# Effect of Individual versus Group Rearing and Feeding of Different Levels of Milk and Skim Milk on Nutrient Utilization in Crossbred Calves

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**ABSTRACT :** A 2×3 factorial design was used to study the impact of rearing systems, individual (I) vs. group (G) and different levels of milk/skim milk feeding (three schedules, F1, F2 and F3) on performance of crossbred (*Bos indicus* × *Bos taurus*) calves. Six calves (three from each sex) were taken in each group on the basis of their birth weight. All the calves were fed colostrum for three days and thereafter, were allotted to three different milk feeding schedules (F), i.e. milk fed upto 8 weeks of age (F1), milk upto 4 weeks followed by 50% (F2) and 100% (F3) replacement of milk with skim milk in the next 4 weeks. Calf starter and cereal green fodder were fed ad libitum to all the calves beginning from second week of age. A digestibility trial was conducted at 15th week of age to assess nutrient utilization during postweaning period. The digestibilty of dry matter (DM), organic matter, total carbohydrate, ether extract and crude protein (CP) were nonsignificant between the rearing systems and the feeding schedules. There was significantly higher digestibility of NDF and ADF in G than I and in F3 than F1 and F2. The concentration CP and total digestible nutrients of the diet ranged from 17.18 to 17.75% and 66.32 to 70.14%, respectively. The DM intake (kg/100 kg body weight) ranged from 1.74 to 2.14 kg during 0 to 8 weeks and 3.19 to 3.41 kg during 0 to 14 weeks of age. The effects during postweaning phase (9-14 weeks of age) showed increased performance in group housed calves compared to individually housed ones with a superior average daily gain (590 vs. 443 g) and dry matter intake (1.79 vs. 1.64 kg). Above all, replacement of milk with skim milk at 50% level after 4th week followed by complete removal after 6th week of age (F2) seemed to suit better in coping with immediate energy starvation due to sole feeding of skim milk (F3) and they performed the best under group housed system of rearing. ***(Asian-Aust. J. Anim. Sci. 2003. Vol 16, No. 10 : 1455-1459)***

**Key Words :** Housing, Skim Milk, Crossbred Calves, Digestibility, Nutritional Plane

## INTRODUCTION

Rearing the preweaned calves is one of the most challenging tasks on the dairy farm. Recommendations and practices like the timing of calf separation, the amount of milk that is provided, when and how solid food and water are provided, the ways calves are housed, the age and methods by which they are weaned vary considerably (Quigley, 1997). About the type of housing, there is diversity of opinion, whether calves should be housed in individual pens or in groups. It has been emphasized to adopt dry feed consumption in calves so as to wean at an early age, which in addition spares milk for human consumption. Use of skim milk in place of whole milk is another approach to economize feeding cost and also, at the same time, inducing the calf to increase its solid feed consumption via a short of energy starvation by introducing low energy skim milk at a suitable age without affecting future animal productivity. The performance of the young crossbred calves fed different levels of milk/skim milk with calf starter and green fodder were reported by earlier workers (Ranjhan et al., 1972 and Krishna Mohan et al., 1987). In an earlier experiment Sahoo et al. (2001) advocated accelerated adoption of preweaned calves to solid feeds for increased ruminal metabolic activity. The present study envisages to find out effect of individual versus group rearing as well as the effect of milk and skim milk feeding as compared to conventional whole milk feeding on performance of crossbred calves.

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## MATERIALS AND METHODS

### Animals and treatment distribution

Thirty six (eighteen males and eighteen females) crossbred calves (*Bos indicus* × *Bos taurus*) were reared under two types of housing (individual, I and group, G) and three different feeding schedules (F1, milk upto 8 weeks; F2, milk upto 4 weeks followed by 50% milk+50% skim milk upto 6 weeks and then 100% skim milk in the next 2 weeks; and F3, milk upto 4 weeks and skim milk alone in the next 4 weeks) in a 2×3 factorial design to have six calves (3 male and 3 female) each in six different treatments (IF1, IF2, IF3, GF1, GF2 and GF3). The distribution of calves in different groups was made on the basis of their birth weight as and when they were received on a staggered basis.

