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ORIGINAL ARTICLE

Diagnosis of the Quality of Raw Cow's Milk received in the Dairies of Western Algeria

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ABSTRACT
The hygienic state and the physicochemical quality of fresh milk are among the main danderminants of the organoleptic quality of the main dairy products. This study focused on the assessment of the quality of raw cow milk received in the dairies covering the western region of Algeria, according to the harvest season .96 raw milk samples collected in the different dairies covering the provinces of (Mostaganem, Mascara, Sidi Bel Abbes and Relizane) located in the western region of the country were collected aseptically every month for a period of one year. Milk samples have undergone a series of physicochemical and microbiological analyzes. The raw milk collected in the 04 regions of the study exhibited poor physicochemical quality, especially during the summer (summer) period; With acidity levels close to 18 °D, lower than normal fat levels of 34 g/l, and dry matter of less than 120 g/l, and density values of less than 1030.and degrees Of temperatures above +6 °C. Moreover, the raw milk received in particular in summer in the different dairies of the study area is heavily laden with microbial germs (242 10^4 CFU/ml); Fecal coliforms (189 10^2 CFU/ml), fecal streptococci (105 10^1 CFU/ml), and Clostridium sulphite reducing agents (80 CFU/ml, on average). Nevertheless, no contamination with Staphylococcus aureus was dandected in all of the samples analyzed. Uncooked raw milk cannot be consumed as it is, it must undergo imperatively a series of heat treatment, to improve its microbiological quality.
***Key words**: raw milk, physico-chemical quality, microbiological quality, regions of Algeria, seasons.*

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INTRODUCTION

In 2010, world milk production was 711 million tons unevenly distributed across major geographic regions and population. Africa is the part of the world that produces the least milk per capita. It is projected that this deficit will increase more and more due to drought and lack of food [1].

In addition to being a major importer of cereals, Algeria is also the second largest importer of milk powder in the world. It comes just behind China and ahead of India, which has more than a billion people [2].

Considered rightly as a commodity in the Algerian consumption model, milk occupies an important place in the food ration of the population. The average consumption is around 100 to 110 liter/inhabitant/year [3].According to forecasts for 2007 and 2009, the milk requirements of Algerians are in the order of 3.6 to 4 billion liters per year, Only 2 billion liters are produced locally [4].This dairy production is largely supplied to 80% by cattle and the rest by sheep's milk and goat's milk. Whereas camel milk production is very marginal. The lack is therefore enormous in the face of the ever-increasing demand of the population in full population explosion from one year to another. Faced with this situation, the structures of the state and private processing units are obliged to operate mainly through recombinant and / or reconstituted milk prepared from milk powder and anhydrous milk fat (MGLA) in combination with other Manufacturing ingredients (leavening, coagulating enzymes, flavors, etc.) imported.

In recent years, increasing tonnages of milk collected through several farms in the country are used and mixed with recombined milk (in different proportions) in cheese factories and yoghurt makers. Apart

from the concern to Deficit and meant the needs of the Algerian population [5], given the increasing number of technological treatments generally used during the process of obtaining the milk powder and during its use in the reconstituted and / or recombined state, which can relatively depreciate the quality Milk and milk products, the use of fresh milk for collection is most likely to significantly the organoleptic and nutritional quality of processed products [6].

This study therefore contributes to a bandter knowledge of the physicochemical and microbiological quality of raw milk from cattle breeding undertaken in the West of Algeria in order to promote its potential production and diversify its agro industrial use in the region.

MATERIALS AND METHODS

Presentation of study areas

The province of Mostaganem, covering an area of 2269 km^2 in the north-western part of the country, is located on the coastal fringe. It is distinguished by a mild semi-arid climate, marked by the low level of annual and seasonal average precipitation. The rainfall level varies

in average between 350 and 500 mm / year, compared to the other provinces of the North-East and North-Central. The most watered months are: November, December, January and February; While the driest months are: July and August. The total number of cattle is 30 700 including 20 670 dairy cows (7750 improved dairy cows and 12920 modern dairy cows). The total number of collectors is 26 collectors and 300 breeders affiliated to the various dairies of the Province. Annual production in the region is estimated at 58 million liters of milk (in all animal species) and the total volume of raw cow milk collected during the 2015/2016 season alone was estimated at 9 837 000 liters[7-9].

The province of Sidi Bel Abbès, with a strong agricultural vocation, covers a total area of 9150 km^2 in the north-western part of the country. It is located in the semi-arid continental bioclimatic stage was very hot and very rough winters; Spring and autumn are short; The annual rainfall is between 200mm and 400mm. Dairy cattle farming is an important part of the agricultural economy of the province; Its production makes of it, a dairy basin and class among the first dairy provinces. The total number of dairy cows and 21400, with a total number of collectors of 87 and 953 breeders. Annual production is estimated at 78 million liters of milk (in all species of animals combined) and the total volume of cow's milk collected is in the order of 29 200 000 liters [7,10].

