Bulgarian Journal of Agricultural Science, 24 (Suppl. 2) 2018,
Agricultural Academy

COMPARATIVE STUDY ON AGE OF CONCEPTION OF BUFFALO HEIFERS IN DIFFERENT FARMING SYSTEMS

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Abstract

Ilieva Y., V. Planski, K. Hristov and P. Penchev, 2018. Comparative study on age of conception of buffalo heifers in different farming systems, Bulg. J. Agric. Sci., 24 (Suppl. 2): 52-56

With the aim to assess the effect of different farming systems on age of first conception, a comparative study was initiated on buffalo heifers from three farms for the period 2010-2015. All three farms (SIC, SIB and IMR) practice immediate separation of newborn from dam, 7-day colostrum and 3-month weaning period, live weight (LW) being monitored on Fm-3 only. Number of heifers assigned (n), farming system (FS), feeding in suckling period (SP) and use of natural-service bull (NS) were as follows: SIC – [n = 38, FS – free-stall plus pasture, SP – cow milk, NS – full time]; SIB – [n = 42, FS – tie-stall plus pasture, SP – buffalo milk, NS – by day]; IMR – [n = 69, FS – tie-stall plus yard, SP – milk replacer after first month, NS – by day, after heifers attain 380 kg LW]. The data were processed using the conventional statistical procedure. The results demonstrate the favourable effect of buffalo milk used in pre-weaning period, expressed in earlier age of conception in the heifers from SIB (729 days), as opposed to suckling cow milk on SIC – by 86 days ($P < 0.05$). Differences in farming system are implied by the considerably lower age of first conception established on SIB, in comparison to IMR (by 147 days, $P < 0.001$) where no pasture is used and breeding to bull is afforded after reaching a threshold live weight. The study found pronounced seasonality of reproduction, expressed in large percentage of heifers (75%) breeding in the period August-December. A tendency was also observed the heifers born in spring to conceive youngest.

Key words: buffalo heifers, age of first conception, breeding season

Introduction

Age of first conception has considerable impact on the economic and genetic efficiency of buffalo farming. The low reproductive capacity of the Bubalus bubalis species, expressed in delayed first pregnancy, the low conception rates and the low growth rates account for the relatively large portion of young (non-lactating) animals in the herds. Young buffaloes require greater resources for longer period of time with no apparent financial returns which affects end profitability (Peeva, 2000; Khan et al., 2008).

Due to hampered ovulation detection in buffaloes, age of puberty is difficult to establish (Barile, 2005b). According to Kanchev (1988) and Terzano (2010), puberty – with the relevant specific endocrine changes in the organism leading to estrus, first ovulation and hence to conception – is genetically predetermined (species specific). Despites, age of first conception has wide ranges of variation (El'Ashry 1992; Пеева 2000; Sule et al., 2001) and, in the same time, relatively low additive genetic variance (Penchev, 1999; Bashir, 2006; Naz and Ahmad, 2006). Namely the low heritability, besides rendering selection a hard and slow process, indicates that the phenotypic variability is explained mainly by non-genetic factors. Such factors, except the climatic conditions and forage resources, include components of farming technology and management (Hafez, 1955; Zicarelli, 2007).

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The objective of the present study was to comparatively evaluate age of first conception in buffalo heifers from different farming systems.

Material and methods

The study assigned 149 buffalo heifers from three farms with different systems of farming. As they are situated in close vicinity in the North-East of Bulgaria, they are considered under one and the same climatic conditions.

All three farms practice immediate separation of newborn from dam, 7-day colostrum and 3-month weaning period. After day 20 the calves are fed alfalfa hay ad libitum and concentrate feed prepared according to the standard norms for this category.

On the farms with semi-intensive system (pasture farming) the animals are supplemented concentrate feed, roughage and fodder, according to the norms for this category.

Each farm uses a natural-service bull.

The number of animals assigned and the management conditions on each farm are as follows:

Farm SIC. The observation is on 38 heifers for the period 2010-2014 bred in semi-intensive (SI) system – free-stall and pasture farming. The growing heifers are admitted to pasture from 8 months of age, for 8 hours a day in summer and for 7 hours in winter. After the colostrum period, the calves are fed cow (C) milk twice daily, 6 L per head per day. The presence of the bull in the herd is full time (day and night).

