*Indian Journal of Animal Sciences* **82** (11): 1398–1402, November 2012

# Comparative study of different milk feeding systems in orphan kids

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Received: 19 September 2011; Accepted: 16 April 2012

ABSTRACT

The present study was conducted to test a group milk feeding device developed by Farm machinery and Power Workshop, IVRI for feeding orphan kids. Ten suckling kids were placed in natural suckling group ($T_1$). The kids born which were not accepted by dam were considered as orphan. Among orphan kids, 10 kids each were kept in individual bottle feeding ($T_2$) and group milk feeder (GMF) $T_3$ group. The experiment was conducted for 90 days. Body weight gain, time and labour required under different feeding systems were recorded. The average body weights at the end of the experiment for the corresponding treatment groups were 11.230, 6.69±0.53 and 10.77±0.58 kg respectively. The body weight gain in $T_2$ and $T_3$ did not differ significantly in first month but differed significantly ($P<0.05$) in second month. However, in third month body weight gain did not differ significantly between $T_1$ and $T_3$. The ADG in groups $T_1$ was higher followed by $T_3$ and $T_2$. Between artificial feeding systems, $T_3$ group required less time than $T_2$ group. Time require for milk feeding at the end of experiment in evening session were 1.41±0.13, 1.06±0.04 and 0.32±0.02 min. respectively which differed significantly ($P< 0.05$) between the groups. The labour (man-min) required during first 15 days irrespective of morning/evening sessions ranged from 23–24 min. in group $T_2$. However, 15 days onwards man-min requirement reduced greatly. Similar trend has been observed in GMF. The average man –min in GMF ranged from 8–9 min. earlier to 15 days and subsequently reduced to 4 min. in rest part of experimental period. Incidence of diarrhea was very less in GMF (20%) compared to bottle feeding (40%). It can be concluded that Group Milk Feeding device helped in saving the time and labour without affecting the body weight gain of orphan kids in comparison to bottle feeding.

**Key words**: Bottle, Feeding device, Milk, Orphan kids

The pre-weaning mortality is one of the major problems in the organized farm which is mainly due to maternal under nutrition, mis-mothering, infection and injury. Therefore, kids who become orphan are generally reared artificial by bottle milk feeding. Artificial milk feeding helps in rearing weak kids conditions, death of doe, during dam sick conditions and agalactia. Further, artificial rearing not only helps in early weaning but also helps in quick re-breeding of doe. The separation of kids from their does after birth did not affect total lactation performance because of the minimal neuron-endocrine milk ejection reflex (Peris *et al.* 1997). The result showed that the artificially reared lambs with low birth weight, adapted readily to the nipple feeding (Kinne 1997). However, artificial feeding through individual bottle manually is time consuming, more labour involvement, extra care, causes drenching pneumonia etc. In developed countries generally milk bars/automatic milk feeding device are used to rear both lamb and kids. Such milk bars are not habitual in India due to cost, late weaning. Therefore, in the present study attempt was made to test a group milk feeding device developed by Farm machinery and Power Workshop of the institute using the local available material suitable to Indian farm conditions. This milk feeding was designed in such way that it can offer milk up to 6 kids at a time and each teat can dispense desired quantity of milk. Further, different reasons responsible for making kids orphan were also recorded.

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## MATERIALS AND METHODS

Advanced pregnant does (45) were identified from the main local goat flock maintained at Sheep and Goat Farm of Livestock Production and Management Section. These does were observed consecutively for 3 days from the day of kidding for the acceptance or rejection of kid. If any doe did not permit a new born to suckle, such kids were considered as orphan which were maintained on artificial feeding where as others were in natural suckling group. The probable reasons for mis-mothering were non experience by doe, tickling effect, injury in the udder, agalactia and poor milk production. Therefore, 10 kids of nearly same body weight

were placed in Natural suckling group and among orphan kids, 20 kids of similar body weight were divided into two groups for artificial milk feeding, viz. individual bottle feeding and group milk feeder (GMF). The experiment lasted for 90 days. The experiment was conducted between February and June 2011.

*Natural suckling:* Kid remained along with mother and had access to suckle naturally as and when required. Both kids and does were kept in the open paddock during day time.

*Individual bottle feeding group:* All kids belonging this group were kept separately. During day time, they were driven in to the open paddock, where they had access to feed and fodder. They were milk fed twice daily once at 9 AM and 4 PM. During morning/evening milk feeding session, 250 ml milk in each session was manually filled into bottle and kid was allowed to suckle with the assistance of a labourer.

*Group milk feeder (GMF):* This device had circular chamber with 6 tilted nipples in the bottom. Each nipple has separate compartment with common lid on the top. The height of the device was adjustable as per the requirement (Fig.1). During the milk feeding time, the GMF was kept near the paddock and 5 kids were allowed at a time for milk suckling. 250 ml milk was poured in each compartment as kids approached the nipples. After completion of milk feeding, the device was washed and dried.