### Housing managemnt and feeding trial

The calves were kept at experimental calf shed of Indian Veterinary Research Institute, Izatnagar (UP), India and

**Table 1.** Chemical composition (%DM) of feeds and fodder

| Feeds and fodder | DM% | OM | CP | EE | Total carbohydrate | NDF | ADF | Hemicellulose |
|---|---|---|---|---|---|---|---|---|
| Calf starter | | | | | | | | |
| Calf starter-I (0-8 weeks) | 89.8 | 88.6 | 24.8 | 2.0 | 61.8 | 31.2 | 13.2 | 18.0 |
| Calf starter-I (9-15 weeks) | 87.4 | 90.5 | 20.5 | 3.9 | 66.1 | 26.3 | 07.3 | 19.0 |
| Green fodder | | | | | | | | |
| Maize-I (0-5 weeks) | 15.5 (12.3-18.5) | 90.2 | 9.1 | 2.2 | 78.9 | 63.2 | 32.7 | 30.5 |
| Maize-II (6-8 weeks) | 12.5 (11.5-14.2) | 90.0 | 8.3 | 2.1 | 79.6 | 64.7 | 33.9 | 30.8 |
| Oat-I (9-14 weeks) | 14.0 (11.5-17.5) | 84.9 | 10.6 | 3.0 | 71.3 | 53.5 | 31.1 | 22.4 |
| Oat-II (15th week) | 14.7 | 85.7 | 10.2 | 2.1 | 73.4 | 58.9 | 36.8 | 22.1 |

**Table 2.** Intake and digestibility of nutrients in calves during digestibility trial

| Attributes | Effects | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Treatments | | | | | | SEM | Rearing systems | | Feeding schedules | | | SEM |
| | IF1 | IF2 | IF3 | GF1 | GF2 | GF3 | | I | G | F1 | F2 | F3 | |
| Intake/day | | | | | | | | | | | | | |
| DM (kg) | 2.57 | 2.44 | 2.21 | 2.42 | 2.54 | 2.46 | 0.102 | 2.40±0.07 | 2.48±0.05 | 2.49 | 2.49 | 2.33 | 0.078 |
| OM (kg) | 2.28 | 2.17 | 1.97 | 2.16 | 2.26 | 2.19 | 0.090 | 2.14±0.06 | 2.21±0.04 | 2.22 | 2.22 | 2.08 | 0.065 |
| CP (g) | 441 | 428 | 391 | 426 | 440 | 430 | 12.66 | 420±10 | 432±6 | 433 | 434 | 411 | 9.56 |
| EE (g) | 85.7 | 82.9 | 75.7 | 82.5 | 85.5 | 83.5 | 2.53 | 81.5±2.0 | 83.9±1.1 | 84.4 | 84.2 | 79.6 | 1.89 |
| Total CHO (kg) | 1.76 | 1.66 | 1.50 | 1.65 | 1.74 | 1.68 | 0.074 | 1.64±0.05 | 1.69±0.04 | 1.70 | 1.70 | 1.59 | 0.051 |
| NDF (g) | 947 | 871 | 773 | 860 | 926 | 884 | 55.91 | 864±36 | 890±30 | 903 | 999 | 829 | 40.17 |
| ADF (g) | 433 | 385 | 336 | 378 | 418 | 394 | 33.89 | 385±21 | 397±19 | 405 | 402 | 365 | 24.06 |
| Hemicellulose (g) | 514 | 486 | 439 | 482 | 508 | 491 | 22.29 | 498±16 | 494±11 | 498 | 497 | 465 | 16.26 |
| Digestibility (%) | | | | | | | | | | | | | |
| DM | 68.1 | 69.4 | 70.9 | 68.9 | 72.0 | 71.5 | 1.490 | 69.5±0.8 | 70.8±0.9 | 68.5 | 70.7 | 71.2 | 1.022 |
| OM | 70.8 | 72.5 | 73.7 | 71.4 | 73.9 | 74.0 | 1.481 | 72.3±0.8 | 73.1±0.9 | 71.1 | 73.2 | 73.8 | 0.983 |
| CP | 67.5 | 68.8 | 68.7 | 66.5 | 67.5 | 66.5 | 1.489 | 68.3±0.7 | 66.8±0.9 | 67.0 | 68.1 | 67.6 | 1.017 |
| EE | 66.7 | 63.9 | 68.8 | 65.4 | 60.7 | 62.8 | 2.804 | 66.5±1.6 | 63.0±1.5 | 66.0 | 65.3 | 65.8 | 1.986 |
| Total CHO (kg) | 71.7 | 72.3 | 75.3 | 72.9 | 78.3 | 76.4 | 1.614 | 73.1±0.8 | 75.8±1.2 | 72.3 | 75.3 | 75.8 | 1.256 |
| NDF | $58.9^{a}$ | $56.8^{a}$ | $60.4^{ab}$ | $57.7^{a}$ | $64.5^{bc}$ | $68.4^{c}$ | 1.545 | $68.7±0.9^{A}$ | $63.5±1.6^{B}$ | $58.3^{A}$ | $60.6^{A}$ | $64.4^{B}$ | 1.580 |
| ADF | 44.3 | 52.1 | 61.0 | 57.9 | 68.9 | 68.4 | 2.092 | $52.5±2.4^{A}$ | $65.0±1.8^{B}$ | $51.1^{A}$ | $60.5^{B}$ | $64.7^{C}$ | 2.837 |
| Hemicellulose | $71.1^{C}$ | $60.1^{AB}$ | $60.1^{AB}$ | $58.0^{A}$ | $60.8^{AB}$ | $68.4^{BC}$ | 2.087 | 63.8±1.8 | 62.4±1.8 | 64.6 | 60.4 | 64.3 | 2.173 |

