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# Assess the Effect of Concentrate and Mineral Mixture on the Growth and Reproductive Performances in Black Bengal Goats

**S. Shekhar***

*Krishi Vigyan Kendra, (ICAR-NRRI), Jainagar, Koderma- 825324, Jharkhand, India*

**Corresponding author*

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**A B S T R A C T**

An on farm trial was conducted to evaluate the effect of concentrate and minerals mixture on growth and reproductive performances of black Bengal goat. The whole trial was divided in to two parts; in first part 45 castrated male goats were selected and divided in three groups. The castrated male goats of group FP were supplemented with gram husk 50 gram/goat/day whereas, group T1 were supplemented with concentrate 100 gram/goat/day and group T2 were supplemented with concentrate 100 gram/goat/day and mineral mixture 10 gram/goat/day. In second part 45 pregnant does were selected and divided in to three groups. The pregnant does of group PC were supplemented with gram husk 200 gram/goat/day whereas, group TP1 were supplemented with 300 gram of concentrate and group TP2 were supplemented with 300 gram concentrate/goat/day and mineral mixture 10 gram /does /day. The body weight gain in castrated male goat and pregnant does were significantly ($P<0.05$) higher in both the supplemented groups as compared to farmers practice group. The biochemical study revealed that non-significant ($P<0.05$) variation in Hb, total protein, albumin, globulin, A: G ratio and BUN level and significant ($P<0.05$) increase in blood glucose, Ca, P, Cu and Zn level were recorded in both the treatment groups. The significantly ($P<0.05$) higher peri-parturient body weight, placenta weight, birth weight of kids and significantly ($P<0.05$) lower kid mortality were recorded in concentrate and mineral mixture supplemented groups than farmers practice group.

## Introduction

Goats scattered all over the world because their immense adaptability to varying environmental conditions. India holds the second largest population of goat in the world as 125.7 million which is 14.6% of world's goat population and 24.4% of Asia's goat population and number of goats in the world has been increasing since 1990 by about 1% to 4 % each year (FAOSTAT, 2012). They proved very useful to man throughout the ages due to their productivity, small size, and non-competitiveness for food. In the developing countries, goats make a very valuable contribution in improve economic status especially land less and poor farmers so, goats termed as "Poor man's cow". But the importance of this valuable livestock is under estimated and its contribution to the uplifment the economic status of the poor goat keepers is inadequately understood.

Goats are often neglected in comparison with cattle and sheep. Now, it is the time to consider and pay attention to the value and capacity of goats for producing food. In Jharkhand, Black Bengal breed of goat is mainly reared by poor and landless farmers. The breed is famous for its high prolificacy, tasty meat (chevon) and leather quality (Husain *et al.,* 1998). The breed attains early sexual maturing and first kidding takes place at the age of about 12 months. They give kid twice in a year or more commonly thrice in two years (Zeshmarani *et al.,* 2007) and the number of kid varies from one kid to four kids. Two kids are very common (56.32%) and four kids are least common (2.11%) Hassan *et al.,* 2007. However, the growth and productivity of the breed was very low under the prevailing extensive system of rearing. In this system, goats are maintained under natural vegetation on degraded community grazing lands and tree lopping, kitchen waste etc., but these feed ingredients are lower in energy, protein content and also deficient of trace minerals and vitamins. These feed ingredients are not sufficient for achieving optimum weight gain and reproductive performance of goats (Kochapakdee *et al.,* 1994). The higher body weight gain and optimum reproductive performance can be achieved through supplement of concentrate and mineral mixture (Madibela and Segwagwe, 2008).

## Materials and Methods

An on-farm trial was conducted in year 2017-18 on male and female Black Bengal goat (*Capra hircus)* of Chopnadih and Banderchokwa villages of Markachho block of Koderma, Jharkhand, India to assess the effect of concentrate and mineral mixture on the growth and reproductive performance of black Bengal goat. The trial was divided in to two parts; in first part 45 castrated male kids of 4.0 to 4.5 months of age and average live body weight 5 to 6 kg were selected and divided in three group viz. FP, T1 and T2. The details of experimental design were depicted in Table1.

Feeding trial was continued for 90 days and the body weights of kids were recorded on 0, 15, 30, 45, 60 and 90 days of feeding trial. Blood samples were collected at 0 day and 90 days of trial. The haemato- biochemical parameters viz. Hb, total protein, albumin, globulin, A: G ratio and glucose, BUN were estimated by commercial kit (Span Diagnostics Ltd., India). The minerals viz. Ca, Cu and Zn were estimated through Atomic Absorption spectrophotometer, Attri (2003) and serum Pi estimated in UV spectrophotometer by UV molybadate method described by Tietz (1998).

