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IMPROVEMENT OF WHITE CHEESE SPREAD PROPERTIES: 2. ADDING OF SOME FLAVOURING AGENTS

Hamad, M.N. F.[1] and M. M. Ismail[2]

[1]Dairy Sci. Dept., Fac. of Agric., Damietta Univ. and [2]Dairy Technology Dept., Animal Production Res. Institute, Agric. Res. Centre, Dokki, Giza.

ABSTRACT

The impact of some flavouring agents to formulation ingredients on the quality of white cheese spread was studied. Seven treatments were made by adding of astmobli, Cheddar cheese, Ras cheese, cream and mixture of Cheddar cheese and cream tastes to cheese blends at 0.03%, whereas green pepper (*Capsicum annum*) at 0.02%. The resultant cheese was stored for 8 weeks at 5 or for 4 weeks at 25°C. The obtained results showed that adding the mentioned additives to cheese blends had no clear effect on pH, total solids, fat, salt, total nitrogen, water soluble nitrogen contents and total viable bacterial count and mould and yeast numbers of fresh white cheese spread and during storage period, whereas adding different flavourings increased TVFA values of cheese. Adding of cream or mixture of Cheddar cheese and cream tastes to formulation ingredients improved the organoleptic properties of white cheese spread.

Keywords: Flavoring agents- White cheese spread

INTRODUCTION

Processed cheese is a dairy product which differs from natural cheese in the fact that processed cheese is not made directly from milk. However, the main ingredient of process cheese is natural cheese. Processed cheese is produced by blending natural cheese of different ages and degrees of maturity in the presence of emulsifying salts and other dairy and nondairy ingredients followed by heating and continuous mixing to form a homogeneous product with an extended shelf life (Guinee *et al.,* 2004). Different dairy ingredients have been used during the manufacture of processed cheese. Powders such as skimmed milk, whole milk, butter milk and /or whey have been used for partial replacement of the natural cheese. Manufacture of low fat processed cheeses and processed cheese spreads has several advantages to consumer health (Gliksman, 1995). Good quality low fat processed cheese spread was obtained previously from Ras cheese with rennet curd of skim milk with or without rice powder as a fat replacers by El-Shibiny *et al.,* (2007). Emulsifying salts are known to affect the quality and properties of processed cheeses (Caric and Kalab, 1993 and Al-Khamy *et al.,* 1997).

Due to an array of options in ingredients and formulations, and processing conditions, manufacturers have numerous possibilities for producing processed cheese with different physicochemical properties which leads to a variety of flavour, functional properties, and end-use applications as desired by consumers. Therefore, appropriate selection of ingredient and processing conditions during process cheese manufacture is very important to produce process cheese with targeted functional properties.

Recently, many cheese production laboratories in Egypt especially in Damietta Governorate are producing white soft cheese spread and called it Kerry cheese. The popularity of white soft cheese spread can be attributed to delicious taste, white color and easily spreadable.

The objective of this study was to develop new acceptable flavours of soft cheese spread to meet the demands of consumers.

MATERIALS AND METHODS

Materials:

Quark cheese used in the ingredient blends was prepared from skim milk concentrates by reconstituting, then added 10% palm oil, then homogenized at 50 bars, then added citric acid and rennet at pH 5.2. Ras cheese (2-3 months) was obtained from private Ras cheese production laboratory in Domiatta Governorate. Precooked cheese was the residual of previous processed cheese blend. Three months old Cheddar cheese was imported from Newzeland by El_Amreity Company, Alobour city, Egypt. The chemical composition of quark, Ras cheese, Cheddar cheese and precooked cheese was indicated in Table (1).

The emulsifying salts used were Egy Phos S20, Egy Phos SCC and Egy Phos B3 emulsifier (consists of sodium monophosphate, sodium diphosphate, sodium polyphosphate and sodium orthophosphate) which obtained from The Egyptian Company for Dairy Products and Food Additives, 10th of Ramadan city, Egypt and CR 15 emulsifier (consists of sodium polyphosphate and sodium triphosphate) which obtained from Magic Line Company, Mansoura City, Dakahlia Governorate, Egypt.

