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CORRELATIONS AND INTERRELATIONS OF SOME DETERMINATIONS AS AFFECTED BY PASTEURIZATION, BOILING AND STERILIZATION OF FRESH MILK

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Four positive significant correlations were found in milk constituents due to sterilization: between pH and casein, non-casein nitrogen; casein nitrogen and precipitated whey protein; and between lactose and reducing capacity. The rest of the correlations between the different determinations were insignificant whether in fresh, pasteurized, boiled or sterilized samples.

Statistical relations of the changes in milk constituents and properties due to heat treatments of fresh milk are valuable and useful in explaining in some of the technological problems in milk processing. In the same time, these correlations will give a clearer picture to the changes occurred in heat treated samples. Therefore, the object of this investigation is to study the correlations existed between pH, acidity, total nitrogen, non-protein nitrogen, casein nitrogen, whey protein, precipitated whey protein, lactose, reducing capacity and color in fresh, pasteurized, boiled and sterilized milk samples.

Experimental and Method of Analysis

All values are obtained from the determinations in part I, II, and III presented in Animal production conference 1969.

The correlation coefficients between the mean values were calculated according to Steel and Torrie (1960).

Results and Discussion

Data in tables 1, 2, 3 and 4 indicated that there were four positive significant correlation coefficients found only in the sterilized milk samples. These correlations were between pH and the casein and non-casein nitrogen, between casein nitrogen and precipitated whey protein and between lactose and reducing capacity. The positive insignificant correlations in the fresh and the three heat treatments were existed in :

(*a*) pH and acidity, total nitrogen, non-casein nitrogen, casein nitrogen, precipitated whey protein and whey protein.

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TABLE 1.—CORRELATIONS BETWEEN SOME DETERMINATIONS IN FRESH BUFFALO SAMPLES

	Acidity	TN	CN	NCN	NPN	W.P	Lactose	Reducing capacity
pH	+	+	+	+	+	+	+	−
Acidity		+	+	+	+	+	−	−
Total Nitrogen (TN)			+	+	+	+	−	−
Casein nitrogen (CN)				+	+	+	−	−
Non-casein nitrogen (NCN)					+	+	+	−
Non-protein nitrogen (NPN)						−	+	−
Whey protein (W.P.)							−	−
Lactose								−

TABLE 2.—CORRELATION BETWEEN SOME DETERMINATION IN PASTEURIZED BUFFALO SAMPLES

	Acidity	TN	CN	NCN	NPN	W.P	ppt. W.P	Lactose	Reducing capacity
pH	+	−	+	+	+	+	+	+	−
Acidity		+	+	+	+	+	−	+	+
Total Nitrogen (TN)			+	+	+	+	−	−	−
Casein nitrogen (CN)				+	−	−	−	−	−
Non-casein nitrogen (NCN)					+	+	+	+	+
Non-protein nitrogen (NPN)						−	+	−	+
Whey protein (W.P.)							−	−	−
Precipitated whey protein (pp. W.P.)								−	+
Lactose									+

TABLE 3.—CORRELATIONS BETWEEN SOME DETERMINATIONS IN BOILED BUFFALO SAMPLES

	Acidity	TN	CN	NCN	NPN	W.P	ppt. W.P	Lactose	Reducing capacity
pH	+	+	+	+	+	+	+	+	+
Acidity		+	+	+	+	+	+	+	−
Total Nitrogen (TN)			+	+	+	+	−	−	+
Casein Nitrogen (CN)				+	+	+	−	+	−
Non casein Nitrogen (NPN)					+	+	−	−	−
Non-protein Nitrogen (NPN)						+	+	−	−
Whey protein (W.P)							−	−	−
Precipitated whey protein (ppt. W.P)								−	+
Lactose									+

TABLE 4.—CORRELATIONS BETWEEN SOME DETERMINATIONS IN STERIIZED BUFFALO SAMPLES.

