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Impact of feeding diet and race on the production and quality characteristics of milk in the commune of Mograne (Gharb Region, Morocco)

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Abstract
For the purpose to put the focus on the impact of feeding diet and the race on the dairy production of milk in the commune of Mograne (Gharb region, Morocco), a farm holding has been persuaded to be subjected to diet for 12 months in 2008. The owner was already convinced to integrate the Holstein breed in 2006 for the five lactating cows. We have calculated the milk production of the holding during the period January-December 2007 as a proof for comparison, where cows have been feeding randomly according to the offer and depending on the season. We were feeding throughout the period of study by alfalfa during the winter period, and the wheat for the summer period. The five cows submitted in this study are of type Holstein. The results recorded during 2008 were very suitable. The production of milk was increasing from 18742 liters in 2007 to 29716 liters in 2008, scoring an increase of 37%. The physicochemical analysis and microbiological conducted before the driving program and after have recorded the results very convincing.

Keywords: Milk, Feeding diet, Dairy production, Quality characteristics.

Introduction

The production of milk in Morocco has tripled over the past thirty years, reaching currently about 1.96 billion liters/year (DDFP, 2010). This increase is more due to the change made at the genetic makeup of the cattle herd than by efforts of improving other factors of production, including the feeding diet (Araba, 2006). For this reason, our farmers must optimize feeding livestock of dairy cows in order to persist in the milk production sector. The present labor aims to show the impact of feeding diet on the production and the organoleptic_quality of the milk of dairy cow. We insist in this study to conduct our investigation by a close monitoring of hygiene and husbandry practices (Rhiat and al., 2010). The cows submitted in this study are the type of Holstein, they are in number of five. the average production before the implementation of the program is 15 liters/day/cow. This average has improved significantly to 22 liters/day/cow and can move to 26 liters/day/cow, during the period of high lactation. Physicochemical analysis and microbiological will be carried out before and after the driving program in order to compare the performance achieved.

Materials and methods

The initial analyzes were held in may 2007 before the application of the driving program food. The second analyzes have been made on may 2008 after five months of the implementation of the program.

Physicochemical Analysis

The temperature of the milk of the holding farm is almost fitting the ambient temperature. The PH measurement is done by a pH-meter type WTW. The acidity of the milk is calculated by titration of the sample of milk by a solution of sodium hydroxide (NAOH). The acidity was expressed in "degree Donric °D (1°D = 0, 1 g of lactic acid/liter).

Measuring the density of the milk is used for studying the watering down of milk. Normally, the density of the milk cow is between 1,030 and 1, 035 (Alias, 1984). For practicing, we homogenized the sample of milk, pour it into a measuring cylinder of 500 ml and plunge it the thermo-lacto-densimeter at 20 degrees, after we wait for the stability. The reading of the density value is done at the top edge depending of temperature. If the temperature is different temperature of 20°C, it is bringing to 20°C according to the following formula:

DC=DL ±0.2 ΔT

(DC: density corrected, DL: density read ΔT: difference in temperature between the milk and 20°C).

The fat content is determined by the method acido-butyrométrique de Gerber which consists in an treatment of the milk by the sulfuric acid and separation by centrifugation in the presence of iso-Amyl alcohol of the fat released (AFNOR, 2001).

The determination of the dry matter content is done after drying milk at a temperature of 103 ± 2°C (1), for 3 hours, until evaporation of the water and stabilisation of the weight of the milk to dry. (we takes 10ml of milk for each sample).

The determination of the ash content of the milk, is done by incineration of the dry matter at 530°C until constant weight (AFNOR, 1993). The chosen method for the detection of watering down of milk is to calculate the dry extract of milk, using the following formula (Hammama, 1996): **M= (90-ESD) /90**

Microbiological Analysis
The microbiological analysis are carried out for the purpose to find the indicators of the hygienic quality of milk which are the enumeration of total aerobic mesophilic flora and the total and fecal coliforms.
We also are interested ti search the germ of industrial interest like: lactic acid bacteria responsible for the fermentation and the acidification of milk, yeasts and finally the harmful bacteria which are pathogens (Fecal streptococci, staphylococci, salmonella and clostridiums).
Microbiological analysis of milk is carried out in three stages: the preparation of dilutions, seeding on the growing media and enumeration of microorganisms.