Other ingredients were whey powder (imported from USA and packaged by Misr Food Additives Company, Badr City, Egypt), butter oil (imported from France by Flecgard, S.A., Importer, Arab Trading Company), Cocoa butter substitute (imported from Premium Vegetable Oils Company, Kuala Lumpur, Malaysia), skim milk powder (low heat – spry dried – ADPI Extra Grade, imported from Germany by El_Amreity Company, Alobour city, Egypt) and potassium sorbate (Pharmacentical Company, Pfizer). Various flavourings (astmboli, green pepper, Cheddar cheese, Ras cheese and cream) were purchased from Delta aromatic International Company, Giza, Egypt.

Table 1. Chemical composition of ingredients

Ingredients	pH	TS %	Fat %	Protein %	Salt %
Quark	5.18	32.54	13.4	12.27	0.24
Ras cheese	4.94	68.24	36.2	29.67	3.1
Precooked cheese	5.56	55.51	28.7	8.5	1.9
Cheddar cheese	4.73	63.48	34.5	26.7	1.4
Whey powder	–	95.11	2.0	10.0	-
Skim milk powder	–	96.53	3.0	37.4	-

Manufacture of white cheese spread:

The manufacture of cheese spread was carried out as described by Meyer (1973). It was concluded from our pervious study that the best formulation of white cheese spread was as follow: quark 30%, Ras cheese 5%, precooked cheese 5%, Cheddar cheese 4%, palm oil 15%, butter oil 3%, skim milk powder 2%, whey powder 3%, emulsifying salts 3% and water 30%.

Potassium sorbate (0.2%) was added as preservatives with cheese ingredients and surface spray before closing.

The above ingredients were used for manufacturing of cheese spread with or without adding of flavourings. Seven treatments of processed cheese spread were manufactured as fallow:

Treatment A: cheese spread made from the above mentioned ingredients without adding of flavourings.

Treatment B: treatment A with adding of astmboli taste (Ripened white cheese for 1-2 months in high salt brine with green pepper *Capsicum annum*).

Treatment C: treatment A with adding of green pepper (*Capsicum annum*) taste.

Treatment D: treatment A with adding of Cheddar cheese taste.

Treatment E: treatment A with adding of Ras cheese taste.

Treatment F: treatment A with adding of cream taste.

Treatment G: treatment A with adding of Cheddar cheese and cream tastes.

White cheese spread of various treatments was made as follows:

Ras cheese was cut into small-pieces with a sharp knife. The pieces were fed into electric mincer to convert them into finally minced cheese. The formulation of blend (except flavourings) was placed in a 15 kg processing tanks (double jackets tank), closed and heated by undirected fire under atmospheric pressure and continuous stirring "100 RPM", at a temperature of 80-85°C for 15 minutes. The melted cheese was maintained at such temperature for 5 minutes and then flavourings of treatments (B, C, D, E, F and G) were added. The flavourings agents of treatments B, D, E, F and G were added to cheese at 0.03% while treatment C was added at 0.02% (the ratio used in cheese factories). The resultant processed cheese spread of all treatments were filled in 120 g plastics and stored for 8 weeks at 5±1°C (refrigerator) or 4 weeks at 25±3°C (room temperature). The processed cheese spread were chemically, microbiologically and organoleptically analyzed while fresh and then each week during storage period.

Methods:

The chemical composition of various ingredients and cheese spread samples were determined in triplicate (AOAC, 1990). The fat content of samples was determined by the Babcock-fat test described by Bartels et al., (1987). Cheese pH was measured using a Spear Tip combination electrode (VWR Scientific, Montreal, QC, Canada). Salt contents of ingredients were estimated using Volhard method according to Richardson (1985). Total volatile fatty acids (TVFA) was determined as described by Kosikowski (1978), and expressed as ml of 0.1N NaOH, 100 g-1 cheese. Cheese samples were analyzed for total viable bacterial count (TVBC); colifom bacteria; staphylococci; moulds and yeast counts according to the methods described by the American Public Health Association (1992). The cheese samples were scored for flavor (50 points), body and texture (35 points) and appearance and color (15 points) by twenty panelists in Dairy Department, Faculty of Agriculture, Damiatta University.

