

Therapeutic Efficacy of Herbal Medicines on Estrus Induction and Reproductive Performance in Lactational Anestrus Cattle

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Abstract

Postpartum lactational anestrus is a major reproductive disorder that reduces fertility and productivity in cattle. This study evaluated the efficacy of two herbal formulations for its treatment in 21 postpartum anestrus cows (>90 days postpartum), randomly assigned to three groups (n=7). Groups I and II received herbal preparations supplied by the National Innovation Foundation (NIF-DST), Government of India, while Group III served as an untreated control. Treatment efficacy was assessed based on estrus response, estrus characteristics, follicular development, serum mineral profile, and conception rate. Group II showed the highest estrus response (85.71%), followed by Group I (42.86%) and the control (14.29%). Treated cows exhibited earlier onset, longer duration, and greater intensity of estrus than control. Follicular diameter did not differ significantly among groups, although progressive follicular development was observed over time. Cows in Group II only found positive pregnancy, which achieved a conception rate of 28.57%, demonstrating superior therapeutic efficacy.

Keywords: Crossbred Cows, Fertility, Herbal Therapy, Postpartum Anestrus.

Introduction

India's cattle population reached 192.49 million (0.8% growth; 18% rise in females) in the 20th Livestock Census. As the leading milk producer, India yields 239.30 million tonnes annually (~25% of global output) (DADF Annual Report, 2024-25). However, intensive selection for milk yield has reduced reproductive efficiency, notably through prolonged postpartum anestrus (PPA) due to delayed ovarian rebound (Gautam, 2023). Postpartum anestrus refers to an extended period of anestrus where in cows fail to exhibit estrus signs even after the voluntary waiting (Sahithi *et al.*, 2019; Rama Goury *et al.*, 2021). In dairy cattle, postpartum anestrus adversely affects timely re-establishment of estrus cycles and fertility (Kawashima *et al.*, 2006). While early follicular growth remains unaffected, later stages govern cyclicity (Peter *et al.*, 2009). Contributing factors include high milk yield, negative energy balance (Satheshkumar *et al.*, 2021), poor management, and reproductive or systemic disorders (Prasad *et al.*, 2025).

Postpartum anestrus (PPA) can be managed with nutrition and herd health, but hormonal therapies though used to restore cyclicity are costly, inconsistent, and associated with side effects and handling constraints (Prasad *et al.*, 2025; Amin *et al.*, 2022; Satheshkumar *et al.*, 2021; Kalaswa *et al.*, 2017).

Herbal remedies offer a cost-effective, safe, and widely accepted alternative with minimal side effects (Amin *et al.*, 2022). However, limited data exist on their fertility outcomes in crossbred PPA cows, prompting this study on estrus induction, follicular dynamics, and fertility response.

Materials and Methods

The present study was carried out on postpartum anestrus cows presented to Veterinary Clinical Complex hospitals, College of Veterinary Science, Tirupati and adjacent Animal Husbandry institutions. The climate in this region is characterized as semi-arid to sub-humid, with a hot summer and cool winter region with rainfall of 896 mm and the ambient temperature ranged from a low of 17.2°C to a peak of about 42°C. The current research work was carried out after obtaining the approval of Institutional Animal Ethics Committee *vide* Approval No. 281/go/ReBi/S/2000/CPCSEA/CVSc/TPTY/097/ Animal Reproduction Gynaecology and Obstetrics/ 2025 Dated: 02-08-2025.

Lactating cows not showing estrus for more than 90 days postpartum and maintained under field conditions at farmer level by following uniform managerial and husbandry conditions were selected for the study. All the selected cows were examined twice per-rectally and ultrasonography was also performed (Chison Ebit 60 at 7.5 MHz) for the absence of corpus luteum and any reproductive tract disorders with a gap of ten days before inducing into experimental group.



