PREVALENCE OF REPEAT BREEDING IN BUFFALO AND ITS EFFECTIVE POSSIBLE FUTURE STRATEGIES

S.G. Mohyuddin[1], A. Riaz[2], S.H. Ali[3] and X.H. Ju[1*]

[1] Department of Veterinary Medicine, Guangdong Ocean University, Zhanjiang 524088, China
[2]Faculty of Veterinary and Animal Sciences, PMAS Arid Agriculture University Rawalpindi, Pakistan
[3]Faculty of Veterinary and Animal Sciences, Riphah College of Veterinary Sciences, Lahore, Pakistan
[*]Corresponding author's E-mail: juxh77@163.com

ABSTRACT: Dairy animals play an essential role in dietary requirements of human beings in the world. However, the milk production efficiency of these animals is low in developing countries due to poor health, feeding as well as breeding and welfare management. In this review, issues faced by buffalo farmers due to poor reproductive efficiency as depicted by low conception rates resulting in repeat breeding and finally long calving interval in buffaloes are discussed. Repeat breeding causes low milk production and reduced number of calves per animal leading to economic losses at farmer and industry levels. Traditionally, the incidence of repeat breeding can be reduced through early diagnosis and treatment. Special care should be given to proper feeding of animals for animal welfare and breeder income. Further research is required to avoid this issue by feeding and breeding management.

Keywords: Repeat Breeding, Buffaloes, Economy, Future Strategies.

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INTRODUCTION

Livestock is the world's largest and fast growing agricultural sub-sector. It accounts for about 40% of agricultural GDP globally, often much more in many developing countries (Pasha and Hayat, 2012).

The efficiency of dairy animals is significantly affected by animal health, management, feeding, and breeding. Animal health-related issues specially reproductive failure can be considered as a major hurdle in buffalo commercial farming and profitability. The normal process of initiation of puberty in heifers is shown in figure 1. Poor reproductive performance is usually measured by poor conception rates and long calving intervals (Barile, 2005; Perera, 2008). Clinical assessments have demonstrated that anestrus and repeat breeding are the two major reasons for poor conception rates in buffalo (Ahmed, 2006; Singh, *et al*., 2008; Patel *et al*., 2007; Ali *et al*., 2009). However in cows the frequency of repeat breeding is low as compared to buffalo (8.68% versus 18.79%) (Patel *et al*., 2007).

Studies on the repeat breeding showed that fertility issues in buffalo are not frequently perceived and the animals are considered as repeat breeder if not conceived after at least three inseminations (Sah and Nakao, 2006; Azawi *et al.*, 2008b). Repeat breeding (RB) been has been highlighted to be an important disorder during the last few decades and its incidence varied among different regions, management systems, and environment. The etiology of RB has appeared to be multi-factorial and incorporate, reproductive tract variations, a hormonal abnormality, nourishing insufficiencies and poor rearing (Purohit *et al*., 2008). Among other factors, environmental conditions such as day length and ambient temperature play a vital role in reproductive success in buffaloes which is evident from conception rates (70 to 80% from July to February) as reported by Agarwal *et al.,* (2005) and Hazem *et al.,* (2019).

Incidence: The incidence of RB is remarkably lower in buffaloes than cattle (Patel *et al*., 2007; Purohit, 2008). Varieties in occurrence can likewise be credited to the heterogeneity of reasons including the impacts of region and season in addition to intrinsic factors (Prajapati *et al*., 2005). In a study conducted by Athar *et al.* (2016), in 82 villages in Pakistan, the overall incidence of RB was found to be 8.9% (1799/21189) in buffaloes and 7.27% (883/12149) in cattle (Table 1).Total number of animals suffering from repeat breeding syndrome in Pakistan. Incidence (%) of repeat breeding in different studies in buffaloes and cattle is shown in Table-2.