In second part 45 pregnant does of approximately 2.0 to 2.5 month pregnant, average body weight 12 to 13 kg body weight and 10 to 12 months of age were randomly divided in to three groups' viz. PC, TP1 and TP2. The details of experimental design were depicted in Table 2. The pre trial body weight of does, body weight at the time of parturition, post kidding body weight of does, litter size, placenta weight, birth weight of kid and mortality (%) of kids up to 4 weeks were recorded.

Goats of each group were kept in separate shed and provide ad libitum water. This schedule was followed till the end of experiment. All the goats were send for grazing 4 to 5 hrs in a day. The male goats and female goats were dewormed 15 days prior to the trial with Albendazole and Fenbendazole respectively @ 7.5 mg/kgb.wt. The vaccination schedules were followed as per standard protocol. The proximate analysis of the concentrate mixture was estimated as per AOAC (2000) (Table-3).

Data analysis was done using software SPSS 16.0. Data pertaining to body weight were analyzed by ANOVA technique to assess the significance of means as per the method described by Snedecor and Cochran (1994).

## Results and Discussion

The mean body weight on 0, 15, 30, 45, 60, 75 and 90 days of trial in different groups of castrated male black Bengal goats were depicted in Table 5. The mean body weight of castrated male goats at 90 days of trial in group FP, T1 and T2 were recorded 8.57 ± 0.32, 9.61 ± 0.29 and 10.17 ± 0.29 Kg respectively. The mean body weight at the time of parturition in does were recorded 16.33 ± 2.18, 18.13 ± 2.12 and 18.83 ± 2.42 Kg respectively in control group, concentrate group and concentrate and mineral mixture supplemented group were Table 7. The body weight gain in castrated male goat and pregnant does were significantly (P<0.05) higher in supplemented groups than farmers practice (control) group. Between the supplemented groups significantly (P<0.05) higher mean body weight was recorded in concentrate with mineral mixture supplemented group (T2). The higher body weight of goats in concentrate with minerals mixture supplemented group might be due to addition of extra energy, protein, minerals and vitamins in diet and better utilization of nutrients. The present findings are in accordance with findings of Niaz, (2017), Tiwari *et al* (2014), Kabirul and Jannatara, (2013), Sultana *et al.*, (2012) and Yadav *et al* (2010). The non significant (P<0.05) variation in Hb, total protein, albumin, globulin, A:G ratio and BUN level were recorded among the groups. Similar findings obtained by earlier works Niaz, (2017), Porwal *et al.*, (2005. In contrast to the present findings Sahlu *et al.*, (1995) recorded significant (P<0.05) increased in serum total serum protein concentration after addition of energy in diet of pregnant goats. Significant (P<0.05) increased in glucose level were recorded in the goats of T1 and T2 groups as compared to the goats of control group. Increased serum glucose level was also recorded by earlier workers More *et al.*, (2008), Singh and Shinde (1997). The high serum glucose level in concentrate feeding group and concentrate with mineral mixture feeding group might be due increase levels of volatile fatty acids (acetic, propionic and butyric) provide more gluconeogenic precursors in the body resulted in to increased plasma glucose level. The average serum Ca, P, Cu and Zn in goats of different control group and treatment groups were depicted in Table-6. The significant (P<0.05) increased in Ca, P, Cu and Zn concentration on 90 days of trial in both treatment groups as compared to control group might be due to incorporation of concentrate and mineral mixture provide extra minerals in the body. Similar findings were also reported by Agrawalla *et al.*, 2017; Niaz *et al*, 2017.

**Table.1** Experimental design for effect of concentrate and mineral mixture in male goat

| Group | No. of male Goat/group | Technology option |
|---|---|---|
| Farmers practice (FP) | 15 | Grazing 4 to 5 hrs in a day and supplemented with gram husk @ 50 gram/goat/day for 90 days. |
| T1 | 15 | Grazing 4 to 5 hrs in a day and supplemented with concentrate mixture e@ 100 gram/goat/day for 90 days. |
| T2 | 15 | Grazing 4 to 5 hrs in a day and concentrate @ 100 gram/goat/day and mineral mixture 10 gram/goat/day for 90 days. |