Diet of cows
The cows took two food rations a days, in the morning and the evening after treaty, according to the table 1.

Results and discussion
A comparative study between two milk was performed: the milk milking post food formulation and the traditional milk. This evaluation helps to determine the impact of diet on the quantity and quality of the milk produced in the region of the Mograne.

The result of physicochemical analysis are shown in table 2. Indeed, the temperature for the two types of milk is the same. It is close to the ambient temperature. PH measurement of samples of raw milk showed an average value of 6.68. This average is the same as that noticed by Bayoumi (1990) and very close to that reported by Alais (1985). The pH of our milk is therefore situated in the range of standards which is between 6.5 and 6.7 (Goursaud, 1985).
The acidity for the traditional milk is high compared to the milk cows which were submitted to the diet. This value is placed in a norm of an interval of 15 and 18°D (Hamamah, 2002). In effect, the values were 17.4°D for the LT against 16.3°D for LRA. Values of LRA density are in the average of 1,032, close to the LT (1,029). Those values of density are in the normal interval range which is between 1.028 and 1.035 (Goursaud, 1985).

The fat content for the LRA is 32.5 g/l, in the range of standards which is between 28.5 and 32.5 g/l accredited by the AFNOR (2001). The ash content is 120.59 g/l for the LRA lower than that announced by Alais (1984) (128 g/l) but close to those reported by Labioui and al. (2009) (117.5 g/l). This difference is explained by the diet and also by the variability of the breed of cattle.

For the microbiological analysis (Table 3), LRA recorded values significantly lower than LT for the total aerobic flora (FMAT), total and fecal coliforms. They are respectively $2.8.10^4$ ufc/ml, $2.3.10^2$ ufc/ml and $1.8.10^2$ ufc/ml. The load of LT is respectively $2.3.10^6$ ufc/ml for FMAT, $2,6.10^4$ ufc/ml for total coliforms and $1.9.10^3$ ufc/ml for fecal coliforms. The load for lactic bacteria LRA is 5,9.106 cfu /ml, higher than the value of LT which is of $9,7.10^5$ cfu/ml. The analyzed samples of LRA and LT mark the absence of pathogenic germs.

About FMAT, the samples contain an average load between $2,3.10^6$ and $2,8.10^4$ cfu/ml, lower than that result found by Hamamah and EL Mouktafi (1990) (2.10^7 cfu/ml) and Labioui (2009) ($7.4\ 10^6$ cfu/ml). The average concentration in the total and fecal coliforms are respectively lower to those mentioned by Hamamah and El

Mouktafi (1990) ($1,8.10^5$ cfu/ml of fecal coliforms) and Labioui (2009) ($5,2.10^3$ cfu/ml for fecal coliforms and $2,0.10^4$ cfu/ml for total coliforms).

The average value of the streptococcus in the samples of LT ($1.70.10^2$ cfu/ml) is much lower than the one announced by Mennane (2008): $1,83.10^4$ cfu/ml and to that found by Labioui and al. (2009) (4.10^2 cfu/ml). However, the samples of LRA are free of streptococcus.

The average load of lactic acid bacteria in our milk is $8,3.10^5$ cfu/ml for the LT, close to that found by Labioui and al. (2009). The content of LRA is greater than LT : $5,9.10^6$ cfu/ml). These bacteria are responsible for the bacterial inhibition by the synthesis of the antibacterial substances (Labioui and al., 2005; Rhiat and al., 2013) which explains the absence of staphylococcus, salmonella, and the clostridium (Pollma and al., 1984; Hamamah and al., 1991).

The load of the yeasts of LT is $1,6.10^4$ cfu/ml. This value is close to the one obtained by Labioui et al. (2009) ($1,22.10^4$ cfu/ml). The value of LRA is lower and represent a an excellent content (8.10^3 cfu/ml).

Concerning the milk production of cows, results obtained show that the cows submitted to the program of feeding diet have emphasized an excellent performance of the production and the organoleptic quality of milk. The production has increased from 18742 liters in 2007 (LT) to 29716 liters registered in 2008 (LRA) representing an increase of 37% (Table 4).

