International Journal of Life Science and Agriculture Research

ISSN (Print): 2833-2091, ISSN (Online): 2833-2105

Volume 04 Issue 12 December 2025

DOI: https://doi.org/10.55677/ijlsar/V04I12Y2025-05

Impact Factor: 7.88 , Page No : 745-766

Effect of storage period on the physicochemical properties of Sudanese camel *(Camelus dromedarius*), milk set type yoghurt

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ABSTRACT

The present study was carried out in the laboratory of Dal Group for Food, Department of Quality & New product development (NPD), Khartoum, Sudan, to assess the effect of storage period on physicochemical properties of camel milk set type yoghurt (CMY). CMY was produced by adding skim milk powder and modified starch either individually or combined to fortified camel milk with 4% milk protein, 1% gum Arabic with or without stabilizer and stored for 30 days at refrigeration temperature. The physicochemical parameters included: (pH value, titratable acidity, viscosity, water holding capacity, total solids content, protein content, fat content, lactose content, glucose content and sucrose content) were measured at storage intervals of 0, 7, 14, 21, and 30 days. In order to assess the effect of addition of skim milk powder and modified starch on physicochemical properties of camel milk set type yoghurt during those storage periods. The results found that the total solid, protein content, titratable acidity, viscosity, water holding capacity of camel milk set-yoghurt samples with or without stabilizer as well as the control yoghurt were significantly ($P>0.05$) increased during storage period, while the pH values, fat content, lactose content, sucrose and glucose were significantly ($P>0.05$) decreased during those storage periods. The results indicated that, the highest ($P<0.05$) total solid, lactose, fat, glucose and titratable acidity was found in camel milk set yoghurt supplemented with 3% skim milk (SMP), while the yoghurt supplemented with 3% SMP+3% stabilizer had the highest ($P<0.05$) protein and sucrose content. The results showed that the control yoghurt had the highest pH value at the end of the storage period compared with other treatments. On the others hand, the camel milk set-yoghurts fortified with 2% starch +1% skim milk +3% stabilizer had the highest ($P<0.05$) viscosity and water holding capacity values in comparison with other treatments. The result also revealed that the combined used of skim milk with modified starch improved the physicochemical properties more than the used of starch only. Statistical analysis pointed out that there were no significant differences in physicochemical properties found between camel milk yoghurt with or without stabilizer addition during the storage period of the present study.

Published Online: December 18, 2025

KEYWORDS: camel milk yoghurt, physicochemical properties, storage period, skim milk powder, modified starch, water holding capacity

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INTRODUCTION

Storage is one of the most important parameters for yogurt production. The physical, chemical, and microbial changes can be determining the storage and shelf life of products (Mahendra et al., 2015). Knowledge of the behavior of yoghurt during long storage is important, because its shelf life is based on whether the products display any of the physical, chemical or sensory characteristics that are unacceptable for consumption. Therefore Mataragas *et al.* (2011) developed a methods to formulate a predictive model of yogurt spoilage concluded that shelf life cannot be established with microbial data alone, as one requires information of other parameters determined by sensory and physicochemical analyses. 1n general, the physiochemical attributes of yogurts are crucial aspects of the quality and overall sensory consumer acceptance of yoghurt during storage period. However, pH and acidity are undoubtedly important parameters in yoghurt processing due to their functional contribution in curd coagulation, ripening, and shelf life. Therefore, Acidity contributes to the flavour, stability, and safety of the yoghurt during its shelf life. Furthermore, Acidic pH greatly impacts foods shelf life and safety because it reduces spoilage and inhibits pathogens growth (Lund et al., 2020). The thickness and consistency of yoghurt are associated with the total solids content, protein type and concentration, and the pH level, as a lower pH increases the strength of the protein gel (Sah et al., 2016). Syneresis or whey separation is a crucial technological defect in fermented milk-based gels that provides liquid on the gel surface and consequently undesired sensory mouthfeel characteristics, which is not appealing to the consumer (El Bouchikhi et al., 2019). Gel rigidity and its water holding capacity are considered factors in determining yogurt's stability against syneresis (Gilbert et al., 2020). Also, viscosity is a crucial factor that affects the taste, texture, and nutritional value of foods. Factors influencing yoghurt texture and whey syneresis include total solids (TS) content, milk composition, homogenization, type of culture, acidity resulting from growth of bacterial cultures and heat treatment of milk (Harwalkar and Kalab, 1986). Storage, in turn, can generate changes in the acidification rate, pH, in the fraction of carbohydrates, organic acids, and oxygen, considering the temperature, time, water activity, and humidity rate (Moineau et al., 2019). Therefore, these changes affect the sensory properties of yogurt such as aroma, texture, and flavor, and influence the effectiveness of probiotic bacteria during its shelf life (Moineau-Jean et al., 2020).

