Ovarian Response of Buffalo Cows with Prolonged Anoestrus Following Hormonal Treatment During Indoor Housing

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Abstract

Large calving intervals in water buffalo cows is attributed to the existence of periods of the year when sexual activity is absent. It is considered that if fertilization did not occur before the buffalo cows entered in the winter season, when kept indoors, then it will take a significant longer time until they enter again in heat and the calving interval will be negatively influenced. The work was conducted over 4 years and consisted of the evaluation of ovarian response following administration of a prostaglandin hormone (PGF2α) during the winter period for a number of 61 buffalo cows, between 5 and 14 years of age. In 22 buffalo cows that showed oestrus within 5 days of PGF2α administration, two artificial inseminations were performed at 12 hours intervals. In 39 buffalo cows that did not show any signs of oestrus, a second dose of PGF2α was administrated 11 days after the first administration, after which they were artificially inseminated at 48 and 78 hours, respectively. Of the 22 buffalo cows that showed oestrus, 19 cows became pregnant, and out of the 39 buffalo cows with prolonged treatment, only 20 heads remained pregnant. The treatment of sexual inactivity in water buffalo cows during indoor hosing by hormonal methods with PGF2α leads to the shortening of the calving interval, the cost of hormonal treatments being balanced by the increase in the number of calves obtained and the milk production.

Keywords: anoestrous, artificial insemination, buffaloes, calving interval, prostaglandins.

1. Introduction

The large interval between calving's in water buffalo cows is due to the longer duration of gestation, silent oestrous which are difficult to observe, and the strong seasonality of the reproduction cycle of the species. The silent oestrous are difficult to be observed by the breeder, however in the case of natural mating practiced in some herds, buffalo bulls are able to detect all cows showing heat. Even in the case of natural breeding, there are long intervals between calving caused by a high frequency of embryonic mortality.

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The greatest influence on the duration of the calving interval in water buffalo has the seasonality of reproduction, the existence of periods of the year in which sexual activity is absent. It is considered that if fertilization did not occur before the buffaloes entered the cold season, then it will take a long time until they re-enter the oestrous cycle and the interval between calving's will be significantly longer.

The calving interval is dependent on the resumption of ovarian activity after calving, fertility of females and on preimplantation embryonic mortality. During pregnancy, the lack of oestrous is due to the secretion of progesterone which maintains the relaxation of the uterine muscles and inhibits the maturation of new ovarian follicles. Calving in buffalo is triggered by the adrenal secretions of the foetus, which allows the secretion of prostaglandins that perform lysis

of the corpus luteum and suppresses the secretion of progesterone. As a result, the gonadotropic hormones of the pituitary gland (FSH and LH) cause the activation of the ovary and the onset of the ovarian cycle [1]. The delay of the ovary to have a new cycle is attributed during the cold season (winter period), to the absence of pituitary hormonal stimuli that are not released due to low GnRH levels. This explanation is, however, tempered by the fact that in the cold season the feed resources are of lower quality, lacking tonic energy that is needed to trigger follicular maturation [2]. Deficiencies in hormonal stimuli, insufficient progesterone secretion, or an energy deficit in the diet lead to a high rate of ovarian or blastocyst embryonic mortality, produced before implantation or, to a lesser extent, even to later embryonic mortality.

In buffalo bulls, unlike females in which sexual activity manifests itself cyclically in the form of oestrous cycles, male libido is continuous. The fact that in winter, the manifestation of libido is very low, can be attributed to the thyroid and pituitary glands secretions, which through the decreased secretion of thyroxine and ICSH (testicular interstitial cell stimulation hormone) disfavour testosterone secretion and expression of sexual reflexes [3].

The aim of the current study was to evaluate the ovarian response of buffalo cows with prolonged anoestrus following hormonal treatment during indoor housing.

2. Materials and methods

The work was carried out at the Research and Development Station for Buffalo Șercaia [GPS: 45°50′N 25°8′E, altitude of site 445 m], for four consecutive years (2016-2019) and consisted of the administration of PGF2α based on hormonal products under different trade names (2 mg PGF2α /ml, 1,5 ml/100 kg body weight), aiming at resuming the sexual cycle of females water buffalo, following the manifestation of estrous, artificial insemination or natural mating were used, taking advantage of the luteolytic effect of prostaglandins.

