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Effect of Season Year Milk Production in Different Breeds of Dairy Cows in Badghis Province

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Abstract

The experiment was conducted on three breeds the total 30 breeds of dairy cows and the number of animal of different breeds was 10 holistan, 10 garai and 10 Cross-bred (CB) during 2019 and 2020. The objective of this study was to know the impact of seasonal on milk production performance of Holistan, Garsi and CB or doragh. The average highest seasonal milk production of Garsi and CB was in spring and summer season, 9.22 and 9.02 liter, respectively and Holistan was highest in spring and summer season (8.261 liter), respectively. The overall average milk production of CB, Holistan and Garsi were 8.86, 7.98 and 7.37 respectively. The seasonal variation and milk production performance of all three breeds were found highly significant. Because the other season production was low. The average milk production of 2470 ± 37 L milk production in spring season followed by 2427 ± 41 L in summer and lowest in winter, as 2403 ± 82 L respectively. The average milk production of Garsi breed in different seasons was estimated and it was noticed that the highest average of 2460 ± 35 L milk production in spring season followed by 2434 ± 14 L in summer and lowest in winter, as 2413 ± 62 L respectively. The average milk production of CB Doragh breed in different seasons was estimated of 2540 ± 35 L milk production in spring season followed by 2457 ± 25 L in summer and lowest in winter, as 2432 ± 20 L respectively.

Keywords: Average, Seasons, Breeds, Milk production. Garsi, CB or Doragh and Holstein.

INTRODUCTION

India is a largest milk producing country in the world, but the production performance of the milking animal is very low. Breed, age, stage of lactation, parity and milking frequency also influence performance production (Epaphras, 2004). Afghanistan is an agricultural country where the majority of its people are engaged in agriculture and livestock (Bolton, 2019). Milk and dairy products are important components of the diet in badghis. The composition of raw milk determines, to a large extent, the nutritional value and the cheese making properties of milk. Therefore, there is great interest in maintaining good milk quality. The composition of milk varies with stage of lactation, season, feeding, health status of the cow and genetic factors (Fox and McSweeney, 1998). and also depends on climatic conditions (Bernabucci *et al*., 2015). Friesian cows, among other imported dairy breeds, contribute significantly to milk production and dairy industry in Badghis. However, importation of European dairy breeds in Badghis is followed by unsatisfactory performance under tropical conditions (Zaabal and Ahmed, 2008). Climate change is defined as a large-scale, long-term shift in the planet's weather patterns such as temperature, wind and rainfall characteristics of a specific region. Climate can affect livestock both directly and indirectly (Bernabucci *et al.*, 2019).

High environmental temperatures during summer seasons may last up to 6 months, with average temperatures over 30°C in many developing countries. One third of the cattle population in the world is located in arid zones, and according to IPCC predictions, the global average surface temperature may increase between 1.8°C to 4.0°C by year 2100 (IPCC, 2007). Seasonal variations in milk yield and composition have been investigated. Larsen *and et al.* (2019) studied the influence of climatic conditions and season on milk composition from 20 Swedish dairy farms located in central and southern Sweden. Those authors have found lower milk fat content in summer compared with winter

milk and attributed the differences to climatic differences. Bouraoui *and et al.* (2002) observed a significant decrease in milk fat and protein yield and a significant increase in the somatic cell count (SCC) of lactating Holstein cows during the summer compared with spring. In a 4-year retrospective study conducted on Holstein cows. Olde-Riekerink *and et al.* (2007) analyzed the seasonal variations in SCC in individual and bulk milk samples. They reported a significant increase in the SCC during August and September.