RESULTS AND DISCUSSION

Chemical composition of white cheese spread:

The various analysis of chesses kept at room temperature (25°C) were stopped after four weeks because of spoilage whereas it continued for eight weeks for cooling preserved cheese (5°C).

The values for pH, total solids, fat and salt contents of each treatment were presented in Table 2. The differences between treatments of cheese spread on pH, total solids, fat and salt contents were not clear. Total solids contents of treatments A, B, C and D stored at 5°C were 41.59, 41.33, 41.74 and 41.77% at the end of storage period respectively. According to Schar and Bosset (2002) the main factors influencing the changes in cheese during storage are product composition, processing, packaging and storage conditions (time and temperature). The similarity in the gross chemical composition of all tested treatments found in present study could be explained with the uniformity of the factors mentioned above.

pH values gradually decreased respectively during storage of the cheese spread. This may be due to continuous fermentation of lactose to lactic acid as well as the gradual increase of degradation products in the resultant cheese during storage period. As it is expected, the reducing rats of pH were higher in cheese stored at 25°C than those of stored at 5°C. Of course, this associated with the stimulant effect of high temperature on bacterial growth and enzymatic activation rates. Similar results were reported by Hamad and Ismail (2009). Marchesseau *et al.*, (1997) stated that the final pH of a process cheese has been found to have a significant effect on the quality, microstructure, and the type of protein interactions in the resulting processed cheese emulsion. The pH range of a good-quality processed cheese should be between 5.4 and 5.8.

Storage period or preservation at 5°C and 25°C had no pronounced effect on total solids, fat and salt contents of white cheese spread. Fat contents of sample D kept at 25°C at zero time and the end of storage period were 27.13 and 27.51% respectively. Total nitrogen (TN) and water soluble nitrogen (WSN) contents of possessed cheese spread had the same trend of TS, fat and salt values (Table 3). Both the control cheese and various samples approximately had the same values of TN and WSN. The values of WSN of fresh cheese were 0.795, 0.792, 0.801, 0.805, 0.795, 0.798 and 0.801% for samples A, B, C, D, E, F and G respectively. During storage period, the WSN contents gradually increased in different cheese treatments and the increases were more pronounced at the end of storage period and also in cheese stored at 25°C. This may be due to the protein breakdown in the cheese by milk and rennet enzymes and other microbial activities (El-Zeini *et al.*, 2007). Adding of various flavouring agents especially astmboli and mixture of Cheddar and cream tastes (samples B and G) to blend ingredients raised TVFA contents of the resultant cheese. These results are in agreement with those of Ismail and Hamad (2011). They reported that adding astmboli and parameli tastes to goat's milk slightly increased NPN and TVFA contents of white cheese. Gradually increase was observed in TVFA contents during storage period.

Table 2. Effect of adding various flavourings to blend ingredients on the chemical composition of white cheese spread

