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Assessment of body condition scoring (BCS) in relation to reproductive performances of Ganjam goats

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Abstract

The present experiment was designed to study the post partum changes of BCS (Body Condition Score) and effect of BCS at kidding, on birth and weaning weight of kids in Ganjam goat. The study was conducted on Ganjam does which were maintained in the farmers home in the villages of Nayagarh district, Odisha. The forty five does were selected and allotted to 3 groups (Group I-BCS: 2.00-2.50, Group II – BCS: 3.00 - 3.50 and Group III – BCS: 4.00-4.50) based on BCS at kidding (BCSK). The BCS of does were recorded at 15 days before kidding, on the day of kidding and 15 days intervals up to 2 month post kidding. The does were selected within age group of 3-4 years and completed at least one kidding. A BCS scale of 1 to 5 with 0.5 increments was used to score the does. The mean BCS, BWT, PS, HW, HG, AG, TC of BCS group I are 2.17, 19.28 kg, 54.33 cm, 58.27 cm, 61.43 cm, 76.43 cm, 26.00 cm respectively, for BCS group II are 3.30, 27.97 kg, 59.53 cm, 63.87 cm, 70.93 cm, 88.07 cm, 28.47 cm and for BCS group III are 4.17, 32.48 kg, 63.33 cm, 67.00cm, 74.40 cm, 94.67 cm, 29.07 cm respectively. The entire BCS group initially showed loss of BCS and BWT during initial post kidding period (up to 45 days) then start to rejuvenate although goat having low BCS (below 3.0) finished with low overall BCS & BWT at the end of study. The birth weight and weaning weight of kids were significantly higher ($p<0.05$) in group III (2.94 & 8.08 Kg) compare to moderate (2.65 & 7.02 Kg) and low BCS group (2.26 & 5.72 Kg). The highest diseases were occurred in low BCS group followed by higher and moderate BCS group. Goats of BCS 3.0 or 3.5 at the time of kidding had lower disease incidence rate at early lactation period than goats with higher or lower BCS. The goat should never be over (>3.5) or under (<2.5) conditioned during dry period. Hence goats with BCS below 2.5 should have provision of extra/additional feeding in order to improve their condition for their better post kidding health perspective.

Keywords: BCS, Ganjam, reproduction, birth weight and weaning

Introduction

BCS is used for evaluating the adequacy of previous feed supply, determining the future feed requirements, assessing the health status of individual animals, establishing the condition of animals during routine animal management and welfare inspections (Maurya *et al.* 2008) [1]. Although in meat production systems information available on the body measurements and their relationship with body weight and body condition scoring is scanty. Very little work was carried out on BCS systems in India for goat. Under Indian conditions scarcity of feed, water and adverse climatic conditions lead to low BCS limiting goat production. So, there is a need to evaluate the fitness of goat using body condition scoring system and suggest the farmers regarding the BCS to be maintained for optimum productivity of their goat flock. Therefore the present investigation was undertaken to study the utility of BCS systems for the assessment the post kidding performance of Ganjam goat with the following objectives: To study the post partum changes of Body Condition Score (BCS) of Ganjam goats under field conditions and effect of BCS at kidding on birth and weaning weight of kids.

Materials and Methods

The present study was conducted on Ganjam does maintained in the farmers home in the villages of Gania block of Nayagarh district of Odissa. The 105 does were selected to study the postpartum changes in a 3 X 30 CRD [3 groups divided based on BCS at kidding (BCSK)]. BCS of does were recorded at 15 days before kidding, on the day of kidding and 15 days intervals up to 2 month post kidding. Does were divided into 3 groups based on the BCS on the day of kidding as Group I-BCS: 2.00-2.50, Group II – BCS: 3.00 - 3.50 and Group III – BCS: 4.00-4.50. The does were selected within age group of 3-4 years and completed at least one kidding.

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The following physical parameters were recorded: BCS, Body weight (BWT), pin shoulder length (PS), height at withers (HW), heart girth (HG) and abdominal girth (AG) and thigh circumferences (TC). The following disease incidences were noticed in the goats during the experimental period like diarrhea, respiratory distress, dystocia, pyometra, metritis, mastitis, fever, caseous lymphadenitis, retention of fetal membranes and lameness. The no of days suffered from various diseases also counted for the study.