Information on temperature-humidity index (THI) milk fat and protein percentage and SCC and environmental pathogens relationships are scarce. Furthermore, to-date, there is shortage in the literature regarding the seasonal variation of coliform count, mammary gland pathogens and THI relationship for SCC, coliforms, mammary gland pathogens and fat, lactose, protein, total solid and solid non-fat percentage. Thus, the objective of this research was to investigate the effect of seasonal microclimatic conditions on milk components of Friesian cows and the relationships between SCC, environmental milk pathogens and different milk components. The majority of the Afghan population lives in rural areas, where poverty and deprivation are the most severe. Since almost all rural households depended directly or indirectly on agriculture and livestock and they earn their daily income from these sectors (Muradi and Boz, 2018). Intestinal metabolisms and reproduction (Nam *and et al.*, 2009). Milk yield in a dairy cow is closely related to the animal's genetic merits and environmental factors (Coelho *and et al.*, 2004). Among the environmental factors, the roles of managements, nutrition and hygiene seem to be crucial (Shibru *and et al.*, 2019). reported that the animal breed, stage of lactation, parity and milking frequency also influence performance production.

Afghanistan is characterized by having a high range of maximum and minimum temperature. Afghanistan is an agricultural landlocked country where majority of its population is engaged in agriculture and livestock husbandry (Aich *and et al.*, 2017). The Hindu Kush Mountains which runs from northeast to southwest, divides the country into different natural regions with totally different temperatures and precipitation rates (Qutbudin *and et al.*, 2019). The climate varies considerably between arid and semiarid with hot summers and cold winters. The lowest mean annual precipitation occurs in the southwestern plateau region and the highest precipitation occurs in the northeastern Hindu Kush Mountain's foothill regions ranging from about 30 mm to 1000 mm respectively. Furthermore, the mean annual temperature is different between the regions ranging from 0.7˚C in Hindu Kush Mountains to 23.3˚C toward southern plateau (Qutbudin *and et al.*, 2019). The climate change in Badghis province is of course extremely continental, cold winters, and dry hot and dusty summers. The temperature changes little from day to day. The monthly average temperature in Badghis province is in Jan-2.3, Feb 0.7, Mar 6.3, Apr 12.8, May 17.3, Jun 22.8 Jul 25.0, Aug 24.1, Sep 19.7, Oct 13.1, Nov 5.9 and Dec 0.6 respectively (Aich *and et al.*, 2017).

Dairy cows need suitable temperatures of between 5˚C and 25˚C. At temperatures above 26˚C, the cow reaches a point where she cannot cool herself and suffers from heat stress (Nam *and et al.*, 2009). In order to increase the yield level, it is necessary to optimize the environmental condition and to improve the genetic structure of the animals. In order to enhance productivity of a dairy animal, it is necessary to develop an understanding of the factors affecting its milk production (Coelho *and et al.*, 2004). Management, nutrition, lactation turn or the age, year and season in which lactation started are the leading environmental factors affecting lactation performance in cattle. Beside these factors, the persistency level of the highest milk production period reached on lactation is a significant factor (Tekerli *and et al.*, 2001). Milk yield and duration of lactation have marked effects on dairy economy (Ahmad, 2007). In view of the aforesaid, the present research work was planned at the dairy farm, Banaras Hindu University, V aranasi. The plan of work comprised finding out the effect of seasons on the milk production of various breeds of cattle viz., Holistan, Garsi and crossbred cows maintained at the dairy farm.

MATERIALS AND METHODS

Pertinent year wise data from the milk production records of various breeds of cows maintained at Badghis province Dairy Farm over a period of two years from January 2019 to December 2020 were collected and these records were classified according to seasons viz., rainy (March to November), winter (January to march) and summer (July to august). This was done to elicit information in respect of the changing trends in management practices and seasonal and breed-wise variation in production parameters. Since season is supposed to levy profound influence on the milk production trends in the same year, the data were collected for given period from three cow breeds available at dairy farm in badghis province Holistan, Garsi and Cross-bred. The results obtained have been duly tabulated and statistically analyzed by (San Digo, Ca, USA) Graphpad.Prism. 5 software.