Treatments	Storage time (weeks)	pH values		TS (%)		Fat (%)		Salt (%)	
		Storage temperature °C							
		5	25	5	25	5	25	5	25
A	0	5.62	5.62	41.24	41.24	27.13	27.13	1.47	1.47
	1	5.56	5.53	41.15	41.65	27.45	27.44	1.57	1.64
	2	5.53	5.45	41.23	41.67	27.36	27.31	1.52	1.87
	3	5.49	5.35	14.56	41.38	27.45	27.67	1.28	1.62
	4	5.44	5.22	41.78	41.28	27.48	27.24	1.47	1.48
	5	5.38	-	41.25	-	27.49	-	1.80	-
	6	5.33	-	41.16	-	27.13	-	1.74	-
	7	5.26	-	41.77	-	27.55	-	1.55	-
	8	5.21	-	41.59	-	27.34	-	1.34	-
B	0	5.60	5.60	41.13	41.13	27.22	27.22	1.51	1.51
	1	5.57	5.52	41.85	41.20	27.68	27.24	1.62	1.47
	2	5.53	5.43	41.57	41.97	27.32	27.63	1.47	1.64
	3	5.48	5.36	41.23	41.17	27.68	27.57	1.54	1.66
	4	5.42	5.24	41.58	41.90	27.49	27.84	1.37	1.48
	5	5.37	-	41.09	-	27.15	-	1.55	-
	6	5.30	-	41.85	-	27.16	-	1.61	-
	7	5.25	-	41.37	-	27.42	-	1.45	-
	8	5.20	-	41.33	-	27.35	-	1.34	-
C	0	5.64	5.64	42.01	42.01	27.05	27.05	1.48	1.48
	1	5.60	5.55	41.97	41.57	27.10	27.15	1.48	1.43
	2	5.55	5.45	41.67	41.35	27.24	27.20	1.42	1.47
	3	5.51	5.36	41.45	41.25	27.15	27.15	1.64	1.46
	4	5.45	5.23	41.87	41.86	27.31	27.22	1.72	1.49
	5	5.40	-	42.07	-	27.25	-	1.56	-
	6	5.34	-	41.58	-	27.20	-	1.45	-
	7	5.27	-	41.63	-	27.20	-	1.64	-
	8	5.21	-	41.74	-	27.25	-	1.51	-
D	0	5.63	5.63	41.11	41.11	27.13	27.13	1.44	1.44
	1	5.59	5.53	41.51	41.25	27.56	27.34	1.43	1.40
	2	5.52	5.45	41.24	41.79	27.48	27.64	1.44	1.45
	3	5.49	5.34	41.24	41.65	27.54	27.41	1.45	1.42
	4	5.44	5.22	41.82	41.85	27.36	27.51	1.48	1.48
	5	5.38	-	41.94	-	27.06	-	1.47	-
	6	5.31	-	41.87	-	27.51	-	1.49	-
	7	5.25	-	41.23	-	27.97	-	1.42	-
	8	5.19	-	41.77	-	27.50	-	1.47	-
E	0	5.62	5.62	41.83	41.83	26.99	26.99	1.46	1.46
	1	5.57	5.54	41.36	41.52	27.14	27.35	1.41	1.45
	2	5.52	5.44	41.27	41.98	27.31	26.74	1.42	1.49
	3	5.48	5.35	41.92	41.26	27.84	27.71	1.44	1.44
	4	5.42	5.21	41.37	41.09	27.11	27.13	1.48	1.47
	5	5.36	-	41.25	-	26.98	-	1.43	-
	6	5.31	-	41.58	-	27.34	-	1.46	-
	7	5.24	-	41.74	-	27.54	-	1.45	-
	8	5.18	-	41.29	-	27.54	-	1.47	-
F	0	5.64	5.64	41.85	41.85	27.84	27.84	1.50	1.50
	1	5.60	5.52	41.27	41.69	27.39	27.45	1.49	1.51
	2	5.55	5.44	41.80	41.67	27.89	27.68	1.47	1.49
	3	5.49	5.31	41.72	41.61	27.86	27.67	1.48	1.48
	4	5.46	5.21	41.08	41.80	27.69	27.84	1.46	1.49
	5	5.40	-	41.74	-	27.13	-	1.47	-
	6	5.33	-	41.23	-	27.99	-	1.51	-
	7	5.25	-	41.75	-	27.67	-	1.50	-
	8	5.19	-	41.67	-	27.86	-	1.48	-

Table 2. continued

G	0	5.65	5.65	41.87	41.87	26.51	26.75	1.45	1.45
	1	5.60	5.54	41.55	41.68	27.34	26.75	1.46	1.44
	2	5.55	5.45	41.84	41.45	27.89	26.75	1.47	1.47
	3	5.51	5.32	41.69	41.69	27.34	26.85	1.48	1.48
	4	5.45	5.23	41.80	41.55	27.56	26.80	1.48	1.43
	5	5.38	-	41.77	-	27.15	-	1.42	-
	6	5.32	-	41.85	-	27.14	-	1.45	-
	7	5.24	-	41.67	-	26.94	-	1.47	-
	8	5.18	-	41.19	-	27.75	-	1.49	-

Table 3. Effect of adding various flavourings to blend ingredients on TN, SN and TVFA of white cheese spread