SEM: Standard error of means. Means in a row under different effects bearing dissimlar superscripts differ significantly ($^{A, B, C}$ $p<0.01$; $^{a, b, c}$ $p<0.05$).

were initially fed with collostrum for first three days before allotting to different treatments. *Ad libitum* calf starter and chaffed cereal green fodder was introduced from the second week and was continued till the end of feeding trial lasting for a total of 15 weeks. The rate of milk/skim milk feeding was at the rate of 1/10th of body weight (BW) upto 4 weeks, 1/15th of BW for 5-6 weeks and 1/20th of BW for 7-8 weeks of age. A digestibility trial for 6 days was conducted after 14 weeks of age taking 4 claves (2 males and 2 females) from each group. In individual housing system of rearing, the calves were kept in individual cubicles having separate feeding and watering arrangements. In group housing, all the six calves (3 males and 3 females) were kept in one large cubicles having common feeding and watering systems. Plenty of fresh and clean drinking water was provided twice daily.

**Diet composition**

The calf starter was composed of barley/maize 50%, solvent extracted groundnut cake 35%, wheat bran 12%, mineral and vitamin mixture 3% for the first 8 weeks (preweaning period) and then, the level of oil cake was reduced to 30% by increasing the level of wheat bran (17%). The green fodder was chaffed (1-5 cm) and offered preferably after the consumption of calf starter. Two types of cereal fodder, viz. maize (*Zea mays*) and oat (*Avena sativa*) was introduced during the feeding trial and the digestibility trial was conducted on with the later.

**Chemical analysis**

Analysis of proximate principles (moisture, ash, ether extract and CP) for feed, residue and faecal samples were carried out as described in AOAC (1980). For fiber

fractions (neutral detergent fiber, NDF and acid detergent fiber, ADF) the modified method of Goering and Van Soest (1970) suggested by Van Soest et al. (1991) was employed.

**Statistical analysis**

Data were analysed by two-way analysis of variance and the main effects of housing and feeding schedules and the individual treatment differences were seen as per the standard procedures described in Snedecor and Cochran (1989).

## RESULTS AND DISCUSSION

**Chemical composition**

The chemical composition of calf starter and green fodder is given in Table 1. During postweaning period the CP content of the calf starter was reduced from 24.78 to 20.50% by reducing the level of oil cakes from 35 to 30%. The higher NDF and ADF content in calf starter-I might be due to inclusion of barley. The CP and ash content of maize was less than that of oats on DM basis. On the other hand the total carbohydrate, hemicellulose, NDF, and ADF was higher in maize than oats. The total solids and fat content of milk and skim milk were 12.83, 4.25 and 9.59, 0.21%, respectively.

**Intake and digestibility of nutrients**

The intake of various nutrients (Table 2) during the trial period did not vary significantly among the groups. However, the DM intake of IF1 and GF2 were nonsignificantly ($p>0.05$) higher than other groups. This might be due to slightly higher body weight and metabolic body size during the digestibility trial (Table 3).