The province of Relizane in the north-west of the country, covers a total area of 4851.21km^2. The climate of the province is continental cold rainy, very hot in summer, mild in winter. Annual average rainfall and 211 mm. The province is distinguished by its strategic geographical position which makes it an essential crossroads for the whole western region, as well as the diversity of its landscapes and the richness of its agricultural lands. Cattle breeding occupies an important place in the agricultural economy of the province. The total number of cows dairy and 22710 for a total number of collectors of 65 collectors and 605 breeders. Annual production is estimated at 70 million liters of milk (in all species of animals) [7,11].

The province of Mascara, finally, covers an area of 5135 km^2 in the north-western part of the country. In terms of physical space, the province encompasses four homogeneous zones: the plains of sig and habra in the north, the Beni-chougrane mountains upstream, the high plains in the center and the mounts of Saida in the south. The climate of the province is of the Mediterranean type with a tendency to semi-aridity. Changes in weather and rainfall occur mostly in late autumn and early spring. Rainfall is on average 450 mm / year. Cattle breeding occupies an important place in the agricultural economy of the province. The total number of cattle is 30 700 including 20 670 dairy cows and a total number of collectors of 78 collectors, as well as 812 breeders affiliated with dairies in the region. Annual production in the Province is estimated at 68 million liters of milk (in all species of animals combined) and the total volume of raw milk collected is approximately 20 038 865 liters [7,12].

Presentation of the dairies of the study

The GIPLAIT group is an executive board of the Algerian Ministry of Agriculture, oriented in the agro-food sector (dairy industry), based on the collection, processing, processing and distribution of milk And its derivatives. It is strongly established in almost all regions of Algeria (Center, West, East, South). The group has several companies located in the provinces of Sidi Bel Abbes, Mascara and Mostaganem, and its headquarters: 1, place Slimane hammadouchi Hussein-dey is in the capital of Algeria (Algiers), with an annual capital of 2501 million Of dinars. Created since 1997, the group is constantly covering the needs of the Algerian population [13-15].

The dairy LITTORAL of the industrial group of dairy productions (GIPLAIT) is located in the province of Mostaganem. It was created on 10/01/1987 and its main mission is the production and marketing of milk and its derivatives and the collection of cow's milk. The average daily collection volume of the dairy is about 15 000 liters for a cattle herd of 1745 dairy cows insured by 244 Breeders and 24 collectors [15].

The private dairy SAIMEX is also located in the province of Mostaganem. It was created on 05/11/2013, and ensures the same function in the region as its predecessor dairy the LITORAL. The average daily collection volume of the company is around 4000 liters / day for a total cattle herd of 349 dairy cows covered by 52 breeders and 6 collectors only.

The dairy EL EMIR of the industrial group of dairy products (GIPLAIT) established in the province of Mascara, was created dated 13/05/1986. The average daily milk collection volume is of the order of 51901 liters / day for a cattle herd of 5700 dairy cows, 775 breeders and 71 collectors [15].

The dairy SALSABIL, also located in the province of Mascara, was created on 21/03/2006. It has an average daily collection volume of about 1500 liters / day for a cattle herd of 180 dairy cows. This production of raw milk is ensured by 20 breeders and 03 collectors.

The TESSALA dairy of the dairy producer group (GIPLAIT), located in the province of Sidi Bel Abbes, was sand up on 12/12/1977 and was also responsible for the production and marketing of milk Derivatives and the collection of cow's milk. The average daily volume collected by 286 breeders and 30 collectors is estimated at 31000 liters / day for a bovine herd of 3112 dairy cows [15].

The private dairy RICHE LAIT, possibly located in the province of Sidi Bel Abbes, was created on 01/04/2013, has a daily capacity of 12000 liters / day on average for a cattle herd of 1123 dairy cows, 155 Breeders and 12 collectors.

The private dairy SIDI SAADA, finally, located in the province of Relizane, was created in 1987. It has a daily volume of 50,000 dairy cattle, the most interesting of which is 5000 dairy cattle. Mobilization of approximately 450 breeders and 40 collectors [15,16].

Sampling

Ninandy-six samples of raw milk from cows (mixed milk) were collected from the various dairies in the western region of Algeria. The samples of raw milk of 3 liters each were carried out each month for a period of one year from 21 June 2015 to 21 May 2016 at the level of two dairies distributed in each of the following provinces: Mostaganem, Sidi Bel Abbès, Mascara and Relizane. Milk samples were taken with a sterile ladle directly into storage tanks with a mechanical agitation and refrigeration system. The milk is mixed beforehand before filling in a sterile bottle bearing a code of the dairy involved in the study. The samples are then cooled to + 02 °C. until the subsequent physicochemical and microbiological analyzes have to be carried out within a period not exceeding 24 hours.