Treatments	Storage time (weeks)	TN (%)		WSN (%)		WSN/TN (%)		TVFA*	
		Storage temperature °C							
		5	25	5	25	5	25	5	25
A	0	1.23	1.20	0.795	0.795	64.63	66.3	16	16
	1	1.23	1.24	0.810	0.826	65.85	66.6	20	22
	2	1.24	1.23	0.836	0.856	67.42	69.6	24	27
	3	1.25	1.24	0.860	0.884	68.80	71.3	27	33
	4	1.24	1.24	0.891	0.952	71.85	76.8	30	39
	5	1.26	-	0.925	-	73.41	-	35	-
	6	1.23	-	0.956	-	77.72	-	37	-
	7	1.24	-	0.978	-	78.87	-	39	-
	8	1.23	-	0.997	-	81.06	-	44	-
B	0	1.24	1.24	0.792	0.792	63.87	63.9	18	18
	1	1.25	1.25	0.819	0.834	65.52	66.7	22	25
	2	1.26	1.24	0.842	0.865	66.83	69.8	25	29
	3	1.24	1.26	0.866	0.897	69.84	71.2	30	34
	4	1.22	1.26	0.898	0.957	73.61	76.0	35	40
	5	1.24	-	0.935	-	75.40	-	38	-
	6	1.27	-	0.960	-	75.59	-	41	-
	7	1.23	-	0.985	-	80.08	-	46	-
	8	1.24	-	0.998	-	80.48	-	50	-
C	0	1.23	1.23	0.801	0.801	65.12	65.1	18	18
	1	1.21	1.20	0.830	0.857	68.60	71.4	20	24
	2	1.22	1.25	0.857	0.898	70.25	71.8	24	29
	3	1.22	1.24	0.881	0.936	72.21	75.5	28	33
	4	1.24	1.24	0.916	0.965	73.87	77.8	31	38
	5	1.25	-	0.944	-	75.52	-	35	-
	6	1.22	-	0.967	-	79.26	-	40	-
	7	1.23	-	0.982	-	79.84	-	44	-
	8	1.24	-	0.997	-	80.40	-	48	-
D	0	1.20	1.20	0.805	0.805	67.08	67.1	17	17
	1	1.22	1.24	0.829	0.851	67.95	68.6	19	22
	2	1.23	1.23	0.857	0.897	69.67	72.9	21	27
	3	1.21	1.21	0.891	0.931	73.64	76.9	24	31
	4	1.22	1.22	0.934	0.958	76.56	78.5	28	37
	5	1.24	-	0.960	-	77.42	-	31	-
	6	1.20	-	0.979	-	81.58	-	34	-
	7	1.25	-	0.986	-	78.88	-	38	-
	8	1.22	-	0.996	-	81.64	-	46	-
E	0	1.24	1.24	0.795	0.795	64.11	64.1	16	16
	1	1.23	1.25	0.825	0.836	67.07	66.9	19	20
	2	1.25	1.26	0.857	0.879	68.56	69.8	22	24
	3	1.24	1.23	0.884	0.920	71.29	74.8	25	29
	4	1.24	1.24	0.919	0.952	74.11	76.8	29	36
	5	1.26	-	0.945	-	75.00	-	33	-
	6	1.24	-	0.968	-	78.06	-	37	-
	7	1.25	-	0.987	-	78.96	-	41	-
	8	1.25	-	1.001	-	80.08	-	46	-
F	0	1.23	1.23	0.798	0.798	64.88	64.9	17	17
	1	1.23	1.24	0.832	0.879	67.64	70.9	20	22
	2	1.25	1.25	0.867	0.913	69.36	73.0	24	26
	3	1.27	1.26	0.897	0.959	70.63	76.1	28	33
	4	1.22	1.24	0.925	0.991	75.82	79.9	32	39
	5	1.24	-	0.957	-	77.18	-	35	-
	6	1.25	-	0.980	-	78.40	-	40	-
	7	1.27	-	0.999	-	78.66	-	44	-
	8	1.24	-	1.011	-	81.53	-	47	-

Table 3. continued

G	0	1.22	1.22	0.801	0.801	65.66	65.7	18	18
	1	1.23	1.26	0.835	0.847	67.89	67.2	22	24
	2	1.25	1.26	0.860	0.897	68.80	71.2	26	29
	3	1.24	1.25	0.894	0.936	72.10	74.9	31	33
	4	1.25	1.21	0.911	0.975	72.88	80.6	36	39
	5	1.27	-	0.939	-	73.94	-	40	-
	6	1.25	-	0.978	-	78.24	-	44	-
	7	1.26	-	0.997	-	79.13	-	47	-
	8	1.23	-	1.015	-	82.52	-	52	-