A BCS scale of 1 to 5 developed by Villaquiran *et al.* (2005) [24] was used to score the does. Scoring is performed in goats using a BCS ranging from 1.0 to 5.0 with 0.5 increments. The

data were analysed by the statistical methods according to Snedecor and Cochran (1994) [23] and as specified in SPSS (Statistical Package for the Social Sciences) statistical package version 21.

Results and Discussions

Physical attributes of pregnant doe on the day of kidding.

The BCS and various physical attributes of pregnant doe on the day of kidding have been depicted in Table-1. The present study suggests that doe group of higher BCS at the time of kidding show higher values of all physical parameters as compared to the lower BCS group.

Table 1: Mean BCS, Body weight and Physical attributes of pregnant doe on the day of kidding.

Group	BCS	BWT (Kg)	PS (Cm)	HW (Cm)	HG (Cm)	AG (Cm)	TC (Cm)
2.0-2.5 (I)	2.17±0.06	19.28±0.91 ^a	54.33±0.99 ^a	58.27±1.07 ^a	61.43±1.01 ^a	76.43±0.66 ^a	26.00±0.58 ^a
3.0-3.5 (II)	3.30±0.07	27.97±0.37 ^b	59.53±0.50 ^b	63.87±0.54 ^b	70.93±0.42 ^b	88.07±0.47 ^b	28.47±0.42 ^b
4.0-4.5 (III)	4.17±0.06	32.48±0.64 ^c	63.33±0.71 ^c	67.00±0.72 ^c	74.40±0.36 ^c	94.67±0.23 ^c	29.07±0.18 ^c
OVERALL	3.21±0.13	26.58±0.91	59.07±0.70	63.04±0.71	68.92±0.91	86.39±0.40	27.84±0.31

*Different superscripts within same column but different row differ significantly ($p < 0.01$).

The same findings were also reported by Akpa *et al.* (2013) [1], Rae (2002), [16] Samardzija *et al.* (2013) [19] and Mule *et al.* (2014) [14]. The physical parameters of pregnant doe of higher BCS group has better condition than BCS of lower group at the time of kidding which could ensure them the birth of viable kids, adequate colostrums production and support high milk production, particularly in early lactation. Similar observations were also reported by Koyuncu and Altıncekcic (2013) [9] and Ghosh *et al.* (2019) [7] that does need to be in good condition (BCS 3 to 3.5) at kidding. The findings of Melesse *et al.* (2013) [12] and Sharma *et al.* (2016, 2018) [21, 22] suggests that a sufficiently high live weight, higher BCS of does were essential in maintaining good reproductive performance as well as growth performance and survival rates of kids. The findings of Serin *et al.* (2010) [20] suggested that a higher body weight and BCS at the time of kidding has a significant effect ($p < 0.05$) on the fertility of goats in breeding

season.

Postpartum changes of BCS of test flock

The postpartum changes of BCS have been depicted in Table – 2 and Figure – 1. The mean value of BCS (Gr-I) after 15 days postpartum decreased to 1.97 then it becomes stabilized for next 15 days (1.97) i.e. 30 days postpartum and later on increased gradually to 2.10 and 2.30 on 45 days and 60 days postpartum respectively. The BCS of test flock (3.0-3.5) show mean BCS 3.44 at 15 days before kidding. Then it started reducing up to 30 days postpartum and stabilised for next 15 days (2.8). After that it started increasing (3.07). But the BCS of test flock (4.0-4.5) show a decreasing trend i.e. BCS assigned 15 days before kidding (4.33) and on the day of kidding (4.17), 15 days postpartum 4.00, 30 days postpartum 3.93 which further reduces to 3.83 and 3.87 on 45 and 60 days postpartum respectively.

Table 2: Postpartum changes of BCS of test flock.

Group	BCS-15 days	BCS-Kidding	BCS+15 days	BCS+30 days	BCS+45 days	BCS+60 days
2.0-2.5 (I)	2.33±0.08	2.17±0.06	1.97±0.09	1.97±0.11	2.10±0.12	2.30±0.10
3.0-3.5 (II)	3.44±0.08	3.30±0.06	3.03±0.16	2.77±0.12	2.80±0.10	3.07±0.11
4.0-4.5 (III)	4.33±0.06	4.17±0.06	4.00±0.15	3.93±0.14	3.83±0.18	3.87±0.20
Overall	3.39±0.13	3.21±0.13	3.00±0.15	2.89±0.14	2.91±0.13	3.08±0.13

The highest gain was achieved by the group I followed by Group II compared to the Group III. From the above result it was observed that the average BCS of pregnant doe decreases

from kidding up to early lactation (Fig. 1). This could be due to pregnancy stress, low dry matter (DM) intake and lactation stress.

