



Milk production performance of local goats of Rohilkhand region under different milking methods

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India possesses 140.53 millions goats, ranking second in the world and contributes 3.4% of the India's total milk production. Small size black local goats, which are yet to be documented as a breed, are found in Rohilkhand region of Uttar Pradesh. This region falls in Upper Gangetic Plain Region of India and has a population of 1,112,156 goats. Flock is being maintained at Institute farm to study the performance of this local goat. Recording of milk production is very important to declare any non-descript goat as meat/dual purpose breed. Therefore, an attempt was made to record exact amount of milk production and milk composition using 25 goats by different milking methods.

Location of study and flock description: Non-descript goats (50) were purchased in 1997 from animal markets Rithora in the Bareilly district. The goats brought to this Rithora market are the representative of the Rohilkhand region as it is one of the known animal markets of the district. Further, 31 goats were inducted to the main population during March 2007. The present population of 225 in the flock is maintained through selection and culling at proper time.

Animal management: All the animals were maintained under stall-fed condition and housed in separate sheds, each attached with open paddock, which allowed the animals to loiter freely. Throughout the study period, the housing and feeding for all the animals was kept as identical as possible in the given farm condition.

Experimental design: Advanced pregnant (primiparous/multiparous) does (25) were separated from the main flock and they were observed for the kidding under strict supervision. Kids were remained with mother for 2 days in individual sheds for colostrum feeding. Thereafter does were selected for different experimental groups.

Weaning group (G1, n-10) : Kids were kept for 2 days along with doe for colostrum feeding. Subsequently kids were

weaned and milk fed separately. For first 15 days kids were milk fed 3 times and subsequently 2 times. Daily does were milked twice and milk volume was recorded. Same milk was used for feeding weaned kids. Milk recording was continued for 90 days.

Udder bag method (G2, n-6) : Kids remained with the dam and however, not had access to milk. To prevent milk suckling udder cloth bags were tied to the mammary system. Milk recording and feeding of kids was done as similar to first group.

Milk test day group (G3, n-9) : Kids were remained with dam and had access to suckle as and when required. However, day before milk test day, kids were separated from their mother in the evening. Milk recording was done in weekly interval. Milk was recorded twice on test day in the morning and evening. Later the kids were mixed with their mother till second reading. Milk recording was done on 13 test days.

Milk composition was analyzed weekly for fat%, SNF%, protein% and lactose% for all the experimental animals. The fresh samples of the morning milking session in a clean test-tube were utilized for analysis. The data were analyzed using Lactoscan as per the standard procedure.

Statistical analysis: The information collected by data sheet was pooled and analyzed as per standard statistical procedure (Snedecor and Cochran 1989) using SAS 9.2.

Month-wise total milk yield in G1, G2 and G3 groups followed the decreasing order (Table 1). The highest milk in first month was observed in all groups which could be due to peak milk yield in the beginning of the lactation. Dhara *et al.* (2012) reported that the milk production in Black Bengal goat reached highest in fourth week of lactation and then declined. This is also in agreement with Fahim *et al.* (2011) and Hassan *et al.* (2010). The TMY (90 day) in G1, G2 and G3 are 59.29 ± 5.32 , 65.87 ± 8.49 and 51.08 ± 5.28 litre respectively. Although values of TMY (90 day) did not differ significantly ($P > 0.05$) in different groups but relatively the mean values were higher in udder bag method followed by weaning and test day group. Our results are also in agreement with Banda *et al.* (1992) who concluded that different milking

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Table 1. Mean±SE of milk yield (litre) in different methods in local goat of Rohilkhand regions

Groups	Average daily milk yield			Total milk yield				TMY (90 days)
	First month	Second month	Third month	Average	First month	Second month	Third month	
Weaning	0.729±0.06	0.621±0.06	0.629±0.06	0.660±0.03	21.81±1.85	18.62±1.83	18.85±1.88	59.29±5.32
Udder bag	0.748±0.08	0.717±0.11	0.730±0.09	0.732±0.05	22.48±2.48	21.48±3.32	21.90±2.86	65.87±8.49
Test day	0.617±0.04	0.610±0.08	0.588±0.04	0.605±0.03	17.56±1.42	17.06±2.44	16.45±1.32	51.08±5.08
Overall	0.693±0.03	0.640±0.04	0.638±0.03	0.657±0.02	20.44±1.12	18.75±1.37	18.72±1.15	57.91±3.51

Means bearing different superscript differ significantly ($P<0.05$) column wise.

