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EFFECT OF PRE-MILKING MANUAL TACTILE TEAT STIMULATION ON PRODUCTIVE PERFORMANCE IN CROSSBRED CATTLE

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ABSTRACT

The objective of this study was to find out the effect of pre-milking manual tactile teat stimulation on productive performance in crossbred cattle. Twelve apparently healthy cross bred cows were randomly selected and divided into three treatments groups (6 in each group) namely T_1, T_2 and T_3 based on pre-milking manual tactile teat stimulation for one minute, two minutes and three minutes, respectively. Milk yield and main milking phase time were significantly ($p < 0.05$) higher in treatment group T_2 as compared to groups (T_1&T_3). Total milking time was significantly ($p < 0.05$) higher in treatment groups T_2 & T_3. Average milk flow rate and SNF were significantly ($p < 0.05$) higher in treatment group T_1 as compared to T_2 and T_3. Fat percentage was significantly ($p < 0.05$) higher in treatment group T_1 and T_3 as compared to T_2. Protein was significantly ($p < 0.05$) higher in T_2 & T_3 as compared to T_1. Milk yield, main milking phase time and total milking time were better when udder was stimulated for two minutes before milking and fat and SNF percentage were better when udder was stimulated either for one minute before milking.

INTRODUCTION

The success of dairy farm depends on profitable production of high quality milk. The milking management is considered as one of the most important and crucial activities at dairy farm having a profound bearing on the farm production efficiency and profitability.The milking of dairy animals regularly,completely,cleanly,gently,quickly and with minimum deployment of manpower have been enunciated as the cardinal principles of efficient milking management. Pre-milking tactile teat stimulation is important to enhance the activity of neuroendocrine mechanism in dairy cows. Good pre-milking stimulation improved the milking performance of cows than no stimulation (Hamann and Dodd, 1992). A one to three minute pre-milking udder stimulation causes increased milk yield and reduction in milking time (Bissell *et al.,* 2014). Tactile teat stimulation resulting in release of oxytocin hormone which causes contraction of alveoli and myoepithelial cells resulted in milk secretion (Bruckmaier and Blum, 1996). It causes forcing the expulsion of the milk into the cisternal compartment (Bruckmaier and Blum, 1998). 10 to 20 seconds of tactile stimulation is sufficient to elicit oxytocin secretion in high producing cows (Ruegg *et al.,* 2000). However differences were observed between species in the physiology of milk ejection reflex (Ellendorff *et al.,*1982). It has been reported that buffaloes have the problem of disturbed milk ejection and rapid termination of lactation in early stages (Ragab, 1975; Pathak,1992). In cross bred cow a reduced dependence of the milk ejection reflex was observed (Akers, 2002). Pre-milking udder stimulation results in increased milk yield in early and late lactation (Bishist and Kamboj, 2010). Bruckmaier (2005) indicated that a short pre-stimulation time would increase stall capacity. A stimulation of at least 20 seconds and a total prep-lag time of 60 seconds increased the average flow rate (Reneau and Chastain, 1995).

In conclusion, in all milk production systems, the maximal possible reduction of stress has to be targeted and proper udder pre-stimulation must be performed for an optimal milking of the cow by the farmer. It is therefore apparent that the different treatments of udder stimulation activities have special physiological purposes. Proper pre-milking udder stimulation is essential for the optimum production of quality milk. Considering the significance of udder stimulation in cows towards enhancement in milk yield and quality production of milk the present investigation was carried out to find the effect of pre-milking manual tactile teat stimulation on productive performance in crossbred cattle.

MATERIALS AND METHODS

The present experiment was conducted in dairy farm of Sam Higgnibottom Institute of Agriculture, Technology and Sciences, Allahabad. All crossbred cows were subjected to Californian Mastitis Test (CMT) and positive reactors were discarded. Twelve apparently healthy crossbred cows free

from any noticeable injuries on udder and kept under similar management condition were randomly selected. Sanitary measures like clipping of long hair on the udder and flank, cleaning of dairy barns, washing of udder and teats with clean water before milking were adopted. All animals were maintained under scientific tail to tail feeding and management system. Cows were milked by dry full hand diagonal method of milking (Singh and Prasad, 1987).

Three different treatment groups (4 cows in each group) for experiment were as follows:

T_1: Udder of cows stimulated for one minute before milking.

T_2: Udder of cows stimulated for two minutes before milking.

T_3: Udder of cows stimulated for three minutes before milking.

