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# ASSESSING THE ACCEPTABILITY OF HORMONE-BASED ESTRUS INDUCTION / SYNCHRONIZATION PROTOCOLS TO OVERCOME ANESTRUS IN BUFFALOES

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## ABSTRACT

Five hundred dairy households in the rural areas of Punjab state were interviewed through comprehensively designed questionnaires to assess the knowledge and experience of farmers regarding the hormone-based strategies to overcome anestrus and getting the buffaloes pregnant. About 81.8% dairy households were unaware ($P<0.05$) about any estrus induction or synchronization hormonal protocol and majority (65.5%) of these belonged to households with <5 animals. Out of households having awareness about hormonal protocol use in buffaloes, the majority (58.2%) belonged to households with >15 animal. Out of dairy farmers using hormonal protocols, the proportion of illiterate was 14.8%. Out of dairy farmers not aware about hormonal protocols, the proportion of illiterate was 52.3%. Data analysis of 91 dairy households who had used hormonal protocols revealed summer (65.9%) and anestrus (82%) as the major underlying reasons for their use in buffaloes. Low success rate (20.2%), high cost (50%) and non-availability of doctor (29.7%) were the reasons for the irregular use of hormonal protocols. The success rate of hormonal protocols under field condition in terms of conception was 47.1%. In summary, the major bottlenecks in acceptability of hormone-based therapeutics strategies under filed conditions are illiteracy, high cost of therapeutics strategies and lack of awareness in buffalo farmers especially in households with <5 animals.

**Keywords**: *Bubalus bubalis*, buffaloes, acceptability, anestrus, hormones, synchronization

## INTRODUCTION

The marginal and small dairy farmers raising 1 to 3 bovines account to 3/4$^{th}$ of livestock wealth and 68% of milk production in India. If a dairy animal fails to conceive at an appropriate time, a farmer is expected to bear tremendous economic losses by decreasing calf crop and milk production (Bisen *et al*., 2018). In fact, the reproductive efficiency of dairy buffaloes is

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hampered by their failure to show overt estrus, and the animals may remain in anestrus for prolonged period. In India, the incidence of anestrus is more in buffaloes than cattle, especially during summer and was reported as 36.6% and 59.4%, respectively (Das and Khan, 2010). However, even higher incidence was reported in nomadic (83%) than rural buffalo (63%; Brar and Nanda, 2004). Thus, there is need to focus on improving the reproductive potential of buffaloes reared by marginal and small farmers through assisted reproductive technologies (Ghuman and Dhami, 2017). An approach suggested that acyclicity in buffaloes under unorganized rearing systems can be alleviated by fixed time artificial insemination (FTAI) using synchronization protocols based on progesterone ($P_4$), gonadotropin releasing hormone (GnRH) and prostaglandins ($PGF_{2\alpha}$), although these protocols had variable outcome with respect to conception (Warriach *et al*., 2015). Induction of synchronized estrus in buffaloes may provide a potential alternative for increasing their lifetime productive period. Given the eminent role of marginal and small farmers in food security, this practice will ensure sustainability and economic viability of dairy farmers. A significant opportunity will be created to boost rural income in coming decades and hence poverty reduction.

However, the major bottlenecks in wide application of hormone-based therapeutic strategies at small farmer's doorstep are, a) poor conception rate during non-breeding season, and b) failure of non-conceived buffalo to return to estrus following application of hormone protocols. Hence, this study was planned to assess the acceptability of hormone-based therapeutic strategies by the farmers to overcome anestrus in buffaloes.

## MATERIALS AND METHODS

### Methodology

The study was carried out at 500 dairy households rearing buffaloes in rural areas of Punjab state using comprehensive questionnaires (Table 1 and 2) designed to carry out personal interview at each of the household. The emphasis was laid on the seasonal pattern of reproductive activity in buffaloes especially number of days spent in anestrus by buffalo, knowledge regarding hormone-based strategies to overcome anestrus and the farmers' experience in getting the animal pregnant through hormone-based strategies. Also, the follow-up investigations were carried out regarding the adoption of these practices by the farmers whose animal were subjected to estrus induction / synchronization protocols.