RESULTS AND DISCUSSION

Milk production performance of Holistan Breed; number of milking cows of Holistan breed were 10 in 2019 in 2020. The annual average milk production was 8.34 liters, being the highest in 2020 than 5.07 liters during 2019. However, the number of milking cows was variable in all the seasons. The average milk production of Holistan breed in different season was

estimated and it was noticed that the highest average of 7.32 liters' milk production in summer season followed by 7.43 liters in winter and lowest in rainy season, as 6.89 liters respectively (T able 1). The seasonal influence on the milk production of Holistan breed was highly significant (p <0.01 Ray *et al*. [8], who reported that the season and year affect the milk production performance amongst cow breeds and their finding was 5.3 liters with coefficient of variation 15.28%, found highly significant (p<0.01). By considering the cows' lactation stage, the effect of season was significant on milk yield of dairy cows. The effects of season on the milk production are presented in Table 1.

Table-1: Average of milk production according to season of year

Breed	Season	Number of animals	Average Milk Yield (L/season)
holistan	Spring	10	2470 ± 37*
	Summer	10	2427 ± 41
	Winter	10	2403 ± 82
Garsi	Spring	10	2460 ± 35*
	Summer	10	2434 ± 14
	Winter	10	2413 ± 62
CB or Doragh	Spring	10	2540 ± 35**
	Summer	10	2457 ± 25
	Winter	10	2432 ± 20

Milk production performance of Garsi Breed

In case of Garsi breed total number of milking cows was 10 in both years. The total number of milking cows of Garsi breed was 10 in 2019 and 2020. The average milk production was 8.89 liters, being the highest in the years 2020 than 4.95 liters during 2019 difference of milk production in both years was also highly significant (p< 0.01). There was a variation in the number of cows in all the seasons. The seasonal influence on the milk production of Garsi breed was highly significant (p<0.01. The average milk production was highest 8.44 liters in winter season than 6.34 liters in summer season and lowest 4.823 liter in rainy season (T able 2). Similar finding was reported by Epaphras *et al*. that the average cow milk production during the dry season, long rains and short rains was 6.1 ± 3.9, 6.6 ± 2.9 and 5.8 ±3.1, respectively. Overall, the differences in average milk production during the three seasonal categories were significant.

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Table-2: Analysis of variance for breed and seasons **(p <0.01)

Source	Anova SS	Mean square	*F* value	Pr >*F*
Week	211.7	79.536	15.89**	<0.01
Month	856.065	84.915	17.67**	<0.01
Season	1146.755	89.788	19.56**	<0.01
Year	4713.865	4713.87	1058.14**	<0.01

Dillon *et al*. (2009), reported that the performance of Dutch Holstein-Friesian (HF), upgraded Irish Holstein-Friesian (CL), French Montbeliarde (MB) and French Normande (NR) dairy cow breeds on a spring calving grass-based system of milk production. The HF cows produced the highest (p < 0.05) yield of milk, while the CL and MB were intermediate.

Milk production performance of Cross Bred (CB) or Doragh

Results from 2019 and 2020 showed that the number of CB was 10 during both years. The average milk production was highest 9.32 liters in 2020 than 6.74 liters in 2019. The difference in milk production was found to be significant during both the years (Lanyasunya *and et al.*, 2006). have also reported the similar findings as daily milk yield per cow varied from 8 to 24 liters which was highly significant. The season showed a significant influence on the milk produiction. The average seasonal milk production was highest in winter season Show in T able 3. (Farina *and et al.*, 2020) also reported that the Holstein cow milk yield decreased during heat stress however, Holstein cows still produced larger volumes of milk.

Table-3: Milk production of different breeds. **highly significant (p <0.01)

Sl. No.	breeds	Means of milk production (liter)		
1	Holistan	7.75**		
2	Garsi	7.35**		
3	dowragh	7.98**		
Anova table				
Source	Anova SS	Mean square	*F* value	Pr >*F*

