



E-ISSN: 2320-7078

P-ISSN: 2349-6800

www.entomoljournal.com

JEZS 2021; 9(1): 896-898

© 2021 JEZS

Received: 01-11-2020

Accepted: 03-12-2020

MK Shukla

Department of Veterinary Gynaecology & Obstetrics, College of Veterinary and Animal Sciences, Sardar Vallabhbhai Patel University of Agriculture and Technology, Modipuram, Meerut, Uttar Pradesh, India

OP Shrivastava

Department of Veterinary Gynaecology & Obstetrics, College of Veterinary Science & A.H. Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh, India

Ashitha Suresh

Ph.D. Scholar, Madras Veterinary College, Chennai, Tamil Nadu, India

Neeraj Verma

Department of Veterinary Gynaecology & Obstetrics, College of Veterinary Science & A.H. Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh, India

D Kumar

Animal Biotechnology Centre, Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh, India

Ashutosh Tripathi

Livestock farm Complex, Sardar Vallabhbhai Patel University of Agriculture and Technology, Modipuram, Meerut, Uttar Pradesh, India

Shambhavi

M.V.Sc. Scholar, Department of Veterinary Gynaecology & Obstetrics, College of Veterinary and Animal Sciences, Sardar Vallabhbhai Patel University of Agriculture and Technology, Modipuram, Meerut, Uttar Pradesh, India

Lalit Mohan Jeena

Animal Biotechnology Centre, Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh, India

BC Sarkhel

Animal Biotechnology Centre, Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh, India

Corresponding Author:**MK Shukla**

Department of Veterinary Gynaecology & Obstetrics, College of Veterinary and Animal Sciences, Sardar Vallabhbhai Patel University of Agriculture and Technology, Modipuram, Meerut, Uttar Pradesh, India

Effect of season on oocyte yield and quality in Indian riverine buffaloes

MK Shukla, OP Shrivastava, Ashitha Suresh, Neeraj Verma, D Kumar, Ashutosh Tripathi, Shambhavi, Lalit Mohan Jeena and BC Sarkhel

Abstract

In the present study the effect of season of oocyte yield and quality was studied in buffaloes. To study the effect of season, 2079 follicles from 439 ovaries in rainy, 1469 follicles from 376 ovaries in summer and 1793 follicles from 310 ovaries in winter season were aspirated. The average number of follicles per ovary in the present study were significantly ($p < 0.01$) higher in winter (5.76 ± 0.12) as compared to rainy (4.75 ± 0.05) and summer (3.90 ± 0.08) seasons. The number of COCs retrieved per ovary and oocyte recovery rate were also significantly higher during winter (3.94 ± 0.09) as compared to rainy (3.15 ± 0.05) and summer (2.62 ± 0.06) seasons. The oocyte recovery rate (%) was also significantly ($p < 0.01$) higher in winter (68.35 ± 0.27) as compared to rainy (66.33 ± 0.50) season. The number of grade I COCs retrieved were significantly ($p < 0.01$) higher in winter (36.32 ± 0.64) as compared to rainy (32.55 ± 0.64) and summer (31.07 ± 0.49) seasons. The results indicate significantly higher quality of retrieved COCs during winter followed by rainy and summer seasons.

Keywords: Season, COCs, oocyte recovery rate, buffalo, COCs retrieval

Introduction

In Indian riverine buffaloes, reared under farm and field condition, breeding activity is observed round the year but the sexual rhythm vary with seasons, with a selective preference towards the cooler months of the year for breeding activity [1]. This is mainly because of poor follicular activity and yield of oocytes of compromised quality [2]. Heat stress has been shown to be harmful to bovine oocytes and embryos [3, 4]. Holstein cows have lower reproductive performance in autumn than in winter, which is likely a late effect of high temperatures during the summer [4]. Similarly, oocytes obtained at the beginning of autumn are of low quality, and quality improves gradually as the winter approaches [5]. Moreover, the effect of heat stress may also interfere with follicular development and with the secretion of hormones such as LH and progesterone [6], thus causing alterations in oocyte quality.

Though studies have established the effect of season on oocyte quality in cattle but limited work has been done on riverine buffaloes in India. The present study was therefore, undertaken with the aim of studying the effect of season on oocyte retrieval and quality in Indian riverine buffaloes.

Materials and Methods

The ovaries for the present experiment were collected from the local large animal abattoir in sterile warm normal saline (37°C) supplemented with Penicillin (6.6 mg dl^{-1}) and Streptomycin (10 mg dl^{-1}) during three seasons viz. Winter (November-February), Summer (March-June) and Rainy (July-October). Immediately after collection the ovaries were transported to the laboratory. A total of 20, 18 and 19 replicates of the experiments were performed during Rainy, summer and winter seasons, respectively.

