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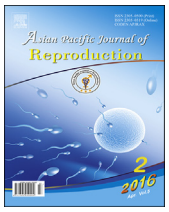

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Repeat breeding: Incidence, risk factors and diagnosis in buffaloes

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ABSTRACT

Repeat breeding in buffaloes was evaluated in terms of incidence, risk factors and diagnosis. The incidence of repeat breeding is low in buffaloes however in different studies the incidence varied from 0.70% to 30%. Because of seasonal suppression of fertility repeat breeding in buffaloes should be limited to the breeding season. Spring and winter calving, first parity, peri-parturient disease and lactation are significant risk factors for repeat breeding in buffaloes. The etiologies of repeat breeding in buffaloes can be failure of fertilization and early embryonic deaths. Only a few of causes of failure of fertilization have been identified in buffaloes. Ovulatory disturbances and ovarian cysts are uncommon in buffaloes and cysts have poor clinical manifestation. Endometritis is the common female cause of fertilization failures in buffaloes whereas poor semen quality and improper insemination are the bull side factors for fertilization failures. Early embryonic deaths are common in buffaloes mated/inseminated during the end of the breeding season due to a low luteal progesterone however embryonic deaths occur late (<25 days) in buffaloes. Diagnostic approaches for repeat breeding include vaginoscopic and transrectal examination and uterine cytology for genital health. More precise evaluations of the ovarian and uterine function can be obtained by ultrasonographic and hysteroscopic examinations performed sequentially however, precise diagnosis of the cause of repeat breeding seems difficult.

1. Introduction

Buffalo plays an important role in maintaining a sustainable food production system in the developing countries [1]. The productivity of buffaloes, however, remains low largely due to poor management of health, nutrition and breeding [2]. The major problems faced by buffalo breeders include poor reproductive efficiency and prolonged inter-calving intervals [3,4]. High incidences of fertility problems were associated with buffalo breeding [5]. Clinical evaluations have shown that anestrus and repeat breeding are the two major causes of infertility in buffaloes [6–9] however compared to cattle the incidence of repeat breeding is low in the buffalo (8.68% *vs.* 18.79%) [9]. A repeat breeder is generally defined as any cow that has not conceived after three or more services associated with true estrus [10]. Fertility problems in buffaloes are often not easily recognized; particularly studies on the repeat breeding syndrome are very few [11]. Buffaloes not conceiving after 3 or more services have been considered as repeat breeding [11,12] however, owing to seasonal suppression of fertility during hot summer months such considerations should be limited to the breeding season [10]. Repeat breeding (RB) syndrome is responsible for long service period and inter-calving interval thereby causing low milk and calf production resulting in to greater economic losses to dairy industry [7]. To curtail these losses exact and early diagnosis of the underlying etiology followed by timely interventions is a prerequisite [7]. The etiology of repeat breeding appears to be multifactorial and include uterine infections and reproductive tract abnormalities, hormonal dysfunction and nutritional inadequacies, and poor breeding and health management [10]. Clinical evaluations often depict the preponderance of genital infections (endometritis) in repeat breeding buffaloes [8,9,12,13]. During recent years many publications have appeared on the

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risk factors, etiology, and diagnostic approaches for repeat breeding in buffaloes and in this review the authors have addressed these issues.

2. Incidence

The incidence of repeat breeding appears to be low in buffaloes compared to cattle [9,10]. Incidence evaluations from clinical data (Table 1) have probably recorded higher incidence on account of the type of cases commonly presented (including buffaloes with low fertility during summer) to clinicians and not based on incidence in buffalo herds.

Variations in incidence can also be attributed to the heterogeneity of causes of the repeat breeder syndrome as well as the effect of locality and season [18].

