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Santosh Kumar
S.M.S. (Anim Science), LRC, National Dairy Research Institute, Karnal, Haryana, India

RK Meena
Assistant Professor, College of Agriculture, Bharatpur (SKNAU), Rajasthan, India

Corresponding Author:
Santosh Kumar
S.M.S. (Anim Science), LRC, National Dairy Research Institute, Karnal, Haryana, India

Effect of antenatal herb supplement on body weight gain of calves

Santosh Kumar and RK Meena

Abstract
Ante-natal care has long-term effects on offspring. Higher birth weight has an increased chance of survival, growth, maturity and lifetime productivity compared with those born below average birth weight. Fewer studies have been carried out on supplementation of *Asparagus racemosus* root powder in pregnant dairy cows and its effect on colostrum composition, calf birth weight and growth rate. The objective of the present study was to determine the effects of antenatal supplementation of herbal feed supplement (*Asparagus racemosus* root powder-ARRP) on colostrum composition, birth weight and body weight gain of Karan Fries calves. Pregnant Karan Fries cows (n=15) were grouped into three groups (PPS, PS and Control) based on equal body weight, expected producing ability (EPA) and parity. PPS (pre to postpartum supplementation) group supplemented ARRP 60 days prepartum to continue postpartum during the colostrum period (control diet + prepartum @ 100 mg/ kg body weight) to continue postpartum (@ 200mg/kg live body weight), whereas PS (Prepartum Supplementation) group were supplemented 60 days prepartum to up to calving (control diet + prepartum @ 100 mg/ kg body weight). The results were compared with the Control group (control diet + no supplementation). All pregnant Karan Fries cows were managed under similar housing, feeding standards and climatic conditions. The results of the present study revealed that prepartum dry matter intake among the group was similar, however, per day change in body weight was higher (p<0.05) in the supplemented group. Cows' body weight loss and total body weight at parturition were positively higher (P>0.05) but, total, as well as per day BW loss during the colostrum period, was lower (P>0.05) in the supplemented group. Supplementation of ARRP has a positive significant (p<0.05) effect on colostrum total protein (%), total solids (%), total immunoglobulin and SCC. Ante-natal supplementation of ARRP did not affect weight at birth (Control-29.00±2.86, PPS-29.40±1.72 and PS- 26.72±0.88 kg) however, reported total, as well as daily weight gain, was higher by 36.84% & 30.52% in PPS and PS group calf in comparison of control respectively.

Keywords: *Asparagus racemosus*, birth weight, body weight, crossbred calves

Introduction
Maternal nutrition is the major intrauterine environmental factor that alters the expression of the fetal genome and may have lifelong consequences on the growth and reproductive performance of calves and progeny of other mammals (Wu *et al*. 2004, Wu *et al*. 2006, Funston *et al*., 2010) [33-34, 6]. In all livestock species, including cattle, offspring born above average birth weight have an increased chance of survival compared with those born below average birth weight. Growth-restricted human infants are at risk of immediate postnatal complications and may be programmed to exhibit poor growth performance and develop significant diseases later in life (Barker *et al*., 1993; Godfrey and Barker, 2000) [1, 7]. Therefore, several prepartum interventions had been tried in past to improve calf health and birth weight through developmental programming refers to the programming of various bodily systems and processes by a stressor of the maternal system during pregnancy or the neonatal period (Wu *et al*., 2006, Funston *et al*., 2010, Zago *et al*. 2019) [34, 6, 35]. Improving livestock productivity through developmental programming in cattle is not well explored in India however, ancient medical practices 'Ayurveda' antenatal care has been given prime importance and elaborated as garbhini paricharya (ante-natal care) from conception to birth and post-birth by the nutritional regimen of food of mother. Ayurveda considers food to be the best source of nourishment as well as medication for the pregnant woman & described a nine-monthly diet for the growth of the foetus in the womb and at the same time ensures the health of the mother (Koppikar V. S. 2008, Shibani *et al.* 2017, Rajebhosale and Pallavi, 2019) [17, 28, 25]. *Asparagus racemosus* (Shatavari) root has been described as a safe herb even during pregnancy hence supplementation is recommended to maintain the proper health, growth and