Recently, the demand for dairy products is rapidly growing, among consumers in particular camel milk (CM) due to the high nutritional value and claimed medicinal properties of camel milk .In spite of he transformation of CM into processed dairy products is a challenging task and requires suitable technologies owing to multiple factors such as unique chemical composition, inherent functionality, presence of multicomponent colloidal system, size of protein micelles, size of fat globules and presence of antibacterial compounds (Arain et al., 2022). Therefore, the possible use of CM for the development of dairy products is dependent on physicochemical and techno-functional properties (Konuspayeva and Faye, 2021).Therefore, one of the most important step in the production of camel yoghurts is the increase of its total solids content by the addition of skim milk powder to optimize the viscosity and improve the body and texture (Omar *et al.,* 2019). Also, starch used in yoghurt to increase its viscosity, improve its mouth-feel, and prevent syneresis. Furthermore, starch granules imbibe water and swell to many times their original size, resulting in increased viscosity of the solution.

Moreso, gum Arabic is widely used as an emulsifier, stabilizer, and thickener due to its excellent emulsifying properties and ability to form stable colloidal suspensions (Sulieman, 2018). Also, GA uses as anti oxidant, anti-microbial, anti-coagulant, anti-inflammatory and shelf-life enhancer of food products (Patel and Goy, 2015). Therefore, incorporating gum Arabic into yogurt may enhance its antioxidant properties, antibacterial activity, and overall stability during storage. Studies of the changes in physicochemical properties during storage would enable producers to predict the shelf life of the product more accurately. Accordingly, the present study aimed to investigate the effects of storage period on physicochemical properties of camel milk set type yoghurt produced by using starter culture, gum Arabic, milk protein, skim milk powder and starch during a course of 30 days.

MATERIALS AND METHODS

Camel Milk: The fresh camel (*Camelus dromedarius*) milk was procred from the nomads in Buttana plains area. 30 liter of camel milk were collected in sterile containers immediately cooled to 4°C and kept at 4±1°C to preserve quality during transportation to the laboratory. The camel milk fortification was done by experiment incorporated four main ingredients were used to improve texture and sensory quality of set type yoghurt as follows:

Skim Milk Powder (Low Heat): Made in the Canada (Gaylea brand), the chemical composition as per manufacturers data were fat (0.8%), protein (32.4-36.7%), lactose (51%), ash (7.90%), moisture (4 %), pH in 10% solution (6.55- 6.80%) and total acidity (0.15% lactic acid %).Milk Protein and Whey Protein (Jogustab 51 HG 3033): made in Newzealand it was contained approximately 51.0% protein (N × 6.38), 2.0% milk fat, 39.0% lactose, 15.0% ash and 14.0% moisture according to the manufacturer' s data.

Food modified starch: Acetylated di- starch adipate (E1422), waxy maize basis, has 1.5-2.1% Acetyl viscosity and 13% loss on drying with about composition of 0.35% protein, 0.2% ash and pH4.5-2.1.

Gum Arabic (*Acacia senegal*): The used Gum Arabic have had a high emulsion capacity, 100 viscosity (25%w/v soln, cps), 4.5 pH , 95% complex carbohydrates, 2.61 % crude protein and >85 soluble dietary fiber. All these ingredients were obtained from Dal Food, Quality and New product development (NDP) Department, Khartoum, Sudan.

Stabilizer (BNILE YSYS1): This stabilizer was composed of milk protein, pectin (E440), Mono-and diglycerides of fatty acids (E471), sodium phosphate (E339) and standardized with sugar (sucrose/ or dextrose). It has 19% protein (Kjeledehl/ factor 6.25), 18% fat, 6.5% ash and 6.0% moisture according to the manufacturer's data.

