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Comparison of the conception rate after fixed time natural mating and artificial insemination in estrous synchronized Murrah buffaloes: A short communication

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Abstract

The present study was conducted to evaluate the conception rate after fixed time natural mating and artificial insemination after Synchronization of estrus in murrah buffaloes. Total 16 murrah buffaloes were selected and randomly divided into two groups, one for natural mating and one for artificial insemination. Buffaloes received estrus synchronization protocol that is, 2mg Oestradiol benzoate intra muscular + 1.38gm Progesterone intra-vaginal on day 0, 12.5mg Dinoprost + 400 IU PMSG intra muscular + removal of the progesterone insert on day 9, 0.0105mg Buserelin acetate intra muscular on day 11 and followed by fixed time natural mating and artificial insemination on day 12 and 13 according to the group. The status of pregnancy was examined by rectal palpation on day 90 post insemination (natural and artificial). All the animals were expressed heat signs and the conception rate was 8/8 (100%) and 5/8 (62.5%) in natural mating and artificial insemination group, respectively. In conclusion, fixed time natural mating may be helpful for the farmers having a small herd of buffaloes.

Keywords: Murrah buffalo, Natural mating, Artificial insemination, CIDR

Introduction

Buffalo is a multipurpose animal, which play an important role in the economy of an Asian countries, Mediterranean region of Europe and Latin America (Zicarelli 1994; Barile 2005)^[60, 7]. Buffaloes are short day polyestrous animal (Vale, 2007)^[55], indeed in the tropical areas near of equator line they are polyestral continuous (Perera, 2011; Singh *et al.* 2000)^[39, 50]. The animals however suffer from inherent reproductive problems such as poor estrous expression and long calving intervals which limits its lifetime production specially in summer season (Prakash *et al.* 2005)^[42]. In addition, the incidences of silent heat are higher in summer than winter months (Khattab *et al.* 1990; Tailor *et al.*, 1990; Kassim and Nany, 1999; Prakash, 2002)^[27, 53, 26, 43]. In general, reproductive activity of buffaloes is mainly determined by day length, climate (ambient temperature and relative humidity) and nutrition (Singh *et al.* 2000; Vale *et al.* 2019)^[50, 56]. However, Singh (1993)^[52] revealed that decreasing day length may be a stronger determinant of the onset puberty and postpartum ovarian activity, than ambient temperature and relative humidity.

The inter-estrous interval in buffaloes may vary from 16 to 28 days and the estrus lasting for 10-20 h during breeding season (Baruselli *et al.* 1997)^[11]. The interval between the onset of estrus and LH surge is 1-12 hours and ovulation

occur 18–40 h after the LH surge (Prakash *et al.* 2005)^[42]. The diminished heat symptoms in buffaloes is due to hyperprolactinemia (Aboul-Ela and Barkawi, 1988; Palta *et al.*, 1997; Phogat *et al.* 1997)^[1, 36, 41], reduced melatonin secretion during longer days (Kassim *et al.* 2008; Chandra Prasad *et al.* 2014; Singh *et al.* 2016)^[25, 17, 48] and lower estradiol levels due to smaller size pre-ovulatory follicles (Baruselli *et al.* 1997; Awasthi *et al.* 2006)^[11, 6], which is affected by low P4 during luteal phase and a reduced pulsatile LH secretion during summer months (Awasthi *et al.* 2006)^[6]. In addition, poor estrus detection (30–40%) (Barkawi *et al.* 1993)^[9], a variable duration of estrus (4–64 h) (Baruselli *et al.* 2001)^[10] are also responsible for declared it poor breeder.

In India, during summer reproductive performance of buffaloes is reduced (Madan, 1988; Tailor *et al.* 1990)^[31, 53]. The hormones like FSH, LH and P4 values are lower during summer as compared to winter season (Phogat *et al.* 2016)^[40]. So, to overcome seasonality and discipline milk production out-of-season breeding may be a suitable management strategy (Zicarelli, 2010)^[61]. Different hormones combination is used time to time for synchronization of estrus and ovulation in buffaloes with different conception rates for out of season breeding (De Rensis and Lopez-Gatius, 2007; Phogat *et al.* 2016)^[19, 40].

