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ORIGINAL ARTICLE

Effect of supplementation of vitamin E, selenium and feeding management practices on sustainable milk production in buffaloes during hot–humid climate in Bundelkhand

Sandip Kumar, S. K. Singh and A.K. Shrivastava
Jawaharlal Nehru Agriculture University- KVK Tikamgarh, M. P.-472001, India

ABSTRACT
An on farm experiment was carried out to assess the vitamin E and selenium on performance of buffaloes in heat stress. A total of 24 animals (80±10 days postpartum and 650±25 kg body weight) were randomly divided in to 3 treatments with 8 buffaloes in each group in a completely randomized design and received a balance feed as per BIS 1992 (Type-II). T_2 group was injected with 10 ml from solution of vitamin E and selenium after interval of 10 days and T_3 group was injected with 10 ml from solution of vitamin E and selenium after interval of 15 days. Dry matter intake and milk yield and milk composition in T_2 & T_3 was observed to be higher value (P>0.05) than control group. The respiration rate and pulse rate were observed to be significantly higher (P>0.05) in T_1 group than T_2 & T_3. Rectal Temperature was also significantly higher in T_1 (P>0.05).
Keywords- *Vitamin E, Selenium, Heat stress, buffaloes***.**

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INTRODUCTION

Summer season is the big challenge in dairy animal production in Bundelkhand region. The hot and humid period was long ranges from 5 to 6 month. Heat increment in dairy animals due to large quantity of metabolic heat and accumulate additional heat from radiant energy, these results into increase the body temperature, decrease feed intake and reduces finally the milk yield and milk fat [12, 14]. The annual loss of milk due to thermal stress on livestock is about 1.8 million tonnes, which is about 2 percent of total milk production in India. This amounts to Rs. 2661.62 crores. The annual loss in milk production of cattle and buffaloes due to thermal stress by 2020 will be about 3.4 million tonnes which will cost more than Rs. 5000 crores at current prices [13]. The loss in milk production due to climate changes of dairy animals will be about 15 million tonnes by 2050. The partitioning of negative impact showed that buffaloes will be affected more than indigenous cattle (Zebu), accounting 0.89 million tonnes milk annual decline in 2020.

Heat stress also decreases reproductive performance of dairy animals viz. decrease length and intensity of oestrus period, conception rate, early embryonic death, increased cases of silent heat and number of artificial insemination. Some cooling systems have been evolved to cope up with this heat load in hot climate conditions [10] but, the heat load in summer season was not completely relieved [1].

Heat stress has been imposed to increase production of oxygen derived free radicals, which can have very deleterious effects [9]. All organ systems are involved with oxidative stress but only in situations of excessive oxidative stress it leads to organ damage, which has adverse effect on health [7]. Certain nutrients act as antioxidants or are components of antioxidants enzymes and have direct effects on oxidative stress. The major reactive oxygen metabolites (ROM) in biological systems are super oxide, hydrogen peroxide, hydroxyl radicals and fatty acid radicals, with them several trace minerals such as copper zinc, manganese, selenium and some vitamins such as E & C are integral components of the antioxidant systems [8].

MATERIAL AND METHODS

The study was conducted as on farm trial on 24 buffaloes from 15 June to 15 September, 2016 at farmer's fields. The experiment period was 90 days; 3 weeks were assigned as an adaptation period. The buffaloes were equally divided in three groups to three treatments i.e. eight buffaloes in each. T_1 group act as control with no injection of solution, T_2 groups prepared and injected selenium vitamin E solution (10 ml I/M) in 15 days interval while in T_3 the solution injected after 10 days interval. Each ml contains vitamin E 50 mg and selenium 1.5 mg. However, the ration offered to animals early in the morning at 5 am and late evening 7 pm. for treatment group only, while for control group animals feed offered at day time as farmer's practice. Experimental diet contained 15 kg non leguminous green + 6 kg wheat straw + 4 kg mustard cake + 3 kg barley + 50 g mineral mixture per day. Access to water was offered three times. Data on feed intake and milk yield were collected at weekly interval. Data on temperature and relative humidity were collected daily. A simple method is given to measure the heat stress in cattle and buffaloes. Test is based on atmospheric temperature (^oC) and relative humidity [11].

$THI = (1.8T_{db} +32) – \{(-0.55 – 0.0055 RH) (1.8T_{db} -26)\}$

db = dry bulb temperature (^oC) and RH = Relative humidity (%).