Table 4. Effect of adding various flavourings to blend ingredients on some microbial groups of white cheese spread

Treatments	Storage time (weeks)	TVBC ($x10^3$)		Coliform ($x10^1$)		Spore-forms ($x10^1$)		Moulds & Yeast ($x10^1$)		*Staph. aureus* ($x10^1$)	
		Storage temperature °C									
		5	25	5	25	5	25	5	25	5	25
A	0	2.85	2.85	-	-	-	-	1.35	1.35	-	-
	1	3.05	4.14	-	-	-	-	1.39	1.66	-	-
	2	3.30	5.95	-	-	-	-	1.45	1.94	-	-
	3	3.54	10.45	-	-	-	-	1.67	4.43	-	-
	4	3.69	20.50	-	-	-	-	1.84	8.75	-	-
	5	4.01	-	-	-	-	-	2.20	-	-	-
	6	8.56	-	-	-	-	-	4.48	-	-	-
	7	13.12	-	-	-	-	-	6.15	-	-	-
	8	18.45	-	-	-	-	-	8.34	-	-	-
B	0	2.88	2.88	-	-	-	-	1.30	1.30	-	-
	1	3.07	4.10	-	-	-	-	1.37	1.70	-	-
	2	3.59	5.50	-	-	-	-	1.47	1.97	-	-
	3	3.80	10.76	-	-	-	-	1.52	4.50	-	-
	4	3.98	19.31	-	-	-	-	1.70	8.81	-	-
	5	4.10	-	-	-	-	-	1.98	-	-	-
	6	8.62	-	-	-	-	-	3.85	-	-	-
	7	13.27	-	-	-	-	-	5.97	-	-	-
	8	18.50	-	-	-	-	-	8.11	-	-	-
C	0	2.83	2.83	-	-	-	-	1.33	1.33	-	-
	1	3.02	4.45	-	-	-	-	1.42	1.79	-	-
	2	3.51	5.58	-	-	-	-	1.51	2.04	-	-
	3	3.81	8.42	-	-	-	-	1.75	4.61	-	-
	4	4.07	18.97	-	-	-	-	1.99	9.08	-	-
	5	4.57	-	-	-	-	-	2.27	-	-	-
	6	8.74	-	-	-	-	-	4.36	-	-	-
	7	12.98	-	-	-	-	-	6.04	-	-	-
	8	17.87	-	-	-	-	-	8.17	-	-	-
D	0	2.87	2.87	-	-	-	-	1.36	1.36	-	-
	1	3.14	4.57	-	-	-	-	1.44	1.82	-	-
	2	3.55	5.87	-	-	-	-	1.50	2.31	-	-
	3	3.87	9.02	-	-	-	-	1.72	4.77	-	-
	4	4.12	18.62	-	-	-	-	2.23	9.21	-	-
	5	4.60	-	-	-	-	-	2.47	-	-	-
	6	9.11	-	-	-	-	-	4.40	-	-	-
	7	12.81	-	-	-	-	-	5.98	-	-	-
	8	17.60	-	-	-	-	-	7.99	-	-	-
E	0	2.84	2.84	-	-	-	-	1.40	1.40	-	-
	1	3.10	4.47	-	-	-	-	1.50	1.87	-	-
	2	3.44	5.94	-	-	-	-	1.62	2.43	-	-
	3	3.63	10.52	-	-	-	-	1.81	4.89	-	-
	4	3.95	19.02	-	-	-	-	1.93	9.37	-	-
	5	4.20	-	-	-	-	-	2.20	-	-	-
	6	8.89	-	-	-	-	-	4.31	-	-	-
	7	12.75	-	-	-	-	-	5.86	-	-	-
	8	17.71	-	-	-	-	-	7.75	-	-	-
F	0	2.80	2.80	-	-	-	-	1.37	1.37	-	-
	1	3.04	4.65	-	-	-	-	1.51	1.85	-	-
	2	3.39	5.89	-	-	-	-	1.68	2.41	-	-
	3	3.70	10.25	-	-	-	-	1.91	4.77	-	-
	4	4.07	19.37	-	-	-	-	2.14	9.25	-	-
	5	4.41	-	-	-	-	-	2.34	-	-	-
	6	9.23	-	-	-	-	-	4.25	-	-	-
	7	12.89	-	-	-	-	-	6.47	-	-	-
	8	18.09	-	-	-	-	-	8.32	-	-	-

