International Journal of Agriculture Sciences
ISSN: 0975-3710&E-ISSN: 0975-9107, Volume 9, Issue 7, 2017, pp.-3840-3842.
Available online at http://www.bioinfopublication.org/jouarchive.php?opt=&jouid=BPJ0000217

Research Article

CORRELATION BETWEEN MILK CONSTITUENTS AND SOMATIC CELL COUNTS IN HOLSTEIN FRIESIAN CROSSBRED CATTLE

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Received: January 20, 2017; Revised: January 24, 2017; Accepted: January 25, 2017; Published: February 12, 2017

Abstract- The present study was carried out in the herd of Holstein Friesian crossbred cows maintained at a private dairy Farm located at Anjora, District Durg (C. G.). Milk samples from Holstein Friesian crossbred cows were analysed to find out relationship between major milk constituents and somatic cell counts (SCC). The least square means obtained for fat%, solid not fat(SNF)%, total solids(TS)%, protein% and lactose%, test day milk yield and fat corrected milk (FCM) yield were 4.33±0.02, 8.29±0.01, 12.62±0.03, 2.99±0.05, 4.51±0.09, 10.50±0.09kg/day and 10.90±0.10kg/day, respectively. Overall mean for SCC found to as 1.42±0.02 ($x10^5$cell/ml). In the present study negative and significant correlation (P<0.01) were observed between test day milk yields with fat and total solids. The correlation between test day milk with SNF, protein and lactose were found to be negative and non significant. Highly and significant correlation (P<0.01)was observed between fat and TS (0.918), fat and SNF (0.178) fat and protein (0.342) and fat and lactose (0.162). Positive and significant (P<0.01) correlation was observed among protein and lactose percentage. Correlations are very significant in direct or indirect selection where alteration in one trait are induced through selection on other trait between which there is genetic correlation. Values of genetic correlations between productions have huge importance in selection of cows, asthey provide possibility for selection of heads on more traits at the same time.

Keywords- H.F., Milk Constituents, Somatic Cell Counts, Correlation.

Citation: Yogi Sourabh, et al., (2017) Correlation Between Milk Constituents and Somatic Cell Counts in Holstein Friesian Crossbred Cattle. International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 9, Issue 7, pp.-3840-3842.

Academic Editor / Reviewer: Nayak Nibedita, Dr Jatin kumar Sahoo

Introduction

Milk is a good source of nutrients and hence important for growth, repairs and provides energy. The composition of cow's milk is also of the greatest importance for the dairy industry. A knowledge of milk composition also aids to evaluate adulteration and the quality of the milk for consumers and milk processing industries. Dairy production in the tropics and subtropics can be enhanced through importation of breeds having superior genetic potential from other countries that can either be used in purebred breeding or in crossbreeding with local breeds [5]. The use of Holstein Friesians has resulted in dramatic rise in milk production over the last few decades. Cattle in the tropics have, on an average, lesser milk yield and shorter lactation length compared to dairy cattle in temperate countries; the difference is caused by both genetic and non-genetic factors [8]. Milk yield and fat percent are important traits to breeders and farmer. Relationship between milk constituents plays an important role in determining several other economic characteristics in farm animals. It is an important attribute as it forms the basis for assessing future milk yield, milk composition and also in making economic and market decisions in farm animals. This is indirect method of improvement of breed performance by estimating correlation between milk constituents. Positive relationships between milk constituents help in genetic improvement strategies by selection of animal.

Materials and Methods

Source of Data

The present study was carried out in the herd of Holstein Friesian crossbred cows maintained at a private dairy Farm located at distance of 10 km from College of Veterinary Science and Animal Husbandry Anjora, District Durg (C. G.). The climate is light tropical, sub-humid with a seasonal variation in temperature and rain fall. Total 432 samples of milk sample collected from 42 animals over a period of 08 month (January 2014 to August 2014) were collected and analysed to study the effects of season, stage of lactation and parity on milk constituents. Lactating animals, which was used for testing milk components were in 1st to 4th order of lactation and different stages of lactation. The information about the parity of cows and date of calving were obtained from the records available in the farm. Each season had 144 samples collected and analyzed. Laboratory analysis was taken by Milk tester (milk analysing device, model LM2), instrument used for determination of Fat, SNF, Protein, Lactose and freezing point of milk. For determination of Somatic Cell Counts ($x10^5$ cells / ml), milk samples were kept in sterile plastic container under an ice-cooled box and transported to the laboratory and analyzed on the same day. SCC in milk samples were done as per method described by [10].

Statistical Analysis

Individual mean comparisons were made for the significant effect. Coefficient of correlation among different milk constituents and with test day milk yield was estimated by the formula as described by [13].