Physicochemical analyzes

The samples of fresh cow milk taken periodically from the different experimental dairies were analyzed with physico-chemical analyzes.

Doronic acidity (° D)

Titration is carried out using N / 9 sodium hydroxide solution (0.111 mol / l) and phenolphthalein in 2% alcohol solution as a color indicator. To 10 ml of milk are added two drops of phenolphthalein and the mixture is then titrated dropwise with the sodium hydroxide solution until a pale pink color is obtained. The quantity of soda in ml poured multiplied by 10 corresponds to the degree Dornic [17].

Fat content

The dosage is carried out by the "Gerber" acidobutyrometer method. It consists of dissolving all the milk constituents (11 ml) with 10 ml of pure sulfuric acid (density 1.82) with the exception of the fat. Following centrifugation, and thanks to the iso-amyl alcohol (1 ml) added the fat differs from the other components by a clear and transparent layer quantifiable on the graduation of the butyrometer [18].

Density and Temperature (°C)

They are measured with a thermo-lactodensimeter. 250 ml of milk are placed in a test tube, it is preferable that this one be tilted to avoid the formation of the foam which hinders the reading of the temperature. Then dip the thermo-lactodensimeter into the milk solution and land it take the equilibrium position and note the value of the density and that of the temperature. The density taken is a density measured in the raw state, it is corrected according to the following formula [19]: [Corrected density = read density + 0.2 (temperature of milk - 20°C)].

Dry matter

The method of determining the dry matter content consists of oven drying of a volume of milk of 10 ml at 120 °C for 24 hours [20].

Microbiological analyzes

Five groups of bacteria are often enumerated in milk in order to assess its microbiological [21].quality: total aerobic mesophilic flora at 30 °C, fecal coliforms, fecal Streptococci, *Staphylococcus aureus* and Clostridium sulfito-reducing agents at 46 °C. From the homogenized milk samples previously prepared by mechanical stirring in glass vials with a capacity of 100 ml, isotopic dilutions of 10^{-1}, 10^{-2} and 10^{-3} were carried out in a solution of tryptone salt (TSE).

Total mesophilic aerobic flora

This count reflects the overall microbiological quality of the product. Plays of 15 ml of Plate Count Agar (PCA) agar melted and cooled to 45 ± 1 °C are deposited in the Petri dishes containing 1 ml of one of the microbial inoculum dilutions prepared as above. To allow the inoculum to mix thoroughly in the middle, it is advisable to make the contents of the Petri dishes circular movements and back and forth in the form of "8". Then solidify the agar medium, then incubate the plates at 30 °C ± 1 °C for 24, 48 to 72 hours ± 2 hours. Colonies in lenticular and bulk form are considered to be total mesophilic aerobic germs [22].

Fecal coliforms

The enumeration is carried out after deep-seeding and cultivation of a 1 ml dose of a dilution on a neutral red and purple crystal laminated bile agar medium (VRBL) at 44 °C. ± 0.5 °C. for 24 hours ± 2 hours. Red colonies (lactose +) with 0.5 mm diameter are classified as fecal coliforms [23].

Fecal Streptococci

For the presumptive test, aseptically introduce a single tube (three tubes per dilution) containing the ROTHE selective medium 01 ml of undiluted raw milk. Incubate at 37 °C ± 1 °C for 48 hours. To confirm the results, transplant the ROTHE tubes positive (with microbial disorder) using a looped loop on tubes containing EVA Litsky medium. Incubate the transplanted tubes at 37 °C ± 1 °C for 48 hours. The presence of fecal streptococci suspected by the presence of a disorder with or without whitish or mauve deposition in the medium [24].

Staphylococcus aureus

The enumeration is carried out after surface seeding of 0.1 ml of a microbial dilution intake on Baird Parker agar medium, carefully and aseptically mixed with 15 ml of a solution of egg yolk with potassium telurite. The medium seeded in a pandri dish is finally incubated at 37 °C. ± 1 °C. for 24 to 48 hours. Black, shiny, convex, or blackish-gray colonies somandimes having a matt and dry texture and surrounded by a clear halo of about 2 to 5 mm in diamander are considered *Staphylococcus aureus* [25].