Fig 1: Image showing follicle development during pre-treatment period

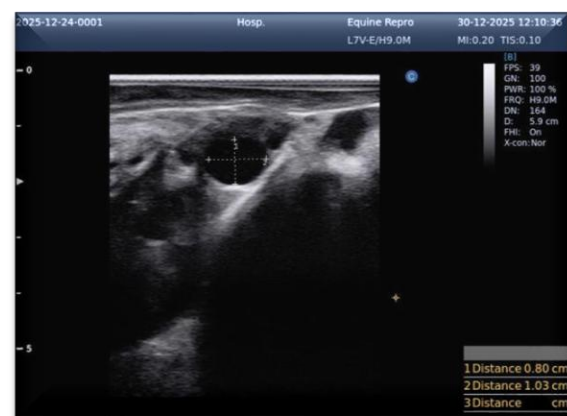


Fig 2: Image showing Preovulatory follicle on Day 10 of herbal therapy

The selected cows were randomly divided into three groups (n=7 each) and Group I cows were administered with AHP/AN/KBC/GJ powder orally @ 75gm daily per animal for four days along with their routine diet; Group II cows were administered AHP/AN/BRH/GJ orally @ 108 gm daily for ten days along with their routine diet and Group III cows were utilized as untreated control. Change the language of this sentence. Two herbal Medicines

were supplied by National Innovation Foundation, an autonomous body of DST, Govt. of India, New Delhi. All the animals were observed for exhibition of estrus signs and inseminated at standing estrus using frozen thawed semen.

During the treatment period, ovarian ultrasonographic images were recorded, and relative positions of scanned and palpated structures were sketched to enable consistent identification and measurement, as described by Ginther (1995). Ovaries of animals under study.. ..All the selected cows' ovaries were scanned at days 0 (initiation of treatment), 5, 10, 14, 20 and 28 to evaluate follicular diameter (mm) by measuring each follicle in two perpendicular planes (Figure 1) and then mean diameter of ovaries was calculated (Figure 2).

Thereafter, estrus response was calculated as the percentage of treated cows that exhibited estrus. Estrus intensity was assessed by using a modified scoring system based on Rao and Rao (1981) and Van Eerdenberg *et al.* (2002) and the intensity was classified as weak, intermediate, or intense (Table 1).

Table 1: Score Card for Assessment of Intensity of Estrus in PPA cows after therapy

S.No.	Symptoms exhibited	Points
1.	Edema, moist vulva	15
2.	Estrual mucus discharge	20
3.	Excitement	10
4.	Bellowing and restlessness	15
5.	Placid response to placement of palm or hand on the rump, raising of tail	10
6.	Frequent micturition	10
7.	Uterine tonicity	15
8.	Cervical relaxation	5
	TOTAL	100

*The symptoms shown by the animals were added and sum of the score was correlated to weak estrus (0-40), intermediate estrus (41-70) and intense estrus (71-100) of that animal

The interval to onset of estrus was calculated from initiation of herbal treatment to the appearance of estrus signs (days). Estrus duration was recorded from first to last behavioral signs (hours). Inseminated cows were monitored, and those not returning to estrus underwent ultrasonographic pregnancy diagnosis 45 days post-insemination. Conception rate was expressed as the percentage of cows conceived among those inseminated.

Analysis of data was carried out by using ANOVA in general and a non-Parametric Kruskal–Wallis test for onset and duration of estrus. SPSS version 15.0 for windows was employed in the analysis. The level of significance of all the parameters was measured at $p < 0.05$ (Snedecor and Cochran, 1994). Results are presented as mean $\pm$ SE and differences were considered statistically significant at $p < 0.05$...

Results and Discussion

Herbal treatment improved reproductive performance in postpartum anestrus cows, as evidenced by higher estrus induction, earlier estrus onset, longer estrus duration, and better conception rates than the control (Table 2). The greater follicular development observed in Group I may have promoted timely oocyte maturation, contributing to improved estrus induction and conception (Sunilkumar *et al.*, 2011).

