تأثير الاصابة بالتهاب الضرع على صفات اللبن والجبن الأبيض المنتج منه

ح . عبد الجليل ، ط . نصيب

أجرى هذا البحث لدراسة تأثير الأصابة بالتهاب الضرع على التركيب الكيماوى للبن الجاموسى وصفات الخثرة الناتجه منه ، كذلك وضع اختبار مبسط وسريع لتحديد مدى صلاحية اللبن المصاب لصناعة الجبن الأبيض .

وقد دلت النتائج على مايلى :-

أن نسبة الدهن والماغنسيوم فى ألبان الحيوانات المصابة كانت منخفضة عنه فى الألبان السليمة وكان الأنخفاض مؤكدا فى كل من المواد الصلبة اللادهنية . الكيزين ،اللاكتوز ،الكالسيوم والفوسفور - ومن جهة أخرى كان الإرتفاع مؤكدا فى كل من بروتينات الشرش والكلورين .

اللبن المصاب كان أطول فى مدة التجبن وانتج خثرة أضعف عنه فى اللبن السليم - وعند خلط اللبن السليم بنسب متدرجة من اللبن المصاب (الذى جمع من الأرباع المصابة) ارتفعت بانتظام نسبة الكلورين وطالت فترة التجبن وانخفضت قوة الخثرة .

وجد أن العينات التى خلطت باللبن المصاب بنسبة أعلى من ١٠٪ أعطت خثرة ذات صفات لا تصلح لانتاج الجبن الأبيض - وكانت نسبة الكلورين على هذه الدرجةمن الخلط ٩١ر٥٢ ملليجرام / ١٠٠ مل لبن - لهذا ينصح باجراء التقدير السريع للكلورين للالبان الواردة لمصانع الجبن الأبيض واعتبار هذه النسبة من الكلورين حد أقصى لصلاحية الألبان الواردة لانتاج الجبن الأبيض.

Dept. of Food Technology,
Faculty of Agriculture, Assiut University,
Head of Dept. Prof. Dr. M.K.E. Yousseff.

MASTITIC MILK AND ITS EFFECT ON WHITE CHEESE MANUFACTURE

(With 4 Tables)

By

H. ABDEL-GALIL and T.A. NASSIB

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SUMMARY

A study was made to evaluate the effect of mastitis infection on the alteration of the chemical and curd properties of buffaloes milk. The development of an easy rabid test to determine the suitability of the mastitic milk for white cheese processing was also investigated.

Results showed that milk produced from mastitic dairy animals is slightly low in fat and magnesium contents and regarding the S.N.F., casein, lactose, calcium, and phosphorus contents they are significantly decreased. On the other hand, affected milk is significantly high in whey protein and chlorine contents.

Mastitic milk had a longer coagulation time and lesser curd tension than normal milk. Mixing normal milk with milk samples collected from the mastitic guarters, regularly increased the chlorine content and the coagulation time, and decreased the curd tension, Higher percentage of mastitic milk over 10% not only lengthened the coagulation time but also caused the production of unsatisfactory curd for white cheese production.

Chlorine content of the 10% mixture was found to be 91.52 mg/100 ml. Therefore, it is recommended to use such index to judge the quality of bulk milk recieved by Dairy factories for white cheese production.

INTRODUCTION

Mastitis stands out as the most widespread and destructive dairy disease. Milk secreted by infected cows may be rendered unfit for consumption and manufacturing purposes due to its high bacterial count and

alteration in its chemical properties.

Due to its insidious nature, mastitis may exist in a herd for comparatively long durations without being recognized by the dairymen.

It is well known that milk used for cheese manufacturing should be of a good quality and produced from healthy dairy animals free from any udder infection. In Egypt, few studies have been conducted to find out the effect of infection on the properties of curd obtained in the process of cheese manufacturing.

The present investigation was undertaken to find out an easy rapid test to evaluate the quality of milk used for cheese making. From the fact that the chlorine content increases in mastitic milk, it is therefore the aim of this work to determine the highest level of chlorine which when present in bulky milk used for cheese manufacturing will not affect the curd properties.