To study the effect of season, 2079 follicles from 439 ovaries in rainy, 1469 follicles from 376 ovaries in summer and 1793 follicles from 310 ovaries in winter season were aspirated. Various parameters like follicles per ovary, COCs retrieved, COCs retrieved per ovary and oocyte retrieval rate were recorded in each group and compared statistically using one way analysis of variance using Systat version 11.

Results

The average number of follicles per ovary in the present study were significantly ($p < 0.01$) higher in winter (5.76 ± 0.12) as compared to rainy (4.75 ± 0.05) and summer (3.90 ± 0.08) seasons (Table 1). Likewise, a highly significant ($p < 0.01$) difference was also observed in the average number of follicles per ovary between summer and rainy seasons,

indicating the effect of season on follicular activity. The number of COCs retrieved per ovary also followed a similar trend with significantly higher number during winter (3.94 ± 0.09) as compared to rainy (3.15 ± 0.05) and summer (2.62 ± 0.06) seasons. The oocyte recovery rate (%) was also significantly ($p < 0.01$) higher in winter (68.35 ± 0.27) as compared to rainy (66.33 ± 0.50) season.

Table 1: Effect of season on oocyte retrieval from abattoir ovaries

Season	Replicates/ no. of ovaries	No. of follicles aspirated	Follicles per ovary	Total no. of COCs retrieved	COCs per ovary	Oocyte recovery rate (%)
Rainy	20/ 439	2079	$4.75^a \pm 0.05$	1380	$3.15^a \pm 0.05$	$66.33^a \pm 0.50$
Summer	18/ 376	1469	$3.90^b \pm 0.08$	986	$2.62^b \pm 0.06$	$67.14^{ac} \pm 0.46$
Winter	19/ 310	1793	$5.76^c \pm 0.12$	1227	$3.94^c \pm 0.09$	$68.35^{bc} \pm 0.27$

Different superscript within a column indicate significance of difference

The number of grade I COCs retrieved were significantly ($p < 0.01$) higher in winter (36.32 ± 0.64) as compared to rainy (32.55 ± 0.64) and summer (31.07 ± 0.49) seasons. Similar trend was also observed in grade II oocytes where a significantly

higher proportion of COCs were retrieved during winter (45.05 ± 0.70) as compared to rainy (42.78 ± 0.58) and summer (41.04 ± 0.42) seasons (Table 2).

Table 2: Effect of season on oocyte quality

Season	Replicates/ no. of ovaries	No. of follicles aspirated	Total no. of COCs retrieved	Grade I COCs (%)	Grade II COCs (%)	Grade III & IV COCs (%)
Rainy	20/ 439	2079	1380	$32.55^a \pm 0.64$	$42.78^a \pm 0.58$	$24.60^a \pm 1.08$
Summer	18/ 376	1469	986	$31.07^a \pm 0.49$	$41.04^a \pm 0.42$	$27.90^b \pm 0.79$
Winter	19/ 310	1793	1227	$36.32^b \pm 0.64$	$45.05^b \pm 0.70$	$18.54^c \pm 0.46$

Different superscript within a column indicate significance of difference

The proportion of grade III-IV COCs retrieved during summer (27.90 ± 0.79) were, however, significantly ($p < 0.01$) higher as compared to rainy (24.60 ± 1.08) and winter seasons (18.54 ± 0.46). The per cent grade III-IV COCs retrieved during rainy seasons were also significantly ($p < 0.01$) higher as compared to winter seasons. The results indicate significantly higher qualities of COCs were retrieved during winter followed by rainy and summer seasons.

Discussion

The follicles per ovary, COCs retrieved per ovary and oocyte recovery rate was significantly higher during winter season as compared to summer and rainy seasons. In contrast to our findings, the oocyte number recovered per ovary and the number and incidence of good quality oocytes were not affected by season in Italian Mediterranean buffaloes [7, 8], which may be due to difference of breeds and different agro-climatic conditions. However, higher oocyte retrieval during peak breeding season which corresponds to the cooler months in Indian riverine buffaloes is also reported [9]. This is in agreement to our findings wherein higher oocyte retrieval was recorded during winter season. This is further confirmation of the lowest sexual activity in Indian riverine buffaloes [1]. In the present study significantly higher grade I (36.32 ± 0.64) and grade II (45.05 ± 0.70) oocytes were recovered during winter as compared to their respective values during rainy (32.55 ± 0.64 and 42.78 ± 0.58) and summer (31.07 ± 0.49 and 41.04 ± 0.42) season. The proportion of grade III oocytes was significantly higher in summer (27.90 ± 0.79) followed by rainy (24.60 ± 1.08) and winter (18.54 ± 0.46) season. This is in agreement with the previous report in buffaloes stating significantly higher proportion of grade I and grade II oocytes in cool environmental temperature as compared to hot environmental temperature [10]. Lower yield of usable oocytes (grade I and II) in the present study during hot summer season