development of the foetus and mother (Rasane and Bhangale, 2016, Meghna *et al*. 2019) [26, 19]. Recently, the beneficial effect of ARRP supplementation during pregnancy has been found to improve the birth weight (Bhosale *et al.*, 2000) [3] and post-parturition weight gain of the child (Gupta and Shaw, 2011) [10] and the number of live piglets at birth, litter weight at birth and reduced number of Mummified foetuses & stillborn piglets, duration of farrowing and incidence of dystocia in pigs (Kakati *et al*. 2019) [14] and body condition at parturition, colostrum composition and milk production (Kumar *et al*. 2014) [18] at a different dose of supplementation. Contrary to the above teratogenicity of methanolic extract of *Asparagus racemosus root*, has also been reported in the rat (Goel *et al.* 2006) [8]. Literature on the supplementation of *Asparagus racemosus* root powder in pregnant dairy cows and its effect on colostrum composition, calf birth weight and growth rate are scanty. Considering its importance during prepartum supplementation, the present study was undertaken to determine the effect of prepartum supplementation of *Asparagus racemosus* root powder to pregnant crossbred cows on colostrum composition, birth weight and body weight gain in the crossbred calf.

Materials and Methods

The experiment was conducted with approval of Institutional Animal Ethics Committee (Project No. B14) at the National Dairy Research Institute Farm, Karnal. Geographically NDRI livestock farm is situated at an altitude of 250 meters above the mean sea level in Indo-Gangetic alluvial plains at 29°42'N latitude and 72°02'E longitude under the subtropical climate with a maximum temperature of 45 °C during the summer months and whereas the minimum value falls to near the freezing point (0 °C) during winter months. The experimental site received average annual rainfall ranging from 760 to 960 mm distributed mostly July-August month. The relative humidity varies from 41 to 85 per cent.

Randomly selected pregnant Karan Fries cows(n=15), blocked equally by body weight, expected producing ability (EPA) and parity into three supplement groups of pre to postpartum supplementation (PPS), Prepartum Supplementation (PS) and Control. The PPS group supplemented ARRP 60 days prepartum to continue postpartum during the colostrum period (control diet + prepartum (@ 100 mg/ kg body weight to continue postpartum @ 200 mg/kg live body weight), whereas the PS group supplemented ARRP 60 days prepartum to up to calving (control diet + prepartum @ 100 mg/ kg body weight). Results were compared with the Control group (control diet + no supplementation).

To investigate the effect of dams supplemented with *ARRP* on body weight gain fifteen calves born from the above three treatment groups Control, PPS and PS of crossbred cows were separated immediately after birth. They were divided into three groups five in each and were fed as per the following schedule:

T1. Colostrum from non-supplemented dams of group C (Control)

T2. Colostrum from supplemented dams of the PPS group

T3. Colostrum from supplemented dams of PS Group

All calf of a different group of cows was fed colostrum of their respective dam up to 5 days of age. Thereafter, they were fed as per the standard NDRI calve feeding schedule. Weekly body weight gain of calves up to 60 days was recorded.

During the experiment period, all dams were fed as per NRC (1989) recommendation by using jowar and concentrate-based TMR, housed separately under loose housing and group management system brick on edges flooring. All cows were separated in calving pens from the rest of the herd 15 days before the expected date of parturition to single calving pens provided with ample space, proper ventilation and drainage, soft bedding and feeding and watering facilities. Weaning of calves was done immediately after calving.

To analyze the colostrum composition, about 100 ml of well-mixed colostrum samples of morning milking were collected daily for up to five days of colostrum period from each animal in a properly cleaned milk sample bottle and stored at -20^{0}C till further analysis. Colostrum fat was estimated every day colostrum of all cows by using Garber's method (ISI, 1977). Colostrum protein was analyzed as per Singhal and Des Raj (1989) [29] and Colostrum total solids (TS) were calculated by Gravimetric method and solid-Not Fat (SNF) value was obtained by subtraction of the percentage of fat from that of total solids. Colostrum total immunoglobulin was estimated by the Zinc sulphate turbidity test (Pfeiffer *et al*, 1977) [24].