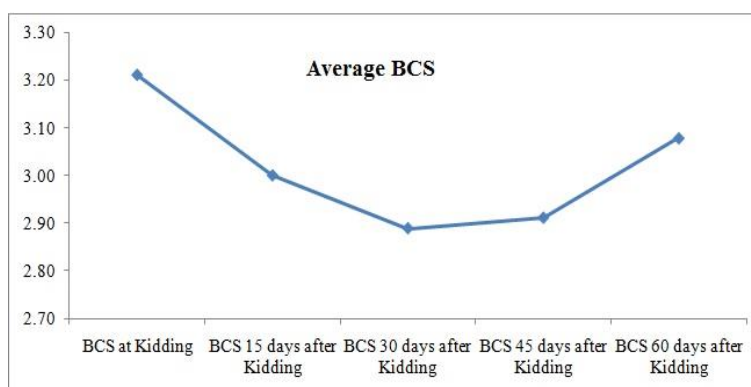


Fig 1: Postpartum changes in overall BCS of the test flock.

The results showed that they started BCS of 3.21 at kidding and gradually reduced up to 45 days of postpartum and rejuvenates to 3.08 at the end of 60 days postpartum. Although there is loss of BCS as usual during early postpartum period but it remains to acceptable limit after 60 days of post partum. Maurya *et al.* (2008) [11] and Ghosh *et al.* (2019) [7] suggested an optimum BCS of 3.00 during lactation. The findings Smardziza *et al.* (2013) [19] suggested decrease in the BCS from 20 days prepartum to partum and a significant decrease from partum to 40 days of post partum in German goats which was found to be in accordance with this present result.

Postpartum changes of Body Weight (BWT) of test flock

From the present study it is clearly evident that the BCS and BWT (Table-3 & Figure-2) reduced gradually up to 45 days of post partum. The loss of BCS and BWT after kidding up to 45 days of postpartum mainly due to mobilization of body fat reserves for milk production. The regain in the BCS after 45 days post partum mainly due to replenishing of body fat reserves by the does due to starting of weaning of kids and improvement of feed intake. Similar result also reported by Barbosa *et al.* (2009) [2] who found weight loss in the first week of lactation and recovery starting from the second and third week of lactation.

Table 3: Postpartum changes of Body Weight of test flock.

GROUP	BWT-15 days	BWT-Kidding	BWT+15 days	BWT+30 days	BWT+45 days	BWT+60 days
2.0-2.5 (I)	20.48±0.87	19.28±0.91	18.42±0.95	18.14±1.03	18.94±1.06	19.53±0.93
3.0-3.5 (II)	29.21±0.35	27.97±0.35	26.84±0.56	25.71±0.57	25.22±0.60	26.22±0.56
4.0-4.5 (III)	33.81±0.61	32.48±0.64	32.43±0.87	31.49±0.78	31.10±0.99	31.25±1.03
Overall	27.84±0.91	26.58±0.91	25.90±0.98	25.12±0.95	25.09±0.91	25.66±0.87

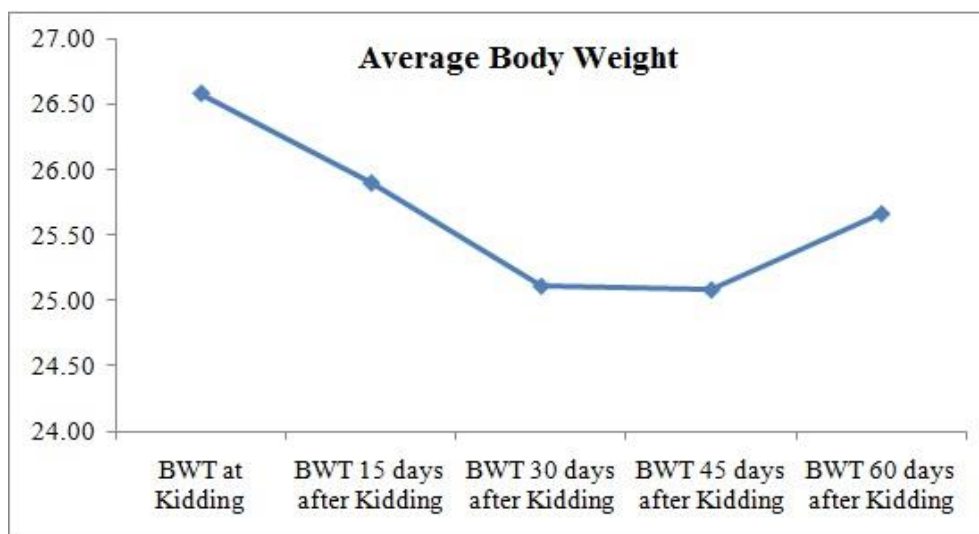


Fig 2: Postpartum changes in overall BWT of the test flock.