Economic implications of repeat breeding: The economic accomplishment of dairy animals depends upon proper and ideal conceptive beat of every individual dairy animals and cattle in the group inside typical physiological range (Ahmed and Bhattacharyya, 2005). Any deviation or prolongation in the breeding rhythm brings about dynamic economic misfortunes because of extending of the dry period and diminished calving and lactation within the life expectancy of the animal (Singh *et al.,* 2006). Unproductive or infertile buffalo mean an

immediate misfortune in less milk production though decreased calf number (Baghel, 2006). Sub-fruitfulness, barrenness, and sterility is the result of impeded typical capacity, all of which result in financial misfortunes because of anestrus, expanded dry period, late development, diminished calving rate and lifetime efficiency of animal, expanded cost of administration and extraordinary culling of the animal (Agarwal *et al.,* 2005). Around 30.4% of cattle and bulls were separated for the most part because of barrenness, which implicates guide misfortunes to the agriculturists and in addition to the hereditary asset (Gupta *et al.,* 2015). Calving interval in buffalo are longer contrasted with those in dairy animals and buffalo have a one month longer growth period (Perera 2008). Repeat reproducing would contribute economic losses with buffalo calves which inherently confirm postponed adolescence and higher age at first calving (Sharma *et al*., 2014).

Risk factors: Many risk factors for repeat breeding have been described for cows including parity, peri-parturient diseases, season, herd size, milk yield, and poor fertility.

Season: The buffalo is categorized as an occasionally breeding animal and females demonstrate a decrease in conception rate in hot and long summer days with expanding a very long time in light (Perera, 2008). Buffalo in India and Pakistan prove ideal fertility during cooler long stretches of the year (Marai and Habeeb, 2010). The regular decrease in regenerative movement is shown by a lessened occurrence of estrous conduct, a decline in the extent of females that experience consistent estrous cycles and by and large lower conception rate (Sharma *et al.,* 2014)

Calving season: Period of calving impacts the reproductive performance of buffalo. In light of the examination of many reports, it has been specified that buffalo calving in the rainy and storm seasons had shorter anestrus period and higher fertility than other season calves (El-Wishy, 2007);(Khan *et al.,* 2009). Fundamentally, a high incidence of repeat breeding was seen in buffalo during the harvest time season (Manoj *et al.,* 2015). A higher rate of poor fertility during fall and summer likely happens because of occasional suppression of ovarian activity and expanding embryonic deaths during times of expanding sunshine length (Campanile *et al*., 2007). The first administration to conception, number of administrations per conception and calving interval were mostly lower in Nili Ravi buffalo calving in summer (May to July) and pre-winter (August to October) contrasted with those calving in spring (February to April) or then again winter (November to January) (Andrabi 2009; Khawaskar *et al.,* 2012) and Murrah buffalo calving within spring and winter (Kumar *et al.,* 2014).

Peri-parturient disorders and metabolic disorders: Postpartum metritis is most significant problem in buffalo (Azawi *et al.,* 2008a) causing great losses in term of delayed conception, prolonged calving intervals and repeat breeding which ultimately causes the mortality. The rate of uterine contaminations has been depicted to be higher in buffalo than cattle in a couple of studies (Azawi, 2006). Unusual calving and post-partum difficulties are critical hazards for the advancement of fertility issues including repeat breeding in buffalo. Buffalo with unusual calving and uterine medical issues demonstrated a higher chance of proportion in support of creating fertility issues (Manoj *et al.,* 2015). Parturient and postparturient conditions affect fertility (Purohit and Markandeya, 2015), also comparable impacts are seen with postpartum metabolic disorder is less vital in the buffalo (Purohit and Saraswat, 2013; Purohit 2014). Buffalo with retained placenta, dystocia or other parturient issue had essentially lower resultant fertility (Jadon *et al.,* 2005; Azawi *et al.,* 2008b), expanded days open and expanded the number of services per conception.

Lactation: Repeat breeder buffalo in the lactation group uncovered that lactating animal with high drain generation required a higher number of administrations per conception than non-lactating and low delivering buffalo(Marai *et al*., 1992). The relationship coefficients were found critical between the quantity of administrations per conception and body weight at first administration (Marai *et al.,* 1992).A greater extent of buffalo delivering 3– 6 kg of drain exposed to repeat breeding (Sah and Nakao, 2006). Buffalo creating more than 3000 kg drain in lactation had the high calving to conception period, and those creating 1000 kg in lactation had the most reduced (Abayawansa *et al.,* 2011).