Table 1: Plant secondary metabolites and proximate composition of *Shatavari* herbal feed supplement

Name of Phytochemical	% Content (%DM basis)
Total Phenolics	4.57
Total Tannin	3.68
OM	90.7
DM	93.2
CP	6.47
EE	0.35
Total Ash	2.50
Acid sol. Ash	0.43
NDF	38.14
ADF	13.40
Hemicellulose	24.74

Statistical analysis of data

The least square method (LSM) Analysis of Variance (ANOVA) technique was employed to estimate the effect of treatment on body weight gain in calves.

The model used for the growth performance of calves in LSM was

$$Y_{ijk} = \mu + A_i + B_j + e_{ijk}$$

Where,

Y_{ijk} = kth observation of milk yield/ reproduction/growth parameter measured on a calf given ith treatment at jth time.

μ = overall mean.

A_i = effect of ith treatment, (i=1, 2 & 3)

B_j = effect of jth time, (j = 1, 2, 3. for weekly data & daily data)

The Analysis of Variance (ANOVA) technique was employed to estimate the effect of treatment on Colostrum composition, and blood metabolites (Snedecor and Cochran,1989) [30].

Results and Discussion

Dry Matter Intake

Prepartum ARRP-supplemented animals did not tend to consume more DM during the prepartum period. The overall average values of DMI (kg/day) during -60 days to day zero

of parturition were 9.56±0.26, 10.25±0.29 and 9.89±0.27 in the control, PPS and PS groups, respectively. The results were in accordance with Mirzaei F. (2010) [20] who reported similar DMI intake in goats supplemented with ARRP-based herbal formulation. A decreasing trend was observed in the quantity of DM intake in all the groups from day -60 to the day of parturition. This trend was quite obvious that it is due to the advancement of pregnancy. During pregnancy, the foetus occupies most of the space in the abdominal cavity, causing pressure on the rumen and thereby the DM intake of animals was reduced from interval to interval (Khan, 2008) [16]. Tyagi, (2007) [32] also found that the DM intake was higher at -60 days of parturition and as the pregnancy advanced the DM intake decreased and was lowest on the day of parturition.

Prepartum Body Weight Change

Prepartum ARRP supplementation did not affect the prepartum total body weight gain while per day change in body weight was significantly (p<0.05) higher in the ARRP-supplemented PPS and PS group. Due to scanty literature results of the present study on body weight change could not be comparable with ruminants, however, it was in line with the previous study of Muralidhar *et al*. (1993) [21] who reported that the mean weight in rats receiving herbal formulation of *ARRP* increased significantly (p<0.05) than the control group during the gestation period. Similarly, the growth-promoting effect of *ARRP* during the gestation period was also reported by Sharma *et al*. (1986) [27] in rats.

Table 2: Mean (±SE) of prepartum and postpartum body weight change and birth weight in Karan Fries cows

Groups	Initial BW (kg)	Just before parturition (kg)	Total Bodyweight Change (kg)	Per day body weight Change (kg)	Total Body weight loss at Parturition (kg)	Calf wt % parturition loss	Calf wt % cows wt
Control	434.02±33.35	458.1±30.46	24.09±5.52	0.403a±0.101	50.90±5.15	57.36±3.70	6.46±0.78
PPS	435.0±22.02	474.8±7.84	39.77±6.24	0.628b±0.095	55.60±3.66	54.31±5.92	6.27±0.58
PS	442.8±25.29	478.9±0.94	36.16±7.19	0.627b±0.164	67.30±11.29	49.01±4.41	5.65±0.34

Means with different superscripts a, b within a column differs significantly (p<0.05)

