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OBSERVATION WITH BODY CONDITION SCORE, VAGINAL CYTOLOGY AND VULVAL BIOMETRY IN *OVSYNCH*-TREATED COWS

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Relations between nutrition and reproduction are complex. Body condition scoring and energy balance are closely related. Reproductive failures have been associated with poor body conditions in animals. This study investigated the interaction of body condition scores (BCS) with exfoliated vaginal cell pattern, and vulva biometry, in twenty White Fulani cows grouped equally according to their BCS (i.e. 4 and 6). There were also two subgroups in each BCS. The cows were treated using standard *Ovsynch* protocol. Parameters were evaluated throughout the entire length of *Ovsynch* protocol. The differences in vaginal exfoliates between subgroups in each BCS, as well as vulva diameters between BCS were not significant ($P>0.05$). The differences between cow groups with BCS=4 and BCS=6 for parabasal cell (i.e. 37.05±3.51 and 38.05±4.64), respectively was not also significant ($P>0.05$), while for intermediate cell (i.e. 27.20±2.18 and 16.35±1.34), and superficial cell (i.e. 35.85±3.04 and 45.40±4.69), respectively were significant ($P<0.05$). We conclude that BCS affected pattern of vaginal exfoliates, but not changes in vulva diameters.

Key words: Body condition score, *ovsynch*, vaginal cytology, vulva biometry, cow.

Achieving and sustaining a satisfactory fertility level is germane to every successful livestock breeding enterprise. The list is however endless, of factors reported as capable of reducing the fertility of livestock. Some of these include: infectious agents, congenital anomalies (15), nutrition, management, expression and detection of estrus, improved genetics (23, 28), and high lactation yields (10, 13). The efficiency of herd members correctly detected in heat and inseminated is one of the four major determinants of pregnancy rate at breeding stations (1). In view of the multiplicative association among these pregnancy rate determinants (1), aids as well as technologies that enhances the efficiency of each factor are now commonly employed. For instance, patterns of exfoliative vaginal cytology have strong relationship with hormonal changes during the estrous cycle, and are useful as predictors of estrus in the female peccary (11) and in the bitch (21). Other species e.g. *caprine* (8, 30), *ovine* (7), *swine* (26), and *bovine* (3, 12), have likewise being studied with respect to vaginal cytological changes during their estrous cycles. All these studies reported similar trends thereby, giving credence to the usefulness of the technique in predicting estrus in the respective species. Similarly, estrus synchronization is a technology whereby a high proportion of animals are brought into estrus at the same period (29). Some of the techniques involved in estrus synchronization e.g. *Ovsynch* and its various modifications additionally allows for timed artificial insemination, and perhaps, almost making estrus detection unnecessary (1). However, the relationship between reproduction and nutrition is complex. Of all nutritional factors associated with reduced reproductive performance i.e. proteins, vitamins, minerals, energy status/balance appears to be the most critical in livestock (20). A practical approach to estimating the energy reserves of the animal is by evaluation of the proportion of body fat and muscle i.e. body condition scoring (14). According to (25), reproductive functions are compromised while demands for

minimum energy reserves are favored, whenever energy deficits occurred in the animal. Though, the exact role of levels of nutrition on ovarian follicular growth and oocyte quality are not yet definitive (4), some effects of low energy reserves/poor body conditions include delayed puberty (9), prolonged postpartum interval (5), insufficient circulating luteinizing hormone (22), and anestrus (17). This paper investigated the influence of body condition score on pattern of exfoliated vaginal cells in *ovsynch*-treated cows. Vulva biometry of the cows was also evaluated to provide information on changes in its diameter following *ovsynch* treatment.

MATERIALS AND METHODS

Location of the study:

The study was carried out at a minor Fulani settlement located at Maya village, Ibarapa Local Government area, Oyo State, Nigeria.

Animals and Management:

White Fulani (WF) beef cows (n=105) were evaluated and scored for body condition on a 9-point scale as earlier described (2). Twenty animals, having body condition scores (BCS) of 4 and 6, in equal halves, were selected randomly and grouped in two (n=10), according to their scores i.e. A1-A10 (BCS=4), B1-B10 (BCS=6). Each group was also randomly divided into two sub groups i.e. $A1_a$ - $A5_e$, $A6_f$ - $A10_j$ and $B1_a$ - $B5_e$, $B6_f$ - $B10_j$. The animals remained among the flock and were identified with ear tags.