The digestibility coefficient of DM ranged from 68.14 (IF1) to 72.03 (GF2) and the difference was found to be nonsignificant between the groups. Krishna Mohan et al. (1987) observed DM digestibility ranging from 68.6 to 74.4% in crossbred calves fed different levels of milk and skim milk and different calf starters at three months of age. The digestibility of OM, total carbohydrate and EE did not differ significantly between rearing systems and among the milk/skim milk feeding schedules. The CP digestibility was around 68-69% showing no significant effect of rearing systems or the feeding schedules. The fiber fractions (NDF and ADF) showed variability in digestibility due to rearing systems (G>I) and feeding schedules (F3>F1, F2). There was significant ($p<0.01$) difference in the digestibility of hemicellulose among different treatments but without any definite trend. This might be due to earlier establishment of rumen microbial population inducing increased fiber degradation/utilization (Bryant et al., 1958; Anderson et al., 1987). Cohabitation in group housed animals induced learning to eat solid feed earlier, and also at higher amounts compared to individually fed animals. Further, the calves under F3 had access to low energy skim milk and might therefore, probably learned earlier to eat solid feed so as to compensate the deficit energy through consumption of calf starter and green fodder. Earlier workers are also of the opinion that the earliest the calf learns eating solid/fibrous feed the faster the development of rumen functionally,

**Table 3.** Nutritive value of diets and plane of nutrition of calves during digestibility trial

| Attributes | Effects | | | | | | | | | | | | | Pooled mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Treatments | | | | | | SEM | Rearing systems | | Feeding schedules | | | SEM | |
| | IF1 | IF2 | IF3 | GF1 | GF2 | GF3 | | I | G | F1 | F2 | F3 | | |
| Average BW (kg) | 76.5 | 72.5 | 66.1 | 71.6 | 78.2 | 70.7 | 4.738 | 71.7±3.1 | 73.5±3.3 | 74.1 | 75.3 | 68.4 | 3.245 | 72.6±1.9 |
| Metabolic body size ($kgW^{0.75}$) | 25.84 | 24.77 | 23.16 | 24.60 | 26.26 | 24.38 | 1.218 | 24.59±0.79 | 25.08±0.60 | 25.22 | 25.51 | 23.77 | 0.833 | 24.84±0.49 |
| CP (%) | 17.18 | 17.59 | 17.75 | 17.63 | 17.33 | 17.50 | 0.258 | 17.51±0.15 | 17.48±0.14 | 17.40 | 17.46 | 17.63 | 0.179 | 17.50±0.10 |
| DCP (%) | 11.60 | 12.12 | 12.19 | 11.47 | 11.70 | 11.65 | 0.393 | 11.97±0.21 | 11.61±0.22 | 11.53 | 11.91 | 11.92 | 0.266 | 11.79±0.15 |
| TDN (%) | 66.32 | 66.38 | 68.70 | 68.39 | 70.14 | 68.5 | 1.506 | 67.13±0.76 | 68.35±0.99 | 66.35 | 68.26 | 68.62 | 1.069 | 67.74±0.62 |
| Intake/day | | | | | | | | | | | | | | |
| DM (kg) | 2.57 | 2.44 | 2.21 | 2.42 | 2.54 | 2.46 | 0.102 | 2.40±0.07 | 2.48±0.05 | 2.49 | 2.49 | 2.33 | 0.078 | 2.44±0.04 |
| CP (g) | 444 | 428 | 391 | 426 | 440 | 430 | 12.66 | 420±10 | 432±6 | 433 | 434 | 411 | 9.56 | 426±6 |
| DCP (g) | 298 | 294 | 268 | 283 | 297 | 286 | 6.55 | 286±5 | 288±4 | 290 | 295 | 277 | 5.00 | 287±3 |
| TDN (kg) | 1.69 | 1.61 | 1.51 | 1.60 | 1.78 | 1.69 | 0.064 | 1.60±0.04 | 1.69±0.04 | 1.64 | 1.69 | 1.60 | 0.052 | 1.65±0.03 |
| Intake/100 kg BW | | | | | | | | | | | | | | |
| DM (kg) | 3.38 | 3.46 | 3.34 | 3.39 | 3.27 | 3.49 | 0.180 | 3.39±0.12 | 3.38±0.07 | 3.39 | 3.36 | 3.41 | 0.118 | 3.39±0.07 |
| CP (g) | 580 | 608 | 593 | 598 | 568 | 611 | 33.30 | 594±22 | 592±13 | 589 | 588 | 602 | 22.39 | 593±12 |
| DCP (g) | 393 | 419 | 407 | 407 | 384 | 407 | 26.95 | 406±16 | 399±12 | 400 | 401 | 407 | 18.13 | 403±10 |
| TDN (kg) | 2.22 | 2.29 | 2.30 | 2.17 | 2.29 | 2.39 | 0.146 | 2.27±0.09 | 2.28±0.07 | 2.20 | 2.29 | 2.35 | 0.098 | 2.28±0.05 |
| Intake (g)/$kgW^{0.75}$ | | | | | | | | | | | | | | |
| DM | 99.8 | 99.9 | 95.1 | 98.5 | 97.0 | 101.1 | 4.143 | 98.3±2.8 | 98.9±1.5 | 99.1 | 98.5 | 98.1 | 2.836 | 98.6±1.6 |
| CP | 17.2 | 17.6 | 16.9 | 17.4 | 16.8 | 17.7 | 0.730 | 17.2±0.5 | 17.3±0.4 | 17.3 | 17.2 | 17.3 | 0.476 | 17.2±0.3 |
| DCP | 11.6 | 12.1 | 11.6 | 11.5 | 11.4 | 11.8 | 0.589 | 11.7±0.4 | 11.6±0.3 | 11.6 | 11.7 | 11.7 | 0.408 | 11.6±0.2 |
| TDN | 65.6 | 66.2 | 65.4 | 65.4 | 67.8 | 69.3 | 3.362 | 65.7±2.1 | 67.5±1.5 | 65.5 | 67.0 | 67.3 | 2.232 | 67.6±1.2 |