MATERIALS AND METHODS

Buffaloes milk used in this investigation was secured from a private farm in Assiut vicinity. Morning samples were taken daily for 21 days from bulk mastitic infected milk and bulk normal milk. Fat, S.N.F., casein, whey protein, lactose, chlorine, calcium, magnesium, and phosphorus contents in infected and normal milks were determined. The normal milk was mixed with mastitic bulk milk at 0, 25, 50, 75, and 100% the coaqulation time and curd tension of such mixtures were measured.

Milk samples, taken from the infected quarters were mixed with normal milk at 0, 5, 10, 15, 20, 25, 30, 50, 75, and 100%. The chlorine content, coagulation time and curd tension were determined in these mixtures. White cheese curd was produced from similar milk mixtures containing up to 30% mastitic milk, by adding 7% salt and rennet at a level usually used to coagulate normal milk in 3 hours. The time of complete coagulation and the curd properties were measured in the produced curds.

Fat, S.N.F., casein, whey protein, and chlorine were determined by the methods described by LING (1963). Lactose was determined using the colorimetric method of BARNETT et al. (1957). Total calcium, magnesium and phosphorus were analized according to versene method of LING (1958) for calcium and magnesium,and colorimetric method of VANSTONE and DOUGLL (1960) for phosphorus using Unicum SP 1300 colorimeter. Coagulation time was determined using the method described by KISZA et al. (1967). Curd tension was determined using the penetrometer as described by ABDEL-GALIL and ABDEL-MOTTALEB (1967). Data were statistically analyzed using T-test as outlined in STEEL and TORRIE (1960).

RESULTS AND DISCUSSION

Table (1) shows that infection with mastitis had slightly decreased the fat content, and significantly decreased the S.N.F. in bulk milk samples. Fat decreased from 6.54 to 6.51%; S.N.F. decreased from 9.71 to 9.62% in normal and mastitic milk, respectively. These results are in agreement with FORNONI (1955), HALE et al. (1956), McKENZIE et al.(1958), KING (1967), and WALSH et al. (1968) working on cows milk.

Infection significantly decreased the casein, and increased the whey protein content in bulk milk samples. Casein decreased from 3.37 in normal milk to 3.07% in mastitic milk; whey protein increased from 0.80 to 0.88%. These results are in agreement with FERRINI and PICCOTIN (1955), DEFRANCESCHI and NANI (1956),NANI and REDAELLI (1957),BERNATONIS et al., (1965) and HOSOYA et al. (1966) working on cows milk.

Lactose significantly dropped from 4.57 in normal milk to 4.46% in mastitic milk, chlorine significantly increased from 72.09 in normal milk to 118.12 mg/100 ml in bulk mastitic samples. These results are in accord with BARRY and ROWLAND (1953), PILIPOVITCH et al. (1956), GILLES (1966), and WALSH and NEAVE (1968) working on cows milk.

Infection with mastitis slightly decreased the magnesium content in mastitic bulk milk samples, it changed from 18.99 in normal milk to

18.76 mg/100 ml in mastitic milk samples. Calcium and phosphorus content decreased significantly from 191.27 to 173.40 mg/100 ml, and from 123.97 to 113.23 mg/100 ml in calcium and phosphorus milk content, respectively. These results are in agreement with KISZA et al. (1967). DEFRANCESCHI & NANI (1956) reported that, infected milks had an elevated N content, but the variations in P were irregular.

Table (2) shows that mastitic bulk milk samples had a longer coagulation time and lesser curd tension. They were 7.5 min. and 2.74 cm. in normal milk; and 28.9 min. and 8.93 cm. in mastitic mik, respectively. Mixing the normal milk with 25, 50 and 75% mastitic bulk milk increased the coagulation time to 10.4, 13.8 and 19.6 min., respectively, and decreased the curd tension (increased the penetration) to 4.41, 5.98, 7.53 cm., respectively

Table (3) shows that mixing normal milk with milk samples collected from the mastitis-infected quarters for 5, 10, 15, 20, 25, 30, 50 & 75%, regularly increased the chlorine content and coagulation time, and decreased the curd tension (increased the penstration). The chlorine content increased from 75.30 to 83.27, 91.52, 99.73, 108.04, 116.26, 124.51, 157.53, and 198.72 mg/100 ml, respectively. The coagulation time increased from 7.0 to 10.8, 15.5, 21.5, 21.5, 26.5, 30.0, 55.0, and 82.0 min. The penetration increased from 2.60 to 3.75, 5.00, 6.20, 7.24, 8.45 & 9.52cm. in 50% mixing. These results agreed with thoses obtained by SOROKINA (1964), KISZA et al. (1967), and HAMPTON and RANDOLPH (1969).