### Observations

Impact analysis regarding farmer's acceptability and economic impact of hormone-based therapeutic strategies to overcome anestrus in buffalo by recording of responses (frequency %) of rural smallholder dairy farmers.

### Statistical analysis

The data collected using questionnaire was entered in an excel spread sheet (Microsoft office excel, 2013). The statistical analysis was conducted using GIMMIX procedure of SAS version 9.3 (SAS/STAT). Frequency percentage for all categories was calculated individually. Statistical evidence for significance ($P<0.05$) for the select categorical variable compared with other categorical variable (in response to a categorized question) was generated using the chi-squared statistical procedure.

## RESULTS AND DISCUSSIONS

It is well known that there is compromised breeding activity in dairy animals especially buffaloes during hot and humid summer season, in tropical countries like India (Kumar *et al*., 2014). With the advancement in ovarian ultrasonography, it was observed that the dairy animals keep on showing regular ovarian activity with the availability of a ovulatory size dominant follicle (Ghuman *et al*., 2010). This lead to a lot of research on availability of suitable hormonal protocols (estrus induction / synchronization) in terms of their cost, ease of use and success rate. The researchers have revealed the success rate in the range of 31.0 to 56.0% in buffaloes during breeding season (Khan *et al*., 2018) and 23.0 to 34.5% in non-breeding season (Sharma *et al*., 2017). Ovsynch and Ovsynch-related protocols are better advocated for use in breeding season and progesterone based protocols for non-breeding season (De Rensis and Lopez-Gatius, 2007). However, the studies on acceptability of these estrus induction / synchronization protocols by the dairy farmers in terms of regular and repeated use at their farms (small or large) remains unknown.

The present survey conducted on 500 dairy households rearing buffaloes regarding the use of hormonal protocols in their dairy animals revealed that 81.8% dairy household were not aware about any of these protocols ($P<0.05$, Table 3). Further analysis of data with respect to <5, 6 to 15 or >15 dairy animal per household revealed that out of dairy households unaware about hormonal protocols, the majority (65.5%) belonged to household with <5 animals (Table 3). On the other hand, out of dairy households which were aware about hormonal protocol use in dairy animals, the majority (58.2%) belonged to households with >15 animal (Table 3). Thus, it can be suggested that the dairy farmers with large dairy herd are more aware about the availability and usefulness of hormonal protocols compared to small dairy herd. This could be due to the education level of farmers, as the present study further revealed that out of the dairy farmers using hormonal protocols, the proportion of illiterate was only 14.8% whereas the proportion of illiterate was 52.3%, who were not aware about hormonal protocols (Table 3). Nevertheless, about 24.7% dairy household who were aware about hormonal protocols for dairy animals were not using the protocol (Table 3). This strengthens the requirement of not only education of farmers but also regular use of extension activities for pursuing dairy farmers to take benefits associated with the use of hormonal protocols.

The detailed analysis of 91 dairy households who had used hormonal protocols in buffaloes was carried out. About 65.9% revealed that the protocols were used only in summer season, whereas only 9.8% dairy households used protocol in buffaloes during winter season (Table 4). This could be due to the inability of dairy animals to express estrus and get inseminated during summer season (De Rensis and Lopez-Gatius, 2007). Furthermore, the present study suggested that 82% dairy household had used protocol due to anestrus condition of buffaloes and only 18% used for making profits (Table 4). Thus, estrus induction / synchronization protocol is a tool for farmers to reduce the economic loss occurring due to non-productive buffaloes.

The dairy households also suggested less success rate (20.2%), high cost (50.0%) and non-availability of doctor (29.7%) as the reasons for the irregular use of hormonal protocols (Table 4). About 74.7 to 81.8% dairy households had beard the cost of hormonal protocol when used

first time or subsequently (Table 4). In fact, about 75.7% households had used hormonal protocols once or twice. About 54.9% of households were of the opinion that the hormones used in protocols should be made available free of cost through Govt schemes (Table 4). Further research should be carried out to increase the success rate of hormonal protocols and to decrease the cost was suggested by 24.1% and 20.8% dairy households, respectively (Table 4). It was inferred from the present study that in addition to requirement of research to improve the efficacy of estrus induction / synchronization protocols in buffaloes, the measures should also be taken to improve farmer education and make free availability of hormones which will help to increase acceptability of hormonal protocols for use in buffaloes.