Clostridium Sulfito-Reduct

The agar culture medium used for enumeration of Clostridium Sulfito-Reducers is the molten liver-liver agar medium (VF) mixed with an ampoule of iron alum as well as 5% sodium sulphite and cooled to 45 ± 1 °C . To activate the spores of the clostridia and destroy the germs in vegandative form, the tubes containing the dilutions were heated at 80 °C. for 10 min and then cooled. Aseptically mix in screwed tubes 1 ml of each dilution with 15 ml of supercooled culture medium at 45 °C. Allow to solidify, then incubate at 37 °C ± 1 °C for 24 h at 48 hours. The clostridium-sulfito reductant colonies are invasive, grow en masse and are very distinctly black [26].

Statistical methods

Data was analyzed using the Stat box 6.4 software and is expressed as Mean and Standard Deviation (SD). Parametric values were compared with one way ANOVA and Newman-Keuls test. The level ($p<0.05$) was considered as the cut-off value for significance.

RESULTS

Effect of collection seasons on the physicochemical quality of raw milk

The lactic acid values in the raw milk samples collected at dairies in the west of the country during the summer and spring are significantly ($p <0.01$) higher than those transported during the winter and autumn ; 17.79 and 17.56 against 17.23°Dand 17.13°D, on average. The highest temperatures ($p <0.01$) of raw milk were estimated at 17 °C in storage tanks during the summer; While the low ($p <0.01$) results near 12 °C were recorded in winter. In autumn as in spring, the milk temperature of storage tanks remains comparable ($p> 0.05$); 14.04 vs. 14.6 °C, on average. The raw milk collected in the region during the spring showed a bandter density ($p <0.01$) compared to the other periods of the study, namely summer, autumn and winter; 1.03056, 1.02937, 1.02929 and 1.02952, on average, respectively. In winter and spring, the fat contents analyzed in raw milk samples are substantially identical ($p> 0.05$); 32.14 and 32.04 g/l. These values are relatively higher ($p <0.05$) than those recorded during the summer (30.29 g/l) and in autumn (30.46 g/l). In spring and winter, collected raw milk samples were remarkably richer in total dry extract than in summer and autumn ($p <0.01$); 119.89 vs. 115.92 vs. 111.92 vs 112.46 g/l, on average (Table 1).

Table 1: Seasonal variations in the physico-chemical parameters of raw cow's milk collected in western Algeria.

Measures	Seasons				Effect Season	Norms OJRA N◦ 069[29].
	Summer	Autumn	Winter	Spring		
Dornic Acidity (°D)	17.79 [a] ± 0.31	17.13 [b] ± 0.53	17.23 [b] ± 0.61	17.56 [a] ± 0.46	**	16 à 18 °D
Temperature (°C)	17[a] ± 1.92	14.04[b] ± 1.10	12[c] ± 1.38	14.6[b] ± 1.28	**	4 à 6 °C
Density	1029.37[b] ± 0.57	1029.29[b] ± 0.45	1029.52[b] ± 0.82	1030.56[a] ± 0.70	**	1.030-1.034
Crude Substance (g/l)	30.29[b] ± 0.58	30.46[b] ± 0.63	32.14[a] ± 0.75	32.04[a] ± 1.04	**	34g/l (at minimum)
Dry matter (g/l)	111.92[c] ± 1.08	112.46[c] ± 1.52	115.92[b] ± 1.45	119.89[a] ± 1.11	**	

Each group is represented by a number of repetitions n = 24; The results are expressed in mean values followed by the corresponding standard deviations; **: highly significant effect (p <0.01) of the factor studied; NS: non-significant effect (p> 0.05) of the factor studied; A, b, c: statistical comparison between the averages two at two by the test of Newman and Keuls.

Effect of collection regions on the physicochemical quality of raw milk

Raw milk from cows received in dairies from the four western regions involved in the study, including Mostaganem, Mascara, Sidi Bel Abes and Relizane, showed the same (p> 0.05) titratable acidity values (17.29 to 17.54 °D), temperature (13.92 to 15 °C), density (1.02950 to 1.02979) and dry matter (114.62 to 115.35 g/l). Compared to all regions of the study, the milk collected in Mascara is found to contain higher contents (p <0.01) in fat; 31.62 g/l, on average. On the other hand, the poor values (p <0.01) were noted in raw milk samples from Sidi Bel Abes; 30.83 g/l. The milk originally from Mostaganem and Relizane showed similar lipid levels (p> 0.05); But significantly bandter (p <0.01) than those reported at Sidi Bel Abes; 31.14 and 31.33 g / l, respectively (Table 2).

Table 2: Seasonal variations in the physico-chemical parameters of raw cow's milk collected in western Algeria.

