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# GROWTH PERFORMANCE AND FEED INTAKE OF BUFFALO CALF UNDER DIFFERENT SHADE MATERIALS DURING SUMMER SEASON

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**Abstract**: The present study was carried out during summer season for a period of 120 days to see the effect of different shade materials on the performance of twenty four buffalo calf. Twenty four buffalo calves after colostrum feeding were selected for study and divided into 4 groups (6 calves in each group). The different groups of calves were studied under different roof materials as followed: Asbestos roof (T1), Pre painted CGI Sheet roof (T2), Thatch with polythene shading roof (T3): Galvanized iron sheet roof (T4). The Initial body weight was 98.83±4.48, 49.50±2.22, 60.93±6.27 and 45.72±2.13kg in T1, T2, T3 and T4, respectively. The fortnightly body weight of calves increased steadily and reached the final body weight and found maximum gain in body weight of T3 group. Significantly higher body weight gain in T3 grouped calves as compare to other groups. The overall ADG during the period of experiment was 0.18±0.01, 0.14±0.01, 0.28±0.02 and 0.14±0.01 kg for T1, T2, T3 and T4, respectively. All the body measurement showed an increasing trend with advancement of age and increase in body weight.

**Keywords:** Body measurements, Growth, Heart girth, summer season Different shade materials.

## Introduction

Production and reproduction status of any herd largely depends on growth and vigour of calves. Overall dairy farm profit can be maximized by reducing calf mortality, better managemental practices and supplementation of the good nutrients and feed additives. Among the various managemental factors involved in optimum growth and production, an adequate diet containing essential nutrients is required [6]. As a result of fast growing trend of restricting the amount of milk or milk replacer during the first few weeks of life in an effort to encourage solid feed intake and allow early weaning, the concept of accelerated growth programmes, accelerated early nutrition, intensified nutrition has been practiced by replacing the whole milk with skimmed milk and calf starter along with supplementation. Calf feed supplemented with various preparations of mineral mixture, vitamins, probiotics

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etc. These are not only costly but also adulterated. So there has been need to provide good herbal replacement of these preparations so that farmer can grow it even in kitchen garden.

The performance of any domestic species including buffalo depends on the influence of heredity and environmental factors. Keeping aside the genetic make-up of the individual management practices play an important role for improving the overall performance of animal to a great extent. The main aim of better management of heifer is to obtain optimum growth rate, efficient feed conversion efficiency as per their genetic potential thereby to attain early maturity weight and subsequently reduce the age at first calving which has direct effect on the life time production performance of animals.

Growth is a complex phenomenon and is difficult to define in simple terms. Growth is taken as increase in body weight. However, an animal can show skeletal growth without putting water or fat from the body. So combinations of body weight and body measurements were applied. In this study gain in body weight and size (length, height, heart girth and pouch girth were used as measurements of growth. India is a tropical climate which is characterized by high temperature and humidity. Extended periods of high ambient temperature coupled with high relative humidity compromise the ability of the dairy calves to dissipate excess body heat. Calves with elevated body temperature exhibit lower DMI and growth with less efficiency, reducing profitability for dairy farms in hot and humid climates. Generally calves are housed in groups in confined outdoor yards during day that leave them expose to high environmental temperatures, which can exceed their ability to dissipate body heat. The ensuing heat stress has important implications for cattle welfare as well as a negative impact on health and production; in extreme cases resulting in death. It has been observed that radiation energy flow on animal is 685 kcal /m²h, but actually only 340 kcal/m²h is from the direct solar radiation and rest is reflected by floor, dust, wall, etc [15].

Therefore, to protect young calves from the extremes of sun and wind simple shading even in the open paddock above the manger is essential during early life. Placing a simple shade over an animal exposed to a hot environment and direct solar radiant energy from the sun cuts the radiant heat load on that animal by about 45% [3]. Solar radiation is a major factor in heat stress and increases heat gain by direct as well as indirect means [14]. Type of roof material generally decides the micro climate in the underneath covered area. The structure casting the shade should have at least one of the following properties: high reflectivity, low conductivity, low under-surface emissity, correct roof profile (slope) and maximum practical height [1]. Therefore, in the present study, to exploit positiveness of each roofing materials, different

types of roof materials were tried to see the effect of growth performance and feed intake of buffalo calf under different shade materials during summer season.