Breed	45654.834	14876.786	865.49	<0.01

Overall performance of different breeds

Table 4 shows that the overall performance of crossbred was better than Holistan and Garsi breeds during both the years 2019 and 2020. This difference in milk production was due to different factors like adaptability, different lactations, feed intake, compatibility, and other management practices applied at dairy farm. These results are in conformity with the findings of (Orgmets *and et al.*, 2002). It may, therefore, be ascertained that during spring, when there is abundance of greens by way of green forages as also the grazing grasses containing relatively higher quality of nutritive value wet CP and DCP content, production potential of the animals reaches the highest level in spite of the fact that during winter lot of energy is utilized for maintenance of the body temperature. Same is true during the rainy season the animals have access to grazing where they nibble lot of green grasses. Since the quality of nutritive value wet CPand DCPis very low, the production cannot be as high as it is during the winters. In the summer season when the mercury touches 42 to 45C even some time more feed intake decrease due to temperature stress and more over quality green fodder are also shanty or almost not available to the animals. On other hand animal contradictory to the decrease feed intake animals consume more water in order to maintain their thermoregulation of the body causing reduction into milk production.

Table-4: Analysis of variance for holistan breed of cows during seasons. **highly significant (p <0.001)

Source	Anova SS	Mean square	*F* value	*F* at 1%
Week	211.7	79.536	15.89**	<0.01
Month	856.065	84.915	17.67**	<0.01
Season	1146.755	89.788	19.56**	<0.01
Year	4713.865	4713.87	1058.14**	<0.01

CONCLUSION

According to the result obtained in this study in badghis province, it was determined that the seasonal changes affected the milk production performance of different breeds under same management practices. The major influences of milk production are due to the sources of variation in milk production, lactation length and dry period are genotype, environment and the interaction between the two. The influence of environmental factors on dairy production has been well documented. It can be concluded that Cross-bred cattle is raised successfully for milk yield under badghis province environmental conditions. season of the year had significant effects on milk production of dairy cattle in Badghis Dairy Farm. The similar results were previously reported (Susanto *and et al.*, 2019) The season had a significant effect on the milk yields. The milk yield of dairy cows in the Badghis Dairy Farm is at a high peak in spring compared to summer and winter seasons. Also, the milk yield of dairy cows is high at 3rd lactation and low at 1st lactation. The milk yield of Holstein dairy cows is at a low level in the Badghis Dairy Farm. Food with good quantity and quality increases the milk yield of dairy cows.

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REFERENCES

- Ahmad, B., Khan, S., & Manan, A. (2007). Production and reproduction performance of Jersey Cattle at cattle breeding and dairy farm harichand charsadda Nwfp. *Journal of agricultural and biological science*.
- Aich, V., Akhundzadah, N.A., Knuerr, A., Khoshbeen, A.J., Hattermann, F., Paeth, H., Scanlon, A. and Paton, E.N. (2017). Climate Change in Afghanistan Deduced from Reanalysis and Coordinated Regional Climate Downscaling Experiment (CORDEX)-*South Asia Simulations. Climate, 5, Article No. 38.* https://doi.org/10.3390/cli5020038.
- Bolton, L. (2019). Agriculture in Afghanistan-Economic Sustainability and Sub-Sector Viability. K4D Helpdesk Report 574. *Institute of Development Studies, Brighton*, 1-12.
- Bouraoui, R., Lahmar, M., Majdoub, A., & Belyea, R. (2002). The relationship of temperature-humidity index with milk production of dairy cows in a Mediterranean climate. *Animal Research*, *51*(6), 479-491.
- Coelho, K. O., Machado, P. F., Coldebella, A., Meyer, P. M., Cassoli, L. D., & Rodrigues, P. H. M. (2004). Factors affecting milk yield at peak and during current lactation of Holstein cows. *Journal of Animal and Feed Sciences*, *13*, 475-478.
- Epaphras, A., Karimuribo, E. D., & Msellem, S. N. (2004). Effect of season and parity on lactation of crossbred Ayrshire cows reared under coastal tropical climate in Tanzania. *Livestock Research for Rural Development*, *16*(6), 42-46.