During the 28-day period, estrus induction rates were 42.86% (3/7), 85.71% (6/7), and 14.29% (1/7) in Groups I, II, and III, respectively. Both herbal-treated groups showed higher induction than the control, with the highest response in Group II. Its response (85.71%) was comparable to earlier reports (75–88%) and consistent with previous findings on herbal therapy, while differences among studies may be due to variation in formulation, animal nutrition, breed, location, and management. The low estrus in the control group aligns with reported spontaneous recovery rates (~10%) Satheshkumar *et al.*, 2021). Overall, improved estrus induction in treated groups suggests that herbal supplementation accelerates resumption of ovarian cyclicity, likely through estrogenic and gonadotropin-like phytoconstituents that enhance follicular development and ovarian function.

The interval from treatment initiation to estrus onset is a key indicator of the resumption of ovarian cyclicity. In the present study, the mean interval to estrus was shorter in the treatment groups than in the control (14.67 ± 2.73 , 16.67

± 0.95 , and 25.00 ± 0.00 days in Groups I, II, and III, respectively). The estrus onset in Groups I and II was comparable to previous reports following herbal therapy (Bhageerathi *et al.*, 2009; Mane *et al.*, 2018; Kalaswa *et al.*, 2024), whereas the delayed onset in the control group agreed with findings in untreated cows (Ravikumar, 2021; Suthar *et al.*, 2021). These results indicate that herbal treatment accelerates follicular maturation and the resumption of ovarian cyclicity. The earlier estrus onset (3–8 days) reported by Sahatpure *et al.* (2016) and Bawaskar *et al.* (2017) may be due to differences in the initial follicular status of the animals.

Estrus duration was longer in the herbal-treated groups than in the control (20.67 ± 1.76 , 23.33 ± 1.52 , and 14.00 ± 0.00 h in Groups I, II, and III, respectively). The estrus duration in Groups I and II was comparable to previous reports following herbal therapy (Sahatpure *et al.*, 2016; Ravikumar, 2021; Senthilkumar *et al.*, 2021) and within the normal range (18–24 h) for crossbred cattle, whereas the shorter duration in the control group may indicate weak or silent estrus associated with spontaneous recovery from postpartum anestrus. Differences in estrus duration are primarily influenced by preovulatory follicular steroidogenesis and estradiol secretion. The prolonged estrus observed in the herbal-treated groups may reflect sustained estradiol production induced by bioactive phytoconstituents with estrogenic and gonadotropin-like activities, which enhance follicular development, ovarian function, and estrus expression (Ginther, 1995; Lucy, 2001; Satheshkumar and Punniyamurthy, 2009; Kumar *et al.*, 2016).

Estrus intensity indicates the degree of behavioral and physiological heat expression essential for timely detection and insemination. In this study, Group I showed 66.67% intense and 33.33% weak estrus, while Group II had 83.33% intense and 16.67% weak estrus. The control group (Group III) exhibited 100% weak estrus, with no intermediate cases in any group. These results agree with previous reports (Kankal *et al.*, 2008; Satheshkumar and Punniyamurthy, 2009) that herbal treatments enhance estrus intensity, and are comparable with Kalaswa *et al.* (2017, 2024). The weak estrus in controls supports findings of Ravikumar (2021) and may be due to reduced hormonal response (Satheshkumar *et al.*, 2021), indicating improved estrus expression with herbal interventions in Groups I and II.

Table 2: Mean ($\pm$ SE) estrus response, time of onset, duration and intensity of estrus and conception rate in postpartum anestrus cows treated with different herbal medicines

Parameter	Estrus response (%)	Initiation of estrus (days)	Duration of estrus (hour)	Intensity of estrus (%)			Conception rate (%)	
				Intense	Intermediate	Weak	Out of all animals	Out of inseminated animals
Group I	42.86 (3/7)	14.67 $\pm$ 2.73	20.67 $\pm$ 1.76	66.67 (2/3)	0	33.33 (1/3)	0	0
Group II	85.71 (6/7)	16.67 $\pm$ 0.95	23.33 $\pm$ 1.52	83.33 (5/6)	0	16.67 (1/6)	28.57	33.33
Group III	14.29 (1/7)	25.00 $\pm$ 0.00	14.00 $\pm$ 0.00	0	0	100.00 (1/1)	0	0

Follicular growth dynamics are one of the key indicators of resumption of ovarian activity in postpartum anestrus cattle. In the present study, the statistical analysis revealed a significant difference ($p < 0.05$) in follicular diameter both between treatment groups and across the duration of the experimental period (Table 3).

