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Yoghurt for Athletic People

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BUFFALOE'S concentrated yoghurt was made by using different levels of Na-caseinate or wheat germ (0.5%,1.0% and 1.5%). The obtained concentrated yoghurt of the all treatments had sufficient energy which is suitable to consume during training or sporting time. Concentrated yoghurt fortified with 1.0% Na-caseinate or 0.5% wheat germ gave the highest score for flavour, body & texture and appearance. ATB culture was used in this work.

Keywords: Yoghurt, Wheat germ,Na-caseinate, Athletic

Athletic people are those who burn a lot of energy during their training or sporting time and who need to compensate this energy with a high nutritive and high energy food.

Yoghurt is the most popular fermented dairy product in Egypt and worldwide. The ipmportance of yoghurt in human diet is determined by its nutritive value and health effects (Buttriss, 1997).Many health benefits have been attributed to yoghurt such as improved lactose tolerance, protection against gastrointestinal infections, effective treatment for specific types of diarrhea, relief of constipation, improved immunity, cholesterol reduction and protection against cancer (Agerbaek *et al.*, 1995; Schaafsma, 1996; Tvede, 1996 and Buttriss, 1997).

Several investigators manufactured Zabady from ultrafiltrated milk. The resultant Zabady had a long shelf-life and considered more suitable as a therapeutic product for lactose-intolerant individuals (Haggag & Fayed, 1988; Abd-Rabo *et al.*, 1988; Hofi, 1990; Khorshid *et al.*, 1992 & 1993; Omar *et al.*, 1998 and Mehanna *et al.*, 2000).

Wheat germs which have high ratio of carbohydrates about 82% and 0.92% fiber is a good source for protein, energy and fibers. Dietary fiber is a generic term that includes plant constituents which are resistant to digestion in the human gastrointestinal tract (Kimura, 1977). Nutritional studies indicate that the dietary fiber can act as a bulking agent; increasing intestinal motility and the wet fecal mass, to provide more bulk to decrease intraluminal pressures of the gastrointestinal tract for diverticuolar diseases, irritable bowel syndrome and the

like (Mongeau & Brassard, 1984 and Okada *et al.*, 1986). In addition, some types of plant fiber can lower serum cholesterol levels (Forsythe *et al.*, 1976).

The present work aimed to study effect of fortification concentrated buffaloe's milk with different levels of Na-caseinate or wheat germ to produce suitable concentrated yoghurt with high energy and nutritional value for athletic people.

Material and Methods

Materials

Fresh buffaloe's milk was obtained from the herd of the Faculty of Agriculture, Cairo University.

Sodium caseinate contained 4.6% moisture, 89.27% protein; 0.8% lactose; 1.2% fat and 4.1% ash obtained from Arbci Laboratory Equipment Co.

Wheat germ contained 11.5% moisture; 14.22% protein; 0.61% ash; 0.92% fiber and 82.33% carbohydrate, was obtained from Cairo Milling Co.

ATB type which consists of *Lactobacillus acidophilus,; Streptococcus thermophilus and Bifidobacterium bifidum* was purchased from Chr. Hansen, Denmark.

Manufacture of concentrated yoghurt

Buffaloe's milk was pasteurized at 72°C/15s. then concentrated by ultrafiltration to achieve 25% total solids. The obtained retentate was divided to seven parts. The first part was served as a control and 0.5%; 1.0% and 1.5% of Na-caseinate and wheat germ were added to the next parts, respectively. The method of Abdel-Salam and El-Alamy (1982) was applied in the manufacture of ultrafiltered concentrated yoghurt.

Methods of analysis

Treatments were chemically examined for total solids, titratable acidity and fat content as described by AOAC (1990) . Total protein (TP) was determined by micro Kjeldahl method according to IDF (1993). pH was measured using a pH Meter (HANNA, pH 211 Instruments Microprocessor pH meter). Caloric value was determined according to the method reported by Walstra and Jenness (1984).

Measurement of syneresis

Syneresis (whey separation) was measured according to Danneberg and Kesselr (1988), with slight modifications . The yoghurt in a plastic cup container was cut into four sections and transferred into a funnel fitted with 120-mesh metal screen; the whey was drained into a graduated cylinder. The amount of whey (ml) drained off was measured after 2 hr at room temperature (20 ± 1°C) on fresh and stored yoghrut for 3, 7 and 10 days.

