Effects of environmental modification on some physiological and production responses of butana COWS

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SUMMARY

the present study involved ten early lactating multiparous cows divided into two groups to investigate the influence of shading condition on the performance of Butana cows in Atbara livestock Research Station. The two groups were assigned to two treatments shaded versus unshaded cows. IV shaded yard demonstrated significantly (P00.01) a lower temperature compared to the non - shaded counterparts which resulted in reducing the respiration rate (1,.0.05). The shading condition also tended to alleviate the impact of high temperature thereby improved the lactation yield and its component percentages of fat, protein, solids - not -fat and ash as well as cow's body weight. Thus the convenient environment provided by the shading condition demonstrated a better physiological and production responses compared with the non - shading counterparts.

INTRODUCTION

Domestic livestock need to maintain a near constant internal environment for survival and efficient functioning. heat or thermal stress results when it becomes increasingly difficult for dairy cows to maintain a normal core NAY temperature of 37.8 - 38.6 °C (rectal) (Buckling et. al., 1991). Accumulation of excess heat in an animal body brought about by hot environments favors deleterious events, if excess heat persists serious degenerative effects may results. Physical protection of lactating cows extremes of climates is of much benefit to their performance such as animal diseases, animal losses or loss of productivity (West, 2003).

The present study was initiated with the objective to investigate the effect of environmental modification on rectal temperature, respiration rate, milk yield and its component percentages of fat, protein, solids - not- fat and ash as well as on cow's body weight in a herd of Butana cattle.

MATERIALS AND METHODS

1- **Cattle types:** The Butana cattle are subtype of Northern Sudan zebu. Their descriptive subtypes are distinguished according to their localities. With a pronounced degree of colouration that varies from a dark red, moderate to mild red colour and with some black shades on the mouth, eyes and shoulders. The hump is large, the dewlap is pendulous and the horns are short (Shendy, Dongola, Dar EI Reh and El Gash types). It resembles Kenana cattle in size and production characteristics.
2- **Animals:** Ten milking multiparous Butana cows, matching as far as possible for parity number, liveweight and stage of lactation, were nomally assigned to two treatments,

shading (S) versus non - shading (NS) with five animals in each, The experiment lasted for ten months Sept/June during the year 2000

3- **Housing:** The building is composed of a large constructed gable with an east west orientation, made up on a non - insulated roof corrugated zinc, and a concrete floor. The building has been partitioned by metallic poles to accommodate the S- cows 26X10m. The walls of the building were on brick made of high thermal conductivity. A bridge of about 2 meters long was left all around over the building's wall for air movement. The NS cows were resided in an earth - bedded yard 30X20m bounded by metallic poles. Water and feeding troughs were available for both treatments inside their yards.

4- **Management:**

The experimental cows were offered a basal diet of fresh- cut irrigated forages of Sorghum (Abu 70). Medicago sativa (Berseem) or a combination of both. In addition to the principal roughages some seasonal forage (guar and maize) were also fed as available. The two groups were offered a similar daily allowance of the roughage diet in two separate meals throughout the trail. The concentrate diet was offered at milking time 0.32 kilogram per one kilogram milk. The cows were hand - milked two times a day without their calves.

5- Data collection:

The cow - yard temperature (YT)°C were taking two times daily using Black global thermometer. Both rectal temperature (RT) C and respiration Tate (RR). (brcath per minute) were recorded on a weekly basis at the noon milking by using the clinical thermometer and stop watch for counting the flank movement respectively. A daily milk yield records were registered for cach individual cow. The content of milk fat, protein. SNE and ash were analyzed monthly using A.O.A.C (1990) methods. The cow's liveweight were recorded monthly after the morning milking by using cattle weighingbridge (1500kg) maximum capacity load to the nearest 5 kg.

6- - **Statistical analysis:**

The data was analyzed using (t- test), means standard errors according to Statistical Package of Social Studies (SPSS), Vijay (1999).

RESULTS

Table 1 portrays that the S condition maintained a lower mean cow vard temperature (YT) of 26.69+1.11'C ($P<0.01$); rectal temperature (RT) of 38.710.08°C ($P>0.05$) and respiration rate (RR) of 25.61+0.79 min 1- counterparis respectively. same table revealed that the values of lactation yield and its component percentages of fat. protein, SNF ash as well as the greater body weight were observed under the S-condition which was statistically ($P<0.05$) compared to 32.64 10.9 °C; 38.9140.08°C and 29.00+0.21 min for the NS highest attained similar to the NS - counterparts ($P> 0.05$).

Table 1 Means + standard errors for the effect of environmental Table 1. modification on physiological and production responses of Butana cows.

Table 1. Means ± standard errors for the effect of environmental modification on physiological and production responses of Butana cows.

Parameter	Shaded	Unshaded
Cows - yard temperature (°C)	26.69 ± 1.11[b]	32.64 ± 1.09[a]
Rectal temperature (°C)	38.71 ± 0.08	38.91 ± 0.08
Respiration rate $(min)^{-1}$	25.61 ± 0.79[b]	29.00 ± 0.21[a]
Milk yield (kg)	671.5 ± 80.93	579.30 ± 69.50
Milk fat percent	5.01 ± 0.17	4.86 ± 0.19
Milk protein percent	3.63 ± 0.04	3.46 ± 0.08
Milk solids - not – fat percent	8.74 ± 0.25	8.68 ± 0.23
Milk ash percent	0.80 ± 0.03	0.76 ± 0.03
Cow – body weight (kg)	292.40 ± 7.28	288.10 ± 6.53

a & b values within the same row bearing different superscripts vary significantly, upper case letter at (P<0.01), lower case at (P<0.05).