Body weight change just after parturition and the colostrum period

Just after parturition, the average body weight in Control, control, PPS and PS were 407.20±21.38, 419.10±4.38 and 411.60±8.14 kg, respectively. At the time of parturition, the average total body weight losses in control, PPS and PS were 50.90±5.15, 55.60±3.66 and 67.30±11.29 kg, respectively. The average total body weight losses at parturition were slightly higher in supplemented PPS & PS, although, these differences were statistically not significant among the groups. Besides higher body weight loss at parturition, the mean body weight of supplemented groups was higher by 2.93% (11.9 kg) and 1.09% (4.4 kg) over the control group. It was also observed that out of the total body weight loss at parturition, the calf birth weight was only 57.36±3.70, 54.31±5.92 and 49.01±4.41 per cent, in the control, PPS and PS groups, respectively (Table 2), reflecting rest loss due to fetal adnexia (membranes and foetal fluids) was more in the PPS & PS than the control group. These minor differences were also not significant among the groups. Body weight just after parturition was more in PPS and PS groups seemed that *ARRP* supplementation tended to improve body energy reserves. There was not any teratogenicitic effect observed in the present study and the results agreed with the previous study by Muralidhar *et al*. (1993) [21].

Body weight loss during five days of the colostrum period was more prominent in PS as compared to PPS and control, which might be due to one case of twin birth and dystocia. The average total body weight loss and per day body weight losses in the Control, PPS and PS groups were 18.80±9.56, 10.70±1.84 & 20.60±6.12 kg and 3.76±1.91, 2.14±0.37 & 4.12±1.22 kg/day respectively. The result of body weight indicates that *ARRP* supplementation during the colostrums period reduced the extent of body weight loss but differences were not significant among the groups. Literature on the effect of *ARRP* supplementation on body weight change pre and during parturition is scanty to the best of my knowledge, but a similar trend in body weight change following feeding cationic or anionic diets has been reported in dairy cows by various authors (Kanna, 2007; Gulay *et al*. 2008) [15, 10]. Body weight loss at parturition is physiological owing to the expulsion of the fetus, fetal fluids and placenta (Brar and Nanda, 2007) [4] and the stress of parturition. The weight loss just after parturition is primarily due to the mobilization of body reserves for fulfilling the demands for maintenance and production of milk and low DMI (Grummer, 2006) [9]. The body weight loss was more prominent in PS supplemented group (Table 3) due to the incidence of twining and dystocia as reported in previous studies (Berry *et al*. 2007) [2]

Table 3: Mean (±SE) of postpartum complications and body weight change during the colostrum period in Karan Fries cows

Groups	Weight of Placenta (kg)	Time required for expulsion of the placenta (h)	% RFM	Twin + dystocia	Just after parturition (kg)	Total Body weight loss (kg)	Body weight loss (kg/day)
Control	3.94±0.34	5.4±1.1	60±21.91 (3)	0	407.20±21.38	18.80±9.56	3.76±1.91
PPS	3.36±0.36	2.4±0.05	20±17.89 (1)	0	419.10±4.38	10.70±1.84	2.14±0.37
PS	3.94±0.28	3.3±0.3	40±21.91 (2)	1+1	411.60±8.14	20.60±6.12	4.12±1.22

The figure in parenthesis indicates the number

Effect of ARRP Supplementation on colostrum composition

After parturition, the cows were milked twice daily and a sample of the first milking every day was collected and analyzed. The means of colostrum constituents i.e. fat, protein, SNF, total solid and total immunoglobulin and somatic cell counts in Karan Fries cows supplemented with and without *ARRP* were reported and found significant effects on colostrum protein, total solid and total immunoglobulin and somatic cell counts (Table 4). Higher protein and total immunoglobulin content have also been reported in crossbred dairy goats supplemented with polyherbal biostumulator (Mirzaei F. 2010) [20].

Table 4: Effect of ARRP supplementation on colostrum composition in Karan Fries cows

No. of Milking	Control	PPS	PS
Fat (%)	4.45±0.19	5.10±0.45	4.76±0.26
Protein (%)	7.98c±1.08	9.85a±1.27	9.24b±1.24
SNF (%)	12.93±1.00	13.63±1.32	13.30±1.21
Total Solids (%)	17.38b±0.95	18.73a±1.23	18.06ab±1.12
Total immunoglobulin (mg/ml)	29.68b±8.93	49.20a±11.80	45.27a±11.60
Somatic Cell Counts (×105 cells/ml)	1.13^{b}±0.11	0.69^{a}±0.07	0.97^{b}±0.06

Means with different superscripts a, b in a row differ significantly (p<0.05)

