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SHORT COMMUNICATION

Biochemical Profile of Cervico-Vaginal Mucus in Relation to Fertility in Crossbred Cows and Heifers

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ABSTRACT

This study was carried out on cows (n=20) and heifers (n=20) belonging to the Dairy farm of College of Veterinary Science and Animal Husbandry, Mhow and clinical cases of progressive farmers brought for artificial insemination to the Teaching Veterinary Clinical Complex and at the doorstep of farmers in nearby villages. The cervico-vaginal mucus samples were collected from the animals at oestrus and were preserved at -20°C for biochemical parameter analysis. Biochemical profile revealed that the mean value of total protein was significantly higher in conceived than that of non-conceived crossbred cows and heifers, whilst peroxidase activity and sialic acid count were significantly lower in conceived than that of non-conceived crossbred cows and heifers. Pregnancy was confirmed by rectal palpation after 2 months of insemination.

Keywords: Crossbred cows, Heifers, Oestrus, Cervico-vaginal mucus (CVM), Biochemical profile

Oestrus, the most visible phase of the oestrous cycle is characterized by nervousness, bellowing and mounting, stands to be mounted by another cow, reduced feed intake and milk production. Fertility of a dairy cow is the ability of the animal to conceive and maintain pregnancy if served at the appropriate time in relation to ovulation. Lack of determination of oestrus sign causes lowers bovine productivity and fertility resulting in significance economic loss to the dairy industry. This study was planned to determine the fertility with biochemical profile in crossbred cows and heifers.

The study was carried out on cows and heifers belonging to the Dairy farm of College of Veterinary Science and Animal Husbandry, Mhow and clinical cases of progressive farmers brought for artificial insemination to the Teaching Veterinary Clinical Complex and at the doorstep of farmers in nearby villages. All the crossbreed cows (n=20) and heifers (n=20) included in this study were apparently healthy, cyclical having no palpable reproductive clinical abnormality on two consecutive rectal palpations, 10 days apart and were negative to white side test to rule out subclinical endometritis and were divided into groups as 1A, 1B, 2A and 2B which is consists of 10 animals in each group. Pregnancy was confirmed by rectal palpation after 2 months of insemination. The cervico-vaginal mucus samples were collected from the animals at oestrus and were preserved at -20°C for biochemical parameter analysis. Total protein was estimated by the method of Lowry *et al*. (1951), peroxidase activity was estimated by α-Napthol- Benzidine method as described by Katsushima and Arakawa (1961) and sialic acid was estimated by the technique narrated by Werner and Odin (1952). The data was analyzed as per the standard statistical method by employing student's t-test (Snedecor and Cochran, 1994).

Biochemical changes, viz., total protein, peroxidase activity and sialic acid count of CVM in conceived and non-conceived crossbred cows and heifers at oestrus are presented in Table 1.

The mean total protein concentrations (mg/ml) of cervico-vaginal mucus in conceived crossbred cows and heifers

were observed in different groups (1A, 1B, 2A and 2B) at oestrus as 42.87±0.42, 41.08±0.46, 42.40±0.56 and 41.20±0.38, respectively, whereas, in non-conceived crossbred cows and heifers, these values were found to be 38.76±0.43, 37.10±0.80, 38.05±0.15 and 37.57±0.98, respectively, with the difference being highly significant (P<0.01) in all the conceived and non-conceived groups (Table 1).

The mean total protein concentrations (42.62±0.35 mg/ml) of cervico-vaginal mucus in conceived crossbred cows. Similar findings were reported in Rural crossbred cows at oestrus by Gavit (2010), 4.23±0.04 g/dl and in buffaloes by Jethva (2010), 4.32±0.05 g/dl, whereas, comparatively higher values were reported in cows by Shukla and Sharma (2006) 8.12±0.23 g per cent. However, comparatively lower values were reported in crossbred cows by Shankar *et al*. (1984), 485.67±48.32 mg per 100ml and Manjunatha *et al*. (2001), 1.04±0.65 g/dl; in cows by Salphale *et al*. (1993), 456.00±0.06 mg per 100ml and Sood *et al*. (2000), 0.200±0.03 mg/dl; in Kankrej cows by Modi (2007), 3.52±0.18 g/dl, whereas, in buffaloes by Bugalia and Sharma (1998), 4.89±0.28 mg/ml and Sharma *et al*. (2013), 7.10±0.50 mg/ml during oestrus.

