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Comparative efficacy of herbal supplementation on biochemical parameters in hypogalactic buffaloes

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Abstract
The present study was undertaken to know the comparative efficacy of herbal supplementation on biochemical parameters in hypogalactic buffaloes. Total 32 apparently healthy, hypogalactic buffaloes, free from mastitis were selected for experiment and randomly divided into 4 groups as T1, T2, T3 and T4 each consisting of 08 animals. The T1 group of 08 buffaloes was kept as disease control. All groups received basal ration along with 25 gm mineral mixture (MM). Group T2, T3, T4 received test diet. Comparative efficacy and residual effect of different herbal galactagogues were evaluated on the basis of biochemical parameters (serum calcium, serum phosphorus, total protein, serum albumin and serum globulin). Treatment with *Lipidium sativum* and *Asparagus racemosus* (T2) was found to be most efficacious in terms of improvement in biochemical parameters.

Keywords: Hypogalactic, *Lipidium sativum, Asparagus racemosus, Leptadinia reticulate, Nigella sativa*

1. Introduction
Herbal additives or botanicals are used as natural additives containing an array of phytochemicals like alkaloids, saponins, tannins, glycosides, essential oils, phytoestrogens, glucosinolates etc. Generally a mixture of several herbs are used rather than a single one to obtain desired effect (Singhal and Thakur, 2005) [10]. These are used in livestock diets to improve intake, performance, health status and milk production. Being a component of nature, these preparations are considered safe, cost effective and environment friendly with no side effect. Hence, their inclusion in the diet should be encouraged.
Profile of blood metabolites have been used widely to identify problem and to indicate dietary causes of low production. The blood biochemical profiles are considered important in evaluating the health status of buffaloes. The estimates of biochemical constituents are the prerequisites to diagnose several patho-physiological and metabolic disorders in hypogalactic buffaloes. The present study was undertaken to study the biochemical alterations before and after supplementation of different herbal galactagogues in hypogalactic buffaloes in early lactation stage

2. Materials and methods
2.1. Survey and Selection of Animals
A survey on total 290 lactating buffaloes between 3rd to 5th parity (204 from unorganized and 86 from organized sector) was done in dairy farms of Jabalpur district. Data were recorded regarding average milk production in previous and present lactation, parity, stage of lactation, vaccination and de-worming status. Modified California Mastitis Test was done to rule out the cases of mastitis. After survey, 32 apparently healthy hypogalactic buffaloes were selected for the therapeutic studies.

2.2. Experimental Design
Hypogalactic buffaloes were divided into 4 groups as T1, T2, T3 and T4 each consisting of 08 animals. The T1 group of 08 buffaloes was kept as control. Group T2, T3 and T4 received treatments with different prototypes as per table no. 01. All groups have received basal ration along with 25 gm mineral mixture (MM).

Table 1: Experimental Design

Treatment Groups	Number of animals	Treatment given
T1	8	Basal ration (existing feeding practices in farm) + Mineral Mixture
T2	8	Basal ration + MM + *Lipidium sativum* (Chandrasur) 70 g + *Asparagus racemosus* (Shatavari) 30 g once daily for 15 days
T3	8	Basal ration + MM + Pulv. *Leptadinia reticulata* (Jivanti) 1.5 g twice daily for 15 days
T4	8	Basal ration + MM + *Nigella sativa* (Kalongi) 50g seed boiled and drenched orally once daily for 15 days

2.3. Collection and processing of samples

Blood sample (4ml) was collected aseptically on 0th day (pre-treatment), day 15th, 30th and 60th (post treatment) from all hypogalactic buffaloes. The blood was centrifuged at 3000 rpm for 10 min for collection of serum for biochemical analysis. All tubes containing blood sample were kept in ice.

Serum calcium (Ca), serum phosphorus (P), total serum protein and albumin were analyzed on semi auto analyzer by using readymade kit manufactured by Erba Manheim, Transasia biomedical (India) Pvt. Ltd. Serum globulin was calculated by subtracting the serum albumin from total protein.

The data were analysed statistically by using nested RBD. Significant mean difference among treatments was compared by Duncan Multiple Range Test

3. Results and discussion

The serum samples of T1 (control), T2, T3 and T4 groups were analyzed at 0th, 15^{th,} 30th and 60th day of experiment.

3.1. Serum calcium (mg/dl)

The mean serum calcium value in T2 group is significantly higher at day 60 post treatment as compared to day 0. Non significant increase was observed between interval in mean serum calcium concentration of group T1 (control), T3 and T4 (Table 02).