Measurement of viscosity

The viscosity of yoghurt was measured by using acoaxial cylinder viscometer (Bohlin V88, Sweden) attached to a workstation loaded with V88 viscometer. The measuring system (C30 Infinite), permits a gap of 1.5 mm between the two cylinders. The sample was first gently stirred for 1 min and the viscometer probe (system 30) was placed in the sample. Measurement of the viscosity was carried out at room temperature 20°C at shear rate ranging form 125 to 1050 1/s in the up and down mode allowing 60 sec intervals between successive measurements .

Determination of tyrosine and tryptophane

Soluble tyrosine and tryptophane were determined spectrophotometrically according to the method of Vakaleris and Price (1959).

Organoleptic properties

Concentrated yoghurt samples of all the treatments were sensory evaluated when fresh and during the storage period by 20 trained panelists from Dairy Technology department, Animal Production Research Institute. Using the following scheme: flavour (60); body & texture (30) and appearance (10) as suggested by Ahmed and Ismail (1978).

Statistical analysis

Chemical and organoleptic results were statistically analysed according to SAS Institute (1990) using General Linear Model (GLM). Duncan's multiple range was used to separate among means of three replicates of samples.

Results and Discussion

Chemical composition of concentrated yoghurt

Table 1 shows the differences in the chemical composition of concentrated yoghurt fortified with different levels of Na-caseinate or wheat germ when fresh or during the storage period at 5°C.

Total solids of all the treatments increased significantly as the fortification levels of Na-caseinat or wheat germ increased, while, the total solids of all the treatments gradually decreased significantly with progressive storage. This may be due to the fermentation of lactose. These results are in agreement with those reported by El-Shibiny *et al.* (1979), who mentioned that the decrease in total solids may be largely due to the fermentation of lactose with the production of lactic acid, acetaldehyde and acetoin.

Addition of either Na-caseinate or wheat germ will affect the fat content unless the added components do have the same content of fat in solid as the yoghurt to concentrated yoghurt had a significant effect on the fat content when fresh while, had no significant effect on the fat content of all the treatments during the storage period at 5°C.

TABLE 1. Effect of using Na-caseinate and wheat germ with different ratio on chemical composition and energy during storage period at 5°C.

Constituents	Storage period (day)	Control	Na-caseinate%			Wheat germ %		
			0.5	1.0	1.5	0.5	1.0	1.5
TS%	Fresh	25.35^{Ba}	25.66^{Cb}	26.27^{Bd}	26.58^{Bd}	25.74^{Cb}	25.84^{Cb}	26.16^{Cc}
	3	25.35^{Ba}	25.65^{Bb}	26.26^{Bd}	26.57^{Bd}	25.74^{Cb}	25.83^{Bb}	26.15^{Cc}
	7	25.26^{Aa}	25.48^{Aa}	26.23^{Ac}	26.53^{Ad}	25.71^{ABb}	25.82^{ABb}	26.12^{Bc}
	10	25.25^{Aa}	25.43^{Aa}	26.19^{Ac}	26.50^{Ad}	25.10^{Ab}	25.81^{Ab}	26.10^{Ac}
TP%	Fresh	11.7^{a}	12.1^{b}	12.5^{c}	12.8^{d}	11.9^{a}	12.1^{b}	12.4^{c}
	3	11.7^{a}	12.2^{b}	12.5^{c}	12.9^{d}	11.9^{a}	12.1^{b}	12.4^{c}
	7	11.6^{a}	12.1^{b}	12.4^{c}	12.8^{d}	11.8^{a}	12.1^{b}	12.5^{c}
	10	11.7^{a}	12.1^{b}	12.5^{c}	12.9^{d}	11.8^{a}	12.1^{b}	12.5^{c}
Fat%	Fresh	11.0^{a}	10.9^{a}	10.8^{a}	10.8^{a}	10.9^{a}	10.8^{a}	10.8^{a}
	3	11.0^{a}	10.9^{a}	10.8^{a}	10.8^{a}	10.9^{a}	10.8^{a}	10.7^{a}
	7	11.0^{a}	10.9^{a}	10.8^{a}	10.8^{a}	10.9^{a}	10.8^{a}	10.8^{a}
	10	11.0^{a}	10.9^{a}	10.8^{a}	10.8^{a}	10.9^{a}	10.8^{a}	10.8^{a}
Ash%	Fresh	1.45^{Aa}	1.46^{Ab}	1.47^{Ac}	1.48^{Acd}	1.44^{Aa}	1.44^{Aa}	1.46^{Ab}
	3	1.45^{Aa}	1.46^{Ab}	1.47^{Ac}	1.48^{Acd}	1.44^{Aa}	1.45^{Aa}	1.46^{Ab}
	7	1.46^{Ab}	1.47^{Ac}	1.47^{Ac}	1.49^{Ad}	1.44^{Aa}	1.45^{Aa}	1.47^{Acd}
	10	1.45^{Aa}	1.47^{Ac}	1.47^{Ac}	1.49^{Ad}	1.45^{Aa}	1.45^{Aa}	1.47^{Acd}
Caloric value (KJ/100 g)	Fresh	1158^{Db}	1183^{Db}	1226^{Dc}	1255^{Dd}	1210^{Dc}	1243^{Dd}	1273^{Dd}
	3	1151^{Ca}	1162^{Cb}	1201^{Cc}	1231^{Cc}	1184^{Cb}	1230^{Cc}	1259^{Cd}
	7	1136^{Ba}	1149^{Ba}	1193^{Bc}	1217^{Bc}	1140^{Bb}	1181^{Bc}	1207^{Bc}
	10	1112^{Aa}	1136^{Aa}	1177^{Ab}	1205^{Ac}	1122^{Ab}	1153^{Ac}	1182^{Ac}