- Fariña, S. R., Garcia, S. C., Fulkerson, W. J., & Barchia, I. M. (2011). Pasture-based dairy farm systems increasing milk production through stocking rate or milk yield per cow: pasture and animal responses. *Grass and Forage Science*, *66*(3), 316-332.
- IPCC. [Accessed May 12, 2015]; *Climate change 2007: the physical science basis.* 2007 https://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_wg1_report_the_physical_science_basis.htm.
- Lanyasunya, T. P., Rong, W. H., Mukisira, E. A., & Abdulrazak, S. A. (2006). Performance of dairy cows in different livestock production systems on smallholder farms in Bahati Division, Nakuru District, Kenya. *Pakistan Journal of Nutrition*, *5*(2), 130-134.
- Larsen, M. K., Nielsen, J. H., Butler, G., Leifert, C., Slots, T., Kristiansen, G. H., & Gustafsson, A. H. (2010). Milk quality as affected by feeding regimens in a country with climatic variation. *Journal of Dairy Science*, *93*(7), 2863-2873.
- Mostert, B. E., Theron, H. E., & Kanfer, F. H. J. (2001). The effect of calving season and age at calving on production traits of South African dairy cattle. *South African Journal of Animal Science*, *31*(3), 205-214.
- Muradi, A.J., & Boz, I. (2018). The Contribution of Agriculture Sector in the Economy of Afghanistan. *International Journal of Scientific and Management, 6:* **750-755.** https://doi.org/10.18535/ijsrm/v6i10.em04.
- Nam, K.T., Kim, K.H., Nam, I.S., Abanto, O.D., & Hwang, S.G. (2009) Seasonal and Regional Effects on Milk Composition of Dairy Cows in South Korea. *Journal of Animal Science and Technology, 51*: **537-542**. https://doi.org/10.5187/JAST.2009.51.6.537.
- Qutbudin, I., Shiru, M.S., Sharafati, A., Ahmed, K., Al-Ansari, N., Yaseen, Z.M., Shahid, S. and Wang, X. (2019). Seasonal Drought Pattern Changes Due to Climate Variability: Case Study in Afghanistan. Water, 11, *Article No. 1096*. https://doi.org/10.3390/w11051096
- Riekerink, R. O., Barkema, H. W., & Stryhn, H. (2007). The effect of season on somatic cell count and the incidence of clinical mastitis. *Journal of dairy science*, *90*(4), 1704-1715.
- Shibru, D., Tamir, B., Kasa, F., & Goshu, G. (2019). Effect of Season, Parity, Exotic Gene Level and Lactation Stage in Milk Yield and Composition of Holstein Friesian Crosses in Central Highlands of Ethiopia. *European Journal of Experimental Biology, 9, Article No. 15.*
- Smith, D. L., Smith, T., Rude, B. J., & Ward, S. H. (2013). Comparison of the effects of heat stress on milk and component yields and somatic cell score in Holstein and Jersey cows. *Journal of dairy science*, *96*(5), 3028-3033.
- Susanto, A., Hakim, L., & Nurgiartiningsih, V. M. A. (2019, November). Environment (Year and Season of Birth) Effects on First-Lactation Milk Yield of Dairy Cows. In *IOP Conference Series: Earth and Environmental Science* (Vol. 372, No. 1, p. 012010). IOP Publishing.
- Tekerli, M., Kucukkebabci, M., Akalin, N. H., & Kocak, S. (2001). Effects of environmental factors on some milk production traits, persistency and calving interval of Anatolian buffaloes. *Livestock Production Science*, *68*(2-3), 275-281.
- Zaabal, M. M., & Ahmed, W. M. (2008). Monitoring of some reproductive parameters in local Egyptian Friesian cows with emphasis on the use of immunogenetic analysis for evaluation of fertility. *Glob. J. Mol. Sci*, *3*, 21-26.
- Zukiewicz, A., Gtzesiak, W., Szatkowska, I., Blaszcyk, P., & Dybus, A. (2012). Genetics Factors of Milk Yield in Dairy Cattle—Advances in the Quest for Universal Markers. *Israel Journal of Veterinary Medicine, 67:* 82-91.