**Materials & Methods**

The present study was conducted at Bihar Veterinary College, Patna during winter season for a period of 120 days (March to June). Twenty four buffalo calves after colostrum feeding were selected for study and divided into 4 groups (6 calves in each group). Each season taken new calf of similar age group. The different groups of calves were studied under different roof materials as followed: Asbestos roof (T1): commercially available asbestos was used. Pre painted CGI Sheet roof (T2): commercially available pre painted CGI sheet having thickness 0.13 mm to 0.5mm, Zinc coated -60gram/$m^2$-120gram/$m^2$ which is durable, anticorrosive and excellent water proof. Thatch with polythene shading roof (T3): four inch thick layer of paddy straw fixed to bamboo frame. Galvanized iron sheet roof (T4): commercially available in the market without painted.

The calves were weighed individually before feeding and watering in the morning at fortnightly interval (15 days interval). Along with the recording of fortnightly body weight, the body measurement viz., height at withers, body length, heart girth and pouch girth were also taken with the help of measuring tape on centimeters scale (cm) at fortnightly interval for each buffalo calf. Body measurement was taken when the buffalo calves are standing in a normal body posture. Body weight of each calf was recorded at fortnightly intervals during the experimental period. Weighing was always recorded around 8.00 AM. The weighing of calves were done by hanging balance with capacity of weighing up to 100 kg (the minimum graduation being 0.001 kg). The rate of growth was calculated as follows: Body Weight Gain (kg) = Body weight at the end of experiment (kg) - Body weight at beginning of experiment (kg) . The feed intake data was taken daily and total dry matter intake was estimated at the end of week. Concentrate, dry fodder and green fodder were offered to the animals individually in separate pens. Weighed quantity of fodder and concentrate were given to the animal and residue were collected and weighed separately. Dry Matter Intake (DMI) from all feed sources were calculated separately and then all added to find out the total dry matter intake of calves for each treatment group..

The data obtained from the studies were compared by analysis of variance (ANOVA) as per the methods described [14].

## Results and Discussion

The performance of the animals is said to be impaired on exposing them to extremes of climatic condition. Environmental conditions especially shelter management also affect the 24 hour behavior in dairy animals in a varying range, which could be used to study the effectiveness of roofing material in a particular agro-climatic region. So there is need to study the effect of growth performance under different shade material of buffalo calves.

### Growth performance

### Body measurement in summer season

All the body measurement such as body height, body length, heart girth and Pouch girth of buffalo calves are presented in table 1. The overall body height changes were 4.00±1.18, 4.00±0.26, 10.83±5.05 and 3.00±0.86, the body length changes were 4.17±0.61, 5.00±2.28, 8.85±2.90 and 3.00±1.53, the heart girth changes were 5.17±2.96, 5.67±0.99, 10.50±3.30 and 4.5±1.8 and pouch girth changes were 9.5±4.26, 6.33±2.20, 12.17±6.10 and 5.50±1.86 cm for T1, T2, T3, and T4, respectively. All the body measurement showed an increasing trend with advancement of age and increase in body weight. The overall changes viz; body height, body length, heart girth and pouch girth were higher in T3 as compared to other shade materials. This might be due to fluctuating body weight changes in different ages of calves. The increased body length in group T3 calves might be due to the influence of temperature on animals development which changed the relative size of body parts resulting in an increase by its greater surface area to dissipate more heat from the body surface compared to other groups. Present finding are supported by [11] who also observed non significant difference in body measurement of crossbred calves when given bathing to reduce heat stress in hot humid conditions.