techniques resulted in different milk production. They conclude that quantity of milk harvested by hand milking is 36.5% less than the suckling and oxytocin techniques in goat. Further, he also concludes that local ewes produced 47.6 and 30.5% higher milk yield by suckling than by hand and oxytocin method respectively. Similarly, Delgado *et al.* (2009) concluded that higher yield was obtained in natural suckling in dairy goat. Conversely, Keskin (2002) estimated the milk production by partial separation of kid from dam or complete separation of kid from birth (Peris *et al.* 1997) found no difference in milk yield throughout lactation compared to suckling. Higher milk yield in udder bag method might be due to presence of kids along with dam which caused no stress either to kid or doe. This is in agreement with Marnet and McKusick (2001) who demonstrated that an artificial rearing system affected the milk yield as well as growth of kid. Test day milk yield generally was lower than other groups

which might be due to sudden separation of young one prior to testing which might cause stress to the dam. It was also observed that due to non habituation for hand milking, does did not letdown milk completely. Further, absence of reflex by the kids during milking and as well as feedback inhibitors of lactation (FIL) lead to low milk production. Average daily milk yield (ADMY) followed the trend of TMY. Since month wise TMY followed decreasing trend with the advancement of the lactation, ADMY also followed the same trend.

TMY (90 days) averaged 57.91±3.51 litre with average ADMY of 0.657±0.02 litre. Milk yield of this local breed was comparatively lower than other important Indian milch breeds like Beetal (Prasad *et al.* 2005) and Barbari (Kala and Prakash 1990). The lower milk production in this local breed could be due to non selection of goats for the milk in field condition as locally this breed is being used for meat purpose.

The composition of the milk obtained through different milking methods in local goat are presented in Table 2. The fat% was almost similar in G1 and G2 group and is higher than G3 which differed significantly ($P<0.05$). Less fat% in G3 could be due to improper letdown by sudden change in milking method (hand milking instead of suckling) and absence of kid leading more residual milk which generally contains high fat. Banda *et al.* (1992) concluded that quantity of milk harvested by hand milking is 36.5% less than the suckling and oxytocin techniques in goat. Less milk production in hand milking than oxytocin induced hand milking might be due to improper milk letdown. Further, it could be presumed that our experimental kids have suckled completely in the evening session leaving less residual milk prior to separation thus, giving less opportunity to produce fat in the morning session of milking. Sharma (2007) also observed that evening milk contains significantly ($P<0.05$) higher fat compared to morning milk.

The SNF% values differ significantly ($P<0.05$). Protein and lactose% were lower (2.82 and 4.39) in G1 in comparison to other 2 groups. They differed significantly ($P<0.05$) in different milking methods. The variation in milk composition, viz. protein and fat is in agreement with results of Banda *et al.* (1992) who found that significant difference ($P<0.05$) in the fat% and protein% in different milking methods (hand milking and oxytocin).

Table 2. Mean±SD of milk composition in different milking methods in local goat of Rohilkhand region

	Weaning	Udder bag	Test day	Overall
Fat %				
First month	5.74 ^a ±0.24	5.57 ^a ±0.32	3.80 ^b ±0.46	5.00±0.27
Second month	6.10 ^a ±0.20	5.94 ^a ±0.25	4.08 ^b ±0.44	5.34±0.26
Third month	6.25 ^a ±0.14	5.92 ^a ±0.12	3.80 ^b ±0.50	5.29±0.29
Average	6.03 ^a ±0.12	5.81 ^a ±0.14	3.90 ^b ±0.26	5.21±0.15
SNF %				
First month	7.87 ^a ±0.08	7.89 ^a ±0.15	7.76 ^a ±0.11	7.84±0.06
Second month	7.86 ^a ±0.08	7.93 ^a ±0.13	7.65 ^a ±0.13	7.80±0.07
Third month	7.99 ^a ±0.09	8.14 ^a ±0.06	7.84 ^a ±0.14	7.97±0.06
Average	7.90 ^{ab} ±0.04	7.99 ^a ±0.07	7.75 ^b ±0.07	7.87±0.04
Protein %				
First month	2.84 ^a ±0.02	2.86 ^a ±0.06	2.93 ^a ±0.05	2.87±0.02
Second month	2.80 ^a ±0.02	2.84 ^a ±0.05	2.87 ^a ±0.04	2.83±0.02
Third month	2.85 ^b ±0.03	2.93 ^{ab} ±0.03	2.97 ^a ±0.03	2.91±0.02
Average	2.82 ^b ±0.01	2.88 ^{ab} ±0.03	2.92 ^a ±0.02	2.87±0.01
Lactose %				
First month	4.40 ^{ab} ±0.03	4.25 ^b ±0.14	4.54 ^a ±0.08	4.41±0.05
Second month	4.35 ^a ±0.02	4.40 ^a ±0.07	4.44 ^a ±0.06	4.39±0.03
Third month	4.41 ^b ±0.04	4.54 ^{ab} ±0.05	4.70 ^a ±0.13	4.55±0.06
Average	4.39 ^{ab} ±0.02	4.40 ^b ±0.06	4.56 ^a ±0.05	4.45±0.03

Means bearing different superscript differ significantly ($P<0.05$) row wise.