Parity order: The age of buffaloes as far as parity concern did not appear any noteworthy impact on repeat is reproducing (Kumar and Singh, 2009). Non-critical impact of parity on repeat breeding had likewise been accounted for (Thirunavukkarasu and Kathiaravan, 2009), though, critical impact of parity on a similar quality was likewise taken note. In one investigation 60% of repeat breeding creatures were buffaloes yearlings (Sah and Nakao, 2006). In any case, such outcomes were most certainly not predictable crosswise over different investigations The incidence (%) of repeat breeding according to parity order in different studies in buffaloes is shown in (Table-3). A higher number of administrations per origination in first parity buffaloes yearlings presumably begin as a result of the low force of estrus in buffaloes yearlings contrasted with grown-up buffaloes Verma *et al.,* 2014).

Etiology: A number of factors are involved in causing repeat breeding. Main etiologies involved which are a

failure of fertilization and early embryonic deaths. Other factors responsible for repeat breeding are environmental stress and poor breeding management (Diskin and Morris, 2008). The causes of repeat breeding in buffaloes are discussed as under.

Failure of fertilization: A study in cows has demonstrated that failure of fertilization represents a low extent (10%– 20%) of pregnancy misfortunes during the initial 21 days post-insemination (Diskin and Morris, 2008). In any case, comparative analysis for buffaloes is not accessible. Additionally, it examine assessing the reasons for the failure of fertilization are not very many and recommend factors conceivable in the bovine (ovulation disappointment, oviductal deterrents, irregular ova, and endometritis). The reason for preparation disappointment can likewise lie with the bull and the procedure and timing of insemination when utilizing artificial insemination. Ovulatory aggravations, for example, anovulation and delayed ovulation have been recorded in a couple of concentrates in buffalo (Singh *et al.,* 2008; Purohit 2008) with resultant repeat breeding.

Female buffaloes: Ovulatory disorder: Delayed ovulation, anovulation, and ovarian cysts are less successive in the buffalo (Purohit 2014) yet can bring about the failure of fertilization. Clinical investigations recorded the frequency of 0.5%– 1.48% ovarian sores in buffalo (Raju *et al*., 2007), with poor clinical manifestation.

Oviductal obstacles and grips: Oviductal blockage that presumably keeps treatment can start from pathologies in the oviduct, for example, hydrosalpinx, pyosalpinx, salpingitis (Vala *et al.*, 2011). What is more, stenosis or developments in the oviduct (Purohit 2014) however most considers have used abattoir determined genitalia and clinical depictions are few. Ovarobursal attachments have been said in a couple of clinical depictions with rate shifting from 0.04% (Modi *et al.,* 2011) to 6.4% (Prajapati *et al.,* 2005; Vala *et al.,* 2011) yet abattoir ponders mirror a higher rate. Ovarobursal adhesions influence ripeness as they interfere with tubal motility (Purohit 2014).

Bull factors: Repeat breeding can start given variables identified with the bull and semen (Azawi 2006). Differential fertility between buffalo bulls exists (Mahmoud *et al.,* 2013; Kumar *et al.,* (2014) and have all the earmarks of being an essential determinant influencing origination rates to insemination or common mating of buffalo. The time of buffalo bull influences the semen volume and the extent of irregular spermatozoa; with grown-up buffalo bulls creating the most astounding volume and most reduced irregular sperms (Khawaskar *et al.,* 2012). The bull breed, semen sort (fluid or solidified), quality and source affect the conception rates (Andrabi 2009).

Breeding management: Mistaken inseminations in respect to estrus were performed in 30.67% of buffalo in one investigation (Sharma *et al.,* 2008) and many repeats reproducing buffalo at insemination had plasma progesterone profiles more noteworthy than one ng/mL recommending that buffalo were inseminated at the wrong time (Singh 2009). An issue with buffalo AI is the poor estrus articulation and absence of effective intends to distinguish estrus. Insemination with respect to ovulation likewise shows up critical to accomplish high fertility (Singh 2009). Moreover, this relied on the abilities of the inseminator, and the principal AI conception rates fluctuated from 25.40% to 37.83% for the diverse inseminators (Sharma *et al*., 2008).

Evaluation of embryonic deaths: Embryonic deaths have been usually assessed by utilizing successive trans rectal ultrasonography (Verma *et al.,* 2014; Diskin and Morris, 2008) and the vanishing of a formerly unmistakable baby or potentially liquids propose embryonic passing. Such estimations are troublesome with trans rectal palpations as most bubaline embryonic passing happen between days 25– 45. Low luteal progesterone is existent in buffalo with embryonic deaths (Campanile *et al.,* 2007), be that as it may, utilizing single or successive progesterone profiles to anticipate embryonic passing appear to be wrong.