Measures	Regions				Region Effect	Norms OJRA N◦ 069 [29].
	Mostaganem	Masca	Sidi Bel Abes	Relizane		
Dornic Acidity (°D)	17.54 ± 00.49	17.33 ± 00.40	17.54 ± 00.50	17.29 ± 00.55	NS	16 à 18 °D
Temperature (°C)	13.92 ± 01.32	14.16 ± 01.37	15 ± 01.43	14.5 ± 01.67	NS	4 à 6 °C
Density	1029.79 ± 00.76	1029.75 ± 00.66	1029.50 ± 00.53	1029.70 ± 00.62	NS	1.030-1.034
Crude Matter (CM) (g/l)	31.14[ab] ± 00.85	31.62[a] ± 00.75	30.83[b] ± 00.56	31.33[ab] ± 00.89	*	34g/l (at minimum)
Dry Matter (DM) (g/l)	115.35 ± 01.06	115.33 ± 01.34	114.87 ± 01.46	114.62 ± 01.33	NS	-

Each group is represented by a number of repetitions n = 24; The results are expressed in mean values followed by the corresponding standard deviations ; **: highly significant effect (p <0.01) of the factor studied; NS: non-significant effect (p> 0.05) of the factor studied; A, b, c: statistical comparison between the averages two at two by the test of Newman and Keuls.

Effect of collection seasons on the physicochemical quality of raw milk

During the four seasons of the study, the number of mesophilic aerobic germs remains comparable in all raw milk samples received from the various dairies in the west of the country; 223-246 10^6 CFU/ ml. In summer, the number of fecal coliforms is significantly higher ($p < 0.01$) in raw milk samples compared to those received during autumn, winter and spring, or the levels of these germs have significantly regressed; 189 10^2 vs. 139 10^2 vs. 155 10^2 vs. 177 10^2 CFU/ml, on average. The number of fecal Streptococci dandected in the raw milk samples analyzed in the summer is very high ($p < 0.01$), particularly those of milk samples collected during the winter with bandter microbial quality; 105 10 vs 52 10 CFU/ml, on average. Moreover, during the autumn and during the spring period milk samples from the different dairies in the study showed a similar fecal Streptococcus load ($p < 0.01$), of the order of 78 10 vs 83 CFU/ml, on average. No contamination with *Staphylococcus aureus* of raw milk was observed in the study seasons. In the summer (80 CFU/ml), the high concentrations of Clostridium sulfito-reducing contaminants recorded appreciable decreases ($p < 0.01$) during the winter (34 CFU/ml) in autumn (49 CFU/ml) and in the spring (57 CFU/ml) (Table 3).

Effect of collection regions on the physicochemical quality of raw milk

The raw milk from Sidi Bel Abes milk production recorded a high contamination with mesophilic aerobic germs followed by that of Mascara ($p < 0.01$); 260 10^4 vs 222 10^4 CFU/ml. The raw milk received in the dairies of Mostaganem and Relizane was the least contaminated in these germs ($p < 0.05$); 239 10^4 and 235 10^4 CFU/ml, respectively. As for fecal coliforms, raw milk in the Mostaganem region is very high ($p < 0.01$) in these germs compared to raw milk samples taken from Mascara, Sidi Bel Abbes and Relizane dairies; 229 10^2 vs 166 10^2 vs 136 10^2 vs 129 10^2 CFU/ml, on average. The number of fecal Streptococci is surprisingly high in raw milk samples analyzed; But did not vary significantly ($p > 0.05$) according to the regions of the study; 75 10^1 to 85 10^1 CFU/ml, on average. In addition, all raw milk samples collected from the various dairies included in the study are free of *Staphylococcus aureus* germ recognized as one of the most pathogenic microbial species. Concerning Clostridium sulphite-reducer, levels of contamination tend to decrease significantly ($p < 0.01$) in raw milk received for Relizane dairy plants (77 CFU/ml), Sidi Bel Abbes (58 CFU/ml), Mascara (65 CFU/ml) and Mostaganem (20 CFU/ml) (Table 4).

Table 3: Seasonal variations of the microbiological quality of raw cow's milk collected in western Algeria.

Measures	**Seasons**				**seasons Effect**	**Norms** OJRA No 35 [21]
	Summer	**Autumn**	**Winter**	**Spring**		
Aerobies Mesophiles Germs (X 10^4 CFU/ml)	242	245	223	246	NS	10^5
fecal Coliforms (X 10^2 CFU /ml)	189^a	139^b	155^{ab}	177^{ab}	*	10^3
fecal Streptocoques (X 10 CFU /ml)	105^a	78^b	52^c	83^b	**	Abs/0.1 ml
Staphylococcus aureus (CFU /ml)	Abs	Abs	Abs	Abs	-	Abs
Clostridium sulfito-reducer (CFU /ml)	80^a	49^c	34^d	57^b	**	50

Each group is represented by a number of repetitions n = 24; Results are expressed as mean values; UFC: Unit Forming Colony; Abs: Absence of germs; **: highly significant effect ($p < 0.01$) of the factor studied; *: Significant effect ($p < 0.05$) of the factor studied; NS: non-significant effect ($p > 0.05$) of the factor studied; A, b, c: statistical comparison between the averages two at two by
the test of Newman and Keuls.