Farm SIB. The observation is on 42 heifers for the period 2010-2015 bred in semi-intensive (SI) system – tie-stall and pasture farming. The heifers are admitted to pasture from 12 months of age, for 8 hours in summer and for 7 hours in winter. In the pre-weaning period, the calves are fed buffalo (B) milk twice daily, 4 L/d. The presence of the bull in the herd is during the day.

Farm IMR. The observation is on 69 heifers for the period 2010-2015 bred in intensive (I) system – tie-stall and exercise yard. The calves are fed 4 L/d buffalo milk until one month of age and the same quantity of milk replacer after that. The heifers are exposed to the bull after reaching live weight of 380 kg, and the bull is present in the herd during the day.

Live weight is monitored on IMR only.

The information about the matings for SIC and SIB was taken from the breeding record books, and for IMR – derived mathematically from the data about age at first calving.

The data were processed using the Conventional Statistical Procedure.

Results and Discussion

The results, presented in Table 1, show significant differences in age of first conception among the studied farms. As a result of feeding cow milk to the heifer calves during their suckling period on farm SIC, the age of their conception is by 86 days, or nearly by 3 months ($P< 0.05$), higher in comparison to the other farm with pasture system (SIB). Using the natural buffalo milk during the complete pre-weaning period on SIB had favourable effect on heifers' conditional development and hence on their puberty and age of first breeding (729 days). In our opinion, the late age of conception on IMR (by 147 days compared to SIB, $P< 0.001$) is due to the shift to milk replacer after one month of age. Our results are in agreement with those of El'Ashry (1992) showing lowering the age of conception to 27 months in heifers fed buffalo milk in the suckling period and confirm the close association between level of feeding and reproductive development (Terzano et al., 1996, 1997; Borghese et al., 1997; Nanda et al., 2003).

Determinative condition for the later breeding of the heifers on farms SIC and IMR is the alteration of their diet from buffalo milk to cow milk or to milk replacer that had taken place in the suckling period. The numerous trials searching for an alternative of the buffalo milk for suckling buffalo calves in the past have resulted in considerable decrease in growth rate (Abou-Hussein and Raafat, 1962; Arora et al., 1974). It should be born in mind that cow milk (also milk replacers for bovine calves) has different composition from buffalo milk – chiefly concerning the Ca/P ratio, but also Ca/protein and content of colloidal Ca (Ferrara and Itrieri, 1974; Kapadiya et al., 2016) – which renders it inappropriate for suckling buffalo calves and their further body development, skeletal system in particular (Zicarelli, 2000; Gonzalez, 2011).

Except by the intensive technology providing unnatural suckling in younger age of the female calves and no natural grazing in their further development, the late age of first conception on IMR is predetermined by the target live weight (380 kg) that is set for the heifers to be exposed to the bull. The monthly weight measurement of the grower heifers resulted in average daily gain of 600 g from birth to 18 months, which is close to the previously observed development in the Bulgarian Murrah (Peeva, 2000), Italian Mediterranean (Terzano et al., 1996) and Nili-Ravi (Bhatti et al., 2007) breeds.

Body weight is definitely strongly linked to age of conception, according to El'Ashry (1992) and Gupta (2016) being even more important than age. That is why, through live weight or body condition score, control on growth and level of feeding is prerequisite since the consequences of malnutri

tion of grower animals are hardly compensated by a following abundant feeding (Campanile, G. et al., 2001; Barile, 2005a), and that is highly dependent on system of farming.

In accordance, farming experience in Italy has shown the favour of semi-intensive systems, as heifers raised on mixed diet have earlier onset of puberty than those exclusively on pasture (Borghese et al., 1997); on the other hand, too fast growth (intensive system) results in obesity and hence in hampered conception (Terzano et al., 1996; Borghese et al., 1996), and in addition to disproportional skeletal development (pelvis in particular) associated with reproductive disorders in breeding age (Zicarelli, 2000).

In addition, practice teaches that excessively early conception (at insufficiently high body weight) of buffalo heifers can affect their further productive and reproductive (calving interval) performance and longevity. Hence, age of first conception is not to be considered alone but in combination with the other reproductive and economic traits.

The data about season of birth (Table 1, differences non-significant) indicate that greatest is the portion of heifers born in summer – 47%. These animals have comparatively late age of conception (836 days), while latest breeders are those born in winter (851 days). The earliest age of first conception belongs to the heifers born in spring (787 days) – the results commensurate with our previous study (Penchev et al., 2014). Bearing in mind that selection of heifers based on season of birth can afford most favourable season of reproduction, accompanied with control over growth and live weight to attain breeding age (Bhatti et al., 2007), it can be recommend replacement selection to be focused on animals born in spring.

