

PERFORMANCE OF PRE-WEANED FEMALE CALVES CONFINED IN HOUSING AND OPEN ENVIRONMENT HUTCHES IN KUWAIT

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ABSTRACT

Objective of the present study was to compare the responses of Holstein Friesian pre-weaned female calves confined in elevated metallic crates in closed-type of housing and polyvinyl hutches in an open environment of Kuwait. A total of 176 newborn Holstein Friesian female calves were randomly distributed to conventional confinement in closed-type calf houses (control) and individual calf hutch in open environment (treatment). These calves were monitored upto the weaning age of 90 days. The average daily live weight gain was significantly higher in calves housed in hutches than conventional housing system (413 versus 113 g/h/d; $P \leq 0.0001$). Mean risk rates (RR) for mortality in hutch and conventional housing were 0.017 and 0.23, respectively. The results showed a significant positive impact of hutch housing with respect to growth, mortality and incidence of diseases in Kuwait's intensive dairy farming system.

Key words: Dairy calves, weight gain, conventional housing, hutch, mortality.

INTRODUCTION

Dairy farms in Kuwait are managed in an intensive system (zero grazing) due to an extreme arid and harsh environment with temperatures ranging from 45 to 50°C during summer and from 20 to -4°C during winter. The replacement dairy female calves are also subjected to intensive closed-type housing environment with cooling and heating arrangements during the summer and winter, respectively. Yet, mortality rate was found to be as high as 90% (mean 43%) and morbidity rate of 100%, causing a serious loss to the dairy producers (Razzaque, 2001). An average growth rate of female calves was found to be 100g/h/d, resulting in stunted calves at weaning, therefore, adversely affecting the age at first breeding and life-time milk yield. However, a study in lambs showed better growth when put in intensive system of rearing (Munir *et al.*, 2008).

According to Berge *et al.* (2009), healthy environmental parameters including timely colostrum feeding, housing, type of bedding materials, hygiene of milk and water are the key to successful replacement calf rearing. Earlier in the pioneering studies, several housing systems were compared for newborn calf rearing in a temperate climate (Friend *et al.*, 1987). Hill *et al.* (2007) noted that naturally ventilated calf housing in all weather conditions, especially during winter, had a positive impact on feed intake and growth rate of young calves. However, information on proper housing and rearing of calves in an environment like Kuwait is scanty for adoption and improvement of calf performance for herd replacement purposes. The objective of the present study was to compare the performance of female Holstein Friesian calves housed

in conventional closed environment with those kept in open type individual hutches in Kuwait.

MATERIALS AND METHODS

Location of farms and study period

The experiments were conducted in two commercial dairy farms having a total herd size of 700 cattle kept under the intensive system of management. These farms are located at Sulaibiya, 25 Km north-west of Kuwait city. The studies were carried out during the two calving seasons from October, 2003 to February 2004 and subsequently from October, 2004 to February 2005.

Experimental design and calf housing

The experimental design involved assigning female calves born during the same calving season randomly to two types of housing as follows: i) closed-type traditional confined calf houses in elevated metallic crates (control), and ii) open-type, newly introduced calf hutches (treatment). Closed-type calf houses were built with brick side walls and metallic roofing (insulated). Pad and fan cooling and electrical heating were used during the summer and winter seasons, respectively. The conventional elevated metallic crate measured 180 X 80 X 90 cm. There were 12 pens close to each other in each group (Plate 1).

In the open environment, polyvinyl jumbo hutch (made in Canada), measuring 248.9 X 167.7 X 139.7 cm was used for individual calf. Each hutch had a built-in-manger, a double pail holder for 6.15 liters pails and top and rear vents for ventilation (Plate 2). Hutches placed on each farm were 2 meters apart from one another and individual calf was held by chain. The

distance between the side walls of one hutch from that of other was 1.5 meters. Desert sands were used as bedding materials in the hutches. The hutches were covered with synthetic shading nets to provide 80% shading to protect calves from direct sun and to provide easy ventilation.



Plate 1: Conventional elevated metallic crates used in closed calf houses.



Plate 2: Side view of calf hutches organized in an open environment over clean sand.

Experimental calves, feeding and management

A total of 176 newborn Holstein Friesian female calves were randomly assigned to a control (n=61) and a treatment (n=115) groups in two commercial dairy farms. Birth and weaning weights and disease events were recorded during the study period of 90 days till weaning of the calves. The calves were kept under uniform management, as described earlier (Razzaque, 2001). The same person on each individual farm took care of the feeding according to the NRC standards (NRC, 2001). Two daily feedings every 24 h on an *ad libitum* basis were followed. The health care for both groups of calves was also similar i.e., administration of electrolyte fluids in the case of diarrhea or scours, and other routine disease prevention, hygienic measures, and treatments as required. The main parameters monitored were: the health conditions of the calves, incidences of disease, mortality and live-weight gain from birth to weaning.