Following the transrectal examination, 61 female buffalo with anestrus were identified, with a period of more than 90 days after calving, aged between 5 and 14 years and with a body condition. The protocol consisted of the administration of PGF2α, following the appearance of oestrous and artificial insemination or natural mating.

In buffalo cows that did not show oestrous after the first administration, another dose of PGF2α was given 11 days after the first inoculation, the appearance of oestrous and artificial insemination or natural mating were monitored and recorded. In those buffalo cows which did not show oestrous, artificial insemination was performed blindly at 72 and 96 hours, respectively.

During winter season buffalo cows received a daily ration consisting out of 25 kg corn silage and 8 kg of hill pasture hay, with no supplementation of concentrates. Animals were kept under tied stanchion barn conditions, on deep straw litter beds, with access to mineral and salt blocks and also *ad libitum* water.

Figure 1. Buffalo cows at Șercaia Research and Development Station

Figure 2. Buffalo bull at Șercaia Research and Development Station

All research activities were performed in accordance with the European Union's Directive for animal experimentation (Directive 2010/63/UE).

3. Results and discussion

Of the 22 buffalo cows that showed oestrous after the first treatment, 19 cows remained pregnant, the fecundity being 86.36%, and of the 39 buffaloes with prolonged treatment (after the second inoculation), only 20 remained pregnant, the fecundity obtained being 51.28%. In total, the fecundity obtained was 63.9%, the birth rate being higher than 92%.

Results concerning reproduction efficiency in Romanian Buffalo are in accordance with those previously reported by Georgescu *et al.* (2008) [4] and Vidu & Bota (2014) [5].

Although the detection of ovarian formations in buffalo cows is significantly much more difficult than in cows, due to the small size of the ovaries, following a correct diagnosis by transrectal examination, it is possible to act with hormonal preparations to revive ovarian function and thus to get the buffalo cows pregnant during the cold season.

Conception rates registered during this research trials are comparable with those previously reported by Gavojdian & Nicolae for the Romanian buffalo breed, during normal reproduction season [6].

At the same time, it was found that animals with poor body condition, the older cows or those who presented various diseases during the *postpartum* period, did not respond positively to this treatment.

The presence of the buffalo bull daily around females has beneficial effects, even if it has a low libido during the cold season.

The use of products based on PGF2α helps to increase the percentage of gestations and implicitly the number of live buffalo calves and, consequently the increase in the production of buffalo milk.

This method is especially beneficial for family farms raising buffaloes, where buffaloes are usually sexually inactive during the winter season, the cost of treatment being affordable. The method also helps to expand artificial insemination in buffalo, especially for farmers accustomed only to natural breeding, bulls usually do not breed in the cold period of the year.

Table 1. The ovarian response after prostaglandin treatment is buffalo cows during winter season

Year	Buffalo cows (n)	Product	1th $PGF_{2\alpha}$ administration		2nd $PGF_{2\alpha}$ administration				Total gestations (No. and %)	Conception rates (%)
			AI (n)	Gestations (n)	AI (n)	Gestations (n)	AI at 72-96 hours (n)	Gestations (n)		
2016	18	Flavoliz	5	5	-	-	13	8	13 (72.2%)	92.3
2017	21	Prosolvin	7	7	4	4	10	4	15 (71.4%)	93.3
2018	12	Enzaprost	4	4	-	-	8	3	7 (58.3%)	100
2019	10	Prosolvin	6	3	2*	1	2	-	4 (40%)	-
Total	61	-	22	19	6	5	33	15	39 (63.9%)	-

4. Conclusions

When dealing with dairy species, reproduction is the main constraint in the onset and maintenance of lactation. Thus, it is important to find biotechnological approaches in order to manipulate and manage the reproduction function of buffalo.

The use of products based on PGF2α helps to increase the percentage of gestations and implicitly, the number of live buffalo calves, leading to an increase of the milk production.

The method described is especially beneficial for family farms raising buffaloes, where cows are usually sexually inactive during the winter season, with the cost of treatment being affordable.

Acknowledgements

This work was supported by a grant of the Romanian Ministry of Agriculture and Rural Development, project number ADER 8.3.2.

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