The same letters had no significant effect at the level 0.05 and the different letters had a significant effect at the level 0.05.

As in fat content, total protein of all the treatments when fresh increased significantly with increasing the added ration of Na-caseinate or wheat germ. The rate of increasing protein content when Na-caseinate used was higher compared with using wheat germ .This may be due to the high content of total protein in Na-caseinate than that in wheat germ.

Ash content of concentrated yoghurt was affected significantly as Na-caseinate or wheat germ used which had a slight increase as a result of increasing the added ratio when fresh. The storage period of all the treatments had no-significant effect on ash content.

The same table showed that using Na-caseinate or wheat germ had a significant effect on the caloric value when fresh which increased with increasing the added ratio. The caloric value of all the treatments was affected significantly with storage and decreased with increasing the storage period due to the degradation of lactose. The rate of decreasing was higher in case of using wheat

germ . This may be due to its high content of carbohydrate (82.38%) compared with Na-caseinate (1.2%). Shalaby *et al.* (1992) and Souci *et al.* (1973) mentioned that the caloric value of Zabady decreased during storage. The transformation of lactose into CO2 may be of even greater importance in relation to loss of solids and caloric value.

Titratable acidity and pH Value

Table 2 shows the changes in acidity and pH value of concentrated yoghurt fortified with Na-caseinate or wheat germ when fresh and during storage period .

The data of the results showed that, the acidity of fresh samples increased significantly with increasing the added ratio of Na-caseinate or wheat germ. Hang and Jackson (1967) stated that increasing the amount of total solids for making fermented milk, increased the acidity . Also, El-Shibiny *et al.* (1977) stated that increasing total solids and protein led to increase the total acidity.

TABLE 2. Effect of using Na-caseinate and wheat germ with different ratio on total acidity and pH value during storage period at 5°C.

Constituents	Storage period (day)	Control	Na-caseinate%			Wheat germ %		
			0.5	1.0	1.5	0.5	1.0	1.5
Acidity%	Fresh	0.92^{Aa}	0.96^{Ab}	0.99^{Ac}	1.04^{Ad}	0.95^{Aa}	0.99^{Ac}	1.03^{Ad}
	3	1.03^{Ba}	1.08^{Bb}	1.10^{Bc}	1.11^{Ac}	1.10^{Bc}	1.13^{Bd}	1.15^{Bd}
	7	1.12^{Ca}	1.14^{Ca}	1.16^{Cb}	1.19^{Cd}	1.17^{Cc}	1.19^{Cd}	1.21^{Cd}
	10	1.20^{Da}	1.22^{Da}	1.24^{Da}	$2..27^{Db}$	1.25^{Db}	1.29^{Db}	1.38^{Dd}
PH Value.	Fresh	4.66^{Dd}	4.66^{Dd}	4.65^{Dd}	4.65^{Dd}	4.61^{Db}	4.56^{Da}	4.58^{Da}
	3	4.60^{Cd}	4.60^{Cd}	4.60^{Cd}	4.60^{Cd}	4.59^{cd}	4.53^{Ca}	4.52^{Ca}
	7	4.53^{Bd}	4.53^{Bd}	4.52^{BC}	4.52^{BC}	4.49^{Bb}	4.47^{Ba}	4.46^{Ba}
	10	4.45^{Ad}	4.45^{Ad}	4.45^{Ad}	4.45^{Ad}	4.41^{Ab}	4.38^{Aa}	4.36^{Aa}

The same letters had no significant effect at the level 0.05 and the different letters had a significant effect at the level 0.05.