The mean total protein concentrations (38.48±0.29 mg/ml) of cervico-vaginal mucus in non-conceived crossbred cows were very close to those reported in Rural crossbred cows at oestrus by Gavit (2010), 3.89±0.04 g/dl, whereas, comparatively higher values were reported in cows by Shukla and Sharma (2006) 6.23±0.14 g per cent. However, comparatively lower values were reported in crossbred cows by Shankar *et al*. (1984), 450.00±59.62 mg per 100ml and Manjunatha *et al*. (2001), 1.02±0.04 g/dl; in cows by Salphale *et al*. (1993), 408.00±0.05 mg per 100ml and Sood *et al*. (2000), 0.120±0.01 mg/dl; in Kankrej cows by Modi (2007), 2.70±0.05 g/dl, whereas, in buffaloes by Bugalia and Sharma (1998), 4.42±0.20 mg/ml; Jethva (2010), 3.39±0.04 g/dl and Sharma *et al*. (2013), 6.20±0.23 mg/ml during oestrus.

The mean total protein concentrations (41.14±0.28 mg/ml) of cervico-vaginal mucus in conceived crossbred heifers were observed very close to that reported in buffalo heifers at oestrus by Jethva (2010), 4.14±0.14 g/dl, whereas, comparatively higher values were reported in cows by Shukla and Sharma (2006) 8.12±0.23 g per cent and in Rural crossbred cows by Gavit (2010), 4.23±0.04 g/dl. However, comparatively lower values were reported

Table 1: Group wise mean (±SE) distribution of biochemical attributes of cervico-vaginal mucus in conceived and non-conceived crossbred cows and heifers

Sl. No.	Groups		Per cent (Animals)	Biochemical attributes (Mean ± SE)		
				Total Protein (mg/ml)	Peroxidase activity (u/g)	Sialic acid (ug/100mg)
1	1A	Conceived	70.00 (7)	42.87±0.42**	21.78±0.74*	33.47±1.23*
	(n=10)	Non-conceived	30.00 (3)	38.76±0.43*	34.97±0.45**	41.77±1.66**
2	1B	Conceived	60.00 (6)	41.08±0.46**	19.38±0.28*	30.33±0.73*
	(n=10)	Non-conceived	40.00 (4)	37.10±0.80*	29.25±0.49**	34.40±0.67**
3	2A	Conceived	80.00 (8)	42.40±0.56**	25.66±1.47*	37.59±0.77*
	(n=10)	Non-conceived	20.00 (2)	38.05±0.15*	37.76±2.34**	43.60±0.67**
4	2B	Conceived	60.00 (6)	41.20±0.38**	20.48±0.62*	32.56±0.89*
	(n=10)	Non-conceived	40.00 (4)	37.57±0.98*	32.76±1.53**	38.85±1.25**
Pooled CB cows (n=20)		Conceived	75.00 (15)	42.62±0.35**	23.85±0.97*	35.66±0.87*
		Non-conceived	25.00 (5)	38.48±0.29*	36.08±1.03**	42.50±1.11**
Pooled Heifers (n=20)		Conceived	60.00 (12)	41.14±0.28**	19.93±0.36*	31.44±0.64
		Non-conceived	40.00 (8)	37.33±0.59*	31.00±0.99**	36.63±1.06**
Overall (n=40)		Conceived	67.50 (27)	41.69±0.27**	22.11±0.67*	33.79±0.69*
		Non-conceived	32.50 (13)	37.77±0.40*	32.96±1.00**	38.88±1.11**

Figures in parentheses indicate number of animals; *The means bearing superscripts in column differ significantly (P<0.05) and ** (P<0.01).

in crossbred cows by Shankar *et al*. (1984), 485.67±48.32 mg per 100ml and Manjunatha *et al*. (2001), 1.04±0.65 g/dl; in cows by Salphale *et al*. (1993), 456.00±0.06 mg per 100ml and Sood *et al*. (2000), 0.200±0.03 mg/dl; in Kankrej cows by Modi (2007), 3.52±0.18 g/dl, whereas, in buffaloes by Bugalia and Sharma (1998), 4.89±0.28 mg/ml and Sharma *et al*. (2013), 7.10±0.50 mg/ml during oestrus.

