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Gore SM
Department of Animal Husbandry and Dairy Science, College of Agriculture, Latur, Parbhani, Maharashtra, India

Chauhan DS
Department of Animal Husbandry and Dairy Science, College of Agriculture, Parbhani, Maharashtra, India

Patange SB
Department of Animal Husbandry and Dairy Science, College of Agriculture, Latur, Maharashtra, India

Kapkar RV
Department of Animal Husbandry and Dairy Science, College of Agriculture, Parbhani, Maharashtra, India

Corresponding Author:
Gore SM
Department of Animal Husbandry and Dairy Science, College of Agriculture, Parbhani, Maharashtra, India

Studies on effect of climatic parameters on milk quality of Holdeo crossbred cattle

Gore SM, Chauhan DS, Patange SB and Kapkar RV

Abstract
The study was undertaken to evaluate the effect of climatic parameters on milk quality of Holdeo crossbred cattle. The duration of research work was 52 weeks on available Holdeo crossbred cows at Cattle Cross Breeding Project, Vasantrao Naik Marathwada KrishiVidyapeeth, Parbhani. The readings of temperature and humidity in cattle shed will be recorded twice in a day by using wet and dry bulb thermometer and the data of temperature, humidity, evapotranspiration, sunshine hours, wind velocity of surrounding environment was taken from meteorological observatory at the university campus which is situated in the vicinity of this farm, to investigate the seasonal variations of milk from Holdeo cows during summer, rainy season and winter season. Temperature, humidity and sunshine hours have as positive relationship with milk fat and SNF percentage with decrease in fat percentage and SNF percentage. All the climatic factors considered in the study accounted for 78.40 per cent direct variation on fat percentage and 67.70 per cent direct variation on SNF percentage respectively, as verified by value of coefficient of determination (R^2).

Keywords: climatic parameters, milk quality and holdeo crossbred cattle

Introduction
Milk has long been recognized as an valuable food of pastoralist diets in all the world, also it is a nutrient food and is recognized to contribute a high proportion of the nutrients, such as micro nutrients, include calcium, phosphorus, vitamins like B and D, high quality protein such as casein protein, also fatty acid composition of milk fat has relation to its potential health benefit and impact on the human health (Frelich *et al*., 2012) [3]. Cattle and buffalo are basically more important to our national economy among all livestock. Different factors, such as race of cows, genetic variants, stage of lactation and environmental factors which can significantly effect on milk component and properties of milk (Bernabucci *et al*., 2002) [3]. Among the various factor affecting animal productivity climate is one.

Effect of climate change on livestock production in two types i.e. direct and indirect. Direct effect includes health, production, growth and reproduction. Indirect effect includes livestock pasture, forage crop production, heat stress, biodiversity, disease and pest and immune system (Chauhan and Ghosh, 2015) [2].

Climate change mainly affects the high producing animals particularly those high producing animals which are raised under tropical conditions, due to high air temperatures and relative humidity. One of the most important impacts of climate change is heat stress that adversely affects milk production and its composition, especially to those animals that have high genetic potential (sheikh *et al*., 2017) [5]. The chemical composition of milk varies greatly as a consequence of numerous factors such as species, breed of animal, climate, season, lactation etc. Feeding system and seasonal variation have effect in composition of milk especially in fatty acid (Frelich *et al*., 2012) [3].

Every state has its own cross breeding policy which is agro climatic and breed specific. Along with these, crossbreds are poor to adapt harsh climate, susceptible to tropical diseases and require constant input of good managemental conditions compared to indigenous livestock genetic resources which are far superior in these aspects. So, even though crossbreeding had initial success but it is necessary to evaluate crossbred animals on large scale basis (Mishra *et al*., 2017) [4]

In 1972, Vasantrao Naik Marathwada Krishi Vidyapeeth also started cross breeding program at Cattle Cross Breeding Project. During last 35-40 years of research, Cattle Cross Breeding Project developed Holdeo cattle having blood level of HF 50% and Deoni 50%. This breed is adapted in Marathwada environment and performing with minimum care maintenance, but due to increasing temperature in last decade this cross- bred may suffer to heat stress. So this research is designed to assess impact of various climatic factors on quality and quantity of Holdeo crossbred cattle

Materials and methods

Study Location

This study was conducted at Cattle Cross Breeding Project (CCBP), VNMKV, Parbhani, Maharashtra, India, which is located at an $19^0$16' North latitude and $76^0$74' East latitude and 409 m above mean sea level. The climate of the region is subtropical one and the region comes under assured rainfall zone with an average annual rainfall of 700 to 885 mm mostly received in about 70 days during June to September. On seasonal basis, it oscillates from humid to sub humid in monsoon, sub humid to semi-arid during post-monsoon and hot and dry in summer.