The pH value wasn't affected significantly with the used amount of Na-caseinate or wheat germ when fresh. The total acidity increased and pH value of all the treatments decreased with storage . The rate of increasing acidity and decreasing pH value in case of using wheat germ was higher than that with using Na-caseinate. This may be due to the high content of carbohydrate in wheat germ. El-Garawany (2004) and Mehaia & Cheryan (1983) stated that total acidity increased an pH value of yoghurt decreased with storage.

Tyrosine and tryptophan

Table 3 indicates the changes in soluble tyrosine and soluble tryptophan of concentrated yoghurt fortified with Na-caseinate or wheat germ when fresh and during storage period at 5°C .

TABLE 3. Effect of using Na-caseinate and wheat germ with different ratio on soluble tyrosine and soluble tryptophan during storage period at 5°C.

Constituents	Storage period (day)	Control	Na-caseinate%			Wheat germ %		
			0.5	1.0	1.5	0.5	1.0	1.5
Soluble Tyrosine (mg/100g Sample)	Fresh	18.01^{Aa}	20.20^{Aab}	22.38^{Ab}	24.65^{Abc}	18.68^{Aa}	20.44^{Aab}	22.62^{Ab}
	3	20.30^{Bab}	22.18^{Bb}	24.82^{Bbc}	26.20^{Bc}	20.00^{Bab}	22.32^{Bb}	24.00^{Bbc}
	7	22.28^{Cb}	26.40^{Cc}	28.62^{Cc}	30.00^{Cd}	22.48^{Cb}	24.64^{Cbc}	26.88^{Cc}
	10	24.34^{Db}	28.34^{Bcd}	30.40^{Dd}	32.42^{Dd}	26.42^{Dc}	28.00^{Dc}	28.76^{Dcd}
Soluble tryptophan (mg/100g sample)	Fresh	28.21^{Aa}	32.88^{Aa}	34.36^{Aa}	36.80^{Ab}	30.80^{Aa}	32.86^{Aa}	34.88^{Ab}
	3	32.68^{Ba}	36.64^{Bb}	40.28^{Bb}	44.63^{Bc}	36.42^{Bb}	38.60^{Bb}	40.62^{Bb}
	7	36.64^{Cb}	40.80^{Cb}	46.28^{Cc}	50.21^{Cd}	40.48^{Cb}	42.64^{cc}	44.00^{Cc}
	10	38.22^{Db}	46.24^{Dc}	48.64^{Dd}	54.11^{Dd}	44.22^{Dc}	46.60^{Dc}	48.08^{Dd}

The same letters had no significant effect at the level 0.05 and the different letters had a significant effect at the level 0.05.

The data showed that the average of tyrosine and tryptophan content of all the treatments significantly increased with increasing the added amount of Na-caseinate or wheat germ used when fresh . This may be due to increasing the amount of protein content. The rate of increasing was when Na-caseinate was used because of its high content of total protein (89.27%) that in case of wheat germ (14.22%). The increase in the soluble tyrosine and soluble tryptophan content of stored yoghurt was significant in all the treatments, probably due to degradation of proteins by the microorganisms.These results are in agreement with Mehanna and Gonc (1988).

Nutritive value of concentrated yoghurt

Manufacture of concentrated yoghurt with ATB culture (*Acidophilus; thermophilus* and *bifidus*) which is rich with bifidobacteria and *lactobacillus acidophilus* in live form for gut implantation, so that, they become predominat organism to prevent colonization of putrefactive bacteria in the intestine. Abdel-Rafee (1998) and Misra & Kulla (1994) mentioned that, *Bifidobacteria* and *acidophilus* are most recent group of bacteria to be recognized as dietary adjuncts. Also, they found that *Bifidobacteria* a and acidophilus provide unfavorable conditions for

growth of potential enteropathogenic organisms, lower cholesterol level, synthesize thiamine, riboflavine, B6 and vitamin K, and also produce digestive enzymes-human casein phosphatase and lysozyme. Consuming fermented products containing these organisms allows the continuous passage of those organisms through the gut, thus minimizing or inhibiting colonization of the intestinal tract by invading pathogens.

Production of concentrated yoghurt fortified with Na-caseinate or wheat germ supplies the athletic people during training or sporting duration with the required energy which they need for caloric value about (1000 Kj) (WHO, 1991).