All 3 groups had the same feeding and mangemental practices. Concentrate and green fodder was offered in the feeding tray after offering the milk. Good sanitation of the pens, feeding utensils, water containers and surrounding experimental area was maintained during the experimental period.

Kids were weighed every 15 days interval before morning milk feeding using electronic balance during experimental

Fig. 1. Group milk feeder.

period. At fortnight interval body weight gain (Kg) and average daily gain (g) was recorded. The duration of time for milk feeding was recorded using stop watch. When kid makes contact with doe's udder was considered as start of suckling time, and rejection by doe (either by moving or by butting) was end of milk feeding. Similarly, from filling of bottle to completion of milk was total duration of milk feeding in bottle feeding group. Similarly in GMF filling of milk in each compartment to completion of milk feeding was total duration of milk feeding. Man power requirement (man-min) for different operations was recorded in all the groups. Labour requirement from driving kids out and into the pen and milking operation as mentioned about was included. The man-min required for whole operation during morning and evening was calculated. Incidence of diarrhea or any other digestive disturbance based on apparent clinical symptoms was recorded through out the period. Treatment was done according to the severity of disease condition. All the statistical analysis was done as per the procedure outlined in

Table 1. Body weights (kg) of kids at fortnight interval under different milk feeding systems

| Treatments | At birth | 15$^{th}$ days | 30$^{th}$ days | 45$^{th}$ days | 60$^{th}$ days | 75$^{th}$ days | 90$^{th}$ days |
|---|---|---|---|---|---|---|---|
| Natural ($T_1$) | 2.11±0.13 | 3.98±0.23$^{a}$ | 5.52±0.31$^{a}$ | 7.10±0.38$^{a}$ | 8.48±0.36$^{a}$ | 9.85±.60$^{a}$ | 11.23±.80$^{a}$ |
| Bottle ($T_2$) | 1.84±0.14 | 3.00±0.19$^{b}$ | 3.82±0.19$^{b}$ | 4.64±0.24$^{c}$ | 5.33±0.31$^{b}$ | 6.00±0.41$^{b}$ | 6.69±0.53$^{b}$ |
| GMF ($T_3$) | 2.15±0.11 | 3.36±0.10$^{b}$ | 4.39±0.15$^{b}$ | 5.74±0.20$^{b}$ | 7.49±0.28$^{a}$ | 9.18±0.45$^{a}$ | 10.77±0.58$^{a}$ |

Means bearing different superscripts in column differ significantly (P< 0.05).

Table 2. Average daily gain (kg) of kids under different milk feeding systems

| Treatments | Age in days | | | | | |
|---|---|---|---|---|---|---|
| | 15 | 30 | 45 | 60 | 75 | 90 |
| Natural ($T_1$) | 0.124±0.00$^{a}$ | 0.129±0.01$^{a}$ | 0.110±0.00$^{a}$ | 0.106±0.04$^{a}$ | 0.103±0.06$^{a}$ | 0.010±0.08$^{a}$ |
| Bottle ($T_2$) | 0.077±0.01$^{b}$ | 0.066±0.00$^{b}$ | 0.062±0.00$^{b}$ | 0.057±0.08$^{c}$ | 0.055±0.03$^{b}$ | 0.059±0.07$^{b}$ |
| GMF ($T_3$) | 0.080±0.00$^{b}$ | 0.074±0.03$^{b}$ | 0.076±0.00$^{b}$ | 0.081±0.02$^{b}$ | 0.093±0.05$^{a}$ | 0.092±0.04$^{a}$ |

Means bearing different superscripts in column differ significantly (P< 0.05).

SPSS® 17.00 package and the sections like descriptives.

## RESULTS AND DISCUSSION

A total of 67 kids were born out of the 45 does kidding. It was found that 55.2% born were healthy and accepted by the doe for natural suckling. But 4.4, 13.4, 8.9, 4.4, 4.4 and 8.9% kids were weak kids, poor milk production by dam, mis-mothering, agalactia, death of doe and mastitis, respectively, which led them to artificial milk feeding.

