



Platform Based Housing System Improved Health and Reduced Mortality Percentage of Goats in Flood Prone Area of Coastal Odisha

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Authors' contributions

This work was carried out in collaboration among all authors. Author LD designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author FHR edited the first draft and author SD managed the analyses of the study. Authors SM, SKS and SNM managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Goat rearing under semi intensive farming conditions is characterized by high kid mortality and low weaning weight percentages. The root cause which needs to be addressed for various diseases and parasites leading to low body weight gain and kid mortality is improper housing practises. The welfare of Black Bengal goats as a source of sustainable livelihood is a burning issue since the beginning thus the researchers for so many years have tried to assess ideal housing system for these goats in context to their geographical climate to optimize their production and welfare, still the reports are scarce in this arena. The experimental platform based goat housing system was constructed for 20 farmers with an average flock size of 16 goats in flood ridden Dasmankula village

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of Marsaghai block Kendrapara district where various families adopted traditional practises of goat farming for sustainable livelihood. This is the first report from Odisha in context of housing pattern of Black Bengal goats where it was observed that a change in housing practise along with proper vaccination schedule led to significant decrease in mortality percentage of goats. The results showed that the body weight increased linearly as the age advanced and the body weight of adult goats at 10 months of age at platform based housing was 9.82 ± 0.74 and 9.12 ± 0.53 as compared to 8.78 ± 0.68 and 7.82 ± 0.42 in mud and slotted floor in males and females, respectively. The platform raised housing system was effective in decreasing gastrointestinal parasite load and thus early recovery from disease incidence as Contagious Ecthyma (ORF). Mortality percentage of goat was significantly reduced after adopting the platform based housing system along with proper vaccination schedule due to establishment of better immune system which was directly proportional to decreased parasitic load in this experimental housing system. However, impact on change in body weight was not significant in kids but somewhat noticeable in case of adults which proved to be a great boon for the goat farmers of Dasmankula village.

Keywords: Platform housing system; Black Bengal goat; Dasmankula; kid mortality; parasites; coastal Odisha.

1. INTRODUCTION

Small ruminants especially goats play a vital role in improvement of rural economy especially amongst marginal and small farmers as a source for nutrition and act as a potential candidate for poverty reduction in coastal Odisha. Typically, Black Bengal goats are kept for slaughter or sales mostly during rituals and traditional ceremonies of the coastal belt of Odisha and for security against crop failure due to erratic rainfalls and cyclones in most cases [1]. According to a study conducted by Kumar [2], estimated losses due to diseases in goats were found to be 23.22% of net returns and 5.21% of gross returns. Economic losses due to mortality attributed by various infectious and non infectious causes in goats have been a major constraint in the traditional flocks [3]. Although these Black Bengal goats are sturdy and have a unique ability to adapt and maintain themselves in harsh environment when compared to other ruminants [4], rearing them in coastal areas of Odisha is characterised by poor management and low productivity. In most cases, low productivity of goats is due to various factors such as high kid mortality and lack of good management practices due to less knowledge on scientific method of goat rearing in farming community. The Black Bengal breed irrespective of being resilient is vulnerable to rain and water logging condition thus making it susceptible to parasitic infestation. The Marsaghai block has a population of 0.091 lakh goats out of total population of 1.0 lakhs of goat population in the Kendrapara district [5]. As reported earlier by Acharya [6] major cause of low productivity in goats is its susceptibility to parasitism due to

traditional mud floor housing system. Therefore, an attempt has been made to change the housing pattern of goat and thus study the change in mortality percentage under two different housing patterns.

2. MATERIALS AND METHODS

2.1 Site of Study

The experimental platform based goat housing system was constructed for 20 farmers with an average flock size of 16 goats in flood ridden Dasmankula village of Marsaghai block Kendrapara district where various families adopted traditional practises of goat farming (approx 70 families) for sustainable livelihood. This village is an adopted village by Krishi Vigyan Kendra, Kendrapara in which various climate-resilient activities on agriculture and allied sector are going on under the National Innovations in Climate Resilient Agriculture (NICRA) program. In village condition goats are not provided with any special shelter and are usually kept in mud kutcha house with thatched roof which often remains damp. Goats however need to be protected from drastic weather during pick summer, rainy and winter. Thus we constructed platform raised goat houses by using local materials available as bamboo stumps and wooden planks for flooring therefore making it resilient to flood and cyclones. The size of goat houses was 15 m (l) x 4 m (w) x 3 m (h) which accommodates 20 goats along with internal partition for housing of bucks and pregnant does. Ventilation is of utmost importance to maintain a desirable interior temperature of 28 to 30°C. If the animals cannot get rid of heat due to high