DISCUSSION

One of the greatest challenges production facing dairy farmers under arid conditions is heat stress. In north Sudan intense radiation energy extends for long periods. Heat production and accumulation, compromised cooling capability causes heat load in the cow to increase to the point that body temperature rises. Ravagnolo and Misztal (2000) stated that maximum were the most critical variables to quantify heat stress, and both variables are easily combined into temperature humidity index. Rectal temperature was taken as an indicator of thermal balance which can be used to assess the adversity of the thermal environment which can affect growth, lactation and reproduction (Thompson, 1973).

in this study the significant etfect of S- condition on RR over the other rmsters might be attributed to the fact that when cows exposed to arions conditions of heat stress their first response will be an increase in OR before the rise in RT (Riek and Lee, 1948 and Bligh, 1957), The effect of environmental modification on RR was investigated under different udies by a number of authors who collectively indicated that shading of animal considerably reduces the influence of solar radiation with the result that ambient temperature (Ta) was the apparent cause of the larger portion of variations in RR (Harries et al. 1960 and Hassan, 1996). Lower RR associated with S - housing may be justified by the fact that shade alleviates much of the solar heat imposed on the animal and which in turn causes a thermal

gradient between the animal surface and its environment which makes it easy for cows to dissipate heat via non- evaporative cooling, thus imposing less tax on energy expenditure (Roman - Ponce er al, 1977). Cow dry matter intake and milk yield are most variables (Mc Farlane, 1963). Despite the unavailability to quantify the forage meal in this study (unavailable forage measuring scale) it observed that the two treatments behaved similar in their rate of forage consumption. The present result s verified that milk yield affected by climatic and its component percentages of the NS - cows tended to he lower than the S- counterparts. Me Dowell and Mc Daniel (1968) declared that the direct influence of high temperature bring about a reduction in the elliciency of utilization of dietary energy for productive purposes, not only do animals eat less, but they return less per unit of intake. Many experiments conducted under controlled temperature conditions have demonstrated retardation in growth rate at high temperature. The degree of elardation depends on age, size of the cow and Ta (Jhonson, 1987). Alhough the difference in body weigh was not significantly ditferent 005) between the treated groups under the current investigalion. the heaviest body weight associated with the S- housing might be attributed environment teflected in lower RT and overall better performance which could be related to less energy expenditure for thermoregulation. Roman - Ponce et al., (1977): Collier et al. (1982) came with the same advocations.

The poor performance that have been demonstrated by the NS co might be justified by the fact that maintenance requirements increases in hot environments efficiencies of the lactating cows, in this respect El Mquist et al., (2005) stated that heat stress causes the medial satiety center of the hypothalamus to stimulate the medial satiety center which inhibits the lateral appetite center, resulting in reduced dictary intake and consequently lower milk production. Wool ghacocorticoids blood level increases with an increase in cnvironmenta) temperature thus increasing catabolism. Despite the fact that the present result comply with previous result reports, Hassan (1996) and Roman Ponce et al. (1977) yet the differences in responses did not attained a statistic significance this might partly altributed to the type of shade ; shading condition in this study (ruof and walls) are constructed from such material that have high thermal conductivity (zinc, thermal brick) that ultimately tended to minimize the difference between the treated groups. And partly attributed to the breed itself which is though to be more acclimatized to its environment and such modification is not qualified to evaluate appreciably the responses under question. the production which will ultimately reduces and Goldstein documented (8561)

CONCLUSION

Since the S-condition in the present study to be : convenient to zebu cattle by lowering rectal temperature, respiration rate and improving the milk yield and cow body-weight; A well design shade structure to suit the prevailing local conditions and to allow ventilation is recommended.

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آثار تعديل البيئة على بعض جني النباتات الانتاجية والفسيولوجية في ابقار البطانة

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تعديل البيئة لخفض درجة حرارة الحظيرة المظللة معنويا) 0.01 (P <مقارنة بالمعاملة تحت الشمس ، وقد بلغت نتائج الدراسة على الرغم من أن نسبة الحرارة إلى زيادة معدل التنفس) 0.05 (P <كانت غير معنوية) 0.05 (P> بالنسبة للدماغ الحرارة المستقيم. هذه النتائج بمجملها أنت إلى التدهور الملحوظ في الحصول على الحرارة ومنتجها و إلى التناقص في أوزان الأبقار وذلك يرجع إلى أن درجة الحرارة الحيوان في علبة حراري لا يتم تحقيق ذلك من خلال تحقيق النتيجة المثالية. أما الأبقار التي وضعت تحت الظل فيلاحظ أنها سجلت تناقصا معنويا) 0.05 (P <في سرعة التنفس إلا أنه معنوي بالنسبة للحرارة المستقيم) 0.05 .(P> هذا الحقل الخاص بالمهرجان والمعلمات والمساعدات في إنشاء بيئة هندسية) 0.05 (P> وخلصت الدراسة إلى تعديل البيئة لحيوان البيئة إلى التحسن الملحوظ في الوظائف الفسيولوجية والإنتاجية تحت الدراسة.