INFLUENCE OF SEASON ON RAW MILK YIELD AND QUALITY IN A DAIRY FARM

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Abstract

The aim of the paper was to evaluate the effect of season on milk yield and quality. Researches were carried out at the Research and Development Station for Bovine Raising Arad, on milk collected daily in the farm from around 350 cows, between years 2009 and 2011. The following traits were studied: total milk yield, average milk yield per cows per day, milk fat percentage and milk protein percentage from the bulk tank. The evolution per month and season (spring, winter, summer and autumn) of these traits was studied using statistical inference. Results showed that milk production was lower in the winter and spring seasons than in summer and autumn.

Key words: milk, quality, yield, season

INTRODUCTION

Milk represents a physiological secretion of the mammary gland, being considered as the perfect food due to its fat, protein, vitamin and minerals content [3]. Each of milk components has an essential role in development and maintaining the health status of the organism [2]. Not the least, the fat and protein milk content have an influence on the milk price.

The variation in milk yield and quality within a species depends on several factors: environment, lactation period, lactation season in which performs.

Such environmental conditions directly influence the milk production quantitatively and qualitatively. It was observed from the study that in seasons with high temperatures (summer and early autumn) milk production increases and decreases in the low temperature. This is due to food intake on the one hand and the relationship between periods of light and darkness on the other hand [1].

During summer the feeding ration contains a large quantity of green fodder, feed that lead to an increase in the quantity of milk. Simultaneously, longer period of light during the summer season stimulates the secretion of prolactin, directly responsible for the synthesis of milk.

The fat and milk protein percentages are highly and negatively correlated with milk production. Therefore, a decrease in the percentage of fat and protein during warm periods and an increase in cold periods were observed. This is due to feed intake structure, which in the cold season contains a larger amount of feed that promotes secretion of fat and protein.

MATERIAL AND METHODS

The study was conducted on Romanian Spotted cows of Fleckvieh-type from elite farm of the Research and Development Station for Bovine Raising – Arad. Measurements were recorded over a period of 25 months, between December 2009 and December 2011. The average number of dairy cows in the study was 350 heads from which in permanent lactation an average of 252 heads.

Three parameters were taken into the studies: milk production, fat percentage and protein percentage. Data were statistically processed, then the differences among averages were tested using Student test.

RESULTS AND DISCUSSIONS

Production data for the three parameters and the average number of lactating cows were recorded during the study. The results are presented in Table 1.

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The results showed that milk production increased in warmer seasons and decreased in the cold season, while the percentage of fat and protein follows had reversed trend. High milk production was recorded between June and September, and the lower milk production between December and February. Maximum of fat percentage has been reached between October to April and the lower one in warm months from May to September. The protein percentage closely followed the fat percentage, thereby the maximum being reached between October to April and bringing its decline from May to September.

In terms of productive yield differences in the succession of the seasons were observed, these differences were generally statistically very significant.

Production parameters evolution can be observed by analysing the charts below.

Table 1 Productive performance of dairy cows during the study period

Month/year	Daily milk production / month	Average daily milk / head	Fat percentage %	Protein percentage %	Cow average
December 2009	2830	11.1	4.4	3.46	255
January 2010	2988	11.67	4.4	3.45	256
February 2010	3194	12.78	4.28	3.37	250
March 2010	3242	13.02	4.18	3.35	249
April 2010	3168	12.87	4	3.31	246
May 2010	3425	13.81	3.88	3.31	248
June 2010	3327	13.3	3.95	3.28	250
July 2010	3602	14.23	3.87	3.29	253
August 2010	3675	14.52	3.76	3.28	253
September 2010	4016	15.74	3.85	3.37	255
October 2010	3763	14.9	4.04	3.4	252
November 2010	3119	12.28	4.25	3.41	254
December 2010	2901	11.24	4.5	3.4	258
January 2011	2848	10.91	4.48	3.4	261
February 2011	2820	11.06	4.5	3.4	255
March 2011	2883	11.48	4.5	3.4	251
April 2011	2948	11.56	4.26	3.35	255
May 2011	3845	14.96	4.08	3.32	257
June 2011	4182	16.66	3.9	3.32	251
July 2011	4093	16.05	3.9	3.31	255
August 2011	3872	15.19	3.87	3.3	249
September 2011	3822	15.35	3.71	3.33	249
October 2011	3900	15.72	4.04	3.39	248
November 2011	3310	13.6	4.38	3.43	244
December 2011	3345	13.76	4.46	3.44	243