SEM: Standard error of means.

**Table 4.** Plane of nutrition of calves during postweaning period (9-14 weeks of age)

| Attributes | Treatments | | | | | | SEM | Pooled mean |
|---|---|---|---|---|---|---|---|---|
| | IF1 | IF2 | IF3 | GF1 | GF2 | GF3 | | |
| Average BW (kg) | 50.0 | 49.7 | 47.1 | 51.6 | 56.4 | 53.8 | 2.94 | 51.4 |
| Average daily gain (g) | 466 | 445 | 419 | 561 | 659 | 550 | 53.81 | 517 |
| Intake/day | | | | | | | | |
| DM (kg) | | | | | | | | |
| Calf starter | 1.12$^{a}$ | 1.13$^{a}$ | 1.14$^{a}$ | 1.53$^{b}$ | 1.50$^{b}$ | 1.54$^{b}$ | 0.051 | 1.33 |
| Green fodder | 0.53$^{c}$ | 0.54$^{c}$ | 0.47$^{c}$ | 0.22$^{a}$ | 0.30$^{b}$ | 0.29$^{b}$ | 0.016 | 0.39 |
| Total | 1.65$^{ab}$ | 1.67$^{abc}$ | 1.61$^{a}$ | 1.75$^{abc}$ | 1.80$^{bc}$ | 1.83$^{c}$ | 0.053 | 1.72 |
| CP (g) | 285$^{a}$ | 292$^{a}$ | 283$^{a}$ | 337$^{b}$ | 339$^{b}$ | 347$^{b}$ | 5.78 | 314 |
| DCP (g) | 193$^{a}$ | 201$^{a}$ | 194$^{a}$ | 224$^{b}$ | 229$^{b}$ | 231$^{b}$ | 3.98 | 212 |
| TDN (kg) | 1.09$^{a}$ | 1.11$^{a}$ | 1.10$^{a}$ | 1.20$^{ab}$ | 1.26$^{b}$ | 1.26$^{b}$ | 0.034 | 1.17 |
| Intake/100 kg BW | | | | | | | | |
| DM (kg) | 3.27 | 3.33 | 3.41 | 3.39 | 3.19 | 3.40 | 0.109 | 3.33 |
| CP (g) | 576$^{a}$ | 587$^{ab}$ | 604$^{ab}$ | 653$^{b}$ | 602$^{ab}$ | 645$^{b}$ | 20.50 | 611 |
| DCP (g) | 389 | 404 | 415 | 434 | 406 | 429 | 13.97 | 413 |
| TDN (kg) | 2.17 | 2.21 | 2.34 | 2.32 | 2.24 | 2.33 | 0.075 | 2.27 |
| Intake(g)/kgW$^{0.75}$ | | | | | | | | |
| DM | 87.0 | 88.6 | 88.8 | 90.0 | 85.2 | 92.1 | 2.533 | 88.6 |
| CP | 15.3$^{a}$ | 15.6$^{a}$ | 15.8$^{a}$ | 17.5$^{b}$ | 16.5$^{ab}$ | 17.5$^{b}$ | 0.464 | 16.4 |
| DCP | 10.3$^{a}$ | 10.7$^{ab}$ | 10.9$^{ab}$ | 11.6$^{b}$ | 11.1$^{ab}$ | 11.6$^{b}$ | 0.327 | 11.0 |
| TDN | 57.7 | 58.8 | 61.0 | 61.5 | 59.8 | 63.1 | 1.687 | 60.3 |