**Table.2** Experimental designs for effect of concentrate and mineral mixture in pregnant female goat (does)

| Group | No. of female goat /group | Technology option |
|---|---|---|
| Farmers practice (PC) | 15 | Grazing 4 to 5 hrs in a day and supplemented with gram husk @ 200 gram/goat/day for 90 days or till parturition. |
| TP1 | 15 | Grazing 4 to 5 hrs in a day and supplemented with concentrate mixture @ 300 gram/goat/day for 90 days or till parturition. |
| TP2 | 15 | Grazing 4 to 5 hrs in a day and concentrate @ 300 gram/goat/day and mineral mixture 30 gram/goat/day for 90 days or till parturition. |

**Table.3** Chemical composition of concentrate mixture fed to black Bengal goat (on % DM basis)

| S. No. | Chemical composition | Concentrate Mixture |
|---|---|---|
| **1.** | Dry matter | 90.60 |
| **2.** | Organic matter | 92.70 |
| **3.** | Crude protein | 20.70 |
| **4.** | Ether extract | 4.41 |
| **5.** | Crude fibre | 9.52 |
| **6.** | Nitrogen free extractives | 52.46 |
| **7.** | Total ash | 7.30 |
| **8.** | Neutral detergent fibre* | 26.15 |
| **9.** | Acid detergent fiber* | 16.13 |

*Determined on ash-free basis

**Table.4** Composition of mineral mixture fed to the black Bengal goat

| S. No. | Ingredient | Nutritional value in1.2 kg |
|---|---|---|
| **1.** | Calcium | 255 gm |
| **2.** | Phosphorus | 127.5 gm |
| **3.** | Magnesium | 6.0 gm |
| **4.** | Manganese | 1.5 gm |
| **5.** | Iron | 1.5 gm |
| **6.** | Iodine | 325 mg |
| **7.** | Copper | 4.2 g |
| **8.** | Zinc | 9.6 g |
| **9.** | Cobalt | 150 mg |
| **10.** | Sulphur | 7.2 g |
| **11.** | Potassium | 100 mg |
| **12** | Sodium | 6 mg |
| **13.** | Selenium | 10 mg |
| **14.** | Vitamin A | 700000IU |
| **15.** | Vitamin D3 | 70000IU |
| **16.** | Vitamin E | 250 mg |
| **17.** | Nicotinamide | 1000mg |
| **18.** | Chromium | 78 mg |

**Table.5** Effect of concentrate and mineral mixture supplementation on mean body weight (Mean ± SE) of castrated male black Bengal goat

| Group | 0 day | 15 day | 30 day | 45 day | 60 day | 75 day | 90 day |
|---|---|---|---|---|---|---|---|
| FP | 5.73 ± 1.26[a] | 5.80 ± 1.26 [a] | 6.39± 1.22 [a] | 7.15± 0.52 [a] | 7.75 ± 0.48 [a] | 8.31± 0.32 [a] | 8.57± 0.32 [a] |
| T1 | 5.45 ± 0.86 [a] | 6.11 ±1.31 [a] | 6.75 ± 1.22 [a] | 7.54± 0.74 [a] | 8.56 ± 0.47 [ab] | 9.17± 0.29 [b] | 9.61± 0.29 [c] |
| T2 | 5.62 ± 1.16 [a] | 6.27 ±1.22 [a] | 6.88 ± 1.22 [a] | 7.94± 0.82 [a] | 9.12 ± 0.34 [b] | 9.64± 0.37 [c] | 10.17± 0.29 [d] |

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

**Table.6** Effect of concentrate and mineral mixture supplementation on haematological, bio chemicals and minerals status in black Bengal goat