external temperature ($> 30^{\circ}\text{C}$), they eat less and therefore produce less. Hence height of roof of the goat shed should be 3 m at the periphery and 3.5 m at the centre for proper ventilation [7]. Slatted floors should be raised about 1.5-2.0 meters above ground level to facilitate easy cleaning and collecting of dung and urine. The gap between the slats should be 1.4 to 1.6 cm to allow easy passage of faecal material and guarantee safe footing for the animals. Newborn and young should not be put on slatted floors [8]. Roofing material was made of bamboo in some cases and earthen tiles in other cases which were cheap and practical. As the slatted floors were raised above the ground level provision was made for collection of dung and urine periodically. Thirty post weaned Black Bengal kids were randomly selected each from mud housing and platform based housing systems. After recording the birth weight of these kids their body weight was further recorded at 4 months and 10 months respectively after rearing them in mud and platform based housing system.

2.2 Eggs Per Gram Count (EPG)

In order to observe the change in parasitism status, faecal samples were collected at various intervals (March, June, August and October) to estimate the eggs per gram (EPG) count. Faecal samples were collected in 30-ml wide-mouthed plastic vials from each animal under study. A part of the individual faecal samples was examined qualitatively for the presence of nematode eggs by using standard salt flotation technique and the remaining part of samples were subjected to quantitative faecal examination by modified McMaster's technique for determining the eggs per gram (EPG) of faeces. Animals were administered with anthelmintics as per faecal examination twice per year and were dipped in 0.5% solution of malathion or 0.02% diazinon once in every month as described by Chowdhury et al. [9].

2.3 Disease Incidence

Before commencing this study it was found from the initial survey data of ARD, Kendrapara that in Dasmanikula village of Marsaghai block in case of growers (5- 14 months age) Black Bengal goats mortality was about 34%, mostly it was attributed to diarrhoea and pneumonia and mortality was higher (nearly 54%) in hot and humid season (May to September). Another disease which was taken into consideration during the course of study was incidence of Contagious Ecthyma (ORF) which often takes

form of outbreak during month of September to November in the district. Immediately after the disease was reported, the healthy animals were treated with antibiotic (Enrofloxacin @5 mg/kg) body weight for three days for preventing the disease. During the time of first report 3 goats from mud housing system and 1 from platform raised housing system were affected with symptoms of ORF. Later on within a period of 14 - 15 days a total of 167 goats were affected with ORF. When calculated, about 43% goats of mud housing system and 37% of platform raised housing system were found symptomatic with ORF. All the affected animals were kept in isolation and were uniformly treated with intravenous fluid like dextrose normal saline for restoring ionic balance with antibiotic (Levofloxacin @ 4 mg/kg body weight) to prevent secondary bacterial infection and anti-inflammatory (Flunixin Meglumine @ 2.2 mg/kg body weight) I/M with KMnO_4 solution (1:1000) washing of lesions and topical application of herbal drug topicure SG [10]. The animals showing respiratory symptoms were given antibiotic (Ceftiofur Sodium @ 2.2 mg/kg body weight) OD I/M along with antihistamine (Pheniramine Maleate 10 gm) BID. Severe sore mouth animals were advised application of Choline Salicylate, Lignocaine and Benzakonium Chloride to reduce pain and thus enhance the feed intake. The response of animals to treatment regime in two different housing systems was recorded and their resumption to feed was compared between mud housing system and platform raised housing system. Also the difference in mortality pattern of animals was compared before and after the experiment. The animals were vaccinated against P.P.R, FMD, H.S and Enterotoxemia in due course with boosters at 3-4 months of age by ARD Dept, Kendrapara.

2.4 Statistical Analysis

Analysis of the arranged data has been made in SPSS following Snedecor and Cochran [11]. The data on faecal egg/oocyst counts were transformed logarithmically and the resulting transformed variables were tested for normality before analysis.

3. RESULTS AND DISCUSSION

3.1 Impact on Body Weight and Growth Rate

The mean body weight of Black Bengal goats at three months of age under mud and slatted floor

housing systems was 1.16 ± 0.12 and 1.23 ± 0.16 kg respectively. The body weight increased linearly as the age advanced and the body weight of kids at 8 months of age at mud and platform raised housing systems was 9.17 ± 1.43 and 9.83 ± 1.57 kg respectively.