Table (4) shows that the coagulation time during the manufactring of white cheese using normal milk and mixed with 5, 10, 15, 20, 25, and 30% mastitic individual milk was prolonged from 3.0 hrs. for normal milk to 4.5, 6.25, 7.5, 8.75, 11.5, and 15.0 hrs. for the other samples, respectively.

Table (4) also shows the effect of increasing the mastitic milk in mixtures used for white cheese manufacturing on curd properties. Up to 10% mastitic milk, although prolonged the curd formation time to more

Table (1): Chemical constituents of normal and mastitic bulk milk samples.

	Normal milk	Mastitic milk
Fat %	6.54	6.51
S.N.F.%	9.71	9.62
Casein%	3.37	3.07
Whey protein%	0.80	0.88
Lactose %	4.57	4.46
Cl. mg/100 ml	72.09	118.12
Ca. mg/100 ml	191.27	173.40
Mg. mg/100 ml	18.99	18.76
P. mg/100 ml	123.97	113.23

Table (2): Coagulation time and curd tension of bulk milk samples containing various percentages of mastitic milk.

	Coagulation time (min.)	Curd tension (cm.)
Normal milk	7.5	2.74
+ 25 %	10.4	4.41
+ 50 %	13.8	5.98
+ 75 %	19.6	7.53
Mastitic milk	28.9	8.93

Table (3): Effect of mastitis on the chlorine content, coagulation time and curd tension of buffaloes individual milk samples.

	Chlorine (mg/100 ml)	Coagulation time (min.)	Curd tension (cm.)
Normal milk	75.30	7.0	2.60
+ 5 %	83.27	10.8	3.75
+ 10 %	91.52	15.5	5.00
+ 15 %	99.73	21.5	6.20
+ 20 %	108.04	26.5	7.24
+ 25 %	116.26	30.0	8.45
+ 30 %	124.51	36.0	9.52
+ 50 %	157.53	55.0	-
+ 75 %	198.72	82.0	-
Mastitic milk	240.10	102.0	-

Table 4: Effect of mastitis on the time of coagulation and the properties of curd obtained during white cheese processing

	Time of Coagulation (hrs.)	Curd properties		
		Texture	Flavour	Over all acceptability
Normal milk	3.0	hard	normal	acceptable
+ 5 %	4.5	hard	normal	acceptable
+ 10 %	6.25	slightly hard	normal	acceptable
+ 15 %	7.5	soft	slightly acidic	not acceptable
+ 20 %	8.75	weak	acidic	not acceptable
+ 25 %	11.5	extreamly weak	highly acidic, bitter	not acceptable
+ 30 % mastitic milk	15.0	extreamly weak	highly acidic, bitter	not acceptable

than 6 hours, produced hard and acceptable curd having normal taste. Higher percentage of mastitic milk than 10% not only lengthened the coagulation time but also caused the production of unsatisfactory curd for white cheese production. Chlorine content of the 10% mixture was found to be 91.52 mg/100 ml. Therefore, it is recommended to use such index to judge the quality of milk entering Dairy factories for white cheese production. Bulk milk containing more than 90 mg/100 ml. chlorine must be considered unfit for white cheese manufacturing.

PERDRIX and PAOLI (1955) reproted that, Staphylococcal mastitis accounted for 75% of mastitis-positive samples and though not very contagious was common in certain regions and constituted a real danger to the quality of Gruyere cheese.

SOROKINA (1964) cited that, batches of 4-5 cheeses were made from (i) the milk of a healthy cow only, (ii) from (i) + 15% subclinical streptococcal mastitis milk, (iii) from (i) + 10% subclinical staphylococcal mastitis milk, or (iv) from (i) + 10% subclinical non-infectious mastitis milk. With (ii) - (iv) curd formation and draining were slower, and the curd particles took longer to harden than with (i), the (ii)-(iv) cheeses were of lower quality and had a coarser texture and a bitter taste.

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