Results

The overall mean for fat percentage, SNF percentage, total solid percentage, protein percentage, lactose percentage, test day milk yield(kg) and 4% milk fat(kg) and somatic cell count (×10^5/ml) were 4.33±0.02, 8.29±0.01, 12.62±0.03, 2.99±0.05, 4.51±0.09, 10.50 ±0.09 Kg, 10.91±0.10 Kg and 1.42± 0.02 x 10^5 cell/ml. Milk composition (fat, CP, SNF and TS) is an important characteristic in dairy cattle. In this study, most of the milk composition measures are positively correlated except the negative correlation between milk yield with fat, SNF, protein, lactose and TS. Highly significant (P<0.01) correlation was observed between fat and TS (0.918), fat and SNF (0.178) fat and protein (0.342) and fat and lactose (0.162). Correlation between TS with protein, lactose, SNF and were found to be 0.499, 0.304 and, 0.554, respectively and were positive and highly significant. Correlation between SNF with protein (0.520) and lactose (0.414) were found to be positive and highly significant (P<0.01) and 0.520 and 0.414 respectively. There exists a positive and significant (P<0.01) correlation between protein and lactose. Negative but non-significant correlation was reported in between Somatic Cell Counts and milk yield in present study.

Table-1 *Overall Means of different milk constituent (%), Test day milk, FCM yield (in Kg) and Somatic Cell counts (x10 ^{5}cell/ ml).*

Dependent Variable	Mean	Std. Error	Std. Deviation
Fat	4.33	0.02	0.638
SNF	8.29	0.01	0.304
Protein	2.99	0.05	0.111
Lactose	4.51	0.01	0.203
TS	12.62	0.03	0.754
Milk Yield	10.50	0.09	4.182
FCM	10.91	0.10	4.108
Somatic Cell Counts	1.42	0.02	0.420

Table-2 *Correlation between different milk constituents and test day milk yield.*

	Milk Yield	Fat	SNF	Protein	Lactose	Total Solids
Milk Yield	1	-0.292**	-0.033 NS	-0.081 NS	-0.081 NS	-0.261**
Fat		1	0.178**	0.342**	0.162**	0.918**
SNF			1	0.520**	0.414**	0.554**
Protein				1	0.367**	0.499**
Lactose					1	0.304**
Total Solids						1
Somatic Cell Counts	-0.003 NS	-	-	-	-	-

** Significant at P<0.01 NS = Not significant,

Discussion

The overall mean for different milk constituents are presented in [Table-1]. Similar mean value fat percent and total solid percent were reported by [7] fat percentage, total solid percentage and lactose percentage are lower than the value reported by[14]. Protein percent in milk of HF crossbred is close agreement with findings of [3,11,16]. The result of lactose percent and test day milk yield(kg) is close agreement with findings of [9]. The result of SCC for present study is within the range of those reported by [2,12,15].

Interrelationship between test day milk yield with major milk constituents and amongst the constituents has been worked out in the present study and is presented in [Table-2]. In the present study negative and significant (P<0.01) correlation were observed between test day milk yields with fat percentage and total solid percentage. The correlation between test day milk with SNF, protein and lactose percentage were found to be negative and non-significant. [4] reported negative correlation between milk yield and major milk constituents. These findings indicate that selection for high milk yield may result in to reduction in percentages of fat, total solids and other milk constituents. Highly significant (P<0.01) correlation was observed between fat and TS, fat percentage and SNF percentage, fat and protein percentage and fat and lactose percentage. This is supported by findings of [1,4,6]. These correlations suggest that as the fat increased, there were tendency for, total solids, SNF, protein and lactose to increase. Thus selection for fat will automatically bring improvement in TS, SNF, protein and lactose contents of milk in Sahiwal cows. This information will be highly valuable in breeding plan to improve these parameters. Correlation between TS with protein, lactose, SNF and were positive and highly significant. These present observations are within the range of those reported by [1,9] in different breeds of cows. Correlation between SNF with protein and lactose were found to be positive and highly significant (P<0.01). This finding is in agreement with [1]. There exists a positive and significant (P<0.01) correlation between protein and lactose. Negative but no significant correlation was reported in between Somatic Cell Counts and milk yield in present study. Similarly, non-significant correlation was reported by [15]. This suggests that selection for protein content will simultaneously improve the lactose content in milk. The study of correlations between test day milk yield and different milk constituent show need of giving weightage not only to the yield of milk but also to other milk constituents like fat, SNF and total solids. Since milk fat is a more desirable trait both in respect of marketing and manufacture of dairy products. Hence it is essential to incorporate fat yield in the selection procedure of any breeding plan. It is also suggested that selection should be done on the basis of both fat and milk yield to take care of milk yield and its constituents. In present study, it was already evident that fat percentage had positive and significant correlation with total solids and protein.

Acknowledgement : Author are thankful to College of Veterinary Science and Animal Husbandry Anjora, Durg, Chhattisgarh and ICAR-Division of Poultry Science, Indian Veterinary Research Institute, Izatnagar, Bareilly, 243122, Uttar Pradesh, India

Conflict of Interest Statement- None

Author Contributions

Study conception, acquisition of data, analysis and interpretation of data: Sourabh Yogi, Research design and interpretation of data: S. K. Chourasia, data collection: Sourabh Yogi, Drafting of manuscript: Sourabh Yogi, S. S. Sahu, and Sudheer Jaiswal and Critical revision: S. K. Chourasia.

Abbreviations-

solid not fat- SNF, total solids- TS, fat corrected milk- FCM, somatic cell counts-SCC, Percentage-%, Kilogram-Kg

Conflict of Interest: None declared

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