Using wheat germ in the manufacture of concentrated yoghurt which increased the dietary fiber which contains (0.92% fiber).

Dietary fiber is a generic term that includes plant constituents which are resistant to digestion in the human gastrointestinal tract (Kimura, 1977). Nutritional studies indicate that the dietary fiber can act as a bulking agent, increasing intestinal motility and the wet fecal mass (Mongeau & Brassard, 1984; Abdel-Magied *et al.*, 1985 and Okeda *et al.*, 1986).

Rheological properties

Table 4 shows the effect of using different levels of Na-caseinate or wheat germ on the change in syneresis and viscosity .

It is clear from the data that, syneresis of the concentrated yoghurt decreased with increasing the fortified ratio of Na-caseinate or wheat germ significantly. The amount of whey exuded or wheying off decreased from 18 ml for control to 12 ml and 14 ml when 1.5% Na-caseinate or wheat germ used, respectively for fresh samples, this may be due to increasing the total solids and the amount of protein content characterized with high water binding capacity (Peri *et al.*, 1995) Also, St. Gelais and Hache (1995) reported that synersis was significantly affected by the protein concentration added to milk.

Also, the data indicated that , storage period affected significantly the amount of whey exuded which decreased with increasing storage.

It is clear in these results that increasing the viscosity of the concentrated yoghurt fortified with different levels of Na-caseinate or wheat germ was affected significantly by the added ratio which increased with increasing the added amount, this effect may be attributed to the high protein content which gave high water holding capacity of the resultant yoghurt, which bound some free water and accordingly increase the yoghurt viscosity. The rate of viscosity increased with increasing the added ratio. It was higher in case of using Na-caseinate compared with using wheat germ. This may be attributed to its high protein content.

Also, the data showed that, the viscosity in all the treatments increased significantly with storage period which may be due to increasing the acidity which contributes to excess yoghurt viscosity. Tamime and Robinson (1999) and El-Kholy *et al.*, (2004) reported that, a high acidity led to excess viscosity may be due to the destabiliztiaon and precipitation of casein at low pH.

TABLE 4. Effect of using Na-caseinate and wheat germ with different ratio on syneresis and viscosity during storage period at 5°C.

Constituents	Storage period (day)	Control	Na-caseinate%			Wheat germ %		
			0.5	1.0	1.5	0.5	1.0	1.5
Syneresis (ml/100g)	Fresh	18^{d}	17^{d}	14^{c}	12^{c}	18^{d}	16^{d}	14^{c}
	3	16^{d}	15^{d}	13^{c}	10^{b}	17^{d}	16^{d}	13^{c}
	7	17^{c}	12.5^{c}	10^{b}	8^{b}	16^{d}	15^{d}	12^{c}
	10	11.5^{c}	10.5^{b}	8.0^{b}	4^{a}	14.5^{c}	14^{c}	10^{b}
Viscosity (CP/S)	Fresh	34.40^{a}	38.40^{a}	39.20^{ab}	41.10^{b}	34.50^{a}	35.42^{a}	36.50^{a}
	3	36.00^{a}	40.39^{b}	41.50^{b}	45.30^{c}	36.42^{a}	37.44^{a}	38.00^{ab}
	7	40.80^{b}	43.00^{b}	44.60^{c}	48.36^{cd}	41.63^{b}	42.12^{b}	44.18^{c}
	10	43.30^{b}	44.82^{c}	45.28^{c}	53.76^{d}	43.88^{bc}	44.68^{c}	47.08^{d}

The same letters had no significant effect at the level 0.05 and the different letters had a significant effect at the level 0.05.

Oragnoleptic properties

Table 5 shows the effect of using different levles of Na-caseinate or wheat germ on the change in organoleptic scorse.

Addition of different levels of Na-caseinate or wheat germ had no significant effect on concentrated yoghurt when fresh while had a significant effect when stored at the same age which may be due to the high developed acidity in case of using wheat germ because of its high content of carbohydrate compared with Na-caseinate.

Fortification with Na-caseinate (0.5% and 1.0%) had no significant effect on body and texture compared with control, while using 1.5% had a significant effect which decreased the obtained score because of its firm consistency . Using wheat germ had a significant effect on body and texture which decreased the scores with increasing the fortification level. Also, the storage period had no significant effect on body and texture of concentrated yoghurt made with different levels of Na-caseinate while using wheat germ had a significant effect during storage specially with using 1.0% and 1.5%. This may be due to the hydrolysis of carbohydrate.