Birth and body weight gain in Calf

Birth wt. is not only an indicator of the newborn's health but also predictive of the child's future health. The effect of dam supplemented with *ARRP* during prepartum and colostrum period on body weight gain was observed in calves and results has been presented in Tables (5) showed that there was no significant (P>0.05) effect of ARRP supplementation on the birth weight of calves and a similar trend was reported for weekly body weight gain to 8th weeks of age. Average daily weight gain was reported 0.285, 0.390 and 0.372 kg/day in Control, PPS and PS groups respectively were numerically higher by 36.84 & 30.52 per cent in PPS and PS groups over the Control group. The result was in accordance with Mirzaei F. (2010) [20] who reported a positive effect of ARRP-based herbal formulation on the weaning weight of kids of crossbred goats. Weight at birth in the PS group was reported lowest due to the birth of twin calve had lower birth weight as compared to singletons (Olson *et al*. 2009, Hossein-Zadeh 2010, Dhakal *et al*. 2013) [23, 12, 5]

The higher weight gain in the calf of ARRP-supplemented groups may be correlated with the quality of colostrum. The present study reported that the quality of colostrum in terms of total protein and immunoglobulin was significantly higher in the colostrum of prepartum *ARRP*-supplemented cows. Furthermore, the values were more sustainable in the group in which *ARRP* was supplemented prepartum to continue the colostrum period which may lead to higher body weight gain as also reported by previous workers (Thu Hang *et al*. 2017) [31].

Table 5: Weekly body weight of calves of Karan Fries cows supplemented with and without *ARRP* during prepartum and colostrum period

Weeks	Calve of Control group cow	Calve of PPS group cow	Calve of PS group cow
0 day (Birth weight kg)	29.00±2.02	29.40±2.02	25.90±2.26
Mean BW (kg) at 8 weeks	36.00±1.25	40.92±1.25	36.96±1.50
Mean ADWG (kg) up to 8 weeks	0.285±0.05	0.390±0.05 (36.84)*	0.372±06 (30.52)*

*Figure in parenthesis indicates a percentage higher value over the control group.

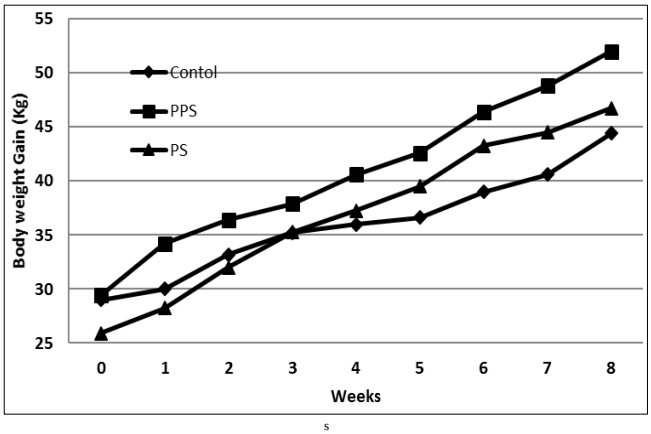

Fig 1: Weekly body weight of calves of Karan Fries cows supplemented with and without *ARRP* during prepartum and colostrum period

Conclusion

Based on the results, it is concluded that ante-natal supplementation of ARRP improves the body reserve of peri-parturient cow positively, did not impair the antenatal development, and improves body weight gain in calf by improving the colostrum quality, however, its needed further validation on large sample size.

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Reference

1. Barker DJP, Gluckman PD, Godfrey KM, Harding J, Owens JA, Robinson JS. Fetal nutrition and adult disease. Lancet. 1993;341:938-941.
2. Berry DP, Lee JM, Macdonald KA, Roche JR. Body condition score and body weight effects on dystocia and stillbirths and consequent effects on post-calving performance. J Dairy Sci. 2007;9:4201-4211. doi:10.3168/jds.2007-0023
3. Bhosale L, Padia D, Malhotra H, Thakkar D, Palep HS, Algotar KM. Capsule Sujat for comprehensive antenatal care and prevention of pregnancy induced hypertension. Bombay Hospital Journal, 2000, 42(1). http://www.bhj.org.in/journal/2000_4201_jan00/original_136.htm
4. Brar PS, Nanda AS. Effect of prepartum supplementary feeding of urea molasses multi-nutrient block on postpartum production and fertility in dairy buffaloes. Indian J. Anim. Sci. 2007;77(10):965-969.
5. Dhakal K, Maltecca C, Cassady JP, Baloche G, Williams CM, Washburn SP.Calf birth weight, gestation length, calving ease, and neonatal calf mortality in Holstein, Jersey, and crossbred cows in a pasture system. J. Dairy Sci. 2013;96:690–698. Access from https://reader.elsevier.com/reader/sd/pii/S002203021200