Change in BCS and Body Weight

The BCSK, changes in BCS and changes in BWT of the test flock is presented in Table 4. From the present study it was observed that although lower BCS group gain some body weight (0.25 Kg) and BCS (0.13) gain but could not able to attain proper BWT and BCS due to poor body conditioning at dry period and kidding. But in other aspect the higher BCS group although lost some BWT (Gr II -0.75 and Gr-III -0.23) & BCS (Gr II -0.23 and Gr III -0.30) but able to regain proper

BWT & BCS due to proper body conditioning at the dry period and kidding time. Similar result reported in findings of Merkhan *et al.* (2013) [13] and Yalimaz *et al.* (2011) [25]. The findings of De Vries and Veerkamp (2000) [5] also suggested that BCS tended to increase in most of the goats during pregnancy except in higher BCS groups and decreased in all the groups during early lactation period. This reduction could be due to the negative energy balance during early lactation.

Table 4: Change in BCS and Body Weight.

Group	BCSK	CBCS	BWTK (Kg)	CBWT (Kg)
2.0-2.5 (I)	2.17±0.06	+0.13	19.28±0.91	+0.25
3.0-3.5 (II)	3.30±0.07	-0.23	27.97±0.35	-0.75
4.0-4.5 (III)	4.17±0.06	-0.30	32.48±0.64	-0.23

Effect of BCS at kidding on birth weight and weaning weight of kids

The BCS, BWT of does at kidding, birth weight and weaning weight of kids of the test flock is presented in Table - 5. The group having moderate (3.0-3.5) and high (4.0-4.5) BCS at time of kidding gave kids which had significantly ($p < 0.05$)

higher birth weight (2.65 and 2.94 Kg) and weaning weight (7.02 and 8.08 Kg) compare to the low condition scored (2.0-2.5) goats (2.26 and 5.72 Kg) The findings of Karna *et al.* (2020) [8] found to be in accordance with this result i.e. the mean birth weight of kid 2.41 kg and weaning weight 7.48 kg in Ganjam kid.

Table 5: Body weight, BCS of Doe at Kidding, birth weight and weaning weight of Kids of different BCSK groups in the test flock.

Group	BCSK	BWTK (Kg)	Birth Weight (Kg)	Weaning Weight (Kg)
2.0-2.5	2.17±0.06	19.28±0.91 ^a	2.26±0.05 ^a	5.72±0.23 ^a
3.0-3.5	3.30±0.06	27.97±0.35 ^b	2.65±0.06 ^b	7.02±0.17 ^b
4.0-4.5	4.17±0.06	32.48±0.64 ^c	2.94±0.04 ^c	8.08±0.17 ^c
Overall	3.21±0.13	26.58±0.91	2.62±0.05	6.94±0.18

* Column wise similar superscript does not differ significantly ($p < 0.05$)

*BCSK - BCS at kidding, BWTK-Body weight at kidding.

The positive relation between BCSK and birth weight observed in the present study was in tune with the findings of Cividin *et al.* (2017) [3] and Sharma *et al.* (2016) [21]. Everett-Hincks *et al.* (2013) [6] and Oldham *et al.* (2011) [15] also reported similar trend that the lambs born to ewes with higher body weight showed higher birth weight as well as weaning weight. Whereas Rhind *et al.* (2001) [17] reported that the lower birth weights of lambs were because of improper nutrition of lower BCS ewes during the final stages of gestation. Poor or limited nutrition during mid or late gestation had been associated with low birth weights (Russel *et al.*, 1981) [18].

In later stage of pregnancy, the nutritional demand for the goat especially the multiple-bearing doe is increased significantly. Under these circumstances the doe cannot meet the increased nutritional demand if nutrition is not optimum. She must utilize body reserves to maintain fetal demand. Therefore it might be expected that the impact of BCS on fetal growth and kid birth weight would be greatest in late pregnancy, especially in situations where does nutrition is limited. So the farmers should give prime importance on feeding management during dry period and doe should be freshening properly with desired BCS and body weight.