Comparative study was made among three groups namely naturally suckled group ($T_1$), bottle fed group ($T_2$) and fed through group milk feeder (GMF) $T_3$. The mean body weights of kids at 15 days interval in different milk feeding systems are presented in table 1. The results revealed that the average birth weight for treatment groups viz. $T_1$ (natural group), $T_2$ (bottle group) and $T_3$ (group milk feeder) were 2.11, 1.84 and 2.15 kg respectively. Sharma (1969) and Ambatkar and Nandan (1984) reported a significant influence of birth weight on subsequent weights in early life. The table shows that the body weight of $T_1$ was relatively more which differed significantly ($P<0.05$) from $T_2$ and $T_3$ up to day 30. However, there was no significant difference between $T_2$ and $T_3$. Further, the body weight at 45 day differed significantly ($P<0.05$) between the treatments. The body weight at 60 day in $T_1$, $T_2$ and $T_3$ were 8.48±0.36, 5.33±0.31 and 7.49±0.28 kg respectively. But 60 day onwards, $T_1$ differed significantly ($P<0.05$) with only $T_2$, however there was no significant difference observed between $T_1$ and $T_3$. The average body weights at the end of the experiment for the corresponding treatment groups were 11.23±.80, 6.69±0.53 and 10.77±0.58 kg respectively. The body weight of $T_2$ group was less than from group $T_1$ and $T_3$. This might be due to more energy losses by the kids when labour tried to restrained kids for bottle milk feeding. However, this was not the case for $T_1$ and $T_3$ groups as they have suckled in a natural way without any stress. Therefore, it can be concluded that, group milk feeder (GMF) provided the same environment as of natural feeding group. It seems that GMF stimulated natural reflexes.

Total body weight gain at the day 90 in groups $T_1$, $T_2$ and $T_3$ were 8.61±1.00, 4.85±0.56 and 8.24±0.52 kg respectively. The results clearly indicated that weight gain in $T_2$ and $T_3$ did not differ significantly in first month and third month. However, in second month body weight gain in all treatments differed significantly ($P<0.05$). Therefore, it can be concluded that group milk feeder did not influence any adverse effects on weight gain, but in $T_2$ body weight remained less. Researcher have also attempted to rear kids by artificial rearing by milk replacer to save money (Arguello *et al.* 2004). The artificial method of rearing kids does not affect growth was also supported by (Sanz *et al*. 1990, Tejon *et al.*1995, Wagenaar *et al.* 2006 and Delgado-Pertinez *et al.* 2009). There are, however, works showing that there was a higher growth rate among naturally suckled kids (Piasentier *et al.* 2000, Argüello *et al.* 2004).

The average daily gain (ADG) in different milk feeding systems has been presented in table 2. Results clearly indicate that, same trend of body again has been observed for ADG also. Between artificial milk feeding systems group $T_3$ had higher body weight than group $T_2$ at every stage of the experiment. This could be due to the fact that kids fed milk by GMF felt more comfortable and enjoyed the natural instinct without any stress. In absence of stress in this group increased more feed intake and gained higher body weight. Higher, ADG in group $T_1$ may be due fact that kids suckled from doe might have consumed more milk had higher body weight along with the fact that these kids were healthier than orphan groups. Lower ADG in $T_2$ in stage of experiment might be due to handling stress, low birth weight and higher incidence of diarrhea.

The morning milk feeding time required in different milk feeding systems has been presented in table 3. The morning milk feeding time at 0–15 days in groups $T_1$, $T_2$ and $T_3$ were 1.86, 1.76 and 0.78 min. respectively. At 0–15 day the mean values of group $T_1$ and $T_2$ did not differ significantly ($P<0.05$). In group $T_3$ overall time requirement was very less as compared to other two groups. Between artificial feeding systems, $T_2$ group required more time as milk feeding was done individually which required extra time in filling of milk bottle. However, in group $T_1$ kids remained all time with doe and frequently suckled milk from doe thus time required was more. Milk feeding time decreased with advancement of age which may be due to the reason that kid was grown up. The milk feeding time at the end of experiment was 0.93,

Table 3. Time required in morning milk feeding at 15 days interval under different milk feeding systems (min/kid)

| Days | Natural ($T_1$) | | Bottle ($T_2$) | | GMF ($T_3$) | |
|---|---|---|---|---|---|---|
| | Morning | Evening | Morning | Evening | Morning | Evening |
| 0–15 | 1.86±0.48$^{a}$ | 1.69±0.20$^{a}$ | 1.76±0.04$^{a}$ | 1.79±0.05$^{a}$ | 0.78±0.06$^{b}$ | 0.75±0.06$^{b}$ |
| 15–30 | 2.59±0.59$^{a}$ | 1.86±0.20$^{a}$ | 1.25±0.02$^{b}$ | 1.22±0.03$^{b}$ | 0.36±0.01$^{b}$ | 0.36±0.01$^{c}$ |
| 30–45 | 2.16±0.79$^{a}$ | 1.86±0.19$^{a}$ | 1.1±0.01$^{ab}$ | 1.12±0.01$^{b}$ | 0.34±0.02$^{b}$ | 0.34±0.10$^{c}$ |
| 45–60 | 1.56±0.19$^{a}$ | 1.82±0.10$^{a}$ | 1.13±0.01$^{b}$ | 1.14±0.02$^{b}$ | 0.32±0.04$^{c}$ | 0.33±0.05$^{c}$ |
| 60–75 | 1.36±0.26$^{a}$ | 1.46±0.22$^{a}$ | 1.11±0.01$^{a}$ | 1.12±0.10$^{a}$ | 0.34±0.05$^{b}$ | 0.33±0.06$^{b}$ |
| 75–90 | 0.93±0.09 | 1.41±0.13$^{a}$ | 1.06±0.05 | 1.06±0.04$^{b}$ | 0.32±0.44 | 0.32±0.02$^{c}$ |