Table 3: Mean ($\pm$ SE) follicular diameter (mm) in postpartum anestrus cows treated with different herbal medicines

Parameter	Follicular Diameter (mm)						Overall Group (n=54)
	Day 0	Day 5	Day 10	Day 14	Day 20	Day 28	
Group 1	8.92 $\pm$ 0.19	10.26 $\pm$ 0.38	10.28 $\pm$ 0.85	8.84 $\pm$ 1.2	7.30 $\pm$ 1.17	7.34 $\pm$ 0.70	8.82 $\pm$ 0.39
Group 2	7.88 $\pm$ 0.89	7.80 $\pm$ 1.17	8.88 $\pm$ 0.57	10.35 $\pm$ 0.47	4.66 $\pm$ 1.71	8.63 $\pm$ 1.86	8.03 $\pm$ 0.39
Group 3	8.41 $\pm$ 0.53	8.39 $\pm$ 1.08	6.81 $\pm$ 0.55	10.14 $\pm$ 0.61	7.69 $\pm$ 0.49	8.14 $\pm$ 0.63	8.26 $\pm$ 0.39

Follicular growth reflects ovarian activity in PPA cattle. In this study, mean follicular diameters at treatment

initiation were 8.92 ± 0.19 mm (Group I), 7.88 ± 0.89 mm (Group II), and 8.41 ± 0.53 mm (Group III), with significant differences ($p \leq 0.05$) between groups and over time. These findings agree with earlier reports (Kumar *et al.*, 2016; Satheshkumar *et al.*, 2021) showing increased follicular growth following herbal treatment, while control values were comparatively lower (Ravikumar, 2021). The observed improvement may be due to enhanced FSH/LH activity, improved follicular wave dynamics, and antioxidant effects of herbal constituents, promoting follicular development beyond the ovulatory threshold (Sahatpure *et al.*, 2016; Sunilkumar *et al.*, 2011).

Conception rate determines the success of infertility management. In this study, overall conception was 28.57% (2/7) in Group II, while Groups I and III recorded 0.00%. Based on inseminated animals, conception rates were 33.33% (2/6) in Group II and 0.00% in Groups I and III. These results in Group II are comparable with earlier reports (Bawaskar *et al.*, 2017; Senthilkumar *et al.*, 2021), while the zero conception in the control group aligns with Ravikumar (2021) and Satheshkumar *et al.* (2021), indicating poor fertility in spontaneous postpartum anestrus cases.

Conclusions

The present study demonstrates that oral administration of herbal preparations significantly improved estrus response, reduced the onset of estrus, optimized estrus duration, and enhanced conception rates in postpartum anestrus cows compared with the untreated control group. Among the treatment groups, Group II exhibited superior follicular development, which may have facilitated timely oocyte maturation, effective estrus induction, and improved conception rates. However, the findings also indicate that enhanced follicular growth alone does not necessarily guarantee improved reproductive performance, suggesting that additional physiological and endocrine factors contribute to successful fertility outcomes. Overall, the results support the efficacy of oral herbal therapy as a practical, economical, and non-hormonal approach for improving reproductive efficiency in postpartum anestrus cattle. The ease of oral administration, coupled with its potential to reduce reliance on exogenous hormonal interventions, highlights the applicability of these herbal formulations as Indigenous Traditional Knowledge (ITK)-based reproductive management strategies. Further large-scale studies and mechanistic investigations are warranted to validate these findings and facilitate their wider adoption in sustainable bovine reproductive management.

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Conflict of Interests

There is no conflict of interest.

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