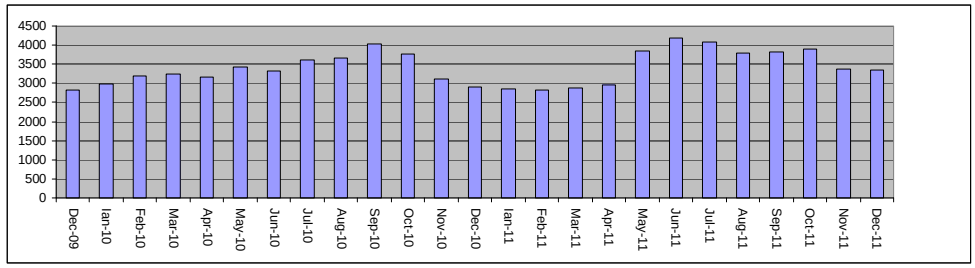

Chart 1 Evolution of milk production during the study

From data presented in chart 1 is clearly observed the milk production curve that follows it throughout the seasons and the trend of increase of production in warmer seasons. As we move during cold seasons, milk production shows a downward slope.

The fat and protein percentages are strongly and negatively correlated with milk production, as shown in chart 2 and chart 3. From data presented in chart 1 is clearly observed the milk production curve that follows it throughout the seasons and the trend of increase of production in warmer seasons. As we move during cold seasons, milk production shows a downward slope.

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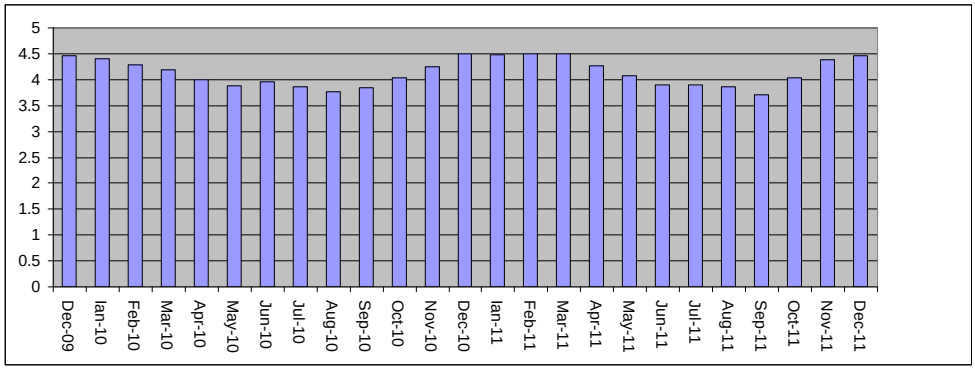

Chart 2 Fat percentage evolution during the study

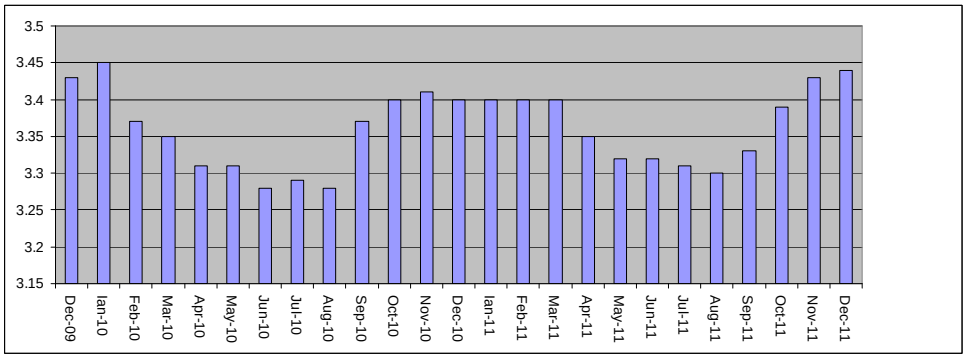

Chart 3 Protein percentage evolution during the study

It can be seen that the values for fat and protein percentages increased during cold, followed by a downward trend in warm periods.