7734?token=DC474F84416999F962F4BE3A4F662A3BA5CA0DC1F3733F3B20BE768CB2B3254958E6C644BF657811BC93D1A44A8C0A41
6. Funston RN, Larson DM, Vonnahme KA. Effects of Maternal Nutrition on Conceptus Growth and Offspring Performance: Implication for Beef Cattle Production. J Anim. Sci. 2010;88:E205-E215.
7. Godfrey Keith M, Barker David JP. Fetal nutrition and adult disease, The American Journal of Clinical Nutrition. 2000;71(5):1344S-1352S.
8. Goel RK, Prabha T, Kumar MM, Dorababu M, Prakash H, Singh G. Teratogenicity of Asparagus racemosus Willd. Root, a herbal medicine. Indian J of Exp. Biol. 2006;44(7):570-573.
9. Grummer RR. Optimisation of transition period energy status for improved health and reproduction. Proceedings of XXIV World Buiatrics Congress 15-19 Oct. 2006. Nice, France; c2006.
10. Gulay MS, Hayen MJ, Bachman KC, Head HH. Prepartum feeding of cationic and anionic diets to Holstein cows given 30 to 60 day dry periods: comparison of dry matter intake, physiological measures and milk production. Asian- Aust. J. Anim. Sci. 2008;21(1):83-89.
11. Gupta M, Shaw B. A Double-Blind Randomized Clinical Trial for Evaluation of Galactogogue Activity of Asparagus racemosus Willd. Iran J Pharm Res. 2011;10(1):167-172. Access from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3869575/
12. Hossein-Zadeh NG. The effect of twinning on milk yield, dystocia, calf birth weight and open days in Holstein dairy cows of Iran. J Anim Physiol Anim Nutr (Berl). 2010;94(6):780-787. doi:10.1111/j.1439-0396.2009.00963.x
13. ISI. Determination of fat by Gerber method. IS: 1224, Part I. Milk. BIS, New Delhi. 1977.
14. Kakati LJ, Kalita G, Hmar L, Samanta AK, Tolenkhomba TC, Das H, *et al*. Effect of Dietary Supplementation of Shatavari (*Asparagus racemosus*) Root Powder on Reproductive Performance of Large White Yorkshire Sow. International Journal of Livestock Research. 2019;9(2):110-113. DOI- http://dx.doi.org/10.5455/ijlr.20180801062915
15. Kanna P Rajesh. Effect of body condition score on metabolic and oxidative status in preparturient cows. MSc. Thesis submitted to NDRI (Deemed University), Karnal, Haryana, India. 2007.
16. Khan HM. Prepartum and postpartum managemental interventions for improving reproductive performance in Murrah buffaloes. PhD thesis. Submitted to NDRI (Deemed University), Karnal, Haryana, India. 2008.
17. Koppikar VS. Garbhini Paricharya (Regimen for the pregnant woman). Ancient Science of life. 2008;28(1):37-39.
18. Kumar S, Mehla RK, Singh M. Effect of Shatavari (Asparagus racemosus) on milk production and Immune-modulation in Karan Fries crossbred cows. IJTK. 2014;13(2):404-408. Access from http://nopr.niscair.res.in/bitstream/123456789/27936/1/IJTK%2013%282%29%20404-408.pdf
19. Meghna PP, Surendran Emy, Sumedhan Varsha J, Sinimol TP. A critical review of Garbhini Ksheerapakas mentioned in Ayurvedic texts of Kerala. Journal of Ayurveda and integrated medical sciences. 2019;4(3):55-58. access from https://www.myresearchjournals.com/index.php/JAIMS/article/view/15862/14809
20. Mirzaei F. Evaluation of efficacy of polyherbal bio stimulator supplementation on performance of cross-bred dairy goats. PhD thesis, submitted to NDRI (Deemed University), Karnal, Haryana, India; c2010.
