CORRELATION OF TEMPERATURE HUMIDITY INDEX WITH MILK YIELD OF CROSSBRED JERSEY COWS

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ABSTRACT

The study was carried out in the herd of Jersey-Sindhi crossbred cows maintained at Livestock Research Station, Kattupakkam, mostly a semi-arid region. The temperature-humidity index (THI) was calculated by applying dry bulb reading and wet bulb reading. The THI calculated for morning and evening during winter were 74.35 ± 0.23, 77.43 ± 0.35 respectively and in summer were 83.39 ± 0.32 and 85.99 ± 0.31 respectively and the differences were found to be highly significant ($P< 0.01$) between seasons. The overall average milk yield per day during lactation of Jersey-Sindhi was 5.52 ± 0.19 kg and average milk yield per day from calving to calving was 4.66 ± 0.23 respectively. The THI and average daily milk yield per cow for both winter and summer were negative correlated but had no significant effect. Even though the THI was above the comfort level, it had little or no effect on the milk yield of crossbred Jersey-Sindhi cattle since the animals in the experimental condition were found to be tolerant to the climatic condition prevailing in that area.

KEYWORDS: Temperature-humidity index (THI), Jersey-Sindhi crossbred cows, milk yield, semi-arid region.

INTRODUCTION

Milk production is considerably affected by environmental factors such as high environmental temperature, relative humidity and air movement. High temperature and humidity in the summer can result in behavioural and physical changes in cattle that affect breeding and reproductive pattern as well as the milk production in the summer causing significant economic losses to the dairy industry. Air temperature above 75°F, with increased relative humidity depressed the milk production in lactating Holsteins, Jersey and Brown Swiss and depressed the feed consumption of all the cattle (Ragesdale *et al.,* 1953). The purpose of the present experiment was to study the temperature humidity index (THI) and its correlation with the milk production of crossbred Jersey cattle in the semi- arid region.

MATERIALS AND METHODS

The study was carried out in the herd of Jersey-Sindhi crossbred cows maintained at Livestock Research Station, Kattupakkam, mostly a semi-arid region. The climatic data were recorded daily, once in the morning at 8.00 A.M and again in the afternoon at 2.00 P.M for both the seasons namely winter and summer. These recordings were done at animal level to quantify the microenvironment prevalent around the animal. The climatic variables recorded were ambient temperature, dry bulb and wet bulb readings of Sling Psychrometer and air velocity. The Psychrometric tables were used to arrive at the relative humidity in per cent using the wet and dry bulb readings. The air velocity and ambient temperature was recorded by digital thermo anemometer.

The temperature- humidity index (THI) was calculated by applying the wet and dry bulb readings in the following formula.

THI= 0.72 (Cdb + Cwb) + 40.6

Where, db = Dry bulb reading in Celsius

wb = Wet bulb reading in Celsius

The data for the study of productive performance of crossbred Jersey cows were collected from Livestock Research Station, Kattupakkam. The data collected were subjected to statistical analysis as per method suggested by Snedecor and Cochran (1994)

RESULTS AND DISCUSSION

The data revealed that THI were lower in morning as compared to afternoon in both the season and also THI was more higher in summer as compared to winter (Table 1).

TABLE – 1 : MEAN ± S.E OF TEMPERATURE – HUMIDITY INDEX

Season / Period	Morning	Afternoon	Mean
Winter	$74.35^{a} \pm 0.23$	$77.43^{b} \pm 0.35$	75.89 ± 0.24
Summer	$83.39^{c} \pm 0.32$	$85.99^{d} \pm 0.31$	84.37 ± 0.17

(Mean bearing different superscript differs significantly)

The analyses of variance of data (Table – 2) revealed that there were highly significant diffrence ($P< 0.01$) between morning and afternoon and also between winter and summer. This may be mainly due to the variation in climatic conditions prevailing in the semi-arid regions of tropical environment during winter and summer.