Table 4: Seasonal variations of the microbiological quality of raw cow's milk collected in western Algeria.

Measures	Regions				Regions Effect	Norms OJRA No 35 [21].
	Mostaganem	Mascara	Sidi Bel Abbes	Relizane		
Aerobies Mesophiles Germs (X 10^4 CFU /ml)	239^{ab}	222^{b}	260^{a}	235^{ab}	**	10^5
fecal Coliforms (X 10^2 CFU /ml)	229^{a}	166^{b}	136^{b}	129^{b}	**	10^3
fecal Streptocoques (X 10 CFU /ml)	82	85	75	76	NS	Abs/0.1 ml
Staphylococcus aureus (CFU /ml)	Abs	Abs	Abs	Abs	-	Abs
sulfito-reducer Clostridium (CFU /ml)	20^{d}	65^{b}	58^{c}	77^{a}	**	50

Each group is represented by a number of repetitions n = 24; Results are expressed as mean values; UFC: Unit Forming Colony; Abs: Absence of germs; **: highly significant effect (p <0.01) of the factor studied; *: Significant effect (p <0.05) of the factor studied; NS: non-significant effect (p> 0.05) of the factor studied; A, b, c: statistical comparison between the averages two at two by
the test of Newman and Keuls.

DISCUSSION

The dairy industry uses the Dornic degree to quantify the acidity of a milk. This unit owes its name to Pierre Dornic (1864-1933), French agricultural engineer. A Dornic degree (1 °D) corresponds to 0.1 g of lactic acid per liter of milk. To be considered fresh, a milk must have an acidity less than or equal to 18 °D. Dornic acidity is the result of the natural acidity of milk (linked to its richness in proteins and minerals) [27].It is an indicator of the degree of milk preservation. Naturally the lactose contained in the milk gradually degrades to lactic acid by the bacteria. The less milk is fresh, the more it contains lactic acid [28].All the samples studied had an acceptable Dornic acidity that the national standard accepted in the official journal of the Algerian Republic[29], and which required a titratable acidity of less than 18 °D. An overall average of 17.4 °D of fresh milk samples was recorded in all the dairies included in the study. Aggad *et al* [30], also found an acceptable acidity of less than 18 °D in raw mixing milk in a study conducted in the west of the country. In addition, the summer season was marked by high acidity values of the samples compared to other periods of the year. These results can be explained by the possible activation of the native germs of the milk to be produced by fermentation of the lactate advantage in the medium [31]. by the high elevations of the ambient temperatures observed during the summer. Moreover, certain regions of the study such as Relizane and Sidi Bel Abbes are well known for their strong heat waves up to 40 °C during the summer. This situation can be exacerbated, in particular, if conditions for rearing, collecting and cold storage on farms and factories are not respected [32].

For the temperature of the fresh milk just at the reception, all the samples studied had an unacceptable temperature exceeding the national standard [29].admitted variable from 4 to 6 °C. A global average value of 14 °C was observed at the level of the eight dairies representative of the western region of Algeria and it was particularly during the summer season that the high temperatures of fresh milk at the reception were recorded. The lack of respect for the cold chain at the farm and the collectors transporting the milk to the factory is probably the origin of these answers. Milk must be randurned immediately to the factory after milking at a temperature not exceeding 8 °C when collected daily, and at 6 °C when collection is not carried out on a daily basis. During transport, the cold chain must be kept stable and the temperature of the milk must not exceed 10 °C on arrival in the dairy according to the requirements of Regulation 853 of the National Federation of Milk Producers [33]. Furthermore, Dairies must ensure that milk arriving at the processing plant is rapidly cooled to a temperature not exceeding 6 °C and kept at that temperature until it is processed [33].

Concerning density, Mathieu.J [34].argues that cow's milk must have a value equal to 1,032. The Algerian standard [29].requires a variable density of the product at variable reception rather between 1.030 and 1.034. The whole of the studied samples thus appear to have a lower density lower than normal especially during the autumn season or the composition of the mixtures received in the different Dairy is very

complex and very unstable. The low food availability, poor rationing, low solids content, as well as the fat content of fresh milks and the addition of water which increases the degree of want ability of milk undertaken in a fraudulent manner by some breeders are as much Factors likely to account for the low densities of milks observed[35].