STRATEGIES TO REDUCE INCIDENCE OF REPEAT BREEDING

Accurate heat Detection: Inadequate and inaccurate estrus detection is one of the greatest vital causes of buffaloes and cows to become repeat breeders. Heat detection should be done accurately and efficiently in animals. In most of the cases, heat determination is less than 50% of many dairy farms. By using a tool of estrus detection helps to improve both correctness and amount of animals getting inseminated in estrus will improve pregnancy rates (Naikoo *et al.,* 2013).

Embryo Transfer: Embryo transfer technique is highly beneficial for lactating dairy cattle. It not only improves pregnancy rates in dairy cattle throughout heat stress but also increases the possibility of reducing the number of repeat breeders. Embryo transfer avoids many reasons for infertility including conception rate failure and early embryonic death. In Japan a study had shown the effectiveness of transfer of *in vitro* produced frozen-thawed embryos in establishing pregnancy in repeat breeding Holstein dairy cattle (Dochi *et al*., 2008).

Administration of Gonadotropin-releasing hormone at Insemination: A study has reported significant beneficial effects of inoculation of Gonadotropin-releasing hormone (GnRH) at the time of insemination in repeat breeder cows. Giving GnRH to repeat breeders could increase conception rates from 7 to 25%. Some

studies have shown a 7.6% increase in conception rate after GnRH treatment (Kaim *et al*., 2003)

Administration of human chorionic gonadotropin Following Artificial Insemination: Human chorionic gonadotropin (hCG) has little or no real effect on fertility. However, studies have used huge number of cows to evaluate the effectiveness of hCG on conception rates and pregnancy loss of high-yielding dairy cows below field circumstances. In a study, (Santos *et al*., 2001)estimated the special effects of hCG administered on day 5 after artificial insemination on corpus leutium (CL) number, concentration of progesterone, conception rate and pregnancy loss in high yielding dairy cows. Treatment with hCG resulted in 86.2% of the cows with more than one CL compared with 23.2% in controls. Plasma progesterone concentrations were increased by 5.0 ng/mL in hCG-treated cows. Conception rates were also increased ($P < 0.01$) for hCG-treated cows on day 28 (45.8 vs. 38.7%), day 45 (40.4 vs. 36.3%), and day 90 (38.4 vs. 31.9%) compared with control group (Santos *et al*., 2001).

Artificial insemination and natural service: Bull breeding program and management of service bulls can directly affect the incidence of repeat breeding. The poor management can increase repeat breeding in cow or buffalo or continuing to the case of repeat breeding. Mostly, cows or buffaloes are inseminated by the bull for natural service (NS) at 180 days in milk (DIM) or after three artificial inseminations. Studies have shown that the application of reproductive method that combines both artificial insemination and NS is beneficial (Champagne *et al*., 2002). Using only one technique (either AI or NS) can reduce the chanced of fertilization. Dairy farms that use only NS for their reproductive management should ensure an intensive bull managing program (Smith *et al*., 2004).

Re-synchronization of Anestrous Cows: More than 50% of lactating dairy cows do not attain pregnancy or remain not pregnant after their first postpartum artificial insemination. Most often the estrous recognition rate is less than 50%, and if cows are not re-synchronized subsequent non-pregnancy detection, the days between inseminations might be increased to the length of 2 estrous cycles. To avoid the long interval between inseminations and from calving to conception, an effective protocol for re-synchronization and re-insemination of non-pregnant cows should be used. The supreme common practice for re-synchronization is to pledge the timed AI practice at non-pregnancy diagnosis; hence, cows which were detected non-pregnant receive the first GnRH injection of the timed AI protocol instantly at non-pregnant diagnosis and are re-inseminated approximately 10 days later (Cerri *et al*., 2008).