### Body weight gain of buffalo calves during summer season

The fortnightly body weight gain of calves in all the four groups are presented in table 2. The Initial body weight was 98.83±4.48, 49.50±2.22, 60.93±6.27 and 45.72±2.13kg in T1, T2, T3 and T4, respectively. Final body weight after end of experiment was 117.83±5.53, 65.00±4.15, 90.00±3.08, and 60.17±3.79 kg in T1, T2, T3 and T4, respectively. The fortnightly body weight of calves increased steadily and reached the final body weight and found maximum gain in body weight of T3 group. Significantly higher body weight gain in T3 grouped calves might be due better micro environment under shade which facilitates the growth of calves irrespective of higher maximum ambient temperature during experimental period. [8] reported that open type of housing with thatched roof sheds is preferred for

growing buffaloes. In contrary, other [12] found no significant difference in growth of calves in loose house with single wall and loose house with four feet side wall..

**Average daily weight gain (kg) in summer season**

The fortnightly ADG of calves during summer season is presented in table 3. The overall ADG during the period of experiment was 0.18±0.01, 0.14±0.01, 0.28±0.02 and 0.14±0.01 kg for T1, T2, T3 and T4, respectively. The overall ADG from T3 (0.28±0.02) kg indicated a significant ($P<0.05$) difference between different shade materials used in the experiment. The ADG was significantly higher ($P<0.05$) for T3 grouped calves as compared to other grouped calves. Whereas, no difference was observed among T1, T2 and T4. [10] observed higher weight gain by providing simple thatch shed to the kids in comparison to tin roof. [16] recorded modest improvement in weight gain for animals using shaded manger. [9] indicated that calves showed improved gains with shade in spring and early summer season heat stress periods (0.41 lb/day for calves).

**Dry matter intake (DMI) (kg/day) of buffalo calves in summer season**

Fortnightly dry matter intake from different sources viz. concentrate, dry fodder and green fodder in different treatment group are presented in table 4, 5 and 6 respectively. The table revealed that DMI of concentrate feed was higher from dry fodder and green fodder which may be due to lower capacity of developing rumen to accommodate larger portion of bulky fodder. However, DMI was higher of concentrate feed and dry fodder in T1 (1.88±0.02) & (1.46±0.01) in comparison to T3 (0.94±0.02 & 1.04±0.05), T2 (0.81±0.01 & 0.74±0.01) and T4 (0.74±0.03 & 0.75±0.01) the DMI from all source was higher ($P<0.05$) in T1 as compared to other shade materials throughout experimental period. Overall DMI of concentrate feed and dry fodder in T1 was differ significantly from all other groups but there was no significant difference between T2 and T4. However, the DMI of green fodder did not differ significantly among the groups throughout the fortnights. Decrease DMI in T2 and T4 as compared to T1 and T3 might be due to direct elevated temperature which reduces gut motality, rumination and luminal concentration [2, 17] and thereby having a direct negative effect on appetite centre of hypothalamus. The present findings are in agreement with others [4, 5, 18] who reported significantly higher DMI by calf kept under thatch and RCC shed. However, [7] reported non significant effect of housing on feed intake of Mehsana buffalo heifers.

## Conclusion

The body measurement in summer season viz. changes of body height, body length, heart girth and pouch girth were more in T3 as compared to other groups. ADG were found to be maximum in T3 group (0.28±0.02 kg) followed by T1 (0.18±0.01 kg) as compared to T2 (0.14±0.01 kg) and T4 (0.14±0.01 kg).