The productive differences obtained during the 25 months of study were calculated and their statistical significances were tested. The results are presented in Tables 2-7.

Table 2 Production differences obtained for milk production for year 2010

Season	Winter 2010	Summer 2010	Autumn 2010
Winter 2010	-280 FS***	-544.7 FS***	-663.1 FS***
Winter 2010	-	-264.7 FS***	-353.1 FS***
Summer 2010	-	-	-88.4 S*
Autumn 2010	-	-	-

Table 3 Production differences obtained for milk production for year 2011

Season	Winter 2011	Summer 2011	Autumn 2011
Winter 2011	-375.51 FS***	-1156 FS***	-816.04 FS***
Winter 2011	-	-780.49 FS***	-440.53 FS***
Summer 2011	-	-	339.96 FS***
Autumn 2011	-	-	-

Table 4 Production differences obtained for fat percentage for year 2010

Season	Winter 2010	Summer 2010	Autumn 2010
Winter 2010	0.37 FS***	0.53 FS***	0.43 FS***
Winter 2010	-	0.16 FS***	0.06 FS***
Summer 2010	-	-	-0.1 FS***
Autumn 2010	-	-	-

Table 5 Production differences obtained for fat percentage for year 2011

Season	Winter 2011	Summer 2011	Autumn 2011
Winter 2011	0.06 FS***	0.45 FS***	0.29 S*
Winter 2011	-	0.39 FS***	0.23 FS***
Summer 2011	-	-	-0.16 FS***
Autumn 2011	-	-	-

Table 6 Production differences obtained for protein percentage for year 2010

Season	Winter 2010	Summer 2010	Autumn 2010
Winter 2010	0,11 FS***	0,15 FS***	0,04 FS***
Winter 2010	-	0,04 FS***	-0,07 FS***
Summer 2010	-	-	-0,11 FS***
Autumn 2010	-	-	-

Table 7 Production differences obtained for protein percentage for year 2011

Season	Winter 2011	Summer 2011	Autumn 2011
Winter 2011	0,08 S*	0,09 FS***	0,02 DS**
Winter 2011	-	0,01NS	-0,06 NS
Summer 2011	-	-	-0,07 FS***
Autumn 2011	-	-	-

As it is clearly presented in Tables no. 2-7, during a calendar year the recorded fluctuations in milk production are statistically significant during a year, which is certified by maintaining this trend throughout the study. The fat percentage follows the same fluctuation but in the opposite direction. Differences were statistically significant.

The protein percentage varies highly statistically significant during the first year of study. In the second year of study the significant variations occur between extreme seasons (winter-summer). During seasons with relatively similar temperatures, spring - summer or summer – autumn, differences were not statistically significant. This is mainly due to moderate temperatures in this period of year and lack of extreme thermal stress.

CONCLUSIONS

The results obtained from statistical processing of data recorded during the study period confirm the influence of the environment (season) on the quality and quantity of milk production, as follows:

1. The milk production increase in seasons with high temperatures as a result of feed ration structure and long periods of daylight.

2. Milk production decreased significantly during cold period due to shortening the diurnal intervals and feed intake that does not contain lactogenic feeds (green fodder).

3. Milk fat percentage increases in cold season and decreases in warm periods, inverse to the of milk production.

4. The protein percentage follows closely the trend of fat percentage, recording high levels in cold seasons and low values in warm seasons.

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