Conclusion

The physico-chemical characteristics of the raw milk samples analyzed were recorded in normal values with a net improvement for the LRA. The microbiological characteristics expressing the values in a normal average for LT. For the samples of LRA, the values are very adequate, with a low load in source of fecal contamination.

Finally, our study was able to show that the adoption of good farming practices, hygiene and a feeding diet have a positive effect on the production as well as on the quality of milk.

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Table 1. Rations for a dairy cow

Basic Food	Quantity (kg)	Supplementary food concentrated
Corn Silage	30	barley (crushed), but, wheat bran, karoube, pulp of alfalfa, soybeans and the CVM
Green bersim	30	barley (crushed), but, wheat bran, karoube, pulp of alfalfa, soybeans and the CVMP

CMV: Supplement mineral and vitamin (It is difficult to put the quantity of basic ingredients of the concentrate or the food concentrates. It varies according to the lactation period of the cow).

Table 2: physicochemical analysis of raw milk before and after the program for the conduct of food exploitation studied

Sample	Temp of the milk after milking (°C)	PH	Acidity d°	Density	Fat (g/l)	Dry Extract (g/l)	Ash (g/l)
LT	36.90	6.67	17.40	1.029	29.50	121.71	6.65
LRA	37.20	6.71	16.30	1.032	32.50	118.96	6.71

LT: traditional milk. before the implementation of the program of feeding diet
LRA: milk whose cows have been submitted to the feeding diet.

Table 3. Microbiological analysis (cfu/ml) of raw milk before and after the program of feeding diet.

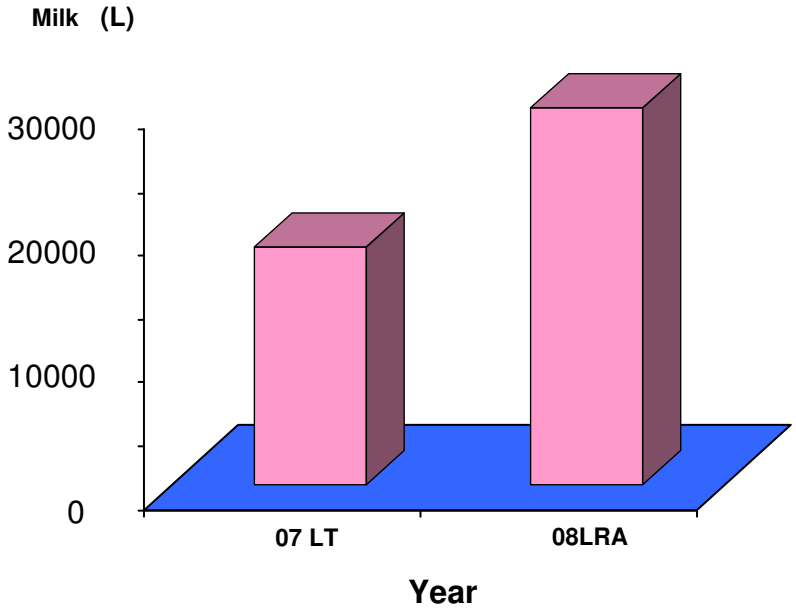
Sample (CFU/ml)	FMAT	Coliforms		Sph	Sal	Clos	Strep	Lactic Bacteria	Yeasts
		Total	Fecal						
LT	$2,3.10^6$	$2,6.10^4$	$1,9.10^3$	0	0	0	$1.70.\ 10^2$	$9,7.10^5$	$1,6.10^4$
LRA	$2,8.10^4$	$2.30.\ 10^2$	$1.80.10^2$	0	0	0	0	$5,9.10^6$	8.10^3

Sph : Staphylococci ; Sal : Salmonella ; Clos : Clostridiums ; Strep : Streptococcus

Table 4. Quantity of milk of the exploitation approved collection center of Mograne of january- rubble of 2007 and 2008.

Month	Quantity/L 2007 (LT)	Quantity/L 2008 (LRA)
January	2246	3352
February	2210	3467
March	1993	3426
April	1937	2981
May	1857	2701
June	1396	2121
July	1210	2042
August	548	1654
September	630	725
October	943	1218
November	842	1387
December	923	2634
Total (Quantity/L)	**18742**	**29716**

Figure 1. Annual quantities of milk delivered during the years 2007 and 2008



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