| Parameters | FP | | T1 | | T2 | |
|---|---|---|---|---|---|---|
| | 0 day | 90 day | 0 day | 90day | 0 day | 90day |
| **Hb (g/dl)** | 10.15 ±0.16 | 10.45 ±0.16 | 10.44 ±0.32 | 10.37 ±0.16 | 10.28 ±0.16 | 10.28 ±0.27 |
| **Total Protein (g/dl)** | 6.57 ±0.15 | 6.61 ±0.17 | 6.49 ±0.23 | 6.65 ±0.21 | 6.54 ±0.25 | 6.69 ±0.18 |
| **Albumin (g/dl)** | 3.51 ±0.24 | 3.65 ±0.19 | 3.57 ±0.27 | 3.84 ±0.17 | 3.64 ±0.21 | 3.85 ±0.19 |
| **Globulin (g/dl)** | 3.06 ±0.27 | 2.96 ±0.22 | 2.92 ±0.21 | 2.42 ±0.19 | 2.91 ±0.17 | 2.84 ±0.22 |
| **A/G ratio** | 1.14 ± 0.25 | 1.23 ± 0.21 | 1.22 ± 0.23 | 1.54 ± 0.21 | 1.25 ± 0.13 | 1.35 ± 0.18 |
| **Glucose (mg/dl)** | 43.70 ±3.11 [a] | 44.15 ±3.11[a] | 44.10 ±3.11 [a] | 54.64 ±1.48[b] | 43.60 ±3.71[a] | 55.64 ±1.38[b] |
| **BUN (mg/dl)** | 41.75 ±1.12 | 40.15 ±0.52 | 40.27 ±1.45 | 41.25 ±0.45 | 42.14 ±0.16 | 40.24 ±0.44 |
| **Ca (mg/dl)** | 8.13 ±0.19 [a] | 8.28±0.21 [a] | 8.21 ±0.16 [a] | 8.37±0.21 [ab] | 8.12 ±0.24 [a] | 8.77±0.23 [b] |
| **P (mg/dl)** | 4.18 ±0.19 [a] | 4.20 ±0.19 [a] | 4.22 ±0.19 [a] | 4.78 ±0.11 [b] | 4.17±0.19 [a] | 5.22 ±0.21 [b] |
| **Cu (ppm)** | 0.54±0.075 [a] | 0.49 ±0.045[a] | 0.57±0.052 [a] | 0.72±0.042 [b] | 0.51 ±0.081 [a] | 0.78±0.042 [b] |
| **Zn (ppm)** | 0.66 ±0.09 [a] | 0.71±0.12 [a] | 0.67±0.17 [a] | 0.79 ±0.19 [b] | 0.65±0.14 [a] | 0.84 ±0.11 [b] |

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

**Table.7** Effect of concentrate and mineral mixture supplementation on body weight and reproductive performance of does

| Parameters | PC | TP1 | TP2 |
|---|---|---|---|
| **Pre trial body wt. of does (Kg)** | 12.43±1.78 [a] | 13.12 ± 1.89 [a] | 12. 65 ± 1.37 [a] |
| **B. wt. of does at the time of parturition(Kg)** | 16.33±2.18 [a] | 18.13±2.12 [b] | 18.83± 2.42 [c] |
| **B. wt. of does after kidding (Kg)** | 13.63±1.18 [a] | 14.43±2.12 [b] | 14.87 ±1.92 [b] |
| **Placenta weight(g)** | 195.5±12.1 [a] | 240.12 ±10.4 [b] | 270.57±11.7 [c] |
| **Litter size (no.)** | 1.5±0.15 | 1.5 ±0.17 | 1.5±0.12 |
| **Birth weight of kids (kg)** | 1.01 ±0.4 [a] | 1.25 ±0.4 [b] | 1.45 ±0.4 [c] |
| **Mortality of kids 0 to 4 wks (%)** | 15.25 ±1.85 [a] | 10.78 ±1.75 [b] | 7.35 ±1.35 [c] |

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

The placental weight were varies significantly (P<0.05) in both treatment groups with comparison to control group. The birth weight of kids in concentrate and concentrate and mineral mixture supplemented groups were significantly higher as compared to control groups. The litter size (no.) of black Bengal goats were varies non significant (P<0.05) in

treated groups and control group. The litter size varies with 1 to 3 kids and occasionally 4 kids depend on plain of nutrition and parity of the does (Hassan *et al.*, 2007; Kabirul and Jannatara, 2013). The birth weight of kids were 1.01 ± 0.4, 1.25 ± 0.4 and 1.45 ± 0.4 kg in control group, concentrate supplement group and concentrate with mineral mixture supplemented group respectively. The present finding is in accordance with findings of earlier workers Ferdous *et al.*, (2011); Salim *et al.*, (2002) and Singla *et al.*, (2014). Kids mortality up to 1 months of age in control group, concentrate supplement group and concentrate and mineral mixture supplemented were recorded 15.25 ± 1.85, 10.78 ± 1.75 and 7.35 ± 1.35 percentage respectively. The lowest kid mortality in mineral supplemented group might be due to better plain of nutrition in gestation period increase birth weight of kid and result into decrease in kid mortality. The findings are in agreement the findings of Mude *et al*, (2010).

It may conclude from the study that supplementation of concentrate @ 100 gram/goat/day and mineral mixture 10 gram/goat/day for 90 days increase body weight and mineral status in castrated male goat and supplementation of concentrate @ 300 gram/does/day and mineral mixture 30 gram/does/day for 90 days or till parturition, increase body weight of pregnant does, placenta weight, kids birth weight and decrease kid mortality in black Bengal goats.

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