Pakistan Veterinary Journal

ISSN: 0253-8318 (PRINT), 2074-7764 (ONLINE)
Accessible at: www.pvj.com.pk

RESEARCH ARTICLE

Reproductive and Productive Performance of Iraqi Buffaloes as Influenced by Pre-Mating and Pre-Calving Concentrate Supplementation

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ARTICLE HISTORY

Received: November 29, 2011
Revised: December 02, 2011
Accepted: December 11, 2011

Key words:
Buffaloes
Concentrate
Milk yield
Pre-mating
Pre-calving
Reproduction

ABSTRACT

The objective of the present study was to investigate the influence of pre-mating and pre-calving concentrate supplementation of Iraqi buffaloes on some of the reproductive (estrus, mating, pregnancy and calving rates) and productive (daily milk yield and calves birth weight) traits. This study was carried out in 4 Iraqi South-central governorates using 596 pre-mating and 628 pregnant buffaloes (during the last two months of gestation). Pre-mating buffaloes were divided randomly into 496 concentrate-supplemented buffaloes (Flushing) and 100 control ones. Additionally, pregnant buffaloes were also divided into 528 concentrate-supplemented buffaloes (Steaming up) and 100 controls. Each buffalo within the flushing and steaming up groups were fed daily on 7 Kg of concentrate diet (13% crude protein and 1.70 Mcal of net energy) for 60 days. The control buffaloes were nourished only on low-quality roughages of the area and wheat bran. Higher estrus (+15%, P<0.01), pregnancy (+23.8%, P<0.05) and calving rates (+30.8%, P<0.01) were observed in concentrate-supplemented buffaloes as compared with controls. An obvious increase in (P<0.05) calving rate (+14.7%), daily milk yield (+44.8%) and calf birth weight (+25.6%) were noted in steaming up buffaloes in comparison with control buffaloes. Results indicated that improvement in feeding schedule of Iraqi buffaloes during pre-mating and late gestation periods enhanced the reproductive performance and increased milk production of subsequent lactation and calf birth weight. These improvements increased owner income ($174=209,000 Iraqi dinar /buffalo) from the sale of meat and milk.

To Cite This Article: Abdulkareem TA, SA Al-Sharifi, SM Eidan and RG Sasser, 2012. Reproductive and productive performance of Iraqi buffaloes as influenced of pre-mating and pre-calving concentrate supplementation. Pak Vet J, 32(3): 345-348.

INTRODUCTION

Buffalo (*Bubalus bubalis*) is an important source of animal protein in many countries of the world including Iraq. In Iraq, it contributes significantly to the food supply in the form of milk (5-8%), meat (1.3%) (FAO, 2009) and leather (Sarwar *et al*., 2009). During the last five years, there has been a pronounced decline in the population of Iraqi buffaloes to a mere 98 thousand (Cruz, 2010). Feed shortage and reduced fertility are the main reasons of this decline (Abdulkareem, 2008). Inadequate nutrition has a negative effect on the buffalo productive and reproductive efficiency as well as the overall health of buffaloes herd in Iraq.

Most buffalo owners nourish their animals on wheat bran and cotton seeds, and in most cases on only small amounts of green roughages (Juma, 1997; Baghdasar *et al.*, 2010). Poor nutrition is one of the main factors for low milk production, long calving intervals and delay in the onset of puberty, all of which contribute to low reproductive performance and productive losses leading to reduced income (Abdulkareem, 2008).

Improved nutrition during pre-mating period stimulates ovulation and conception rates (Robinson *et al.,* 2006). Folliculogenesis is a nutritionally responsive process that adapts to direct and indirect nutritional signals. Increased nutrition stimulates folliculogenesis, and there is now strong evidence to show that follicles respond to direct action of nutrition. There is little evidence to show that nutrition stimulates folliculogenesis indirectly by increasing the secretion of gonadotrophins (Scaramuzzi *et al*., 2010a). On the other hand, enhancing nutrition by supplementary

concentrate diet during the late gestation period increases birth weights of calves and milk production from the dam (Sanh, 2009). Reproductive and productive traits of pre-mated and pregnant Iraqi buffaloes were examined in this study as affected by nutrition.