Regardless the genetic makeup of doe the adequate feeding is very essential to achieve optimum BCS at kidding. The nutritional level should be adjusted in such a way that doe should not be over or under conditioned. The doe which have higher BCS during kidding (3.0 – 4.5) probably produce more colostrums and milk during lactation and suffers fewer incidences of metabolic diseases. So doe having optimum BCS can nurture their kids very effectively which leads to higher weaning weight. The does having lower BCS (<3.0) unable to handle lactation stress leads to poor milk production, negative energy balance and various metabolic disorders.

Disease Incidences in relation to BCS

In the present study disease incidences and total diseases days were higher in low and high BCS (2.0-2.5 & 4.0-4.5) compare to moderate BCS (3.0-3.5) group. The mean occurrence of diseases (BCS 2.0-2.5: 0.93, BCS 3.0-3.5: 0.53 and BCS 4.0-4.5: 0.86 were significantly higher ($p < 0.05$) in low and high BCS group compare to moderate BCS group. The similar trend was observed for mean days ($p < 0.01$) suffering from diseases (BCS 2.0-2.5: 4.33, BCS 3.0-3.5: 2.22 and BCS 4.0-4.5: 4.13).

Table 6: The effect of BCS at kidding (BCSK) on disease incidences of Ganjam goat.

Parameters	BCS 2.0 – 2.5	BCS 3.0 -3.5	BCS 4.0 –4.5	Overall
Incidences of diseases	14	8	13	35
Total diseases days	65	33	62	160
Mean occurrence/goat*	0.93 ± 0.24 ^a	0.53 ± 0.11 ^b	0.86 ± 0.19 ^a	0.77 ± 0.16
Mean days suffering from disease/goat**	4.33 ± 0.59 ^a	2.2 ± 0.36 ^b	4.13 ± 0.65 ^a	3.56 ± 0.63

*Note: Total disease days equal to number of days suffered from various diseases by a particular group of goat.

** Means bearing different superscripts within a row differs significantly ($p < 0.05$).

*** Means bearing different superscripts within a row differs significantly ($p < 0.01$).

The highest diseases were occurred in low BCS group followed by higher and moderate BCS group. Goats of BCS 3.0 or 3.5 at the time of kidding had better health statuses the early lactation period than goats with higher or lower BCS. Koyuncu and Ozis Altıncelik (2013) [9] observed that a herd of goats in good body condition will be less susceptible to metabolic disorders, diseases, mastitis and reproductive problems. In the present study cases were lameness, diarrhea and fever were higher in low BCS group. On the other hand incidences of reproductive disorder like dystokia, retention of fetal membrane, pyometra and metritis etc. were higher in BCS group 4.0 – 4.5. Occurrences of diarrhea were more frequent in lower BCS groups than in higher ones. Diarrhea is a common manifestation of endoparasitic infestation which has been associated with lower BCS scores (Costa *et al.* 2012, Loker *et al.* 2012 and Sharma *et al.* 2018) [4, 10, 22]. So feeding management during dry period is very crucial for maintaining post kidding health status of goat.

Conclusions

The Does with BCS≥3.0 have more chest girth which is a true

indicative of health, productive and reproductive performance of the animal. So the BCS is extremely beneficial in evaluation of the nutritional status and also helpful in the selection of healthy animals. Adequate feeding is required to maintain an optimum BCS of 3.00 – 4.00 at kidding. The plane of nutrition should be adjusted in such way that does should not be over or under conditioned during kidding. Does having lower BCS of below 3.00 at kidding may be unable to handle the pregnancy and lactation stress, resulting in negative energy balance leading to metabolic and reproductive disorders. So using BCS as a tool to identify does with lower BCS at kidding time and preferentially feeding them on good plane of nutrition is likely to be beneficial to the doe and also increase their kid growth rates and weaning weight. Even though does (BCS>3.0) loses body fat reserves during early lactation (up to 45 days of kidding) they were able to regain BCS to 3.00 quickly so that the optimum service period can be maintained. So feeding management during dry period is very crucial for maintaining post kidding health status of goat. The goat should never be over (>3.5) or under (<2.5) conditioned during dry period.

Hence goats with BCS below 2.5 should have provision of extra/additional feeding in order to improve their condition for their better post kidding health perspective.

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