Though much difference was not found in body weight gain from birth till maturity (10 months) as depicted between mud housing and platform raised housing systems (Table 1) but Oliveira et al. [12] and Kumari et al. [13] reported improved performance of kids on mud housing system, whereas, Bhakat and Nagpaul [14] and Lupton et al. [15] and Bharambe et al [16] observed the improved growth of goat kids on slatted floor.

3.2 Impact on Faecal Egg Count

Before commencing this experiment it was found that adult Black Bengal goats (6-9 months of age) died mostly due to suspected gastrointestinal parasites (68%). Therefore the Black Bengal goats were dewormed before the start of experiment and they were further dewormed regularly every 4 months interval after faecal examination. The faecal samples were collected at monthly intervals and egg per gram count (EPG) was made before and after construction of platform raised housing system. A significant difference was found in the Least squares means of EPG was found which is elaborated by bar diagram in Figs. 1, 2 and 3.

Table 1. Body weight of black Bengal goats observed at different ages in two different housing systems in coastal Odisha

Sl. no	Parameters	Mud housing system		Platform raised housing system	
		Black Bengal males	Black Bengal females	Black Bengal males	Black Bengal females
1.	Birth weight (kg)	1.16 ± 0.12	1.08 ± 0.14	1.23 ± 0.16	1.14 ± 0.11
2.	Weaning weight of kids at 4 months of age (kg)	4.73 ± 0.41	4.13 ± 0.28	5.23 ± 0.32	5.08 ± 0.25
3.	Body weight at 10 months (kg)	8.78 ± 0.68	7.82 ± 0.42	9.82 ± 0.74	9.12 ± 0.53

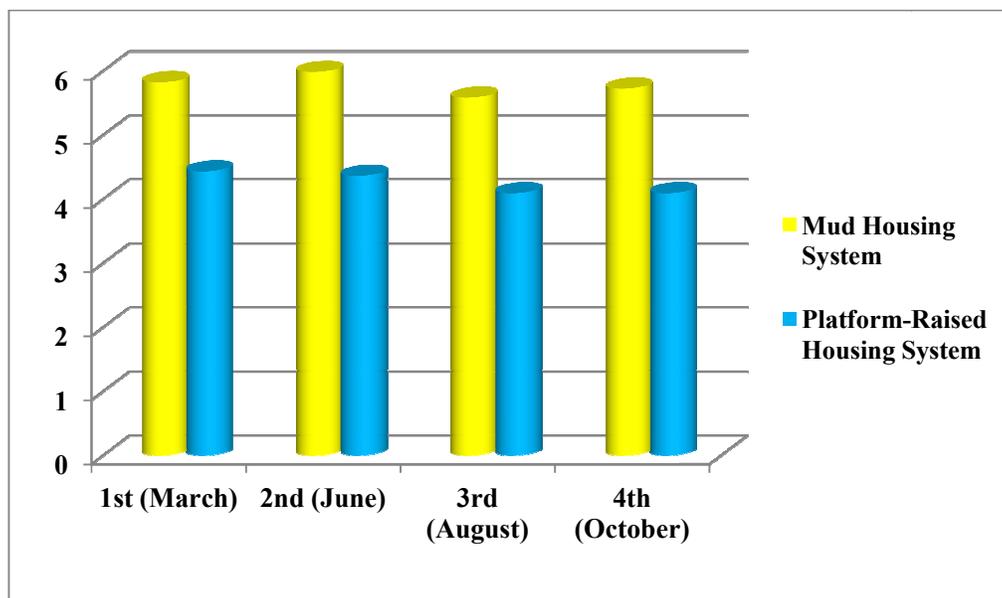


Fig. 1. Coccidial load in faecal matter of black Bengal goat in different housing system