Dairy household survey with respect to buffalo rearing and field application of hormonal protocols suggested that majority (52.3%) of buffaloes subjected to these protocols were anestrus, followed by repeat breeder (31%) and cycling (16.5%; Table 3). The duration of anestrus or repeat breeding was up to 6 month in 78.6% and 70.3% buffalo, respectively (Table 3), which were subjected to hormonal protocols. Previous studies have also suggested that estrus induction / synchronization protocols were used in anestrus (Savani *et al*., 2017) or repeat breeder (Biradar *et al*., 2016) buffalo. The timely application of these protocol can minimize the loss due to unproductive period in the life span of a buffalo (Ghuman and Dhami 2017).

Furthermore, about 60.5% of buffalo which were subjected to hormonal protocol belonged to summer season (Table 3). It is well known that anestrus in summer season is the major issue which warrants the application of these protocol in buffaloes (Warriach *et al*., 2015). Dairy household survey for buffaloes further revealed that the success rate of use of protocol in terms of conception was 47.1% in field conditions (Table 3). Here, it is important to consider the fact that if a buffalo fails to conceive after the end of voluntary waiting period, a farmer has to bear a loss of $4.2/day in terms of loss of milk and other managemental expenses whereas the cost of using a $P_4$+$E_2$+eCG protocol is $26.16 (Ghuman and Dhami, 2017). In the present survey, majority of (52.3%) of buffaloes subjected to protocol were anestrus (Table 3) and 82% dairy household used protocols due to anestrus condition (Table 4). Thus, even 47.1% success rate of protocols recorded in present study can have huge impact on economics of buffalo farming. Others have suggested that success rate of Ovsynch protocol was 30% (Savalia *et al*., 2013). The success rate of 50 to 60% was achieved following the use of progesterone-based protocols in buffaloes (Naseer *et al*., 2013). The present survey also suggested that following the failure of hormonal protocols, about 27.8% buffalo were sold out by the dairy farmers since most of farmers were not ready to bare economic losses due to low milk yield of non-pregnant buffaloes.In summary, the major bottlenecks in the acceptability of hormone-based therapeutics strategies by buffalo farmers are illiteracy, high cost of protocols and lack of awareness especially in households with <5 animal. The use of hormone based therapeutic strategies under field conditions have economic impact on dairy households as 82% households used these strategies due to anestrus condition of buffaloes and 41% success rate was recorded.

Table 1. Questionnaire of dairy household response with regard to field application and acceptability of hormonal protocols (estrus induction / synchronization) to overcome anestrus in buffaloes.

| **Name of the owner: .....** | **Date: .....** | | **Address: .....** |
|---|---|---|---|
| Herd Size | <5 animals | 6-15 animals | >15 animals |
| Buffalo (n) | | | |
| Farmer education (Tick) | Illiterate | $10^{th}$ pass | Graduate |
| Are you aware about estrus synchronization protocols? (Tick) | Yes | | No |
| If yes, then used are not (Tick) | Yes | | No |
| The number of time protocol used (Tick) | Once | Twice | Thrice / When required |
| Cost of protocol beard at first time (Tick) | Farmer | University | Others |
| Animal conceived by protocols | Total | | Conceived |
| Cost of protocol beard subsequently time (Tick) | Farmer | University | Others |
| If using regularly, reasons (Tick) | Anestrus | Less labour cost | Profit |
| If not using regularly, reason (Tick) | Less success rate | Costly | Doctor non-availability |
| Suggestions by farmer for increasing acceptability of protocol (Tick) | Increase success rate | Decrease cost | Cost bearing by govt |

Table 2. Questionnaire of dairy household survey regarding the outcome of buffalo subjected to estrus induction / synchronization protocols.

| **Reproductive status of animal (Tick)** | **Anestrus** | **Repeat breeding** | | **Cycling** |
|---|---|---|---|---|
| In anestrus then duration (Tick) | 2-4 mo | 4-6 mo | 6-8 mo | >8 mo |
| If repeat breeder then duration (Tick) | 2-4 mo | 4-6 mo | 6-8 mo | >8 mo |
| Season in which protocol applied (Tick) | Summer | | Winter | |
| Fate of protocol (Tick) | Success | | Failure | |
| If failure of protocol then fate of animal (Tick) | Sold | | Kept as it is | |