Methodology

This study was conducted at Cattl Cross Breeding Project (CC BP) Vasantrao Naik
Marathwada Krishi Vidyapeeth, Parbhani. The research work was conducted during 01 March 2017 to 28 February 2018 for a period of 52 weeks. The data were classified in accordance with day and season. The readings of climatic attributes in cattle shed was recorded twice in a day by using wet and dry bulb thermometer and the data of temperature, humidity, evapotranspiration, sunshine hours, wind velocity of surrounding environment was taken from meteorological observatory at the university campus which is situated in the vicinity of this farm, to investigate the seasonal variations of milk from Holdeo crossbred cows during summer, rainy and winter season.

Milk sampling

Cows were milked twice daily at (5.30 am) and at (4 pm). Milk samples were collected early morning at milking time (6:30 am) in clean plastic bottles (60 ml). After thoroughly mixing for getting homogeneous sample, they were immediately transferred to laboratory for analysis at the temperature of air conditioned room. The time between sampling and analysis did not exceed one hour. The milk samples of Holdeo crossbred cows were taken twice a week at Monday and Thursday day in order to get a strictly 7-d interval.

Chemical analysis of milk sample

Fat percentage determination

Fat percentage determination was done by using the Gerber's method (ISI, 1958). measure.

SNF percentage determination

The SNF percentage determination was, done by using lactometer. Calculated solids-not-fat (SNF) content by using the given formulas.

% SNF = CLR / 4 + (0.25× fat %) + 0.44 (ISI Formula)

Where,

CLR = Corrected lactometer reading,
(Corrected lactometer reading = LR + CF),
LR = Lactometer reading,
CF = Correction factor.

Determination of Temperature Humidity Index (THI):

The climatograph based on daily average ambient temperature and humidity is commonly used for calculating the index to differentiate among location on the basis of physical environment. The index which combines these two climatic factors is temperature humidity index (THI) which is calculated according to National Research Council (1971) as follows: (Annonymous, 1971)

THI = 0.72 (dbt°C + wbt°C) + 40.6

Where,
dbt°C = dry bulb temperature (°C)
wbt°C = wet bulb temperature (°C)
Determined THI values were used to identify heat stress and to examine the monthly variation of THI.

Statistical Method

The data on milk composition (Milk fat and SNF) was subjected for statistical analysis by the method of correlation and regression analysis given by Snedecor and Cocharan (1967). After assessment of variability the data were subjected for the study by the method of correlation and regression analysis.

Y= a+ b1 x1 +b2 x2 +b3 x3 +b4 x4 + b5 x5 +b6 x6 +b7 x7 + uij

where, Y is dependent variable; x is independent variables; a is constant; b is coefficient of x, x1 is max. temp, x2 is min. temp, x3 is max. humidity, x4 is min. humidity, x5 evapotranspiration, x6 sunshine hours, x7 is wind velocity and x8 is THI and uij is error term. This multiple regression equation describes an average relationship between dependent and independent variable, which is used to predict the dependent variables. The variability of model was tested with the help of coefficient of multiple regressions (R2). The significance of R2 was tested with 'F' test and significance of individual partial regression coefficient was tested with student't' test.

Results and discussion

It was evident from the Table 1 that the mean maximum and minimum temperature of whole period is 34.06 ± 0.23 and 18.7 ± 0.30^0C, respectively. Maximum humidity and minimum humidity of whole period is 72.88 ± 0.83 per cent and 38 ± 1.16 per cent, respectively. Evapotranspiration, sunshine hours, wind velocity and THI value is 6.46 ± 0.18, 7.77 ± 0.15hrs, 4.08 ± 0.08 km/hr. and 76.02 ± 0.29, respectively. It was observed that average fat percentage was 3.88 ± 0.010 per cent and SNF percentage was 8.65 ± 0.004 per cent, respectively.

Table 1: Mean value and correlation coefficients of climatic attributes with Fat and SNF per cent in Holdeo crossbred cattle

Sr. No.	Variable	Fat per cent		SNF per cent	
		Mean ± SE	Correlation coefficient (r)	Mean ± SE	Correlation Coefficient (r)
1	Maximum Temperature (X_1)	34.06 ± 0.23	-0.688**	34.06 ± 0.23	-0.650**
2	Minimum Temperature (X_2)	18.7 ± 0.30	-0.718**	18.7 ± 0.30	-0.601**
3	Maximum Humidity (X_3)	72.88 ± 0.83	0.400**	72.88 ± 0.83	0.393**
4	Minimum Humidity (X_4)	38.01 ± 1.16	0.081^{NS}	38.01 ± 1.16	0.143^{NS}
5	Evapotranspiration (X_5)	6.46 ± 0.18	-0.645**	6.46 ± 0.18	-0.622**
6	Sunshine hours (X_6)	7.77 ± 0.15	-0.003^{NS}	7.77 ± 0.15	-0.109^{NS}
7	Wind velocity (X_7)	4.08 ± 0.08	-0.503**	4.08 ± 0.08	-0.392**
8	THI (X_8)	76.02 ± 0.29	-0.841**	76.02 ± 0.29	-0.788**
Fat per cent=3.88 ± 0.010 SNF per cent=8.65 ± 0.004					