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**Table 1: Mean± SE of fortnightly body measurement (cm) of buffalo calves during summer season**

| Fortnights | Asbestos roof (T1) | PPCGI roof (T2) | Thatch roof (T3) | GI sheet roof (T4) |
|---|---|---|---|---|
| **Body height** | | | | |
| I | 101.17±1.99 | 85.50±2.42 | 92.17±2.08 | 86.33±2.08 |
| II | 101.33±1.79 | 86.5±2.42 | 92.33±2.02 | 86.83±2.09 |
| III | 102.50±1.50 | 87.33±2.66 | 94.00±1.75 | 87.50±2.29 |
| IV | 102.50±1.50 | 88.50±2.61 | 96.50±2.04 | 88.50±2.29 |
| V | 103.33±1.50 | 89.00±2.79 | 98.35±2.96 | 89.33±2.17 |
| VI | 103.67±1.37 | 89.17±2.73 | 100.33±3.53 | 89.33±2.17 |
| VII | 103.67±1.37 | 89.33±2.66 | 102.83±3.77 | 89.33±2.17 |
| VIII | 105.17±1.50 | 89.50±2.26 | 103.00±3.00 | 89.33±3. 73 |
| **Overall changes** | **4.00±1.18** | **4.00±0.26** | **10.83±5.05** | **3.00±0.68** |
| **Body length** | | | | |
| I | 92.83±2.99 | 77.17±1.98 | 83.00±3.11 | 78.83±3.15 |
| II | 93.33±2.31 | 78.50±2.02 | 83.00±3.02 | 79.67±3.16 |

| | | | | |
|---|---|---|---|---|
| III | 94.00±2.29 | 80.83±2.20 | 85.33±2.86 | 79.00±3.14 |
| IV | 94.67±2.33 | 81.00±2.09 | 86.50±2.88 | 80.17±3.07 |
| V | 95.33±2.50 | 81.67±2.22 | 88.17±2.88 | 80.67±3.02 |
| VI | 95.83±2.64 | 81.67±2.22 | 90.17±3.48 | 80.67±3.02 |
| VII | 96.33±2.52 | 82.17±2.13 | 91.50±2.80 | 81.50±3.08 |
| VIII | 97.00±2.72 | 82.17±2.13 | 91.85±2.93 | 81.83±3.00 |
| **Overall changes** | **4.17±0.61** | **5.00±2.28** | **8.85±2.90** | **3.00±1.53** |
| **Heart girth** | | | | |
| I | 117.17±4.22 | 85.50±2.61 | 99.00±1.61 | 94.33±3.02 |
| II | 118.00±4.22 | 88.50±2.18 | 100.50±1.61 | 95.00±2.98 |
| III | 122.50±3.47 | 89.83±2.30 | 102.17±1.44 | 95.33±3.16 |
| IV | 122.83±3.48 | 90.33±2.16 | 104.50±1.85 | 96.83±3.24 |
| V | 123.00±3.45 | 90.83±2.10 | 105.83±1.62 | 98.50±2.89 |
| VI | 123.00±3.45 | 90.83±2.10 | 107.50±1.95 | 98.50±2.89 |
| VII | 122.50±3.34 | 91.17±2.10 | 109.33±2.39 | 98.67±2.88 |
| VIII | 122.33±3.27 | 91.17±2.10 | 109.50±2.27 | 98.83±2.88 |
| **Overall changes** | **5.17±2.96** | **5.67±0.99** | **10.5±3.39** | **4.5±1.84** |
| **Pouch girth** | | | | |
| I | 126.83±2.18 | 95.00±2.79 | 107.00±3.52 | 98.33±2.51 |
| II | 126.50±2.51 | 96.33±2.89 | 108.67±3.03 | 100.00±2.49 |
| III | 132.33±2.16 | 98.66±2.26 | 109.66±3.83 | 102.00±2.67 |
| IV | 133.50±1.94 | 99.50±2.26 | 112.50±3.72 | 102.67±3.19 |
| V | 133.67±1.98 | 99.83±2.19 | 115.33±3.38 | 98.50±2.89 |
| VI | 134.00±1.62 | 100.50±2.22 | 116.17±3.84 | 103.83±2.92 |
| VII | 135.53±2.18 | 100.50±1.98 | 117.50±3.86 | 103.83±2.92 |
| VIII | 136.33±2.61 | 101.33±1.69 | 119.14±4.63 | 103.83±2.92 |
| **Overall changes** | **9.5±4.26** | **6.33±2.20** | **12.17±6.10** | **5.50±1.86** |