***Ovsynch* Treatment:**

The standard *Ovsynch* protocol (18) was used. Cows in both BCS groups were administered with 100 mcg Gonadorelin acetate (Gonadorelin®, Parnell Australia PTY Ltd.) via intramuscular route on day 0, followed by 500 mcg Chloprostenol (Estroplan®, Parnell Australia PTY Ltd.) on day 7, and a second 100 mcg Gonadorelin acetate on day 9.

Collection of vaginal smear and cytology:

Vaginal smear was collected daily from the cows at 7:30 a.m. for cytology with the aid of a vaginal swab. The method earlier described (8) was slightly modified. Briefly, this involved restraint in standing position by a herdsman, as well as rope-restrain of the hind legs. The large animal swab was then introduced gently from the rear at 45^o towards the roof of the vulva, and advanced carefully to the anterior vaginal mucosa. This portion was then swabbed, air-dried, stained with Giemsa, and evaluated using x400 of the microscope. Exfoliates were thereafter categorized into parabasal, intermediate, and superficial epithelial cells by counting from five fields of the microscope. Vaginal smear was collected daily, beginning a day before *ovsynch* treatment and ending on the last day of *ovsynch*.

Vulva biometry:

The vertical (i.e. distance between superior and inferior commissure) and horizontal (i.e. at the broadest horizontal curvature) diameters of the vulva were measured using a measuring tape and recorded in centimeters. Vulva (horizontal and vertical) diameters was evaluated daily, beginning a day before *ovsynch* treatment and ending on the last day of *ovsynch*.

Guide on Research Conduct:

This study was conducted under strict adherence to the principles of the care and use of farm animals in research, teaching and testing of the Canadian Council on Animal Use.

Data analysis:

Analysis of variance was used for data obtained from all animals while the student-t-test was used to test significance between the means of data from the BCS groups and subgroups under the Statistical Package for Social Science (SPSS 19) at 95% Confidence Interval. P-values less than 0.05 were regarded as significant ($P<0.05$).

RESULTS

The results of the study is presented in Tables 1, 2 and 3. Table 1 shows that the differences between the mean values for parabasal (33.33±4.63 and 40.67±4.42), intermediate (27.11±2.32 and 27.67±3.00), and superficial (39.11±3.65 and 32.22±4.78) epithelial cells for subgroups $A1_a$ - $A5_e$ and $A6_f$ - $A10_j$ respectively, were not significant ($P>0.05$). Similarly, the differences between the mean values for parabasal (37.11±5.80 and 39.22±5.70), intermediate (17.67±2.76 and 14.89±0.82), and superficial (44.89±6.13 and 46.11±5.81) epithelial cells

Table 1: Differences in mean proportions of vaginal exfoliates between subgroups at the two BCS

Epithelial cell type (%)	**$A1_a$ - $A5_e$ / $B1_a$ - $B5_e$ (%)**	**$A6_f$ - $A10_j$ / $B6_f$ - $B10_j$ (%)**	**P-value**
Parabasal:			
BCS=4	33.33±4.63	40.67±4.42	P>0.05
BCS=6	37.11±5.80	39.22±5.70	P>0.05
Intermediate:			
BCS=4	27.11±2.32	27.67±3.00	P>0.05
BCS=6	17.67±2.76	14.89±0.82	P>0.05
Superficial:			
BCS=4	39.11±3.65	32.22±4.78	P>0.05
BCS=6	44.89±6.13	46.11±5.81	P>0.05

BCS=4: Subgroups $A1_a$ - $A5_e$ and $B1_a$ - $B5_e$, BCS=6: Subgroups $A6_f$ - $A10_j$ and $B6_f$ - $B10_j$

Table 2: Differences in mean proportions of vaginal epithelial cell types of cows at the two BCS

Vaginal epithelial cell type (%)	**A1-A10**	**B1-B10**	**P-value**
Parabasal	37.05±3.51	38.05±4.64	P>0.05
Intermediate	27.20±2.18	16.35±1.34	P<0.05
Superficial	35.85±3.04	45.40±4.69	P<0.05

BCS=4: Group A1-A10, BCS=6: Group B1-B10.