* Significant at 0.05 per cent ** Significant at 0.01 per cent NS= non-significant

It was observed that maximum temperature, minimum temperature, evapotranspiration, wind velocity and THI had negative significant effect on Fat and SNF per cent while, maximum humidity had positive significant effect on fat and SNF per cent. Minimum humidity had positive non-significant effect on Fat and SNF per cent. With increase in maximum humidity and sunshine hours Fat percentage and SNF percentage was decreased. It was also found that maximum humidity was inversely correlated with fat percentage and SNF percentage.

Table 2: Climatic factors contributing the variation in Fat and SNF per cent of Holdeo crossbred cattle

Sr. No.	Fat				SNF		
	Variable	Estimated Regression coefficient	SE of (b)	t value	Estimated Regression Coefficient	SE of (b)	t value
1	Max.temp.X_1	-0.017	0.0027	-6.103**	-0.0044	0.0013	-3.295**
2	Min.temp.X_1	-0.0035	0.0021	-1.619^{NS}	0.00072	0.0010	0.681^{NS}
3	Max. Hum. X_3	-0.0030	0.00061	-4.963**	-0.0013	0.00030	-4.459**
4	Min. Hum X_4	0.00029	0.00060	0.487^{NS}	0.000075	0.00029	0.256^{NS}
5	Evpt. X_5	-0.011	0.0042	-2.707**	-0.0048	0.0020	-2.309*
6	Sunshine Hr.X_6	0.0073	0.0025	2.935**	-0.00076	0.0012	-0.623^{NS}
7	Wind velocity X_7	-0.0094	0.0034	-2.784**	0.00094	0.0017	0.567^{NS}
8	THI X_8	-0.014	0.0019	-7.551**	-0.0089	0.00094	-9.488**
R^2=0.784 F=161.55					R^2=0.677 F=93.20		

Intercept=5.89 Intercept=9.60 * Significant at 0.05 per cent ** Significant at 0.01 per cent

It was observed that maximum temperature, maximum humidity, evapotranspiration, wind velocity and THI indicated negative significant association with fat percentage, while minimum temperature indicated negative non-significant association with fat percentage, while, minimum humidity indicated positive non-signification association with fat percentage. Sunshine hours had positive and significant effect on fat per cent. All the climatic variables together accounted for 78.40 per cent variation in fat per cent. The R2 value did not reach the level of significant for the fat percentage. With regard to SNF percentage minimum temperature, maximum humidity, evapotranspiration and THI indicated negative significant association with SNF percentage, while, sunshine hours indicated negative non-significant, while minimum temperature, minimum humidity and sunshine hour's showed positive non-significant association with SNF percentage.

All the climatic parameters together accounted 67.70 per cent variation in SNF percentage. The R^2 value did not reach the level of significance indicate effect of climatic parameters on SNF percentage in Holdeo cattle.

Conclusion

The above findings indicated that Holdeo crossbred cows were sensitive to climatic changes on their fat and SNF percentage. The correlations maximum temperature, minimum temperature, evapotranspiration, wind velocity and THI were negatively significant with milk fat and SNF percentage. Maximum humidity was positively significant effect on milk Fat and SNF percentage. However, minimum humidity had positively non-significant and sunshine hours had negatively non-significant effect on milk fat and SNF percentage. It was noticed that with increase in maximum humidity and sunshine hours fat and SNF per cent decreased.

References

1. Bernabucci U, Ronchi B, Lacetera N, Naedone A. Markers of Oxidative Status in Plasma and Erythrocytes of Transition Dairy Cows During Hot Season 1 J dairy sci 2002;85(9):2173-2179.
2. Chauhan DS, Ghosh N. Association of climatic variables with lactation performance of Deoni cows in subtropical region of India. Vet Sci Res J 2015;6(1):10-15.
3. Frelich J, Slachta M, Hanus O, Spicka J, Samkova E, Węglarz A, Zapletal P. Animal Science Papers and Reports 2012;30(3):219-229.
4. Mishra SP, Mishra C, Sahoo SS. Crossbreeding experiments in India – lessons to learn and voyage to future. The Pharma Innovation J 2017;6(10):32-35.
5. Sheikh AA, Bhagat R, Sheikh TI, Rouf RD, Shafkat AS, Jaan MW, Pooja D. Effect of climatic chang on reproduction and milk production performance of livestock: A Review. J Pharmacognosy and Phytochemistry 2017;6(6):2062-2064.