MATERIALS AND METHODS

Animals and treatments: This study was carried out in four Iraqi South-central governorates (Baghdad, Muthanna, Thi-Qar and Basra) from August 2005 to November 2007. The study involved 596 pre-mated and 628 pregnant buffaloes (during the last two months of gestation). Pre-mated buffaloes were divided randomly into 496 flushed and 100 controls. Pregnant buffaloes were also divided into 528 nutrient enhanced (Steaming up) and 100 controls. The control buffaloes were nourished on traditional low-quality roughages and wheat bran. Each buffalo within the flushing and steaming up groups were fed the control diet plus 7 Kg (1.5% of live body weight, NRC, 2001) of concentrate daily (13% crude protein, 6.52% ether extract, 10.24% crude fiber, 7.11% ash and 1.70 Mcal of net energy) for 60 days. The concentrate consisted of barley grains, wheat bran, maize, cottonseed, soybean meal and mixture of salts, vitamins and minerals at percent levels of 35, 30, 17, 10, 5 and 3, respectively. All animals were vaccinated against brucellosis, foot and mouth disease, hemorrhagic septicemia and rinderpest. Pre-mated buffaloes were naturally mated following estrus detection. Pregnancy was detected by rectal palpation between 45 and 60 days post-mating. Pregnancy rate was defined as the proportion of all buffaloes that were pregnant at days 60 post-mating. Calving rate was determined as the buffaloes that calved successfully. Milk yield of buffaloes was obtained by hand milking at 0600 and 1800 h and using the amount produced between these times. Milk yield was recorded beginning from post–calving period until one month later. Calf birth weights were obtained directly after calving.

Statistical analysis: Statistical computations were performed using one-way classification of SAS program (SAS, 2001) to examine the effect of treatment on milk yield and body weight of newborn calves. The statistical model for analysis of variance was:

$Y_{ij} = \mu + T_i + e_{ij}$

Where:

Y_{ij} = dependent variable (Milk yield and birth weight of calves).

μ = overall mean.

T_i = effect of period (T=Feeding group; Control group).

e_{ij} = error term.

Differences among means of milk yield and birth weight of calves were computed using the Duncan multiple range test. The Chi-square test was employed to compare the differences among percentages of estrus, pregnancy and calving rates of pre-mating buffaloes as well as calving rate of pregnant buffaloes (Steel and Torrie, 1990).

RESUTLS

Reproductive performance: The concentrate supplementation positively affected the overall reproductive performance of Iraqi buffaloes (Table 1). There was a difference in rate of estrus ($P<0.01$) percentage, pregnancy rate ($P<0.05$) and calving rate ($P<0.01$), with concentrate - supplemented buffaloes performing better than the control group. The increased differences of the respective reproductive traits for the enhanced fed group were 15, 23.8 and 30.8% compared with control group. On the other hand, greater ($P<0.05$) calving rate was observed in supplemented pregnant buffaloes with increased rate of 14.7% compared with traditionally fed buffaloes (Table 2).

Productive performance: The concentrate supplementation program during the last stage of pregnancy (steaming up) had obviously increased calving rates from 65.25% in control buffaloes to 76.50% in concentrate–supplemented buffaloes (Table 2). Abortion related to physiological and management reasons remained the same in both the groups. The concentrate supplementation improved (+44.8%, $P<0.05$) daily milk yield of calved buffaloes (8.93±3.88 Kg) compared to controls (4.93±2.71 Kg; Table 2). In the same manner, treated buffaloes exhibited higher (+25.6%, $P<0.05$) calves birth weight in comparison with controls (43.00±2.82 vs. 32.00±2.82 kg; Table 2).

DISCUSSION

The effects of nutritional supplementation on folliculogenesis and ovulation rate have been widely investigated in farm animals where there is a strong evidence for the use of target nutritional supplementation as a non-hormonal means of increasing prolificacy and fertility of farm animals (Scaramuzzi and Martin, 2008). Higher estrus, pregnancy and calving rates of concentrate-supplemented group (85, 76.65 and 75%, respectively)

Table 1: The effects of pre-mating concentrate supplementation on reproductive performance of Iraqi buffaloes

Trait	Concentrate–supplemented group	Control group	Increasing percentage [(1)]	$\chi 2$ and level of significance
Estrus rate (%)	85.00	72.25	15	3.41**
Pregnancy rate (%)	76.65	58.37	23.8	4.62*
Calving rate (%)	70.50	48.75	30.8	5.66**

*= $P < 0.05$, ** = $P < 0.01$; [(1)] Calculated as higher value – lower value / higher value × 100.