**Table 2: Mean± SE of fortnightly body weight changes of buffalo calves during summer season**

| Fort nights | Asbestos (T1) | PPGCI roof (T2) | Thatch roof (T3) | GI sheet roof (T4) |
|---|---|---|---|---|
| I | 98.83±4.48 | 49.50±2.22 | 60.93±6.27 | 45.72±2.13 |
| II | 101.67±4.01 | 51.75±2.04 | 65.33±5.41 | 47.92±1.96 |
| III | 104.50±4.08 | 54.17±2.44 | 69.75±5.74 | 50.07±2.64 |
| IV | 107.75±4.32 | 56.67±2.51 | 72.08±5.31 | 51. 77±3.02 |
| V | 109.75±4.70 | 58.83±2.60 | 76.17±5.34 | 53.00±3.30 |
| VI | 112.00±5.21 | 61.00±3.59 | 81.17±4.62 | 55.83±3.36 |
| VII | 114.67±5.50 | 63.33±3.93 | 85.17±4.02 | 58.00±3.76 |
| VIII | 117.83±5.53 | 65.00±4.15 | 90.00±3.08 | 60.17±3.79 |

**Table 3: Mean± SE of fortnightly ADG (kg), of buffalo calves in summer season**

| Fortnights | Asbestos roof (T1) | PPCGI roof (T2) | Thatch roof (T3) | GI sheet roof (T4) |
|---|---|---|---|---|
| I | 0.18±0.03$^{a}$ | 0.15±0.02$^{a}$ | 0.30±0.02$^{b}$ | 0.15±0.02$^{a}$ |
| II | 0.18±0.03$^{a}$ | 0.12±0.02$^{a}$ | 0.30±0.05$^{b}$ | 0.15±0.02$^{a}$ |
| III | 0.22±0.02 | 0.12±0.02 | 0.15±0.02 | 0.12±0.02 |
| IV | 0.13±0.02$^{a}$ | 0.13±0.02$^{a}$ | 0.27±0.05$^{b}$ | 0.08±0.04$^{a}$ |
| V | 0.15±0.02$^{a}$ | 0.13±0.02$^{a}$ | 0.33±0.03$^{b}$ | 0.18±0.02$^{a}$ |
| VI | 0.17±0.02$^{ab}$ | 0.15±0.02$^{a}$ | 0.27±0.05$^{b}$ | 0.14±0.03$^{a}$ |
| VII | 0.20±0.02$^{a}$ | 0.10±0.02$^{a}$ | 0.33±0.06$^{b}$ | 0.14±0.03$^{a}$ |
| **Overall** | 0.18±0.01$^{a}$ | 0.14±0.01$^{a}$ | 0.28±0.02$^{b}$ | 0.14±0.01$^{a}$ |

Means bearing different superscript in a row differ significantly (P<0.05)

**Table 4: Mean± SE of fortnightly concentrate (kg/day) intake of buffalo calves in summer season**

| Fortnights | Asbestos roof (T1) | PPCGI roof (T2) | Thatch roof (T3) | GI sheet roof (T4) |
|---|---|---|---|---|
| I | 1.61±0.03$^{a}$ | 0.75±0.02$^{bc}$ | 0.85±0.01$^{b}$ | 0.66±0.04$^{c}$ |
| II | 1.61±0.03$^{a}$ | 0.75±0.02$^{b}$ | 0.91±0.04$^{c}$ | 0.66±0.04 |
| III | 1.65±0.02$^{a}$ | 0.81±0.02$^{b}$ | 0.93±0.03$^{b}$ | 0.65±0.05$^{c}$ |
| IV | 1.68±0.03$^{a}$ | 0.81±0.02$^{b}$ | 0.95±0.05$^{c}$ | 0.73±0.03$^{c}$ |
| V | 1.70±0.04$^{a}$ | 0.82±0.02$^{b}$ | 0.95±0.05$^{c}$ | 0.75±0.03$^{c}$ |
| VI | 1.71±0.04$^{a}$ | 0.82±0.02$^{b}$ | 0.95±0.05$^{c}$ | 0.79±0.02$^{c}$ |
| VII | 1.72±0.04$^{a}$ | 0.85±0.01$^{bc}$ | 0.98±0.05$^{b}$ | 0.81±0.02$^{c}$ |
| VIII | 1.75±0.03$^{a}$ | 0.85±0.01$^{b}$ | 1.03±0.06$^{c}$ | 0.85±0.01$^{b}$ |
| **Overall** | **1.68±0.02** $^{a}$ | **0.81±0.01**$^{b}$ | **0.94±0.02**$^{c}$ | **0.74±0.03**$^{b}$ |