The mean total protein concentrations (37.33±0.59 mg/ml) of cervico-vaginal mucus in non-conceived crossbred heifers were lower as compared to those reported in cows at oestrus by Shukla and Sharma (2006) 6.23±0.14 g per cent and in Rural crossbred cows by Gavit (2010), 3.89±0.04 g/dl. However, comparatively lower values were reported in crossbred cows by Shankar *et al*. (1984), 450.00±59.62 mg per 100ml and Manjunatha *et al*. (2001), 1.02±0.04 g/dl; in cows by Salphale *et al*. (1993), 408.00±0.05 mg per 100ml Sood *et al*. (2000), 0.120±0.01 mg/dl; in Kankrej cows by Modi (2007), 2.70±0.05 g/dl, whereas, in buffaloes by Bugalia and Sharma (1998), 4.42±0.20 mg/ml; Jethva (2010), 3.41±0.04 g/dl and Sharma *et al*. (2013), 6.20±0.23 mg/ml during oestrus.

The mean peroxidase activity (U/g) of cervico-vaginal mucus in conceived crossbred cows and heifers was found in different groups (1A, 1B, 2A and 2B) at oestrus to be 21.78±0.74, 19.38±0.28, 25.66±1.47 and 20.48±0.62, whereas, in non-conceived crossbred cows and heifers the activity was observed as 34.97±0.45, 29.25±0.49, 37.76±2.34 and 32.76±1.53, respectively (Table 1).

The mean peroxidase activity (23.85±0.97 U/g) of cervico-vaginal mucus in conceived crossbred cows was higher as compared to those as reported in buffalo heifers at oestrus by Prasad *et al*. (1980), 20.11±1.08 U/g, whereas, in non-conceived crossbred cows, the mean peroxidase activity was 36.08±1.03 U/g, with the difference being significant (P<0.01) lower in conceived than non-conceived crossbred cows. Srivastava *et al*. (2000) concluded that cervical mucus peroxidase affected pregnancy significantly.

The mean peroxidase activity (19.93±0.36 U/g) of cervico-vaginal mucus in conceived crossbred heifers was found lower as compared to the values reported by Prasad *et al*. (1980), 20.11±1.08 U/g in buffalo heifers at oestrus, whereas, in non-conceived crossbred heifers the mean peroxidase activity was 31.00±0.99 U/g, with the difference being significant (P<0.01) lower in conceived than non-conceived crossbred heifers.

The mean sialic acid concentrations (µg/100mg) of cervico-vaginal mucus in conceived crossbred cows and heifers were observed in different groups (1A, 1B, 2A and 2B) at oestrus as 33.47±1.23, 30.33±0.73, 37.59±0.77 and 32.56±0.89, whereas, in non-conceived crossbred cows and heifers, these values were found to be 41.77±1.66, 34.40±0.67, 43.60±1.49 and 38.85±1.25, respectively (Table 01).

The mean sialic acid concentrations (35.66±0.87 µg/100mg) of cervico-vaginal mucus in conceived crossbred cows were observed lower as compared to those reported in buffaloes by Vadodaria (1987), 9.67±0.10 mg per cent. However, comparatively lower values were reported in crossbred cows by Agrawal and Datta (1976), 32.10±9.10 µg/100mg, whereas, in non-conceived crossbred cows the mean concentration of sialic acid was observed as 42.50±1.11 µg/100mg that was lower as compared to the values reported in buffaloes by Vadodaria (1987), 12.38±0.47 mg per cent, with the difference being significant (P<0.01) lower in conceived than in non-conceived crossbred cows.

The mean sialic acid concentrations (31.44±0.64 µg/100mg) of cervico-vaginal mucus in conceived crossbred heifers were found lower as compared to the values reported by Vadodaria (1987), 9.67±0.10 mg per cent in buffaloes, whereas, in non-conceived crossbred heifers the mean concentration of sialic acid was observed as 36.63±1.06 µg/100mg that was lower as compared to the values reported by Vadodaria (1987), 12.38±0.47 mg per cent in buffaloes, with the difference being significant (P<0.01) lower in conceived than non-conceived crossbred heifers.