Table 2: The effects of pre-calving concentrate supplementation on calving rate (%), milk yield (Kg) and calf birth weight (Kg) of pregnant Iraqi buffaloes

Trait	Concentrate– supplemented group	Control group	Increasing percentage [(1)]	$\chi 2$ and level of significance
Calving rate (%)	76.50	65.25	14.7	3.14*
Milk yield (kg)	8.93 ± 3.88[a]	4.93 ± 2.71[b]	44.8	*
Calves birth weight[1](kg)	43.00 ± 2.82[a]	32.00 ± 2.82[b]	25.6	*

Means with different superscripts for each trait differ significantly; [1]Mean ± SEM; * = $P < 0.05$; [(1)]Calculated as higher value – lower value / higher value × 100.

may explain the role of pre-calving nutritional supplementation (13% CP and 1.70 Mcal of net energy in this study) to assure good body condition at calving and suggested that it is effective at increasing cholesterol availability to maintain ovarian follicle function and favor earlier resumption of ovarian activity (Oliveira Filho *et al*., 2010) and consequently enhance pregnancy and calving rates. Nutrition enhances ovulation rates, fetal gonads and calf post-natal development (Robinson *et al*., 2006). Higher calves body weight of concentrate–treated group (43±2.82kg) as compared with control group (32±2.82kg) may confirm this hypothesis. In contrast, feeding of control buffaloes pre-mating on low quality roughages and small amounts of wheat bran resulted in a shortage in protein and energy during these critical physiological stages (Al-Haboby *et al*., 1999) and led to deterioration in estrus, pregnancy and calving rates of these buffaloes. Protein is required for adequate conception rate, establishment of pregnancy and fewer abortions in animals (Armstrong *et al*., 1990). Furthermore, the physiological link between energy intake and fulliculogenesis most probably involves several metabolic hormones and growth factors including insulin, insulin-like growth factor–I (IGF-I), leptin and growth hormone. Insulin-glucose system may also have effects specific to granulose and theca cells (Scaramuzzi *et al*., 2010a). The concentrations of glucose in ovarian venous blood are lower than in carotid arterial blood (Scaramuzzi *et al*., 2010b), indicating that the ovary actively takes up the glucose from circulation. On the other hand, the addition of 10% cottonseed as a rumen undegradable protein (RUP) to concentrate diet may play a role in improving the reproductive performance of treated buffaloes. The RUP was reported to increase ovulation rate in sheep (Hamra *et al.,* 1992) and goats (Hamra and Hassan, unpublished data) and consequently improved pregnancy and calving rates.

It was clear that increase in milk yield in concentrate–treated buffaloes as compared with control group (8.93±3.88 vs. 4.93±2.71 kg) was related to increased crude protein and/or net energy used in the current study (Wright *et al.,* 1998; Wang *et al*., 2007). The nutrient supplementa- tion may lower stress during early lactation, and this may be the reason for significant increase in milk yield of the present study. Moreover, the RUP may also have a crucial supporting role in high milk production in lactating buffaloes (Taquire *et al*., 2010). Milk yield was obviously increased (+44%) in concentrate-treated buffaloes as a result of RUP supplementation in the current study. Increased milk yield of Surti buffaloes (Patel *et al.,* 2006) and increased milk yield and calf birth weight in Nili-Ravi buffaloes (Usmani and Inskeep, 1989) in response to concentrate diet supplementation during pre-partum period has been documented. Increased crude protein supplementation would increase the amount of nitrogen available to rumen microbes for microbial protein synthesis and increase the efficiency of utilization of absorbed amino acids for milk protein synthesis (Anonymous, 1993; Wang *et al*., 2007). Calves birth weight was improved in treated group (+25.6%). These results are in agreement with those reported by Usmani *et al*. (1987) in Nili Ravi buffaloes. Higher body weight of buffaloes at calving resulted in heavier birth weights and possibly higher growth rates of new born calves. Improved nutrition during late gestation related to the changes in the development of neonatal adipose tissue (Underwood *et al*., 2010) might have resulted in increased body weight at calving.

Based on the data obtained in these experiments, it may be concluded that feeding pre-mating (flushing) and late pregnant buffaloes (steaming up) with concentrate supplementation of 7.0kg daily was appropriate for improving reproductive and productive efficiency of Iraqi buffaloes.

REFERENCES

Abdulkareem TA, 2008. Early pregnancy diagnosis of Iraqi riverine buffaloes using pregnancy-specific protein B (PSPB) and progesterone. PhD Dissertation, College of Agriculture, University of Baghdad, Iraq.

Anonymous, 1993. Energy and Protein Requirements of Ruminants: An Advisory Manual Proposed by the AFRC Technical Committee on Responses to Nutrients. CAB International, Wallingford, UK.

Al-Haboby AH, AD Salman and TA Abdulkareem, 1999. Influence of protein supplementation on reproductive traits of Awassi sheep grazing cereal stubble. Small Rumin Res, 34: 33-40.

Armstrong JD, EA Goodall, FJ Gordon, DA Rice and WJ McCaughey, 1990. The effect of level of concentrate offered and inclusion of maize gluten of fish meal in the concentrate on reproductive performance and blood parameters of dairy cows. Anim Prod, 50: 1-10.