Table 4. continued

G	0	2.87	2.87	-	-	-	-	1.40	1.40	-	-
	1	3.11	4.54	-	-	-	-	1.55	1.90	-	-
	2	3.42	5.94	-	-	-	-	1.66	2.54	-	-
	3	3.80	10.34	-	-	-	-	1.94	4.80	-	-
	4	4.17	19.22	-	-	-	-	2.30	9.34	-	-
	5	4.50	-	-	-	-	-	2.79	-	-	-
	6	8.97	-	-	-	-	-	4.11	-	-	-
	7	12.78	-	-	-	-	-	6.24	-	-	-
	8	18.24	-	-	-	-	-	8.40	-	-	-

Kapoor and Metzger (2008) stated that in addition to natural cheese and emulsifying salts, there are various other dairy and non-dairy (colours, flavours, spices, food gums, mold inhibitors, and so on) ingredients that are used in processed cheese manufacture. Different ingredients affect the physicochemical properties, flavour, and the functional properties of process cheese in different ways. Moreover, the appropriate selection of natural cheese and emulsifying salt is also very important in order to produce processed cheese with desired final properties.

Microbiological properties of white cheese spread:

The effects of adding some flavouring agents to formulation ingredients of white cheese spread on total viable bacterial count (TVBC), coliform, sporeforms bacteria, mould and yeast and *Staphylococcus aureus* were illustrated in Table 4. Coliform, sporeforms bacteria and *Staphylococcus aureus* were not detected in all treatments of fresh processed cheese and during storage period due to good hygienic condition during manufacturing and storage period.

There were non-pronounced differences between treatments of cheese spread in the TVBC and mould and yeast numbers. On the other hand, as the storage period progressed the TVBC and mould and yeast numbers increased. This numerical increase was higher in cheese stored at 25°C than that stored at 5°C.

Organoleptic properties of white cheese spread:

Table 5 represents the effect of adding various flavouring agents to formulation ingredients on the sensory evaluation of cheese spread. There were no clear differences in the color and appearance and body and texture scores between different treatments of cheese spread at the beginning and within during storage stage. Treatments A, B, C and D gained 32, 31, 31 and 32 for scores of body and texture after 8 weeks of storage period respectively. The main difference between control and tested samples was found in sensory evaluated flavour. The flavour scores of samples treated with cream (treatment F) or mixture of Cheddar cheese and cream (treatment G) were higher than that of control or samples treated with astmboli, green pepper, Cheddar and Ras cheese tastes. In all cheese treatments, the sensory evaluation scores gradually decreased during storage period especially in cheese stored at room temperature.