Chi-square statistics was used to compare mortality rates, and paired t-test was applied for the comparison

of live weight gain of calves between the control and treatment groups (Snedecor and Cochran, 1980).

RESULTS

Birth weight and growth rates

There was no significant difference in the birth weight of calves between the treatment (30.07 Kg) and control (28.45 Kg) groups (Table 1). However, calves reared in hutch housing showed significantly higher average daily live weight gains and survival rates than the calves reared in conventional systems over the 90 days test interval (Table 1).

Disease incidence and mortality

The risk rate values for mortality were 0.017 and 0.23 for female calves reared under hutches and conventional housing, respectively (Table 1), the difference was significant ($P < 0.0001$). There was no significant difference in disease incidence during the first age interval of 0–15 days for calves of the two housing systems at both farms. In fact, 100% calves of 1-15 days of age at both farms suffered from the scour (Table 1). Due to the absence of separate maternity barns, at that time in both dairy farms, the cows delivered on sand floor on their barns. Calves were cleaned and separated immediately and fed colostrum. Yet in both farms, the calves suffered from scours during the first two weeks. Hutch housed calves recovered and their performance significantly improved until weaning. Thus, in calves kept under hutch housing, incidence of disease decreased to 78.26% at 16-30 days of age and 23.48% at 31-90 days of age. However, in calves kept under conventional housing, the incidence of diseases was 88.52% at 16-30 days of age and 77.05% at 31-90 days of age (Table 1).

DISCUSSION

In Kuwait, the usual practice of dairy operation had been importation of pregnant dairy heifers, rearing them for milk production for an average of 2-3 lactations and then culling them as beef animals. The losses of young calves born from un-adapted imported cows were very high prior to their weaning, presumably due to adaptation problem to local environment. Housing of new born calves was found to be the main concern to dairy producers (Razzaque *et al.*, 1999). Dairy producers in Kuwait and elsewhere in many developing countries use conventional calf housing in the closed calf barns in crates having direct contacts between the sick and healthy calves. Present studies demonstrated benefits of introducing and adapting the hutch housing for pre-weaned calves under the prevailing environment in Kuwait, irrespective of the season.

Table 1: Birth weight, weight gain, deaths and disease incidence in calves kept under two housing systems

Parameters	Hutch housing	Conventional housing
Number of calves	115	61
Mean birth weight (Kg)	30.07	28.45
Weight gain (g/day)	413 ^a	113 ^b
Number of deaths	2 (1.74%) ^a	14 (22.95%) ^b
Risk rate for mortality (%)	0.017 ^a	0.23 ^b
No. of disease cases at different ages		
1–15 days	115 (100%)	61 (100%)
16–30 days	90 (78.26%)	54 (88.52%)
31–90 days	27 (23.48%) ^a	47 (77.05%) ^b

Values with different superscripts within a row differ significantly ($p \leq 0.0001$).

Growth rate

The differences in the growth rates of female calves in two types of calf housing (conventional crates in closed calf barns and hutches) indicated that in conventional housing, the calves were presumably subjected to stressful environment such as behavioral, physical and spread of diseases. However, in hutch housing in the open environment and use of clean sand beds irrespective of seasonal changes of temperature appeared to have provided a comfortable environment to calves. These findings are consistent with results of Hill *et al.* (2007). Behavioral satisfaction of calves in open environment hutches in our studies might have contributed to a better growth rate than calves housed in confined crates (Heinrichs *et al.*, 2005). A comfortable resting posture and display of increased social behavior were earlier observed to be positively associated with an increased growth rate of calves (Andrighetto *et al.*, 1999; Chua *et al.*, 2002)

Incidence of disease

Our findings of significant difference in mortality risk rate (RR) between the two types of calf housing in commercial farms (RR 0.23 in conventional and RR 0.017 in hutch housing) served as a demonstration to the dairy producers in Kuwait. Thus, they could save approximately their 96% of the replacement Holstein Friesian calves (Razzaque, 2005). The main advantages of hutch housing include: isolation, less pathogen loads, open ventilation and physical comfort of young calves (Webster, 1983; Razzaque, 2006). Moreover, the polyvinyl hutches are durable and easy to clean and maintain.

Based on previous findings (Razzaque *et al.*, 1999; Razzaque *et al.*, 2001), the most prevalent cause of disease in calves aged over 15 days was pneumonia. The results would suggest that the calves reared in hutches are less likely to experience respiratory diseases than those reared in closed shed in conventional environment.

There had been a significant positive impact of introduction of hutch housing to Kuwait for raising female calves for herd replacement. A higher disease

incidence found in calves aged between 1 to 15 days in this study was consistent with the findings of Khan and Khan (1991). They found major incidence of diarrhea, pneumonia and deaths in calves from birth to two weeks of age. It is clear from the results that a significantly higher growth rate in calves kept under hutch housing was associated with less disease incidence, as expected.

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