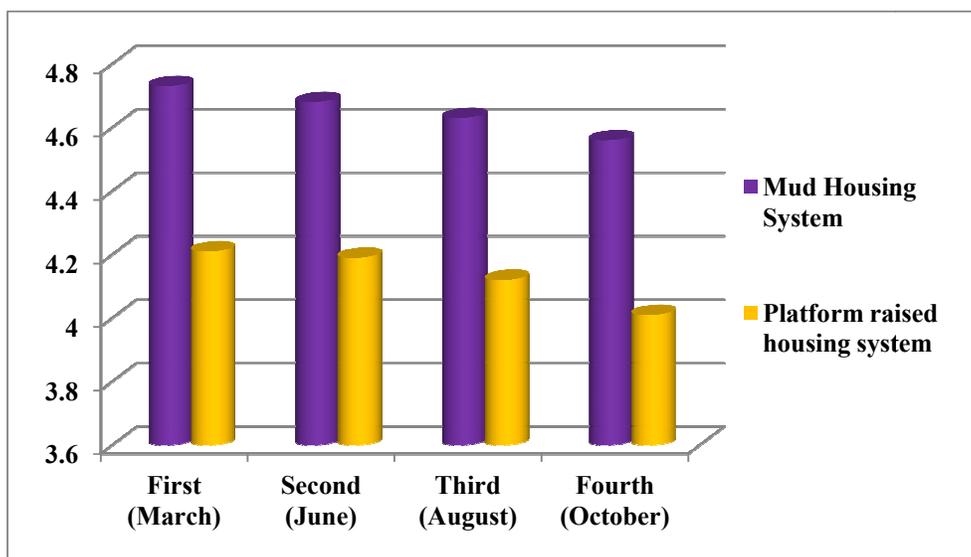


Fig. 2. Cestodes load in faecal matter of black Bengal goat in different housing system

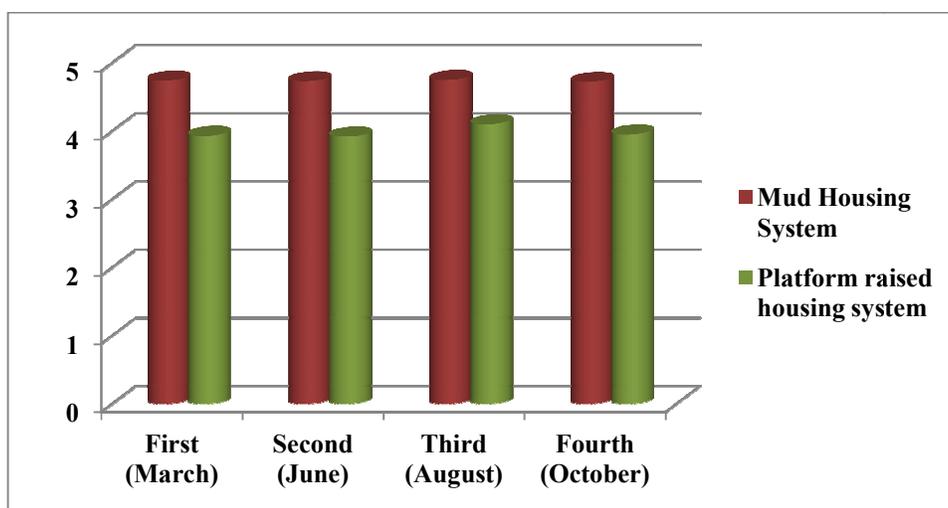


Fig. 3. Nematodes load in faecal matter of Black Bengal goat in different housing system

During the initial sampling period i.e month of March, the cestodes, nematodes and coccidial load was present considerably higher amount in the faecal samples of goats reared on both type of housing methods, which might be due to lack of management practices pertaining housing methods and absence of deworming before commencing the experiment. The coccidial load in mud housing system increased considerably during second sampling i.e month of June which is the season for onset of south west summer monsoon in the district somewhat similar to that of first sampling which was taken in the month of March. On the contrary, there was significant reduction of coccidial load in goats housed under

platform raised housing during second sampling (June) which proved that the elevated structure above ground level was helpful in decreasing the coccidial load in goats during the peak time of incidence in the district. Moreover, similar increase was found again during third sampling taken during end of October where in the coastal districts of Odisha there is onset of North east winter monsoon. This scenario pose better survival of the oocysts in the surrounding due to increased moisture and increased incidence of coccidiosis due to uptake of infection through faeco-oral route. Further, in the platform raised housing system, the animals after administration of anti-coccidial drugs, were unable to pick up

the infected oocytes from dry slatted floors which in contrary gets absorbed in the mud type housing system. The current findings were in alignment to the previous reports of Catchpole et al [17] and Tahir et al. [18] who reported that the raised slatted flooring reduced the prevalence of coccidiosis by preventing the chance of picking up infection from the floor. Similar finding was reported by Thiruvankadan et al. [19] in context to Tellichery kids regarding estimation of parasitic load via faecal egg count reared on platform raised slatted floor in contrast to mud floor but the difference was not so significant in that case and thus the author attributed this to lower rainfall (less than 800 mm) of the study area. As concern as other worm loads as cestodes and nematodes the overall Least square means of LEPC was significantly lower in case of goats reared on platform raised housing system than on mud floor housing system during all four sampling periods.