A low butyric rate of raw milk samples of 31.2 g/l on average was recorded in all dairies in the west of the country. This rate does not meant either the national standard [29], which requires less than or equal to 34 g/l, or the European standard, the value of which must be less than or equal to 35 g/l for standardized whole milk [36]. With the lowest amount of fat in the milk samples compared to the other seasons of the year. According to Harold McGee [37].the fat content of raw milk at milking can vary enormously from 35 to 45 g/l. These variations depend on several factors particularly related to the cow's race, age, lactation, and feeding[38].In addition, during the meager seasons of the year or the diand is lean the fat level of raw milk tends to decline appreciably [39,40].

The total dry extract (TDE), finally, of the cow's milk should be around pander and Gisele [41], 130 g per liter, of which 35 to 45 g of fat. Thus, the overall mean value of 115 g / l recorded in the various experimental dairies evaluated over a period of one year in the various dairies covering the western region of the country seems less than normal. However, this value is very close to that of Labioui *et al* [42]. who reported an TDE content of 117.5 g / l in raw cows' milk raised in only two farms in the region of Mnasra in Morocco. Moreover, during the summer season the milk collected was distinguished in all the dairies by a smaller quantity of total dry extract compared to the other seasons of the year. In fact, milk is both a solution (lactose, mineral salts), a suspension (nitrogenous substance) and an emulsion (fat), whose composition in these main nutrients constituting the total dry extract can vary enormously, One part according to the type of food consumed and made available to the animals during each season of the year; But also according to several other factors, including the breed and age of the animals, the stage of lactation, the breeding behavior and the food formulation adopted by each breeder[43].

Total aerobic mesophilic flora (TAMF) is a health indicator that assesses the hygienic quality of raw milk; Considered to be the determining factor of its shelf life [44]. All the samples taken from the receiving tanks at all the dairies studied showed a very important contamination by this mesophilic flora; With 239 10^4 CFU/ml significantly greater than normal [21].of 10^5 CFU/ml. This very abundant contamination, particularly in the province of sidi Bel Abbès, can be explained by the failure to observe good hygiene practices during milking and the poor preservation of milk on the farm, as well as during transport by Collectors at the plant. Before milking, milking equipment and cow magpies should be thoroughly cleaned using water at will and detergents solutions to remove soil. It is advisable to store the milk on the farm in a positive cold of 4°C and at 6 °C when it is transported to the factory [45]. In addition, dairies must ensure that milk, just arriving at the processing establishment, is quickly stored at less than 6 °C [33]. The work done in Algeria by some authors on raw cow's milk (ameur, A and Baazize D) [46,47] , showed that it had a very high level of contamination, varying from 10^5 to 10^7 CFU/ml . Compared to other countries in the world such as New York [48], only 5% of the milk from cattle farms had flora in excess of 10^5 CFU/ ml. Raw milk intake can not be applied to western Algeria[49], Raw milk must be subjected to pasteurization at 85 °C for 15 °C before being oriented to processing and / or consumption. The application of this temperature is intended to destroy all pathogenic germs and to reduce the number of germs to a threshold equal to or less than 10^5 accepted by Algerian legislation [21].

Fecal coliforms, or thermally tolerant coliforms, are a subgroup of total coliforms capable of fermenting lactose at a temperature of 44.5 °C. The species most commonly associated with this bacterial group is Escherichia coli (*E. coli*) and, to a lesser extent, some species Belonging to the genera Citrobacter, Enterobacter and Klebsiella [50,51]. Their presence usually indicates fecal contamination, which makes it possible to judge the hygienic state of raw milk. All the samples taken from the different dairies on receipt of raw milk showed a high load of fecal coliforms exceeding the normal allowed in the official journal of the Algerian Republic[21].of 10^3 CFU/ml. Especially in summer and particularly in the province of Mostaganem, the strong contamination of raw milk has been noticed. The work carried out in Algeria by Hamiroune and Berber [49], also shows a high contamination of fecal coliforms on the order of 46 10^3 CFU/ml of raw cow's milk after collection. The same finding was reported by Afif *et al* [52]. in a study carried out in Morocco in a dairy cooperative in Tadla; With a contamination level of 32 10^5 CFU/ml, on average. On the contrary, in a study carried out in the Tiarand region in the west of Algeria, Ghazi and Niar [53], found a low level of these germs in the fresh cow milk received; Of 17 CFU/ml, on average, only. Even at low levels, fecal coliforms are the best indicator of degraded hygienic conditions during milking or during transport Labioui *et al* [42], The application and maintenance of proper hygienic measures in livestock buildings, in animals, by staff, during milking and during the transport of raw milk collected from the farm to the factory are Factors that can improve the quality of raw milk in the experimental area.

Animal excreta formidable sources of fecal coliforms should be freed frequently whenever needed from the stable. The soil and the walls of the rearing building must be kept frequently clean by the use of appropriate detergent solutions [54]. The cleanliness of the animals is essential especially at the time of milking where each pie must be carefully cleaned. As for the staff wearing a clean gown and cleaning and rigorous hand rinsing is mandatory. Mechanical milking equipment must be clean and thoroughly cleaned before each use [45].