There is not any report available for the conception rate in buffaloes after fixed time natural mating (NM) after synchronization of estrus. So, this experiment was conducted to evaluate the conception rate after fixed time natural mating and artificial insemination (AI) after synchronization of estrus in Murrah buffaloes.

Materials and Methods

Experimental design

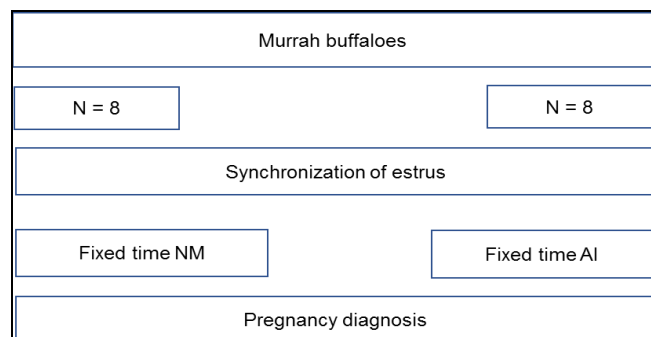


Fig 1: Experimental design of the study

Experimental location and animals

The present study was conducted at KhasaMurrah Buffalo Farm Village Gangwa, Hisar, Haryana, India during the summer season, April 2023. Adult Murrah buffaloes

between 4 to 9 years of age and more than 90 days in milk with their body condition scores varied between 2.5-4 (Ferguson *et al.* 1994)^[20] were included in the study (Figure 1).

Experimental procedure

The buffaloes were examined by rectal palpation for the status of genitalia. Total 16 Murrah buffaloes were selected having normal genitalia and not having any history of dystocia or any genital disease, randomly divided into two groups one for fixed time NM with Murrah bull and other for AI with frozen thawed Murrah bull semen after synchronization of estrus (Figure 2). Expression of estrus was observed onward day 11 during the early morning and late evening for 20-30 min each time after estrus synchronization (Mohan *et al.* 2010; Barkawi *et al.* 1998; Ansari, 2001; Gordon, 1996; Gami *et al.* 2013)^[33, 8, 4, 23, 21], viz., visual observations: mucus discharge, bellowing (Qureshi *et al.* 1998; Brar and Nanda, 2004; Singh and Barwal, 2010; Ashok, 2013)^[45, 13, 49, 5] and Vulvar edema (Danell *et al.*, 1984; Ullah and Usmani, 1985)^[18, 55] and transrectal palpation (Prasad *et al.* 1986; Singh, 2013; Gamit *et al.* 2015)^[44, 51, 22]. The status of pregnancy was examined by rectal palpation on day 90 post insemination (natural and artificial).

Estrous synchronization protocol

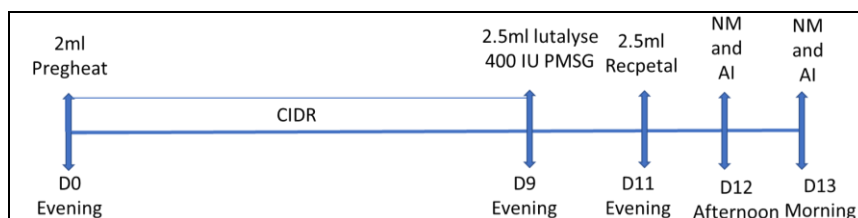


Fig 2: Estrous synchronization protocol (Note: D= day, NM= Natural mating, AI= Artificial insemination)

Details of Drugs used

Table 1: Details of Drugs used for heat synchronization

S.N.	Trade name	Composition	Dose and rout of administration	Manufactured by
1	Pregheat	1mg Oestradiol benzoate/ml	2ml IM	Virbac
2	Eazi breed CIDR 1380	1.38gm Progesterone / insert	1 Insert Intra-vaginal	Zoetis
3	Lutalyse	5 mg Dinoprost/ml	2.5 ml IM	Zoetis
4	Folligon	1000 I.U. PMSG/ Vial	400 IU IM	MSD
5	Receptal	Buserelin acetate 0.0042 mg/ ml	2.5 ml IM	MSD

Statistical analysis

Pair-wise statistical comparisons of conception rate were performed using Student's t test (***) = $p < 0.005$.