3.3 Impact on Disease Incidence and Mortality Pattern

The overall kid (0-3.5 months of age) mortality within study period was about 36%, of which the major causes were non infectious (68%) i.e due to gastro intestinal parasites and some ectoparasites as ticks and mites while 32% was due to infectious i.e. PPR, Enterotoxemia, FMD

and Haemorrhagic Septicaemia. The incidence of infectious diseases as PPR, HS, FMD and Enterotoxemia decreased drastically as depicted by pictorial representation in Fig, 4. The change happened only after the farmers followed proper vaccination schedule along with proper housing practices. Timely vaccination with boosters was given to the animals by ARD, Kendrapara throughout the year except some diseases as ORF for which no vaccination is done and which often takes the form of outbreak in the district. After the goats were uniformly treated significant difference regarding the response to the regime was noticed between the goats reared under two different housing systems. There were 6 mortality cases from animals reared under mud housing system while no mortality observed in animals reared under platform raised housing system. Also it was noticed that goats reared on raised slatted floor responded quicker and better to the treatment regime than goats reared under mud housing system. The goats reared under raised slatted floor housing system resumed normal feeding behaviour after suffering from ORF at least on an average of 3 days earlier than goats reared under mud housing system. This might be attributed to lower parasitic load among raised slatted housed goats which in turn has an effect on enhancement of immune system which was in coherence with the study as previously reported in case of sheep [20].

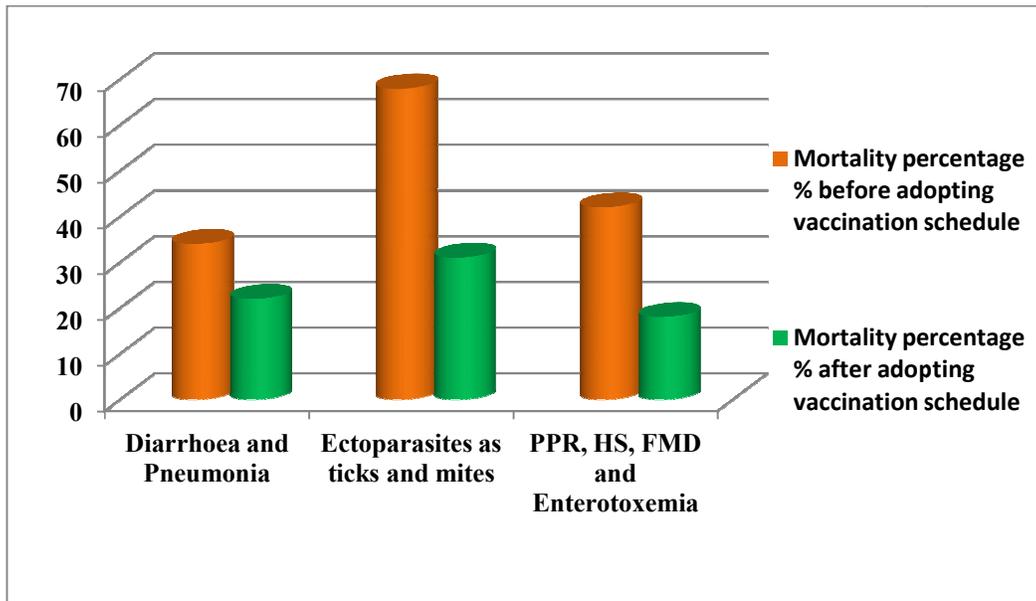


Fig. 4. Decrease in mortality percentage after adopting raised platform housing system along with proper vaccination schedule

4. CONCLUSION

The findings of current study concluded that the wooden slatted floor in goat shelters in this coastal areas benefit in increasing performance of growing kids and adults with respect to body weight gain at different ages. This platform based housing system effectively controlled the gastrointestinal parasitic load which pose a great economic burden to the marginal and small farmers. Though it is clearly mentioned in the article that in order to combat spread of infectious disease proper vaccination schedule was adopted but housing system also plays a pivotal role in disease control by enhancing the immune system due to decreased parasitic load. Moreover, the raised housing system was effective enough to strengthen the immune status of animals due to lower parasitic count which resulted in early recovery from disease as ORF. As this platform based housing system was constructed from locally available raw materials as bamboo stalks and wooden planks they were found to be cost effective in this study but still further studies are required in addressing the economic benefits of platform raised housing system in terms of reduced labour and change in feeding system for further decrease of investment cost and thus increase in profit output of goat production system.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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