Means bearing different superscripts in row wise respective sessions differ significantly ($P< 0.05$).

Table 4. Labour requirement in different milk feeding operations at different stage of age (Man-min/day)

| Days | Natural ($T_1$) | Bottle ($T_2$) | | GMF ($T_3$) | |
|---|---|---|---|---|---|
| | | Morning | Evening | Morning | Evening |
| 0–15 | — | 24.29±1.05 | 23.14±1.25 | 9.21±0.55 | 8.78±0.50 |
| 15–30 | — | 15.84±0.25 | 14.29±0.23 | 4.75±0.22 | 4.35±0.23 |
| 30–45 | — | 13.27±0.06 | 13.17±0.08 | 4.51±0.10 | 4.07±0.15 |
| 45–60 | — | 13.12±0.09 | 12.91±0.10 | 4.31±0.07 | 4.08±0.03 |
| 60–75 | — | 12.16±0.05 | 12.01±0.06 | 4.21±0.05 | 4.06±0.04 |
| 75–90 | — | 11.67±0.07 | 11.65±0.08 | 4.20±0.02 | 4.03±0.06 |

1.06 and 0.32 min. respectively.

Similarly, the evening milk feeding time (min) required in three groups followed the same trend. Milk feeding time decreased with advancement of age. However, during second and third fortnight, time required in milk feeding was more. There was possibility of more/peak milk production in udder and thus kids suckled more frequently leading to more suckling time. Our findings agreed with Jansen and Budde (2006) who, also concluded that teat fed calves took longer to ingest the milk compared with bucket fed calves. Time require for milk feeding at the end of experiment were 1.41, 1.06 and 0.32 min. respectively. Milk feeding time differed significantly ($P< 0.05$) between the groups.

Table 3 clearly indicates that irrespective of feeding time (morning/evening), the time required for natural suckling was more in comparison to artificial feeding system. Among artificial feeding, GMF helped in reducing the milk feeding time as 5 kids suckled simultaneously and conditioning of kids for milk feeding at a particular time. During suckling, all kids consumed milk as early as possible due to competition and also there was no change of teats during suckling. Jansen and Budde (2006) also observed the effect of milk feeding method and group size on feeding behaviour in dairy calves. They found that calves fed via a teat, spent more time in ingesting the milk than bucket. Further, irrespective of milk feeding time, the average number of suckling was 3±0.4/h. However, Walter *et al.* (2010) observed average of 2±0.2/h and each suckling lasted approximately 43±15 sec. Our observation indicates more suckling time in comparison to earlier finding.

Labour requirement in different milk feeding systems has been presented in Table 4. In group $T_1$, since all kids remained with the doe, there was no involvement of labour. In group $T_2$, the man-min required during first 15 days irrespective of morning/evening sessions ranged from 23–24 min. However, 15 days onwards man-min requirement reduced greatly. The decrease in man-min requirement was due to learnt experience by kids. Similar trend has been observed in GMF. The average man –min in GMF ranged from 8–9 min. earlier to 15 days and subsequently reduced to 4 min. in rest part of experimental period. Jansen and Budde (2006) also observed the effect of milk feeding method and group size in dairy calves. They found that calves fed via a teat, spent more time in ingesting the milk than bucket. Calves in groups ingested the milk faster than calves housed in pairs, which suggested that the competition for milk was greater than in pairs.

Incidence of diarrhea was more in natural system (70%) in compare to others. Incidence of diarrhea was very less in GMF (20%) compared to bottle feeding (40%). Further, re-occurence of incidence of diarrhea in particular kids were more in natural and bottle feeding (71–75%). However, no such severe diarrhea was observed in GMF. The incidence of diarrhea in natural suckling groups was marginally more probably due to over suckling. Our findings are also supported by Kusiluka *et al.* (1998) who also observes 14–44% of diarrhea incidences in the herd and such incidences are mainly due to over suckling, overcrowding and infectious agents.

It can be concluded that group milk feeding device helped in saving the time and labour without affecting the body weight gain of orphan kids in comparison to bottle feeding.

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