SEM: Standard error of means. Means in a row bearing dissimlar superscripts differ significantly ($p<0.05$).

metabolically as well as anatomically (Lyford and Huber, 1988; Quigley III et al., 1991; Sahoo et al., 2001).

**Nutritive value of diet and plane of nutrition of calves during digestibility trial**

The average BW (kg) of calves in different groups ranged from 66.06 to 78.19 and were statistically similar ($p>0.05$). The CP, digestible CP (DCP) and total digestible nutrients (TDN) content (%) of the diet ranged from 17.18 to 17.75, 11.60 to 12.19 and 66.32 to 70.14, respectively, indicating that all the calves received similar ($p>0.05$) level of nutrients from the diet.

The average daily DM, CP, DCP and TDN intake per unit BW were also similar in all the treatment groups indicating nonsignificant ($p>0.05$) effect of rearing systems and feeding schedules. The DM intake (kg/100 kg BW) ranged from 3.27 in GF2 to 3.49 in GF3, which was indicative of adequate voluntary feed intake for sustaining optimum growth in crossbred animals. Similar levels of DM intake during three months of age was also observed by various workers (Das et al., 1985; Rout et al., 1996; Sahoo et al., 1996).

**Plane of nutrition of calves during postweaning period**

The digestibility trial conducted at 15th week of age was taken as the basis for the assessment of plane of nutrition in calves during postweaning period and is presented in Table 4. The average BW of calves during postweaning period averaged at 50.0, 49.7, 47.1, 51.6, 56.4 and 53.8 kg and they had an average daily gain (ADG) of 466, 445, 419, 561, 659 and 550 g in IF1, IF2, IF3, GF1, GF2 and GF3, respectively showing nonsignificant ($p>0.05$) difference among the groups. Interestingly, the voluntary consumption of calf starter was higher ($p<0.05$) and that of green fodder, lower ($p<0.05$) in group housed calves, there by influencing the total intake of DM, CP and DCP as compared to individually housed ones. A growing competitiveness for the consumption of more palatable calf starter in group housed calves is quite obvious. The DM intake ranged from 1.61 to 1.83 kg (average, 1.72 kg) with an overall nutrients intake (g/kg $W^{0.75}$) of 88.6, 16.4, 11.0 and 60.3 for DM, CP, DCP and TDN, respectively. If we consider a weaned calf of 50 kg BW consuming calf starter, the NRC (2001) recommendation values stand higher than the values observed in the present study. The TDN value of diets for calves weighing 60-80 kg with an ADG of 500 g is recommended at 86% for the DM intake at 1.27 kg. However, in the present study the DM intake was higher (1.72 kg) to compensate for the less energy dense diet (67.7% TDN), and it seemed that group housed calves consumed enough nutrients for nearly 600 g gain compared to 440 g in individually reared ones. The plane of nutrition of calves showed increased utilization of nutrients in GF2 and the values was being lowest in IF3 indicating better performance in group housed animals receiving 50% skim milk after 4 weeks compared to 100% replacement of milk with skim milk and further, individually reared animals showed relatively delayed adaptation to solid feed as evidenced from their reduced DM intake (1.64 vs. 1.79 kg) postweaning (9-14 weeks of age). Weary (2002) prefered housing young dairy calves in small groups for early social interactions in the development of normal social behaviour

and improved overall performance.

## IMPLICATIONS

The group housed calves performed better compared to individually housed ones with a superior average daily gain and dry matter intake. Further, replacement of milk with skim milk at 50% level after 4th week followed by complete removal after 6th week of age (F2) seemed to suit better in coping with immediate energy starvation due to sole feeding of skim milk (F3) and they performed the best under group housed system of rearing.

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