Cows were milked by full hand method of milking. Milk yield of experimental animals was recorded also main milking phase time by means of stopwatch (Actual time require for milking), total milking time (Treatment + Actual milking time), average milk flow rate calculated based on observation noted and representative sample of 200 ml milk was collected directly into sterilized conical flasks of 250 ml capacity and cotton plugs were replaced immediately. Samples were brought to the laboratory for determination of per cent fat, protein, lactose, ash, solid not fat (SNF), acidity and specific gravity. Fat per cent was determined by using Gerber method as per IS: (1224) (Part-II), 1977. Protein per cent was determined by formal titration method described by (Korprich, 1946). Lactose per cent was determined according to method stated by Barnett and Nawab (1957) and Marier and Boulet (1959). Total ash per cent of milk samples was estimated as per the procedure recommended by BIS IS: (7874) (Part-I), 1976. Solids Not Fat (SNF) was determined by Richmond's formula. TS percent was determined by gravimetric method as per IS: (1479) (Part-II), 1961. Lactometer was used for determination of specific gravity (Murphy and Boor, 2000). Acidity was determined as per (AOAC, 2005).

Data were statistically analyzed by one-way ANOVA and results were expressed as mean ± SE. Means were compared using Tukey's multiple comparisons test. The statistical package of Graph pad prism, San Diego, USA was used for analyzing the data.

RESULTS AND DISCUSSION

The average of various milk parameters is presented in Table 1. The average milk yield in groups T_1, T_2 and T_3 was 4.45 ± 0.23, 5.19 ± 0.22 and 3.11 ± 0.21, respectively. This finding is similar to the finding of Bissell *et al*. (2014) who suggested a one to three minute pre-milking udder stimulation. Average milk yield was significantly ($P<0.05$) higher in T_2 with two minute stimulation as compared to T_1 and T_3. Contrary to this report Mayer (1985) found 0.5 to 1 minute pre-milking udder stimulation is sufficient for maximum removal of milk. Philip (1986) found that pre-milking udder stimulation till milk let

Table 1 : Milk parameters in groups T_1, T_2 and T_3

	T_1	T_2	T_3
Milk yield (Kg/day)	4.45 ± 0.23^b	5.19 ± 0.22^a	3.11 ± 0.21^c
Main milking phase time (min)	2 ± 0.10^b	2.33 ± 0.10^a	1.4 ± 0.09^c
Total milking time (min)	3 ± 0.10^b	4.33 ± 0.10^a	4.40 ± 0.0^a
Average milk flow rate kg/min	1.48 ± 0.02^a	1.20 ± 0.02^b	0.71 ± 0.03^c
Fat (%)	4.11 ± 0.15^a	3.59 ± 0.12^b	4.12 ± 0.20^a
Protein	3.28 ± 0.03^b	3.34 ± 0.02^a	3.37 ± 0.03^a
Lactose	4.77 ± 0.04	4.78 ± 0.06	4.70 ± 0.04
Ash	0.68 ± 0.00	0.68 ± 0.00	0.67 ± 0.00
SNF	8.61 ± 0.1^a	8.5 ± 0.09^b	8.5 ± 0.07^b
Total solids	12.51 ± 0.15	12.84 ± 0.27	12.39 ± 0.09
Acidity	0.13 ± 0.00	0.14 ± 0.00	0.14 ± 0.00
Specific gravity	1.03 ± 0.00	1.03 ± 0.00	1.03 ± 0.00

Means bearing superscripts in lower case letter in row differ significantly ($p<0.05$).

Table 2 : Correlation among milk parameters in group T_1

	MMPT	TMT	AMFR	F	P	L	A	SNF	TS	AD
MY	0.90**									
TMT	0.90**									
AMFR	0.90**	0.90**								
F	-0.25	-0.25	-0.26							
P	0.01	0.01	0.01	-0.27						
L	0.14	0.14	0.14	0.04	-0.51*					
A	0.02	0.02	0.01	0.19	0.08	0.21				
SNF	-0.09	-0.09	-0.08	0.46*	-0.23	0.12	0.07			
TS	0.38	0.38	0.38	0.08	-0.34	0.61**	0.31	0.08		
AD	0.03	0.04	0.02	0.50*	-0.13	-0.01	0.06	0.7**	0.08	
SG	-0.21	-0.2	-0.2	0.15	-0.3	0.19	0.12	0.18	0.27	0.24

**Correlation is significant at the 0.01 level ($p < 0.01$). *Correlation is significant at the 0.05 level ($p < 0.05$).

MY = Milk yield (Kg/day); MMP = Main milking phase time (min); TMT = Total milking time (min); AMFR = Average milk flow rate kg/min; F = Fat (%); TS = Total solids; P = Protein; L = Lactose; A = Ash; SNF = Solid Not Fat; AD = Acidity; SG = Specific gravity

Table 3 : Correlation among milk parameters in group T_2

	MMPT	TMT	AMFR	F	P	L	A	SNF	TS	AD
MY	0.99**									
TMT	0.99**									
AMFR	0.90**	0.98**								
F	-0.75*	-0.75	-0.72*							
P	-0.18	-0.18	-0.16	0.22						
L	-0.20	-0.20	-0.22	0.11	-0.22					
A	0.38	0.38	0.39	-0.20	-0.33	0.15				
SNF	-0.24	-0.24	-0.21	0.17	-0.11	0.30	0.20			
TS	0.21	0.21	0.18	-0.27	-0.20	-0.09	-0.02	-0.01		
AD	-0.45*	-0.45*	-0.46*	0.58*	0.01	0.16	-0.09	0.18	-0.01	
SG	0.42	0.42	0.37	-0.53	-0.17	-0.39	0.00	-0.48*	0.00	-0.30