Table 2: Effect of herbal galactagogues supplementation on serum calcium (mg/dl) of hypogalactic lactating buffaloes.

S. No.	Treatment	Interval			
		0	15	30	60
1.	T1(control)	$7.67^{aA}\pm0.13$	$7.31^{aA}\pm0.11$	$7.91^{aA}\pm0.10$	$7.99^{aA}\pm1.09$
2.	T2	$7.58^{aB}\pm0.17$	$7.84^{aAB}\pm0.17$	$7.95^{aAB}\pm0.16$	$8.02^{aA}\pm0.16$
3.	T3	$7.73^{aA}\pm0.14$	$7.88^{aA}\pm0.14^{aA}$	$7.96^{aA}\pm0.14$	$8.01^{aA}\pm0.14$
4.	T4	$7.71^{aA}\pm0.12$	$7.83^{aA}\pm0.12$	$7.91^{aA}\pm0.12$	$7.95^{aA}\pm0.11$

Mean values with different superscripts between treatment (lowercase) and between interval (uppercase) differ significantly (P <0.05)

Serum calcium concentration in all the groups was below the normal range as reported by Antarkar (1980) [1] and Hussain *et al*. (2001) [3] that low serum calcium is associated with hypogalactia in cattle. It was also reported that in advance pregnancy and early lactation calcium level fall below the normal range. The depressed trend in Ca++ levels could be a result of the impaired absorption of food metabolites from the gastrointestinal precursor, excessive losses through urine, colostrums as it was much more drained in the colostrums during excessive milking and due to insufficient mobilization from the skeleton. As the stage of lactation progresses the serum calcium level increased which corroborates with the findings of Ronalds *et al*, (1975) [6] and Nale (2003) [5]. In treatment groups there was significant increase due to mineral mixture supplementation.

3.2. Serum phosphorus (mg/dl)

The mean serum phosphorus value between interval in T2 group is found to be 4.37±0.08 at day 0(pre treatment) it increased significantly on day 15th (4.46±0.07) and day 60th (4.56±0.07) post treatment. Non-significant increase was observed in T1 (control), T3 and T4 (Table 03).

Table 3: Effect of herbal galactagogues supplementation on serum phosphorus (mg/dl) of hypogalactic lactating buffaloes.

S. No.	Treatment	Interval			
		0	15	30	60
1.	T1(control)	$4.41^{aA}\pm0.06$	$4.48^{aA}\pm0.05$	$4.53^{aA}\pm0.05$	$4.55^{aA}\pm0.05$
2.	T2	$4.37^{aB}\pm0.08$	$4.46^{aAB}\pm0.07$	$4.54^{aAB}\pm0.07$	$4.56^{aA}\pm0.07$
3.	T3	$4.45^{aA}\pm0.05$	$4.53^{aA}\pm0.05$	$4.56^{aA}\pm0.05$	$4.58^{aA}\pm0.05$
4.	T4	$4.43^{aA}\pm0.06$	$4.49^{aA}\pm0.06$	$4.51^{aA}\pm0.05$	$4.52^{aA}\pm0.06$

Mean values with different superscripts between treatment (lowercase) and between interval (uppercase) differ significantly (P <0.05).

At day 0 the serum phosphorus concentration in all groups was low which resemble the findings of Shibu *et al*. (2002) [9] who stated that phosphorus level decline at first month of lactation. Moderate depression in the levels of phosphorus might be due to the necessity of it for the colostrums synthesis (Rook and Thomas, 1983) [7] and enhanced carbohydrate metabolism.

There was significant increase in mean phosphorus level in T2 group which was due to supplementation of *Asparagus racemosous* and *Lepidium sativum* in diet (Roy *et al*.2014) [8] In other treatment groups there was non-significant increase in phosphorus concentration which may be due to the supplementation of mineral mixture in the diet.

3.3. Serum total protein (gm/dl)

In control group there is non-significant change in serum total protein at different intervals. In group T2, T3 and T4 there is significant increase in total protein at day 15th (post-treatment), 30th and 60th as compared to day 0 (Table 04).

Table 4: Effect of herbal galactagogues supplementation on serum total protein (gm/dl) of hypogalactic lactating buffaloes.