Baghdasar GA, SF Abbass, JK Al-Saedy, AD Salman and AS Sadiq, 2010. A study of body dimensions of Iraqi buffalo of different stages and ages in Al-Fudhailyia region. 1st Iraqi Confer Buffalo Dev, December 22nd, 2010, Iraq.

Cruz LC, 2010. Recent developments in the buffalo industry of Asia. Proc 9th World Buffalo Cong, April 25-28, Buenos Aires, Argentina.

FAO, 2009. Food Outlook, Global Market Analysis, pp: 42-51.

Hamra AH, SA Hassan and RAM Al-Jassim, 1992. Effect of undegradable protein on ovulation rate of Awassi sheep.12th Int Cong Anim Reprod Artif Insem 23-27 August, Hague, Netherlands.

Juma KH, 1997. Present status in buffalo production in Iraq. Buffalo J, 2: 103-113.

NRC, 2001. National Research Council, Nutrient Requirement of Dairy Cattle, 7th Rev-Ed, National Academy Press, Washington, DC, USA.

Oliveira Filho BD, GH Toniollo, AF Oliveira, MA Viu, HT Ferraz, DT Lopes and ML Gambarini, 2010. The effect of offering an energy and protein supplement to grazing Canchim beef cows either postpartum or both pre- and postpartum on lipid blood metabolites and folliculogenesis. Anim Reprod Sci, 121: 39-45.

Patel MJ, GK Patel, RM Patel, KC Patel and RD Patel, 2006. Effect of dietary condition on milk production and composition of cows and buffaloes during one lactation. Eur J Lipid Sci Tech, 85: 201-204.

Robinson JJ, CJ Ashworth, JA Rooke, LM Mitchell and TG McEvoy, 2006. Nutrition and fertility in ruminant livestock. Anim Feed Sci Tech, 126: 259-276.

Sanh MV, 2009. Effect of supplementation with cassava leaf meal before and after calving on birth weight, growth rate of calves and body weight change of buffalo cows in smallholder farms. Livest Res Rural Dev, 21: 98.

Sarwar M, MA Khan, M Nisa, SA Bhatti and MA Shahazd, 2009. Nutritional management for buffalo production. Asian-Aust J Anim Sci, 22: 1060-1068.

Scaramuzzi RJ, H Brown and J Dupont, 2010a. Nutritional and metabolic mechanisms in the ovary and their role in mediating the effect of diet on folliculogenesis: A perspective. Reprod Dom Anim, 45 (Suppl. 3): 32- 41.

Scaramuzzi RJ, BK Campbell, CJH Souza and DT Bird, 2010b. Glucose uptake and lactate production by the autotransplanted ovary of the ewe during the luteal and follicular phases of the estrus cycle. Theriogenology, 73: 1061-1067.

Scaramuzzi RJ and GB Martin, 2008. The importance of interaction among nutrition, seasonality and socio–sexual factors in the

development of hormone free methods for controlling fertility. Reprod Dom Anim, 43 (Suppl 2): 129-136.

SAS, 2001. Guide for personal computer. Version 9th. SAS Inst. Inc. Cary North Carolina, USA.

Steel RGD and JH Torrie, 1990. Principles and Procedures of Statistics. A biometrical approach. McGraw-Hill, Kogakusha Ltd., Tokyo, Japan.

Taquire NA, MA Shahzad, M Nisa, M Sarwar and M Fayyaz, 2010. Influence of bypass protein on buffalo productivity. Proc 9th World Buffalo Congress, April, 25-28, Buenos Aires, Argentina.

Underwood KR, JF Tong, PL Price, AJ Roberts, EE Grings, BW Hess, WJ Means and M Du, 2010. Nutrition during mid and late gestation affects growth, adipose tissue deposition, and tenderness in cross-bred beef steers. Meat Sci, 86: 588-593.

Usmani RH and EK Inskeep, 1989. Effect of pre-partum feeding on milk yield and calf growth rate in limited-suckled and non-suckled buffalo. J Dairy Sci, 72: 2087-2094.

Usmani RH, GS Lewis and NA Naz, 1987. Factors affecting length of gestation and birth weight of Nili-Ravi buffalo. Anim Reprod Sci, 14: 195.

Wang C, JX Liu, ZP Yuan, YM Wu, SW Zhai and HW Ye, 2007. Effect of level of metabolizable protein on milk production and nitrogen utilization in lactating dairy cows. J Dairy Sci, 90: 2960-2965.

Wright TC, S Moscardini, PH Luimes, P Susmel and BW McBride, 1998. Effects of rumen-undegradable protein and feed intake on nitrogen balance and milk protein production in dairy cows. J Dairy Sci, 81: 784–793.