**Correlation is significant at the 0.01 level ($P < 0.01$). *Correlation is significant at the 0.05 level ($P < 0.05$).

Table 4 : Correlation among milk parameters in group T_3

	MMPT	TMT	AMFR	F	P	L	A	SNF	TS	AD
MY	0.99**									
TMT	0.99**									
AMFR	0.90**	0.99**								
F	-0.59*	-0.59*	-0.57							
P	0.20	0.20	0.22	-0.16						
L	-0.16	-0.16	-0.12	0.27	0.15					
A	-0.19	-0.19	-0.20	0.33	-0.08	0.39				
SNF	0.55*	0.54*	0.54*	-0.21	0.08	-0.13	0.00			
TS	0.29	0.30	0.27	-0.38	0.03	-0.07	0.48*	0.06		
AD	0.03	0.03	0.05	0.17	0.10	0.33	0.48*	0.07	0.38	
SG	-0.17	-0.16	-0.16	0.58*	-0.02	0.08	-0.10	0.18	-0.45*	0.20

**Correlation is significant at the 0.01 level ($p < 0.01$). *Correlation is significant at the 0.05 level ($P < 0.05$).

down increase milk 2322 ± 162 vs.1844 ± 185). Philip (1986) recommended a 45 seconds and Zinn *et al*. (1982) reported 30 seconds a pre-milking udder stimulation for complete removal of milk in Jersey and Jersey crossbred animals. Average main milking phase time (min) was significantly ($p < 0.05$) higher in T_2 (2.33 ± 0.10) than T_1 (2 ± 0.10) and T_3 (1.4 ± 0.09). Total milking time was significantly ($p < 0.05$) higher in T_2 and T_3 as compared to T_1. Average milk flow rate was significantly ($p < 0.05$) higher in T_1 as compared to T_2 and T_3. Weiss and Bruckmaier (2005) found that due to no pre-milking udder stimulation milk flow rate decreased significantly (1.81 ± 0.03 vs. 2.0 ± 0.03). According to this finding pre-milking manual tactile teat stimulation is important for better milk flow rate. Higher milk flow rate (0.49 ± 0.10) was observed in the Murrah buffalo due to pre-milking udder stimulation (Thomas *et al*., 2005). Fat percentage in T_1, T_2 and T_3 was 4.11 ± 0.15, 3.59 ± 0.12 and 4.12 ± 0.20, respectively. Fat percentage was significantly ($p < 0.05$) higher in groups T_1 and T_3 as compared to T_2. Philip (1986) found increased Milk fat due to pre-milking udder stimulation (5.03 ± 0.1 vs.5.0 ± 0.1). Similarly many authors reported about also found the increased fat and milk yield due to pre-milking udder stimulation (Bishist and Kamboj, 2010; Brandsma,1978; Philips,1986; Rasmussen, 1992). No significant effect of udder stimulation on fat content was observed by Thomas *et al*. (2005). Mean protein percentage was significantly ($p < 0.05$) higher in T_2 and T_3 as compared to T_1. No significant difference in percent lactose, total solids, acidity and specific gravity was recorded among all the three groups. SNF was 8.61 ± 0.1, 8.5 ± 0.09 and 8.5 ± 0.07 in T_1, T_2 and T_3, respectively. The mean SNF was significantly ($p < 0.05$) higher in group T_1 as compared to T_2 and T_3. The correlation among various milk parameters in T_1, T_2 and T_3 is presented in Table 2, 3 and 4, respectively. Main Milking phase time was significantly ($p < 0.01$) correlated with Milk yield, total milking time and average milk flow rate in each of the three treatment groups. Total milking time was positively ($p < 0.01$) correlated with average milk flow rate in each of the treatment groups. Thomas *et al*. (2005) reported a non -significant effect of pre-milking udder stimulation on SNF percentage. Total milking time was negatively correlated with acidity and fat percentage in T_2 and T_3, respectively. Total milking time was significantly ($p < 0.05$) correlated with SNF. Average milk flow rate was negatively correlated with fat percentage and acidity in T_2. Fat percentage was significantly ($p < 0.05$) correlated with acidity in T_1, T_2 and specific gravity in T_3. Protein content was negatively correlated with lactose in T_1. Lactose was positively correlated with total solids in T_1. Acidity was positively correlated with total solids in T_3. SNF was positively correlated with acidity and negatively correlated with specific gravity in T_1 and T_2, respectively. Total solids were negatively correlated with specific gravity in T_3. Increased total solid was observed in Murrah buffalo due to pre-milking udder stimulation (Bishist, 2010).

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