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REFERENCES

Agrawal, S.C. and Datta, I.C. 1976. Sialic acid and hexosamine concentrations in cervical mucus in different breeds of cows and buffalo at oestrus. *J. Reprod. Fertil.*, **48**: 363-364.

Bugalia, N.S. and Sharma, R.D. 1998. Biochemical milieu of cervical mucus in fertile and infertile buffaloes. *Indian Vet. J.*, **75**: 567-568.

Gavit, S.K. 2010. Studies on physico-biochemical characteristics of oestrual cervico-veginal mucus with reference to body condition score and fertility in rural crossbred cows. M.V.Sc. thesis (Gynaecology and Obstetrics), Anand Agricultural University, Anand.

Jethva, P.K. 2010. Studies on physico-biochemical characteristics of oestrual cervico-veginal mucus with reference to body condition score and fertility in rural buffaloes. M.V.Sc. thesis (Gynaecology and Obstetrics), Anand Agricultural University, Anand.

Katsushima, N. and Arakwa, T. 1961. A method for colorimetric estimation of peroxidase in serum or plasma. *Tohoku J. Exp. Med.*, **75**: 238-242.

Lowry, O.H., Rosebrough, N.J., Farr, A.L. and Randall, R.J. 1951. Protein measurement with the Folin phenol reagent. *J. Biol. Chem.*, **193**: 265-275.

Manjunatha, R., Mahmood, S., Kumar, H., Singh, R. and purbey, L.N. 2001. Serum and oestrual cervical mucus biochemical profile during oestrous cycle in repeater crossbred cows. *Indian Vet. J.*, **78**: 710-713.

Modi, L.C. 2007. Studies on biochemical profiles of blood serum and cervical mucus in repeat breeding Kankrej cows. M.V.Sc. Thesis submitted to Gujarat Agricultural University, S.K. Nagar.

Prasad, A., Bachlaus, N.K., Arora, R.C. and Pandey, R.S. 1980. Protein Concentration, Phosphatases & Peroxidase in Cervical Mucus of Buffalo Heifers during oestrous Cycle. *Indian J. Exp. Biol.*, **18**(3): 251-253.

Salphale, G.V., Kadu, M.M., Fasihuddin, M. and Kadu, M.S. 1993. Study of some physical properties of estrual cervical mucus in synchronized normal and repeat breeder crossbred cows with special reference to fertility. *Indian J. Anim. Reprod.*, **14**(2): 77-78.

Shankar, U., Sharma, M.C., Varma, R.P. and Gupta, O.P. 1984. Physico-biochemical studies of cervical mucus in cyclic and repeat breeding cross bred cattle. *Indian J Anim. Reprod.*, **4**(2): 42-44.

Sharma, V., Prasad, S. and Gupta, H.P. 2013. Studies on physical and rheological properties of cervico-vaginal mucus during early pregnancy in buffaloes (*Bubalus bubalis*). *Vet. world*, **6**(8): 508-511.

Shukla, S.P. and Sharma, R.D. 2006. Studies on biochemical changes in the uterine fluid of repeat breeding crossbred cows. *Indian J. Anim. Reprod.*, **27**(1): 21-22.

Snedecor, G.W. and Cochran, W.G. 1994. Statistical Methods, 7th Edition, Oxford and IBH Publishing Company, New Delhi, India, pp 312-317.

Sood, P., Vasishta, N.K., Singh, M.M and Nigam, J.M. 2000. Relationship of certain biochemical attributes in cervical mucus with conception rate in cows. *Indian J. Anim. Reprod.*, **21**(1): 57-58.

Srivastava, K., Shanker, U., Agarwal, S.K. and Sahni, K.L. 2000. Effect of oestrus cervical mucus peroxidase and fern pattern on fertility in crossbred cows. *Indian J. Anim. Sci.*, **70**(8): 807-809.

Vadodaria, V.P. 1987. Physico-biochemical profile of oestrual cervical mucus congenital for conception in buffaloes and heifers of Mehsani breed. Ph.D Thesis submitted to Gujarat Agricultural University, S.K. Nagar.

Werner, I. and Odin, L. 1952. On the presence of sialic acid in certain glycoproteins and in gangliosides. *Acta Soc. Bot. Pol.*, **57**: 230-235.