If calculated value is >72 indicates heat stress.

RESULTS AND DISCUSSION

Thermal heat index: Table 1 show that even fluctuation in temperature up to 4 ^0c there is not much variation in thermal heat index (humidity index) due to high relative humidity which leads to uneasiness to buffaloes due to less dissipation of heat from body and they are not in harmony with the nature in summer season.

Dry matter intake: Effect of dry matter intake was shown in Table - 2. Dry matter intake in T_2 & T_3 was observed to be higher value than control group ($P>0.05$) in comparison to T_1. However, DMI in T_2 & T_3 was not significantly different ($P<0.05$).

Milk Production: Data in Table 3 show that selenium vitamin E injection group was observed to be higher milk yield and milk composition like fat percentage, total solid percentage and solid not fat percentage ($P>0.05$).

Physiological Activity: Data in Table 4 show that respiration rate and pulse rate were observed to be significantly higher ($P>0.05$) in T_1 group than T_2 & T_3. There is no difference in T_2 & T_3. Rectal Temperature was also significantly higher in T_1 ($P>0.05$). The temperature in T_2 is slightly higher in T_3 but there was no significant difference ($P>0.05$) between T_2 & T_3.

Table 1: Thermal heat index on weekly basis

Week	Tdb (^0C)	RH	Humidity Index (THI)
1	29.7	53.33	78.3
2	27.8	65.9	77.6
3	27.8	79.6	79.4
4	25.9	91.1	77.6
5	25.9	86.9	77.1
6	27.2	81.1	78.6
7	26.0	88.4	77.5
8	26.3	87.7	78.1
9	25.2	89.4	76.3
10	25.1	88.4	75.9
11	26.9	83.0	78.4
12	25.2	82.1	75.6
13	25.2	74.3	74.6
Mean	26.5	80.9	77.3

There have been many reviews of nutritional management for animals in hot climates [5]. There are several major key areas of nutritional management which should be taken during hot weather. Some of them were reformulation of ration to account for reduced Dry Matter Intake, Heat increment and high nutrient requirements during hot climates [3]. There are several demonstrations on nutrient requirement of dairy animals for modifying it during hot weather. Voluntary Dry Matter Intake decreased by 50% in heat stress [14] milk fat and its composition were adversely affected by the heat stress because reduced dry matter intake leads to less nutrient available in the mammary gland for metabolism due to reduced

blood flow in all visceral organ as mammary gland too which is supported by [2, 4]. Viatamin E and selenium prevent production of free radicals and its action in tissues and by this mechanism they reduced heat stress.

Rectal temperature, respiration rate and pulse rate in this experiment was adversely affected by the heat of the weather. However, it is contrast to the result observed by [6].

Table 2: Dry matter intake

Treatment	DMI (kg/day)	DMI (kg/100 kg body weight)
T_1	14.2	2.58
T_2	17.6	3.20
T_3	17.9	3.25
SEM	0.81	0.24
P Value	0.61	0.64

Table 3: Milk production and composition

Treatment	Milk (kg/day)	Fat %	T. S. %	SNF %
T_1	9.0	5.8	13.27	8.9
T_2	9.9	6.3	13.65	9.2
T_3	10.1	6.4	13.67	9.2
SEM	1.13	0.18	0.26	0.09
P Value	0.66	0.96	0.72	0.30

Table 4: Rectal temperature, respiration rate and pulse rate

Treatment	Rectal Temperature (^{0}C)	Respiration Rate (per minute)	Pulse Rate (per minute)
T_1	39.5	35.0	63
T_2	38.5	32.0	58
T_3	38.3	33.0	58
SEM	0.74	0.95	0.68
P Value	0.87	0.94	0.89

CONCLUSION

Long periods of high ambient temperature comprise the ability of the lactating buffaloes to dissipate excess body heat. Animals with elevated body temperature showed lower Dry Matter Intake, milk yield and abnormal physiological behavior which reduced profit of the farmers also. The occurrence of heat stress can be determined by the monitoring of weather conditions and by measuring some parameter like rectal temperature and respiration rate. Therefore, feeding management and composition of feed very become important and need to be change. Feed rations should be changed gradually. It is more appropriate to offer feed in colder time, early morning or late evening along with mineral mixture which have selenium – vitamin E and proper housing facilities for dairy buffaloes. Result observed in this experiment suggested that feeding of selenium – vitamin E can help to improve dairy buffaloes productivity under heat stress conditions.

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