Table 3. Dairy household (HH) response (yes/no) with regard to field application of hormonal estrus induction / synchronization protocols in buffaloes.

| **Response whether protocols used or not** | **Animals per household** | | |
|---|---|---|---|
| | **<5** | **6-15** | **>15** |
| (P<0.05); Dairy animal per HH (Total HH = 500) *vs* Response | | | |
| Yes, HH = 91 (18.2%) | 12 (13.1%) | 11 (12.0%) | 68 (74.7%) |
| No, HH = 409 (81.8%) | 237 (57.9%) | 55 (13.4%) | 117 (28.6%) |
| (P<0.05); Buffalo per HH (Total HH = 500) *vs* Response | | | |
| Yes, HH = 91 (18.2%) | 20 (21.9%) | 18 (19.7%) | 53 (58.2%) |
| No, HH = 409 (81.8%) | 268 (65.5%) | 97 (23.7%) | 44 (10.7%) |
| (P<0.05); Farmer education *vs* Response | | | |
| ---- | Illiterate | 10th Pass | Graduate |
| Yes, HH = 91 (18.2%) | 13 (14.8%) | 55 (60.4%) | 23 (25.3%) |
| No, HH = 409 (81.8%) | 214 (52.3%) | 147(35.9%) | 48 (11.7%) |
| (P<0.05); Awareness about protocols *vs* Response | | | |
| ---- | Yes | No | |
| Yes, HH = 91 (18.2%) | 91 (100.0%) | 0 | |
| No, HH = 409 (81.8%) | 101 (24.7%) | 308 (75.3%) | |

Table 4. Diary household (HH) response following the use of estrus induction / synchronization protocols in buffaloes.

| **Survey** | **Response** | | | |
|---|---|---|---|---|
| Season in which protocol used, HH=91 | **Summer** | | **Winter** | **Both** |
| | 60 (65.9%) | | 9 (9.8%) | 22 (24.1%) |
| Reason for regular use of protocols, HH=50 | Anestrus | | Less labour cost | Profit |
| | 41 (82.0%) | | 0 | 9 (18.0%) |
| Reason for not regular use of protocols, HH=73 | Less success rate | | Costly | Doctor non availability |
| | 15 (20.5%) | | 37 (50.6%) | 22 (30.1%) |
| Protocol cost beard first time, HH=91 | Farmer | | University | Others |
| | 68 (74.7%) | | 23 (25.2%) | 0 |
| Protocol cost beard subsequently, HH=45 | 37 (82.2%) | | 8 (17.7%) | 0 |
| Number of times protocol used, HH=91 | Once | Twice | Thrice | If required |
| | 47 (51.6%) | 22 (24.1%) | 8 (8.7%) | 14 (15.3%) |
| Farmers suggestion for increasing acceptability of protocols, HH=91 | Increase success rate | | Decrease cost | Cost bearing by govt |
| | 22 (24.1%) | | 19 (20.8%) | 50 (54.9%) |

Table 5. Dairy household survey regarding the outcome of dairy buffaloes (n=380) subjected to estrus induction / synchronization protocols.

| Parameter | Observation | Protocol applied (%) |
|---|---|---|
| Reproductive status of animal | Anestrus | 199 (52.3) |
| | Repeat breeding | 118 (31.0) |
| | Cycling | 63 (16.5) |
| Duration of anestrus | 2-4 mo | 69 (34.9) |
| | 4-6 mo | 87 (43.7) |
| | 6-8 mo | 21 (10.5) |
| | > 8 mo | 22 (11.0) |
| Duration of repeat breeder | 2-4 mo | 0 |
| | 4-6 mo | 83 (70.3) |
| | 6-8 mo | 21 (17.7) |
| | > 8 mo | 14 (11.8) |
| Season in which protocol applied | Summer | 230 (60.5) |
| | Winter | 150 (39.5) |
| Fate of protocol | Success | 179 (47.1) |
| | Failure | 201 (52.8) |
| Fate of animal (If failure of protocol) | Sold | 56 (27.8) |
| | Kept as it is | 145 (72.1) |

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