21. Muralidhar TS, Gopumadhavan S, Chauhan BL, Kulkarni RD. Lack of teratogenicity after administration of d-400, an oral hypoglycemic ayurvedic formulation, during gestation and lactation. J Biol. Chem. Res. 1993;12(3-4):151-156.
22. National Research Council (NRC), Nutrient requirement of dairy cattle. 6th Nov. Ed. National Academy Science, Washington, DC, USA; c1989.
23. Olson KM, Cassell BG, McAllister AJ, Washburn SP. Dystocia, stillbirth, gestation length, and birth weight in Holstein, Jersey, and reciprocal crosses from a planned experiment. J Dairy Sci. 2009;92:6167-6175. Access from https://reader.elsevier.com/reader/sd/pii/S0022030209713347?token=42914B5DADD89B1365FCBF57F67EC4B8EE80CC2A4AA08C008811653373CD2F0A262EB93BA20BC3BED6A8D793843F1F15
24. Pfeiffer NE, McGuire TC, Bendel RB, Weikel JM. Quantitation of Bovine immunoglobulins: Comparision of single immunodiffusion, Zinc Sulphate turbidity, Serum electrophoresis and refractometer methods. American J Vet. Res. 1977;38(5):693-698.
25. Rajebhosale SB, Pallavi P. Regimen For The Pregnant Woma. Aayushi International Interdisciplinary Research Journal (AIIRJ). 2019;6(3):85-88. access from https://www.aiirjournal.com/uploads/Articles/2019/03/3660_21.Suchita%20B.%20Rajebhosale%20&%20Panhale%20Pallavi.pdf
26. Rasane SR, Kirti Tushar Bhangale KT. Garbhini Paricharya according to various Samhita. Med Pulse International Journal of Ayurveda. 2016, 1(1). access from https://www.medpulse.in/Ayurveda/Article/Volume1Issue1/Ayurveda_1_1_2.pdf
27. Sharma S, Dahanukar S, Karandikar SM. Effects of long-term administration of the roots of ashwagandha (*Withania somnifera*) and shatavari (*Asparagus racemosus*) in rats. Indian Drugs. 1986;23:133-139.
28. Shibani D, Kamini D, Rout S Prasad. Garbhini Paricharya (Ante-Natal Care) – View of Harita Samhita (A Treatise Of 10th Century). Indo-American Journal of Pharmaceutical Research. 2017, 7(07). Access from https://iajpr.com/archive/volume-7/july-2017#
29. Singhal OP, Desraj. New approach for chemical quality assurance. Indian Dairyman. 1989;41:43-47.
30. Snedecorm GW, Cochran WG. Method of statistical analysis. Oxford and I.B.H. Publication Co. Calcutta, Bombay, Delhi; c1989.
31. Thu Hang BP, Dicksved J, Sjaunja KS, Wredle E. Colostrum quality, IgG absorption and daily weight gain of calves in small-scale dairy production systems in Southern Vietnam. Trop Anim Health Prod. 2017;49(6):1143-1147. doi:10.1007/s11250-017-1308-6
32. Tyagi N. Milk production and reproductive performance

of cows fed on bypass fat supplemented ration. PhD thesis, submitted to NDRI (Deemed University), Karnal, Haryana, India; c2007.
33. Wu G, Bazer FW, Cudd TA, Meininger CJ, Spencer TE. Maternal nutrition and fetal development. Journal of Nutrition. 2004;134(9):2169-2172.
34. Wu G, Bazer FW, Wallace JM, Spencer TE. Board-invited review: intrauterine growth retardation: implications for the animal sciences. Journal of Animal Science. 2006;84(9):2316-2337.
35. Zago D, Canozzi M, Barcellos J. Pregnant cow nutrition and its effects on foetal weight: A meta-analysis. The Journal of Agricultural Science. 2019;157(1):83-95. doi:10.1017/S0021859619000315