may be due to heat stress which alters the endocrine patterns and reduces follicular development. This heat induced decrease in usable oocytes may be due to a series of cellular alterations that affects nuclear and cytoplasmic compartments of the bovine oocytes [11], leading to retrieval of higher proportion of grade I and II (usable oocytes) during winter months / cooler part of the year. Also retrieval of oocytes of higher quality during winter is reflected by the higher developmental competence of oocytes during cooler part of the year recorded by various workers in the past in Indian [12], Italian Mediterranean [8] and Egyptian [2] under *in vitro* embryo production set up.

Conclusion

It can be concluded from the present study that ovary contains more number of follicles and significantly higher number of COCs per ovary were retrieved during winter season. Winter season was also associated with higher oocyte recovery rate and oocyte quality.

Acknowledgement

Facilities extended by Animal Biotechnology Centre, Nanaji Deshmukh Veterinary Science University, Jabalpur and Rashtriya Krishi Vikash Yojana are gratefully acknowledged.

References

1. Taneja M, Singh G, Totey SM, Ali A. Follicular dynamics in water buffalo superovulated in presence or absence of a dominant follicle. *Theriogenology* 1995;44:581-597.
2. Khairy MAZ, Abdoon AS, Mahrous KF, Amer MA, Zaher MM, Li-Guo Y *et al.* Effect of season on the quality and *in vitro* maturation rate of Egyptian buffalo (*Bubalus bubalis*) oocyte. *Journal of Cell and Animal Biology* 2007;1(2):29-33.

3. Al-Katanani YM, Webb DW, Hansen PJ. Factors affecting seasonal variation in 90-day non return rate to first service in lactating Holstein cows in a hot climate. *Journal of Dairy Science* 1999;82:2611-2616.
4. Wolfenson D, Roth Z, Meidan R. Impaired reproduction in heat-stressed cattle: basic and applied aspects. *Animal Reproduction Science* 2000;60:535-547.
5. Roth Z, Arav A, Bor A, Zeron Y, Braw-Tal R, Wolfenson D. Improvement of quality of oocytes collected in the autumn by enhanced removal of impaired follicles from previously heat-stressed cows. *Reproduction* 2001;122:737-744.
6. Rensis FD, Scaramuzzi RJ. Heat stress and seasonal effects on reproduction in the dairy cow – a review. *Theriogenology* 2003;60:1139-1151.
7. Gasparini B, Neglia G, Palo RD, Campanile G, Zicarelli L. Effect of cysteamine during *in vitro* maturation on buffalo embryo development. *Theriogenology* 2000;54:1537-1542.
8. Di Francesco S, Novoa MVS, Vecchio D, Neglia G, Boccia L, Campanile G *et al.* Ovum pick-up and *in vitro* embryo production (OPU-IVEP) in Mediterranean Italian buffalo performed in different seasons. *Theriogenology* 2012;77(1):148-154.
9. Manjunatha BM, Gupta PSP, Ravindra JP, Devaraj M, Nandi S *In vitro* embryo development and blastocyst hatching rates following vitrification of river buffalo embryos produced from oocytes recovered from slaughterhouse ovaries or live animals by ovum pick-up. *Animal Reproduction Science* 2008;104(2):419-426.
10. Nandi S, Chauhan MS, Palta P. Effect of environmental temperature on quality and developmental competence of buffalo oocyte. *The Veterinary Record* 2001;148:278-279.
11. Paula-Lopes FF, Lima RS, Risolia PHB, Ispada J, Assumpção MEO, Visintin JA. Heat stress induced alteration in bovine oocytes: Functional and cellular aspects. *Animal Reproduction* 2012;14:395-403.
12. Manjunatha BM, Ravindra JP, Gupta PSP, Devaraj M, Nandi S. Effect of breeding season on *in vivo* oocyte recovery and embryo production in non-descriptive Indian river buffaloes (*Bubalus bubalis*). *Animal Reproduction Science* 2009;111(2):376-383.