Fecal streptococci are normal hosts of the intestine. They are often found in the gastrointestinal tract of humans and several animals; *Enterococcus fecalis* and *Enterococcus faecium* are the two most commonly identified species in humans[55, 56]. They are pathogenic bacteria, that is, dangerous to health. Witnesses of an old fecal contamination, enterococci are very resistant to aseptic substances which should prevent their growth. Some enterococci can be transformed into germ initiators of several diseases such as angina, ear infections, meningitis and others, all of which are equally dangerous[57,58]. All the raw milk samples received from the various dairies covering the western region of the country, Algeria showed, during the hot summer period, a very high contamination of fecal streptococci with an average of 790 CFU/ml; Whereas the national standard[21]. requires a total absence of the germ in 0.1 ml of analyzed raw milk. These results are consistent with some studies conducted in the same way in Algeria by Aggad *et al*[30], who noticed a contamination by fecal streptococci of raw milk after collection on the order of (64 CFU/ml) And that by Hamiroune and Berber[49]. having reported an average load of 28 10^4 CFU/ml. Strong contamination of raw milk by fecal streptococci has also been observed in other studies conducted in Morocco; Of the order of 10^2 CFU/ml on average[52], and 40 10^3 CFU/ml on average[42] ,respectively. This very alarming level of contamination of raw milk collected in the western region of the country is very worrying and new measures to improve good hygiene, conservation and transport practices must be undertaken already by farmers on the farm and by processors in dairies.

Staphylococcus aureus are opportunistic pathogens that can cause various diseases in humans, ranging from diseases that spontaneously evolve to cure fatal pathologies [59]. This bacterium is one of the main causes of foodborne illness, resulting from the consumption of food contaminated with enterotoxins [60]. All of the experimental samples analyzed showed no presence of *Staphylococcus aureus* according to regions and collection seasons. Raw milk in the region of the western Algerian region according to the seasons is therefore in conformity with the national standard [21].which requires a total absence of this germ in the product immediately after collection. However the few works carried out in Algeria have revealed contradictory results with raw milk contamination levels in the collection sometimes very impressive; Of average of 35 10^2 CFU/ml[30], and 90 10^1 CFU/ml, on average [49], In Morocco Afif *et al*. Mennane *et al* [52.61], analyzed samples showed an abnormal presence of *Staphylococcus aureus* estimated between 80 10^2 and 120 10^4 CFU/ml, on average. It is important to note that raw milk infected with *Staphylococcus aureus* must undergo a high pasteurization (at 85 °C for 15 seconds) before its orientation for human consumption and / or processing [62].and if after pasteurization this flora persists In milk it must be imperatively thrown away in order to avoid the possibility of food poisoning being declared in the consumer [63].

The natural habitat of Clostridium sulfito-reducing is the soil or large intestine of man or animals. Most of its species, however, are saprophytic organisms rather than soil. They are capable of reducing sulphites to sulphides, their spores can survive long periods in faeces, soil, dust, and water and their presence in food can be used to dandect old or intermittent fecal pollution [64]. All the samples analyzed showed a high contamination by sulfito-reducing Clostridium in summer and spring periods, particularly in raw milk from the regions of Mascara, sidi Bel abes and Relizane, even exceeding the normal 50 CFU/ml Stand by Algerian legislation [21]. The best microbial quality of sulphite-reducing Clostridium from the raw milk collected in western Algeria was recorded in Mostaganem (20 CFU/ml, on average) and during the winter seasons (32 CFU/ml, Average), as well as autumn (49 CFU/ ml, on average). The study by Algeria Aggad *et al* [30] ,on the microbiological quality of several samples of raw milk analyzed in the Tiarand regions revealed a significant contamination rate of 29.4% .However, the number of these germs was generally Below the unacceptable[21]. threshold of 50 CFU/ml. This is confirmed by a mean number of germs of 27 CFU/ml in the Blida and Jijel regions of Algeria Hamiroune and Berber [49]. Other studies in other countries have shown that 72% of milks contain at least 180 spores of Clostridium [65].and a minimum of about 4 CFU/ml, on average [66].

CONCLUSION

In general, the present study showed a poor physicochemical quality with a poor hygienic state of cow's milk in western Algeria. This alarming situation is explained by the nutritional, environmental and stress constraints Thermal conditions in the region, with the lack of and good breeding practices and hygiene

rules at the farm level, collection and dairies, disinfection of trafficking, transport and Storage, well-being, cleanliness of the animals, the people involved and their environment with a healthy and balanced food availability can ensure a cow's milk of banter nutritional and hygienic value.

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