S. No.	Treatment	Interval			
		0	15	30	60
1.	T1(control)	6.59^{aA}±0.05	6.60^{cA}±0.05	6.60^{dA}±0.05	6.60^{dA}±1.05
2.	T2	6.60^{aB}±0.05	7.10^{dA}±0.04	7.15^{aA}±0.04	7.18^{aA}±0.04
3.	T3	6.62^{aB}±0.06	6.95^{aA}±0.06	6.97^{bA}±0.05	6.99^{bA}±0.05
4.	T4	6.57^{aB}±0.05	6.77^{bA}±0.04	6.78^{cA}±0.04	6.79^{cA}±0.04

Mean values with different superscripts between treatment (lowercase) and between interval (uppercase) differ significantly (P <0.05)

Total protein contents usually used as an appraisal of nutritive status of an animal reflecting food intake and metabolism. This increase in total protein concentration following parturition might be attributed to the supplementation of herbal galactagogues**.** It might also be due to haemo-concentration and water losses occurred following parturition. These findings were similar to Kumar *et al*. (2011) [4] and Soni *et al*. (2013) [8] but differed from Barhane (2000) [2] who found no significant change in total protein.

3.4. Serum albumin (gm/dl)

The mean serum albumin value between interval was found to be significantly higher on day 15th, 30th and 60th (post-treatment) in all the treatment groups i.e. T2, T3 and T4 when compared to day 0. There was non-significant increase in T1 (control) group (Table 05).

Table 5: Effect of herbal galactagogues supplementation on Serum albumin (gm/dl) of hypogalactic lactating buffaloes.

S. No.	Treatment	Interval			
		0	15	30	60
1.	T1(control)	2.30^{aA}±0.01	2.31^{cA}±0.01	2.32^{cA}±0.16	2.32^{cA}±0.15
2.	T2	2.27^{aB}±0.02	2.59^{aA}±0.02	2.61^{aA}±0.02	2.61^{aA}±0.02
3.	T3	2.28^{aB}±0.02	2.44^{bA}±0.01	2.45^{bA}±0.01	2.46^{bA}±0.01
4.	T4	2.28^{aB}±0.02	2.37^{bcA}±0.01	2.38^{bcA}±0.02	2.88^{cA}±0.01

Mean values with different superscripts between treatment (lowercase) and between interval (uppercase) differ significantly (P <0.05)

The mean serum albumin value was reported to be lowest at day 0 of the experiment in all the groups which tallied with the statement of Ronalds (1974) [6] who reported that serum albumin was lowest in early lactation upto one month, later it got subsequently increased in all treatment groups which may be due to the supplementation of herbal galactagogue.

3.5. Serum globulin (gm/dl)

In group T2, the serum globulin value was found to be significantly higher at day 15th (4.54±0.06) 30th (4.55±0.05) and 60th (4.56±0.04) post-treatment as compared to day 0 (4.33±0.06) pre-treatment. In group T1 (control), T3 and T4 there was non-significant change in serum globulin values between different intervals (Table 06). This might be due to the supplementation of *Asparagus racemosus* (immuno-modulatory activity) and *Lepidium sativum* (synergistic action). However, no work has been reported regarding increase in globulin.

Table 6: Effect of herbal galactagogues supplementation on serum globulin (gm/dl) of hypogalactic lactating buffaloes.

S. No.	Treatment	Interval			
		0	15	30	60
1.	T1(control)	4.29^{aA}±0.05	4.28^{bA}±0.05	4.28^{bA}±0.05	4.27^{bA}±0.04
2.	T2	4.33^{aB}±0.06	4.54^{aA}±0.06	4.55^{aA}±0.05	4.56^{aA}±0.04
3.	T3	4.39^{aA}±0.05	4.50^{bA}±0.06	4.52^{bA}±0.06	4.52^{aA}±0.06
4.	T4	4.42^{aA}±0.05	4.40^{abA}±0.04	4.40^{abA}±0.04	4.41^{abA}±0.03

Mean values with different superscripts between treatment (lowercase) and between interval (uppercase) differ significantly (P <0.05)

4. Conclusion

Galactagogues are medications that aid in initiating, maintaining, and augmenting of adequate milk production. *The present study was designed to test the galactagogue property of Asparagus racemosus (Shatavari),* Lipidium sativum *(Chandrasoor),* Leptadinia reticulata (Jivanti) *and* Nigella sativa (Kolongi*) in milking buffaloes as there is a need for substitutes in some other form and natural ways (such as herbs), which are considered as safe, cheap, locally available and at the same time they also improve production and reproduction performance of milch animals.* On detailed reviewing the experimental studies, it was found that T2 ***[***Lipidium sativum (Chandrasur) *and* Asparagus racemosus (Shatavari)***]***group was found to be best amongst all justifying the increased value of all *biochemical* parameters contributing in good health status of the animal throughout the age.

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