3. Economic implications of repeat breeding

The economic success of dairy cattle and buffalo economy lies in proper and optimal reproductive rhythm of each individual cow and buffalo in the herd within normal physiological range [21]. Any deviation or prolongation in the breeding rhythm results in a progressive economic losses due to widening of the dry period and reduced calving and lactation during the life span of the animal [22]. Barren or infertile buffaloes mean a direct loss in milk production whereas reduced calf crop hamper the selection efficiency in long term dairy herd improvement [23]. Poor reproductive performance of the animals leads to economic losses due to reduced production and additional cost on management [24]. Sub-fertility, infertility and sterility is the outcome of impaired normal function, all of which result in economic losses due to anestrus, extended dry period, late maturity, decreased calving percentage and life time productivity of animal, increased cost of management and intense culling of the animals [25]. About 30.4% of cattle and buffaloes were culled mainly due to infertility, which incriminates direct losses to the farmers as well as to the genetic resource [26]. Reproductive disorders such as repeat breeding can lead to economic losses in terms of reduced fertility, low life time production, longer calving interval and increased culling in dairy cows [27] and buffaloes [28]. Calving intervals in buffaloes are longer compared to those in cows and buffaloes have a one month longer gestation period [4]. The calving intervals are prolonged on account of delayed resumption of postpartum estrus [29] and a further delay in conception due to repeat breeding would substantially increase these losses. Repeat breeding would contribute to significant economic losses with buffalo heifers which inherently evidence delayed puberty and higher age at first calving [30].

Table 1
Incidence of repeat breeding in different studies in buffaloes (%).

Breed	Incidence	References
Mehsani	6.00–30.00	[5]
Bihar	8.82	[14]
Murrah	5.00	[15]
Pakistani buffaloes	0.70	[16]
Egyptian buffaloes	4.34	[17]
Gujarat	6.35	[18]
Tamil Nadu	4.03	[19]
Murrah	11.04	[20]
Nepal	6.00	[12]
Uttar Pradesh	5.40	[15]

4. Risk factors

A large number of risk factors for repeat breeding have been described for cows including parity, peri-parturient disease, season, herd size, milk yield and poor fertility [31]. Similar descriptions for buffaloes are few and are mentioned.

4.1. Season

The buffalo is a considered a seasonally breeding species and females show a decline in reproductive activity during hot summer months in response to increasing day length [4]. Buffaloes in India and Pakistan evidence optimum fertility during cooler months of the year [32]. The seasonal decline in reproductive activity is manifested by a reduced incidence of estrous behavior, a decrease in the proportion of females that undergo regular estrous cycles and generally lower conception rate [15].

Higher calving frequencies during rainy and winter seasons [33] reflect maximum fertility of buffaloes during the months of September to December in India [34]. A few recent studies depicted negative effects of temperature humidity index (THI) on fertility traits in buffaloes [35,36]. High levels of circulating prolactin [37] are considered to mediate the effects of hot summer by suppressing LH and progesterone secretion. Relationships between corpus luteum vascularization, corpus luteum function, and pregnancy outcome of AI in buffaloes were consistent across the breeding season and transition period in previous study [38]. The pregnancy rates and embryonic mortality rates in buffaloes bred during the breeding period were 58.0% and 7.3% whereas they were 45.6% and 23.0% during the transition period [38] reflecting the effects of transition period on increase in embryonic mortalities and decrease in pregnancy rates.

The distinction between the breeding season and the transition period is the relatively low proportion of buffaloes that have optimum corpus luteum function and P4 concentrations required to establish a pregnancy during the transition period, which is manifested in a greater incidence of embryonic mortality and leads to repeat breeding [38].

4.2. Calving season

Season of calving influences the reproductive performance of buffaloes. Based on analysis of many reports it has been mentioned that buffaloes calving in the rainy and monsoon seasons had shorter anestrus period and higher fertility than other season calvers [29].

Reproductive disorders in buffaloes were common during summer and rainy seasons [39]. Significantly, higher incidence of repeat breeding was observed in buffaloes during the autumn season [40]. A higher incidence of poor fertility during autumn and summer probably occurs due to seasonal suppression of ovarian activity and increasing embryonic deaths during periods of increasing daylight length [41,42]. The first service to conception, number of services per conception and calving intervals were significantly lower in Nili Ravi buffaloes calving in summer (May to July) and autumn (August to