Means bearing different superscript in a row differ significantly (P<0.05)

**Table 5: Mean± SE of fortnightly dry fodder (kg/day) intake of buffalo calves in summer season**

| Fortnights | Asbestos roof (T1) | PPCGI roof (T2) | Thatch roof (T3) | GI sheet roof (T4) |
|---|---|---|---|---|
| I | 1.41±0.03$^{a}$ | 0.71±0.02$^{b}$ | 0.88±0.03$^{c}$ | 0.69±0.03$^{b}$ |
| II | 1.42±0.03$^{a}$ | 0.70±0.02$^{b}$ | 0.91±0.04$^{c}$ | 0.70±0.06$^{b}$ |
| III | 1.45±0.02$^{a}$ | 0.74±0.03$^{b}$ | 0.91±0.04$^{c}$ | 0.75±0.04$^{b}$ |
| IV | 1.42±0.03$^{a}$ | 0.74±0.03$^{b}$ | 1.03±0.06$^{c}$ | 0.75±0.04$^{b}$ |
| V | 1.45±0.02$^{a}$ | 0.75±0.02$^{b}$ | 1.03±0.06$^{c}$ | 0.75±0.03$^{b}$ |
| VI | 1.51±0.02$^{a}$ | 0.75±0.02$^{b}$ | 1.21±0.05$^{c}$ | 0.75±0.03$^{b}$ |
| VII | 1.51±0.02$^{a}$ | 0.75±0.01$^{b}$ | 1.21±0.05$^{c}$ | 0.81±0.02$^{b}$ |
| VIII | 1.51±0.02$^{a}$ | 0.78±0.02$^{b}$ | 1.21±0.05$^{c}$ | 0.81±0.02$^{b}$ |
| **Overall** | **1.46±0.01**$^{a}$ | **0.74±0.01**$^{b}$ | **1.047±0.05**$^{c}$ | **0.75±0.01**$^{b}$ |

Means bearing different superscript in a row differ significantly (P<0.05)

**Table 6: Mean± SE of fortnightly green fodder (kg/day) intake of buffalo calves in summer season**

| Fortnights | Asbestos roof (T1) | PPCGI roof (T2) | Thatch roof (T3) | GI sheet roof (T4) |
|---|---|---|---|---|
| I | 0.5±0.04 | 0.5±0.04 | 0.5±0.04 | 0.5±0.04 |
| II | 0.5±0.04 | 0.5±0.04 | 0.5±0.04 | 0.5±0.04 |
| III | 0.5±0.04 | 0.5±0.04 | 0.5±0.04 | 0.5±0.04 |
| IV | 0.5±0.04 | 0.5±0.04 | 0.5±0.04 | 0.5±0.04 |
| V | 0.5±0.04 | 0.5±0.04 | 0.5±0.04 | 0.5±0.04 |
| VI | 0.5±0.04 | 0.5±0.04 | 0.5±0.04 | 0.5±0.04 |
| VII | 0.5±0.04 | 0.5±0.04 | 0.5±0.04 | 0.5±0.04 |
| VIII | 0.5±0.04 | 0.5±0.04 | 0.5±0.04 | 0.5±0.04 |
| **Overall** | **0.5±0.00** | **0.5±0.00** | **0.5±0.00** | **0.5±0.00** |