. In the farm using naturally produced feed the calving distribution curve has a high peak in

September and a low peak in March. In the farm disposing of cultivated too, there is only one peak of the curve placed in September. Since all three farms are placed in the North hemisphere they have to undergo the effect of the same photoperiodicity or there is a 3 month difference in the placement of curve peaks in Carpathian buffaloes and in the buffaloes of Venezuela.

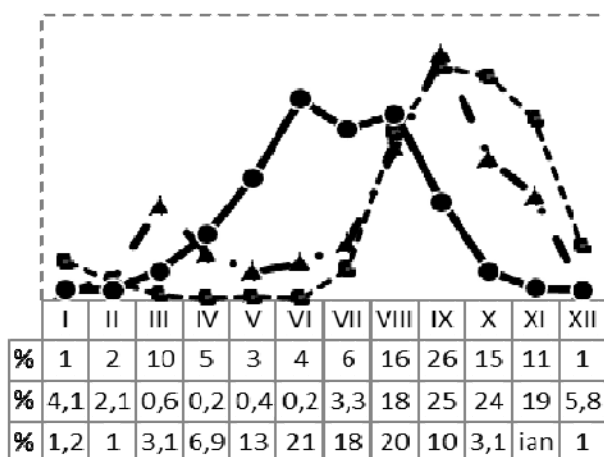


Figure 2. Comparing calving dispersion in two Venezuela farms and in Romania

At the same time in Venezuela farm disposing of cultivated feed stuff the calving dispersion index is 0.01 responding to the high grouping class, while in the Romanian farm is 0.05, responding to the strong grouping, although this last farm is located on a much northern latitude. These facts allow arguing that photoperiodicity does not control the sexual activity in the buffalo genetic species.

Comparing calving distribution in a buffalo farm from Brazil with our data we found out similar aspects. The peak of calving frequencies in Brazil is placed in March. That means 3 or 4 months before the peak of calving frequency in Romania. Brazil is located in the South hemisphere of the Earth and from astrological point of view the photoperiodicity distance in time between South and North has to be of 6 months. Again it seems that grouping of calving isn't caused by photoperiodicity. It is true that the distance in time between calving peaks between Venezuela and Brazil is of 6 months but this fact can be explained but similitude of the equatorial climate induced by

photo periodicity at the north and south of Equator.

The index of calving grouping in buffaloes of Brazil is 0,06 indicating a strong grouping but its value a little bit higher than in Romania could be caused by a reaches vegetation at the Equator.

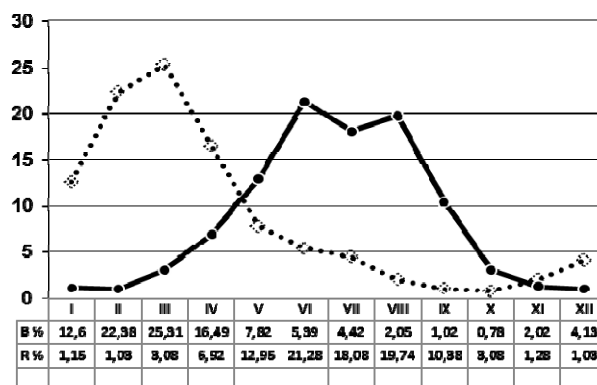


Figure 3 Calving distribution in a buffalo farm in Brazil

Annual differences concerning calving distribution are presented in fig. 4. These are impressive.

Absence of calving is registered in many months of the year. There were lacks of calvings 3 times in December, 3 times in January 4 times in February, 2 times in March, 1 time in April, 3 times in October and 7 times in November, out a total of 9 years. Lack of calvings in October means lack of mating in January, the month when animals' underfeeding starts. Lack of mating could occur up to May, differing with the year. The longest period without calving was registered from October 2005 up to February 2006 when no parturition was registered. This period was preceded by the high fertility of 84% in the 2005 year. Nevertheless this is not a rule. Under average fertility has been repeated from 2000 year up to 2003 year when medium fertility was attained and over average fertility followed in 2004 and 2005 years. Fertility increasing of fertility year by year, from 33% to 84% during this time should not be due to photoperiodicity but for sure is due to a better management.