TABLE – 2 : ANALYSIS OF VARIANCE OF TEMPERATURE – HUMIDITY INDEX

Source Of Variation	D.F	M.S	'F' Value	C.D
Between Variables	3	1141.12	300.38**	0.57
Error	156	3.79		

****** Highly significant ($P < 0.01$)

The value calculated for both season were above the upper limit (75) of acclimatization for the average dairy cows as observed by Johnson et al. (1962) and Ingraham (1974). This indicates that the environmental conditions prevailing in the experimental unit was not very conducive to the animals to live and produce and this may also might have reduced the milk production in dairy cows as observed by Johnson, (1987).

The mean±S.E ambient temperature (0^{C}) recorded during morning and afternoon of winter season was 25.80±0.21 and 29.34±0.22 respectively and that of summer season was 31.46±0.29 and 36.06±0.35 respectively. The mean ambient temperature recorded during summer was 33.03±0.15^{0C}, which was higher than that of winter 27.57±0.18^{0C}. This indicates that the temperature prevailing in the experimental unit during both seasons was above (26.6°C) at which the milk production decreased in high producing cows. The mean±S.E relative humidity (%) recorded during morning

and afternoon during winter season was 79.55±0.99 and 64.95±1.30 respectively and that of summer season was 68.00±1.74 and 53.03±1.33 respectively. The mean relative humidity recorded during summer (63.80±0.82 %) was lower than that recorded during winter (72.25±0.93 %). This explains that relative humidity during summer was lower than winter in tropical environment. The mean±S.E of air velocity (m/s) recorded during morning and afternoon of winter season was 0.22±0.01 and 0.34±0.02 respectively and that of summer season was 0.30±0.01 and 0.44±0.01 respectively. The mean air velocity recorded during winter (0.30±0.01 m/s) was lower than that of summer season (0.37±0.01 m/s). This indicates that the air velocity recorded during winter and summer in the experimental unit was less than the wind speed of 2.25 m/s, as stated for hot dry daytime environment in tropical countries.

The average milk yield per day during lactation in Kg and from calving to calving in Kg born during rainy, winter and summer season were (6.10 ± 0.45), (5.68 ± 18), (4.98 ± 0.34) and (5.39 ± 0.72), (4.97 ± 0.22), (3.90 ± 0.47) and the overall average were (5.52 ± 0.19) and (4.66 ± 0.23). Statistical analysis revealed that there was no significant difference between different seasons of birth.

The correlation coefficients of average daily milk yield per day with the temperature-humidity index for winter and summer with T value are presented in Table 3.

TABLE – 3 : Correlation of milk yield with temperature – humidity index

S. No.	Season	Correlation Coefficient Of Average Daily Milk Yield Per Cow A Day With Temperature Humidity Index	'T' Value	Result
1	**Winter**	-0.0425	0.2623	NS
2	**Summer**	-0.254	1.619	NS

NS - Not significant

The average daily milk yield per day during winter and summer was negatively correlated (-0.0425 and -0.254) with temperature-humidity index and there was no significant correlation between milk yield and temperature-humidity index. The impact of temperature-humidity index was lower and non-significant over the average daily milk yield per day of Jersey-Sindhi crossbred in both winter and summer. This was similar to the findings of Hassan *et al.* (1981) and Triveni dutt *et al.* (1995) who observed non-significant negative correlation between daily milk yield and temperature humidity index. But the findings of Kundu and Bhatnagar (1985) stood against this, who observed a negative and significant correlation between daily milk yield and temperature-humidity index. In our experimental condition the crossbred Jersey-Sindhi cattle were found to be tolerant to the climatic condition prevailing in that area. Hence, the daily milk yield and temperature-humidity index did not significantly correlate even though it had a negative correlation coefficient.

It may be concluded that the mean ambient temperature of 27.57 ± 0.18^{0}C, with a relative humidity of 72.25 ± 0.93 and air velocity of 0.37 ± 0.01 m/sec during winter season had a favorable influence on production and reproduction in terms of comfort as revealed by significant reduction in rectal temperature, respiration rate and pulse rate compared to summer season. Even though temperature-humidity index was found to be slightly above the comfort level, it had little or no effect on the milk yield of animal studied.

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