Table (5). Sensory evaluation of processed cheese spread

Treatments	Storage time (weeks)	Color& Appearance (15)		Body & Texture(35)		Flavour (50)		Total (100)	
		Storage temperature °C							
		5	25	5	25	5	25	5	25
A	0	14	14	32	32	45	45	91	91
	1	14	13	32	32	45	43	91	88
	2	14	12	32	30	45	40	91	82
	3	14	12	32	28	45	37	91	77
	4	14	10	32	23	44	33	90	66
	5	14	-	32	-	43	-	89	-
	6	13	-	32	-	42	-	87	-
	7	13	-	30	-	41	-	84	-
	8	12	-	30	-	38	-	80	-
B	0	14	14	31	31	44	41	89	86
	1	13	12	31	31	44	40	88	83
	2	13	12	31	30	44	39	88	81
	3	13	11	31	27	44	37	88	75
	4	13	10	31	23	44	35	88	68
	5	13	-	31	-	42	-	86	-
	6	13	-	31	-	40	-	84	-
	7	12	-	30	-	38	-	80	-
	8	12		30	-	36	-	78	-
C	0	14	14	31	31	44	44	89	89
	1	14	12	31	30	44	44	89	86
	2	14	10	31	28	44	42	89	80
	3	13	10	31	25	43	40	87	75
	4	13	10	31	23	43	37	87	70
	5	13	-	31	-	43	-	87	-
	6	12	-	30	-	40	-	82	-
	7	12	-	30	-	39	-	81	-
	8	12	-	29	-	38	-	79	-
D	0	14	14	32	32	46	46	92	92
	1	14	13	32	30	46	46	92	89
	2	14	12	32	30	46	45	92	87
	3	14	12	31	28	46	42	91	82
	4	14	10	31	24	46	40	91	74
	5	13	-	31	-	45	-	89	-
	6	13	-	30	-	45	-	88	-
	7	13	-	30	-	45	-	88	-
	8	13	-	30	-	45	-	88	-
E	0	14	14	31	31	43	43	88	88
	1	14	11	31	29	43	40	88	80
	2	14	10	31	28	43	36	88	74
	3	14	10	31	26	43	34	88	70
	4	13	9	31	23	41	32	85	64
	5	13	-	30	-	40	-	83	-
	6	12	-	30	-	40	-	82	-
	7	12	-	29	-	37	-	78	-
	8	12	-	29	-	34	-	75	-
F	0	14	14	32	32	48	48	94	94
	1	14	13	32	32	48	48	94	93
	2	14	12	32	32	48	47	94	91
	3	14	12	32	29	48	46	94	87
	4	14	10	31	23	48	40	93	73
	5	14	-	31	-	47	-	92	-
	6	13	-	31	-	46	-	90	-
	7	13	-	31	-	45	-	89	-
	8	13		30	-	44	-	87	-
G	0	14	14	33	33	49	49	96	96
	1	14	14	33	33	49	49	96	96
	2	13	13	33	32	49	48	95	93
	3	13	13	33	31	48	47	94	91
	4	13	12	33	30	48	44	94	86
	5	13	-	33	-	47	-	93	-
	6	13	-	32	-	46	-	91	-
	7	12	-	32	-	45	-	89	-
	8	12	-	31	-	45	-	88	-

CONCLUSSION

In conclusion, adding of cream or mixture of Cheddar cheese and cream tastes to formulation ingredients could be recommended for improvement of white cheese spread quality.

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تحسين خواص الجبن الأبيض القابل للفرد:
٢- إضافة بعض مواد الطعم

محمد نور الدين فريد حماد[١] و مجدي محمد إسماعيل[٢]

[١]قسم الألبان – كلية الزراعة – جامعة دمياط.

[٢]قسم بحوث تكنولوجيا الألبان – معهد بحوث الإنتاج الحيواني – مركز البحوث الزراعية – مصر.

تم في هذا البحث دراسة تأثير إضافة بعض الطعوم المستخدمة على نطاق تجاري لمكونات الجبن على خواص الجبن الأبيض القابل للفرد. حيث إضيفت طعوم الأسطمبولي والجبن الشيدر والجبن الراس وطعم القشدة و خليط من طعم الجبن الشيدر و طعم القشدة إلي خلطة الجبن بنسبة ٠.٠٣% في حين إضيف طعم الفلفل الأخضر بنسبة ٠.٠٢% و تم حفظ الجبن الناتج على درجة حرارة ٥°م لمدة ثمانية اسابيع و على درجة حرارة ٢٥°م لمدة أربعة اسابيع. و تشير النتائج إلي أن إضافة هذه الطعوم لم يكن لها تأثير واضح على قيم الرقم الهيدروجيني و المواد الصلبة و الدهن و الملح و النتروجين الكلي و النتروجين الذائب في الماء و العد الكلي للبكتريا و اعداد الفطريات و الخمائر بالجبن الناتج، إلا أنها أدت إلي زيادة في قيم الأحماض الدهنية الكلية الطيارة. و قد ظهر تحسن واضح بالخواص الحسية للجبن الأبيض القابل للفرد نتيجة لإضافة طعوم القشدة وخليط من طعم الجبن الشيدر وطعم القشدة.

قام بتحكيم البحث

أ.د / الطاهره محمد احمد عمار	كلية الزراعة – جامعة المنصورة
أ.د / عبد الحميد ابو الحسن عسكر	كلية الزراعة – جامعة عين شمس