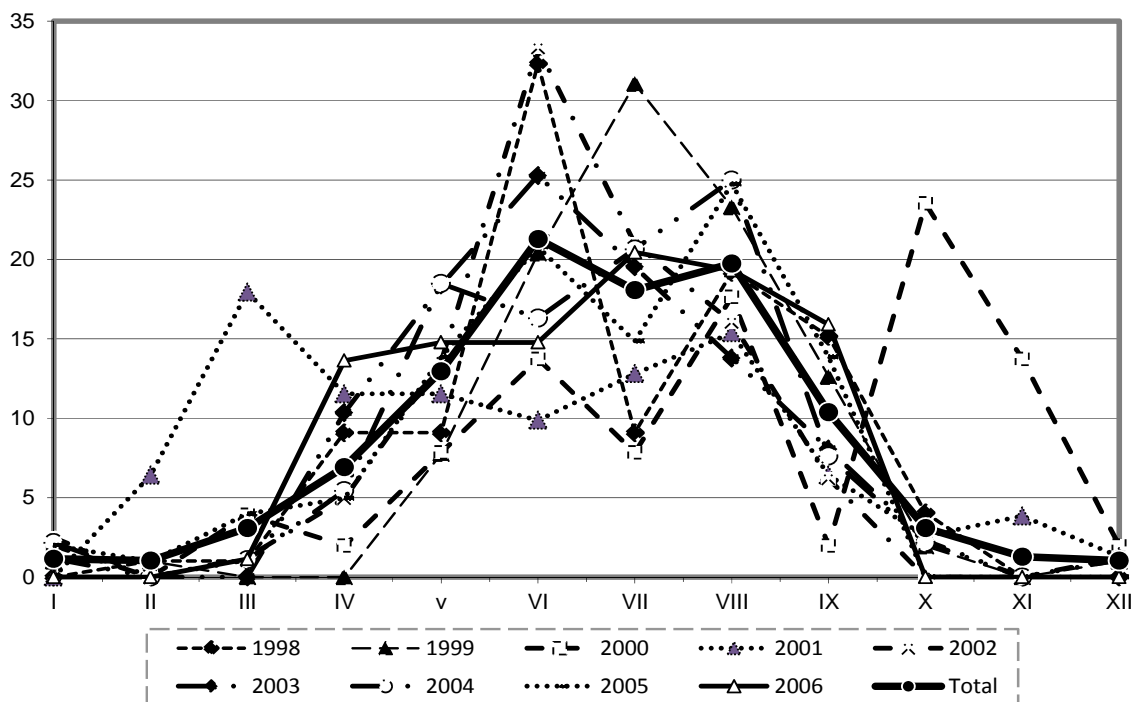


Figure. 4. Global monthly calving distribution and per years

Curve aspects are very different as well. The shortest curve was registered in 2006 year and covers 7 months. It is continuous and has the peak in July. There are other three continuous curves. They had a length of 9 months in 1998 and in 2005 and a length of 11 months in the 2001 year. In the 2000 year the curve was interrupted once and in the rest of years the curves were interrupted twice. In 5 years curves had 1 peak of calving frequency, with the highest value 33.33% in 2002 and the lowest value 20.45 % in 2006. The other curve of calving frequencies had 2 peaks in 3 years and three peaks in 1 year. Such diversity shouldn't be induced by photoperiodicity which is the most precise and invariable phenomenon by sciences.

There is no doubt that the frequency calving variance is due to the weather of each year and its effect on natural and cultural feed resources for buffaloes. In addition managerial factors of stress for buffalo cows' welfare are acting too. More attention has to be paid to the housing buffaloes in the cold period of the year.

### Conclusions

The present research argue that grouped calving, very spread in buffalo breeding, isn't caused by photoperiodicity but is the effect of the climate in aria of existence of wild buffalo ancestors. Firstly the difference between the length of dark and of light nearby Equator is a small one while climate comports two seasons, the winter when it rains and green plants are growing fast and the summer when it is dray and feeding resources for herbivorous animals are decreasing drastically.

Carpathian Buffalo, living in a more north latitude aria with a more expressed photoperiodicity, than in life's aria of its ancestors doesn't show a higher concentration of calving period.

Most variance in calving dispersion in this breed is due to annual variations concerning the level of feeding and of the organisms' welfare.

The above findings are strong arguments to consider the Italian program for intensive farming

with buffaloes as the best and the fastest way to get rent ability in buffalo breeding.

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