Table 3: Differences in mean vulva diameters of cows at the two BCS

Vulva diameter (cm)	**A1-A10**	**B1-B10**	**P-value**
Vertical	17.04±0.03	14.00±0.00	P>0.05
Horizontal	12.20±0.06	13.40±0.10	P>0.05

BCS=4: Group A1-A10, BCS=6: Group B1-B10.

for subgroups $B1_a$ - $B5_e$ and $B6_f$ - $B10_j$ respectively, were not significant (P>0.05). Table 2 shows that the differences between the mean values for cows in groups A1-A10 and B1-B10. The difference between the mean values for parabasal (37.05±3.51 and 38.05±4.64) was not significant (P>0.05), while those for intermediate (27.20±2.18 and 16.35±1.34), and superficial (35.85±3.04 and 45.40±4.69) epithelial cells were significant (P<0.05). Table 3 shows the differences between the mean values for vulva biometry for cows in A1-A10 and B1-B10. For both vertical (17.04±0.03 and 14.00±0.00) and horizontal (12.20±0.06 and 13.40±0.10) vulva diameters, the differences were not significant (P>0.05).

DISCUSSION

Our observation (Table 1) between subgroups with similar BCS in this study indicated that responses of individual animals, with respect to vaginal exfoliates, consequent upon *ovsynch* treatment were comparable. The fact that this observation was true with the subgroups in both body condition scores further strengthens the suggestion of this finding that cows with same body condition will likely respond in similar ways to ovsynch treatment, especially, with respect to vaginal cytological pattern. Since BCS is directly related to energy status (27) in the animal; and energy status is a major nutritional factor influencing reproductive processes, findings in the current study suggests that BCS may be a basis for grouping animals

with respect to expected reproductive performances.

Table 2 shows at a glance, significant ($P<0.05$) differences in intermediate and superficial cells between cows with BCS=4 and BCS=6. During normal estrous cycles, the vaginal epithelium changes in its epithelia cell composition from parabasal (starting early proestrus) to intermediate, and then a predominance of superficial cells during estrus (8, 21). The higher ($P<0.05$) proportion of superficial cells of cows with BCS=6, may be explained by the lower ($P<0.05$) proportion of intermediate cells in the same group, whereas, cows with BCS=4, had higher ($P<0.05$) intermediate cells and a correspondingly lower ($P<0.05$) superficial cells. This result becomes more interesting with the finding that the vaginal epithelium (evident by proportion of parabasal cells) in both groups had a comparable starting point (37.05%, 38.05%). This observation again suggest that BCS may influence cellular cycles in the vaginal epithelium, with higher BCS facilitating normal cellular changes. In this study, 45.4% superficial cells was obtained in cows with BCS=6. This value is comparable with 46.09% reported in Aceh cows (24), and is 10.24% higher than the value obtained for cows with BCS=4 in the present study. Again, considering the relatively short period of the estrous cycle during which superficial cells are found and predominate, it is evident from the present study that for BCS=6, proportion of superficial cells was higher than any other cell type whereas, parabasal cells were similarly higher in cows with BCS=4. These finding suggest some level of anomaly in the regulation of activities of the vaginal epithelium.

Observation with both vertical and horizontal vulva diameters indicate that there were no differences between White Fulani (WF) cows with either BCS 4 or 6. Vulva swelling as well as other changes in the vulva during estrous cycle had been linked with release of estrogen (6, 31). This may suggest that if estrogen is the only factor responsible for vulva swelling, BCS would not influence it. Before far reaching claims are laid however, it should be emphasized that changes in vulva diameters had been reported as imprecise and insufficient predictor of estrus in goat (8), and cattle (16, 19). We conclude that *ovsynch*-treated WF cows with different body condition scores have dissimilar exfoliated vaginal cellular pattern but similar vulvar biometrical parameters.

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