Results and Discussion

Expression of estrus

Buffaloes received estrus synchronization protocol that is, 2mg Oestradiol benzoate intra muscular + 1.38gm Progesterone intra-vaginal on day 0, 12.5mg Dinoprost + 400 IU PMSG intra muscular + removal of progesterone insert on day 9, 0.0105mg Buserelin acetate intra muscular

on day 11 and followed by fixed time natural mating and artificial insemination on day 12 and 13 according to the group. All the experimental animals were expressed heat signs (vulvar edema, cervico-vaginal-mucus discharge and uterine tone) except bellowing.

Conception rate

The conception rate was 8/8 (100%) and 5/8 (62.5%) in NM and AI group, respectively. It was significantly ($p < 0.005$) differed from each other.

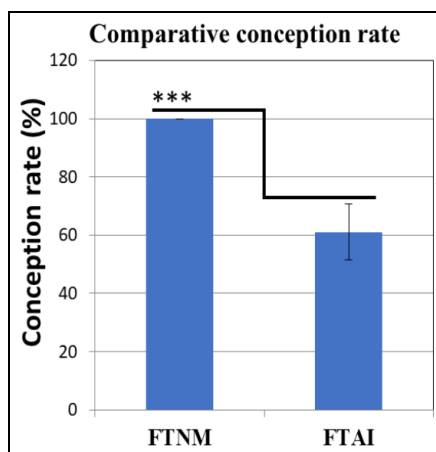


Fig 3: Comparative conception rate (Note: FTNM= Fixed time natural mating; FTAI= Fixed time artificial insemination. Error bars indicate SD. Pair-wise statistical comparisons were performed using Student's t test (***) = $p < 0.005$).

The expression of estrus in the present study are supported by Malik *et al.* (2011) [32], Parmar *et al.* (2014) [37], Thangapandiyar *et al.* (2015) [53] and Kumar *et al.* (2016) [28], they recorded a 100% estrus response by norgestomet + PMSG treated anestrous buffaloes under farm conditions. It was observed that the combined effect of progesterone priming of the brain for estradiol receptors and high endogenous estradiol with PMSG administration mainly responsible for behavioral signs (Cavaliere *et al.* 1995) [16]. Agarwal *et al.* (2001) [2] also revealed that the better induction of estrus in norgestomet+ PMSG treated buffalo might be through the synergistic effect of endogenous and exogenous gonadotropin on folliculogenesis, oocyte maturation, and subsequent estradiol production. Some researchers also observed 83 to 100% estrus response after estrus synchronization (Ramakrishnan *et al.* 2012; Ali and Fahmy, 2007; Buhecha *et al.* 2016; Paul and Prakash, 2005; Biradar *et al.* 2014) [45, 3, 14, 38, 12]. The 100% estrus response in this study might be due to the effect of exogenous progesterone, which sensitizes the hypothalamus receptors for the estrogen, and higher estradiol production by larger follicles and following PMSG injection mainly responsible for behavioral signs of estrus (Nayak *et al.* 2009; Parmar *et al.* 2014) [35, 37].

The conception rate in NM group is supported by Vecchio *et al.* (2007) [59]; Campanile and Neglia (2010) [15], they revealed that the chances of embryo mortality (28-60 days after fertilization) are lower in NM than AI in buffaloes. In addition, Lemma (2011) [29] revealed that cryopreservation causes detrimental effect on sperm compartments and their functions. The conception rate after fixed time AI in this study (Figure 3) is supported by Kumar *et al.* (2016) [28], they observed overall 62.5% and 66.6%, in cosynch and norgestomet + PMSG protocol, respectively during summer season. In addition, Naseer *et al.* (2013) [34] also observed 60% conception rate in CIDR+PMSG treated anestrous buffaloes during summer season. However, a slightly better conception rate (75%) with CIDR+PMSG protocol by Nayak *et al.* (2009) [33] and 75% with Cosynch-plus protocol by Kumar *et al.* (2016) [28] has been observed. Mean while, Yendraliza *et al.* (2011) [60] observed 100% conception rate after fixed time AI by using select synch estrus

synchronization protocol in swamp buffalo (*Bubalus bubalis*) in Indonesia.

Conclusion

All the animals were expressed heat signs and the conception rate was 8/8 (100%) and 5/8 (62.5%) in natural mating and artificial insemination group, respectively. It was concluded that, the fixed time natural mating after estrus synchronization may be helpful for the farmers having small herd of buffaloes and it need to be further investigations.

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