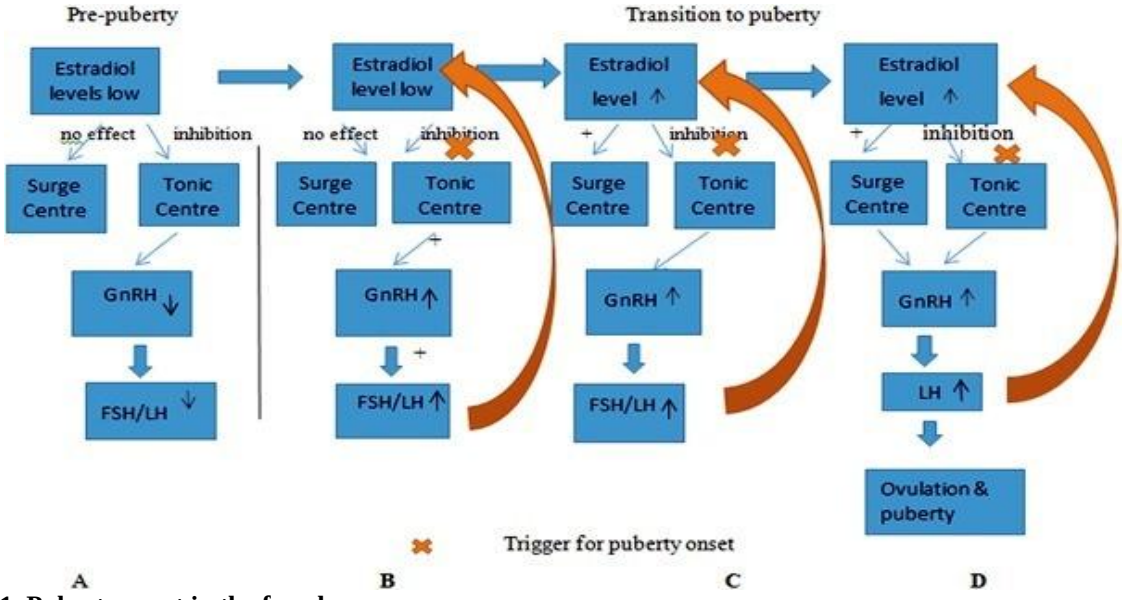

Figure-1. Puberty onset in the female

Before puberty low level of estradiol cannot stimulate the hypothalamus to synthesize enough GnRH. Toward a shift to the puberty estradiol concentration increases allowing hypothalamic neurons to produce enough GnRH, as a results concentration of LH and FSH incidents enhances which in turn increases the concentration of GnRH and LH. LH surge results in ovulation and the initiation of puberty in heifers. Adapted from (Lea and England, 2019).

Table-1. Animals suffering from repeat breeding syndrome in selected parts of Pakistan.

		Buffalo			Cattle				
Province/area	**Villages**	**Heifer**	**Adult**	**Total animals included**	**Heifer**	**Adult**	**Total animals included**	**G. Total**	**Percentage**
Punjab	70	35	1654	1689/18800	45	718	763/10140	2452/28940	8.5
KPK*	8	8	70	78/989	10	66	76/1296	154/2285	6.74
Baluchistan	2	-	-	160	-	26	465	26/625	4.16
AJK**	2	2	30	32/240	18	18/248	50/488	10.24	
Pakistan	82	45	1754	1799/20189	55	828	883/12149	2682/32338	8.29

* Khyber Pakhtunkhwa, ** Azad Jammu and Kashmir, Adapted from Athar *et al*., (2016)

Table-2. Incidence percentage of repeat breeding in different studies on buffaloes and cattle (Saraswat and Purohit, 2016).

Region	Incidence
Sweden	10
Indonesia	62
Pakistan	0.70 to 7.9
Egypt	4.34
Gujarat	6.35
India (Tamil Nadu)	4.03
Nepal	6.00
India (Uttar Pradesh)	5.40
Bangladesh	11.5

Table-3. The incidence percentage of repeat breeding according to parity order in different studies on buffaloes.

Parity	Incidence	References
Heifer	3.85	Singh *et al.,* (2006)
	22.22	Dhaliwal, (2005)
	60.00	Sah and Nakao, (2006)
1st	16.66, 59.00	Sah and Nakao, (2006) Dhaliwal, (2005)
2nd	7.15	Singh *et al.,* (2006)
	27.77	Dhaliwal, (2005)
3rd	22.22	
4th	11.11	Dhaliwal ,(2005)

Conclusion: It was concluded that repeat breeding has an economic impact on buffalo production and consequently, local meat and milk production. Better and modern techniques like ultra-sonography are useful to get a prompt and better diagnosis. Also, special care should be given for proper feeding of animals and food additive in animal's foodstuff for animal welfare and breeder income.

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