	Acidity	TN	CN	NCN	NPN	W.P	ppt. W.P	Lactose	Reducing capacity	Color
pH	+	+	*+	*+	−	+	+	−	+	+
Acidity		+	+	+	+	+	+	−	−	+
Total Nitrogen (TN)			+	+	+	+	+	−	+	+
Casein Nitrogen (CN)				+	+	+	*+	+	+	+
Non casein Nitrogen (NCN)					−	+	+	−	−	+
Non protein Nitrogen(NPN)						+	+	−	−	+
Whey protein (W.P.)							−	−	−	+
Precipitated whey protein ppt. (W.P)								−	*+	−
Lactose									+	+
Reducing capacity										−

* = The correlation is significant.

(*b*) Total nitrogen, and non-casein nitrogen, non-protein nitrogen, casein nitrogen and whey protein.

(*c*) Acidity and total nitrogen, non-casein nitrogen, non-protein nitrogen, non casein nitrogen or whey protein.

(*d*) Non-casein nitrogen and casein nitrogen or whey protein.

(*e*) precipitated whey protein and reducing capacity.

The change in color correlated positively with all determinations in sterilized milk except with precipitated whey protein and the reducing capacity which correlated negatively. The negative correlations in all treatments are found only between the following:

(*a*) Total nitrogen and lactose.

(*b*) Precipitated whey protein and whey protein and lactose.

(*c*) Whey protein and lactose and reducing capacity.

The correlations between pH and non protein nitrogen or lactose and between non-casein nitrogen and non protein nitrogen were positive in fresh, pasteurized and boiled samples while was negative in sterilized samples. The positive correlation in fresh milk between non-protein nitrogen and lactose changed to negative in pasteurized, boiled, and sterilized milks. The correlation between non casein nitrogen and lactose is postitive in fresh and pasterized samples but it is negative in boiled and sterilized milk samples. The negative correlation in milk between lactose and reducing capacity, be comes postitive when the milk was pasteurized or boiled or sterilized. Although the correlations between pH and reducing capacity and between non protein nitrogen and whey protein and between casein nitrogen and lactose were negative in fresh and pasteurized milks yet they were positive in boiled and sterilized samples. The correlations between total nitrogen and reducing capacity and between casein nitrogen and reducing capacity were negative in all treatments exception the sterilized samples. While the correlations between casein nitrogen on one hand and whey protein and non protein nitrogen on the other hand were negative in pasteurized samples, they were positive in fresh, boiled, and sterilized samples. The correlation between acidity and lactose changes from positive in pasteurized and boiled samples to negative in fresh and sterilized samples. The correlation between reducing capacity and acidity or non protein nitrogen was positive pasteurized samples and negative in fresh, boiled and sterilized sample. The correlations between precipitated whey protein and casein nitrogen and total nitrogen were negative in pasteurized and boiled samples, but they were positive in sterilized samples. The negative correlation which was present in pasteurized samples between precipitated whey protein and acidity changed to positive when the samples were boiled or sterilized. The correlation between precipitated whey proteins and non casein nitrogen was positive in pasteurized and sterilized samples but negative in boiled samples.

Agreeing with the present results, regarding the positive insignificant correlations between acidity or pH and total nitrogen, non casein nitrogen and casein nitrogen and also between acidity and pH. Rifaat *et al* (in press) obtained similar correlations in fresh milk. Furthermore, Harland *et al* (1955), found that the amount of protein denatured was closely related to its original a mount. They also stated that the amount of - SH content in the original milk was found to be very variable and not closely related to the whey protein content. In addition, Gould and Frantz (1945) pointed out that the pH changes in the milk correlated well with the majority but not with all the changes in titratable acidity.

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درجة الارتباط والعلاقات الاحصائية لبعض التقديرات ومدى تأثيرها بالبسترة وغلى وتعقيم اللبن الطازج

ابراهيم الدسوقى رفعت ـ جمال الدين الصادق ـ فاروق هلال ـ احمد عبد الغنى

الملخص

توجد ٤ علاقات احصائية جوهرية بين مكونات اللبن نتيجة تعقيمه وهى بين رقم الـ pH والنتروجين الكيزينى والغير كيزينى وكذلك بين النتروجين الكيزينى وبروتينات الشرش المترسبة بين اللاكتوز والمقدرة الاختزالية .

كانت باقى العلاقات الاحصـــائية بين مختلف التقديرات غير جوهرية سواء فى العينات الطازجة أو المبسترة او المغلية أو المعقمة .