The milk composition in our studies is almost consistent in every month with marginal variation. Goetsch *et al.* (2011) concluded that composition varies as the lactation advances. The lowest content of milk fat was established in the mid stage of lactation, whereas the highest fat content was recorded at the end of lactation (Hassan *et al.* 2010). Similarly, with the progress of lactation period fat, ash and TS are reported to increase while lactose content decreases (Kala and Prakash 1990).

Irrespective of different milking methods, the overall fat, SNF, protein and lactose% were 5.21 ± 0.15 , 7.87 ± 0.04 , 2.87 ± 0.01 and 4.45 ± 0.03 . Fat% in this breed is higher than observed in Beetal (Prasad *et al.* 2005). The SNF content is lower than observed in Jamunapari and Jhakhrana and almost similar with other breeds like Sirohi and Barbari (Sharma 2007).

SUMMARY

A flock of local goats of Rohilkhand region is being maintained at Institute farm to study their performance. Exact amount of milk production and milk composition by different milking methods were recorded. The local goat of Rohilkhand region produced 57.91 ± 3.51 litre milk in 90 days with daily average of 0.657 ± 0.02 litre. The milk fat, SNF, protein and lactose% were 5.21 ± 0.15 , 7.87 ± 0.04 , 2.87 ± 0.01 and 4.45 ± 0.03 respectively. Type of milking method has no influence on milk production but fat, protein and lactose% differed significantly in different milking methods.

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REFERENCES

- Banda J W, Steinbach J and Zerfa H-P. 1992. Composition and yield of milk from non-dairy goats and sheep in Malawi. Small ruminant research and development in Africa. *Proceedings of the First Biennial Conference of the African Small Ruminant Research Network*. ILRI. FAO corporate document repository.
- Delgado-Pertínez M, Guzmán-Guerrero J L, Mena Y, Castel J M, González-Redondo P and Caravaca F P. 2009. Influence of kid rearing systems on milk yield, kid growth and cost of Florida dairy goats. *Small Ruminant Research* **81**: 105–11.
- Dhara K C, Ray N, Taraphder S and Guha S. 2012. Milk production performance of Black Bengal goats in West Bengal. *International Journal of Livestock Production* **3** (2) : 17–20.
- Fahim A, Patel B H M, Singh M, Dutt T, Mondal S K and Ramgovind. 2011. Studies on certain phenotypic characteristics of local goat of Rohilkhand. *Indian Journal of Animal Production and Management* **7** (3–4) : 218–221.
- Goetsch A L, Zeng S S and Gipson T A. 2011. Factors affecting goat milk production and quality. *Small Ruminant Research*, doi:10.1016/j.smallrumres.2011.09.025.
- Hassan M R, Talukder M A I and Sultana S. 2010. Evaluation of the production characteristics of the Jamunapari goat and its adaptability to farm conditions in Bangladesh. *Bangladesh Veterinarian* **27** (1) : 26–35.
- Kala S N and Prakash B. 1990. Genetic and phenotypic parameters of milk yield and milk composition in two Indian goat breeds. *Small Ruminant Research* **3**: 475–84.
- Keskin M. 2002. Effect of rearing systems on kid performance, lactation traits and profitability of Shami (*Damascus*) Goats. *Journal of Applied Animal Research* **22**: 267–71.
- Marnet P G and McKusick B C. 2001. Regulation of milk ejection and milkability in small ruminants. *Livestock Production Science* **70**: 125–33.
- Peris S, Caja G, Such X, Casals R, Ferret A, and Torre C. 1997. Influence of kid rearing systems on milk composition and yield of Murciano-Granadina dairy goats. *Journal of Dairy Science* **80**: 3249–55.
- Prasad H, Tewari H A and Sengar O P S. 2005. Milk yield and composition of the Beetal breed and their crosses with Jamunapari, Barbari and Black Bengal breeds of goat. *Small Ruminant Research* **58**: 195–199.
- Sharma R B. 2007. Studies on milk composition of different Goat breeds and its utilization for paneer making. *Annual Report 2006–07. Central Institute for Research on Goats*, Mathura, Uttar Pradesh, pp: 26–28.
- Snedecor G W and Cochran W G. 1989. *Statistical Methods*. 8th edn, Iowa State University Press.