As in body and texture the appearance was affected significantly and the same trend with using 1.0% and 1.5% wheat germ when fresh and during the storage period was observed.

The same table indicated that, the total scores of concentrated yoghurt were affected with using different levels of Na-caseinate or wheat germ. The highest score was obtained when 1.0% Na-caseinate when fresh or during the storage period at 5°C. Using 0.5% of wheat germ gave the highest score compared with 1.0% and 1.5% wheat germ when fresh or during storage.

TABLE 5. Effect of using Na-caseinate and wheat germ with different ratio on organoleptic properties during storage period at 5°C.

Constituents	Storage period (day)	Control	Na-caseinate%			Wheat germ %		
			0.5	1.0	1.5	0.5	1.0	1.5
Flavour (60)	Fresh	58^{Ad}	58^{Ad}	59^{Ad}	57^{Bd}	58^{Ad}	57^{Bd}	57^{Bd}
	3	58^{Ad}	58^{Ad}	59^{Ad}	57^{Bd}	59^{Ad}	57^{Bd}	54^{Cb}
	7	58^{Ad}	58^{Ad}	59^{Ad}	57^{Bd}	58^{Ad}	56^{Cc}	52^{Da}
	10	57^{Bd}	57^{Bd}	58^{Ad}	57^{Bd}	57^{ABd}	55^{DC}	50^{Da}
Body & texture (30)	Fresh	27^{Ad}	27^{Ad}	28^{Ad}	25^{Bc}	27^{Ad}	25^{Bc}	23^{Cb}
	3	27^{Ad}	27^{Ad}	28^{Ad}	25^{Bc}	27^{Ad}	25^{Bc}	23^{Cb}
	7	27^{Ad}	27^{Ad}	28^{Ad}	25^{Bc}	27^{Ad}	25^{Bc}	22^{Da}
	10	27^{Ad}	27^{Ad}	27^{Ad}	24^{Cb}	26^{Bc}	23^{Cb}	21^{Da}
Appearance (10)	Fresh	10^{Aa}	10^{Aa}	10^{Aa}	10^{Aa}	10^{Aa}	9^{Bab}	8^{Cb}
	3	10^{Aa}	10^{Aa}	10^{Aa}	10^{Aa}	10^{Aa}	9^{Bab}	7^{CDC}
	7	10^{Aa}	10^{Aa}	10^{Aa}	10^{Aa}	10^{Aa}	8^{Cb}	7^{CDc}
	10	10^{Aa}	10^{Aa}	10^{Aa}	10^{Aa}	10^{Aa}	8^{Cb}	6^{Dd}
Total (100)	Fresh	95^{Aab}	95^{Aab}	98^{Aa}	92^{Bb}	95^{Aab}	92^{Ab}	90^{Abc}
	3	95^{Aab}	95^{Aab}	98^{Aa}	92^{Bb}	96^{Aab}	92^{Ab}	87^{Bc}
	7	95^{Aab}	95^{Aab}	98^{Aa}	92^{Bd}	95^{Aab}	91^{Bbc}	84^{Cd}
	10	94^{Bab}	94^{Bab}	96^{Cab}	91^{Cbc}	93^{Cb}	88^{Cc}	81^{Dd}

The same letters had no significant effect at the level 0.05 and the different letters had a significant effect at the level 0.05

In conclusion it is possible to make concentrated yoghurt by using 1.0% Na-caseinate or 0.5% wheat germ, which gave a suitable product for athletic people during training or during sports time for its high nutrational value and provide them with the required energy.

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الزبادى لفئة الرياضيين

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تم صناعة الزبادى المركز الجاموسى وذلك بتركيز اللبن الجاموسى الكامل بالترشيح الدقيق وتدعيمه بـ ٠,٥%، ١%، ١,٥% بكلٍ من كازينات الصوديوم أو جنين حبة القمح وتم تصنيعه إلى زبادى ليكون ملائم لفئة الرياضيين حيث أن كل المنتجات السابقة أعطت الطاقة الحرارية المطلوبة للرياضيين سواء أثناء التدريبات أو أثناء الألعاب الرياضية وحصل الزبادى المركز المدعم بـ ١% كازينات صوديوم أو ٠,٥% جنين حبة القمح على أعلى درجات تحكيم من حيث الطعم والقوام والتركيب والمظهر ودرجات التحكيم الكلية. وتم استخدام بادئ ATB فى عمل هذه التجارب.