The seasonal incidence of conceptions is presented with Figure 1. There is a pronounced seasonality of breeding, starting from August and continuing to December – a period in which three thirds of the heifers have become pregnant. Our study is in compliance with those of Parmeggiani et al. (1993, 1994) and Barile (2005a) that the percentage of heifers coming in heat in the period of short day length is considerably higher. According to Kanchev et al. (1993) and Perera (2011) this is due to seasonal ovarian activity which in the temperate zones is associated with photo period and melatonin secretion.

The results regarding season of birth and season of conception herein confirm the observed seasonality of calving of the buffaloes in Bulgaria (Penchev, 1999; Peeva, 2000; Penchev et al., 2014). Accordingly, advanced preparatory measures for adequate level of nutrition of the heifers during the breeding season can contribute for increasing the conception rates. This is essential for the economy of the farm because of the imminent risk an animal with missed estrus in the main breeding season to enter a prolonged anestrus.

To summarize, management of reproduction in a buffalo herd is to be focused on maintaining optimal age of first conception based on harmonic system of farming, with special attention on feeding of all the categories from suckling heifer calves to breeding heifers, and in balance with the other reproductive and economic traits. The results herein and elsewhere imply recommendable semi-intensive pasture technology for grower and reproductively advanced heifers. This, in combination with adequate control of the breeding process in respect to seasonality and other peculiarities of reproduction of the water buffalo species, is investment in the future for the farmer.

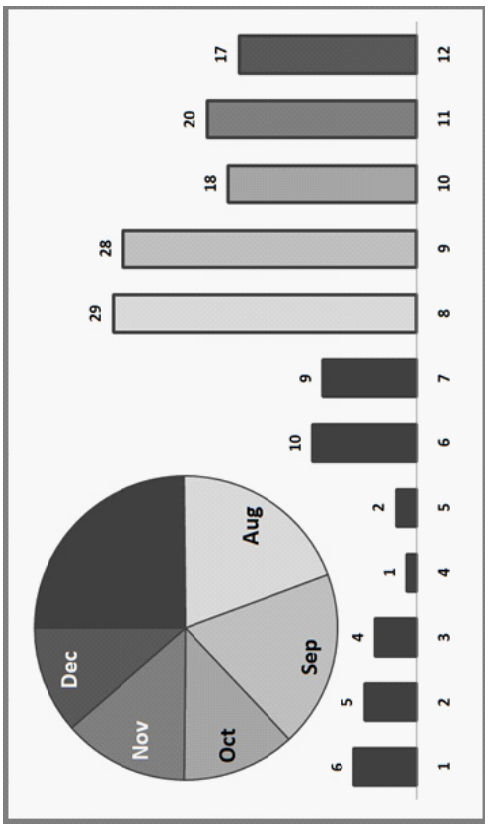

Fig. 1. Seasonality of first conception – numbers (bars chart) and percentage (pie chart)

Table 1. Age of first conception by farm, season of birth, and season of calving

Variables	n	$(\bar{x}) \pm Sx^{-}$	CV	t-test
Farm				
SIC	38	815±24,1	18,2	2-1*
SIB	42	729±24,3	21,6	
IMR	69	876±19,3	18,3	
Season of birth				
Winter	12	851±39.7	16,2	
Spring	30	787±30.5	21,2	n.s.
Summer	70	836±19.9	19,9	
Autumn	37	803±29.4	22,3	
Season of calving				
Winter	28	792±30.1	20,1	
Spring	7	812±81.7	26,6	
Summer	48	800±22.7	19,6	n.s.
Autumn	66	846±21.3	20,4	
Mean	149	819±13.7	20,3	

Significance by t-test: ** – P≤ 0.001; * – P≤ 0.05; n.s. – P> 0.05

Conclusions

The study established significantly lower age of first conception on the buffalo farm with technology practicing feeding buffalo milk to suckling calves and pasture for grower heifers (729 days) – by 86 days lower than the farm with cow milk and pasture (P< 0.05) and by 147 days than that with milk replacer and no pasture available (P< 0.001).

Management of reproduction is to be in accordance also with the specificity of breeding seasonality, expressed in large portion of buffalo heifers conceiving in the period August to September.

Aknowledgements

The publishing of the present scientific paper is co-financed by "Scientific Researches" Fund Contract №01/31 from 17.08.2017.

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