Starter Culture: Thermophilic yoghurt culture name (YO-FLEX EXPRESS 3.0) composed of Streptococcus thermophilusand lactobacillus bulgaricus were used as starter cultures,obtained from Dal Food, Quality and NDP Department,Khartoum, Sudan.

Preparation and Manufactured of Camel MilkSet Type Yoghurt

A total of 60 litre of camel milk were preheated at 65°Cfor 30 minutes for pasteurization to preserve milk beforesupplementation or processing into yoghurt, and then camelmilk was fortified with 4 % w/v. Milk protein and wheyprotein (jogustab 51 HG 3033) and 1%) w/v) gum Arabic.Thus was increased the total solids of camel milk to 14 %, and then the mixture was divided into two parts:

Part 1: Homogenized at 160 bars with 3% stabilizer.

Part 2: Homogenized at 160 bars without stabilizer.

Sample from part 2 was taken and used as the control samples, then the mixture in both parts were divided into 5equal parts; The 1st t part was supplemented with only 3 %(w/v) modified starch (sch), the 2nd part was supplementedwith 2% Sch + 1% skim milk powder (SMP), the 3rd part was supplemented with 1.5% Sch + 1.5% SMP, the 4th part was supplemented with 1% Sch + 2% SMP and 5th part was supplemented with only 3 % (w/v) SMP. All samples in both treatments and the control was heated to 90°C for 5 minutes for pasteurization, then cooled to reduce the temperature to 43°C, when the temperature reached 43°C the mixture was inoculated with 2% of commercial yoghurt culture and packed into plastic cups (200g capacity) in 50 replicates for each treatment. Then the inoculated camel milk was incubated at 42°C until a pH of 4.6 was attained in approximately 13-14 h (the pH end point). When the pH end point was achieved, the yoghurts were cooled at 5°C and stored at the same temperature during all periods of post-acidification prior to analysis.

Physicochemical analysis: To study the effect of storage periods on the physicochemical properties of camel milk set type yoghurt samples were subject to physicochemical analysis viz fat, protein, total solids (TS), lactose, pH, titratable acidity, water holding capacity and viscosity for intervals of 0, 7, 14, 21, and 30 days .

Determination of fat, protein, total solids and lactose: Fat, protein, total solids and lactose were measured by Foodscan TM, FOSS Analytical A/S69, Slangeruggade and DK3400 Hillerod Denmark.

Determination of pH: The pH was determined at room temperature (27C)and was calibrated with buffer standards of ph 4and ph 10 prior to use was used. Therefore, the probe of ph meter was inserted in the cup of set type yoghurt samples and pH value was recorded.

Determination of titratable acidity: The acidity of samples was measured by titral meter. Therefore, ten ml of each sample was placed in white porcelain dish and 30 ml of distilled water were added. The probe of titral – meter was inserted in the white porcelain dish and titration figure was recorded. To get the percentage of lactic acid (1ml of 0.1 sodium hydroxide (NaOH) 0.009 grams of lactic acid) was calculated by titration figure × 0.009.

Determination of water holding capacity The water holding capacity (WHC) of camel milk set type yoghurt was measured by centrifugation of five grams yoghurt sample at 4500 rpm for 30 minutes at 10°C (Jouan, MR1822, France). The WHC was calculated as follows: WHC (%) = (1-W1/W2) × 100 where: W1 = weight of whey after centrifugation, W2 = yoghurt sample weight (Isanga and Zhang, 2009).

Determination of viscosity: Viscosity of samples was determined at sample temperature of 5 °C using Viscometer and spindle number LV 4. The spindle was rotated at 20 rpm. The readings were recorded at the 15th second of the measurement period as centipoises (cP) as described by Ranadheera *et al.* (2012). After every sample studied, the spindle was carefully rinsed with water and wiped out gently before next use.

Statistical analysis: The data obtained were analyzed using Statistical Package for Social Science (SPSS program version 20). Duncan's multiple range tests was used for meanseparation between the treatments at ($p \leq 0.05$) level. Regression analysis was also used to describe the relations between the observed increases or decreases in the parameters in accordance to the intervals of the studied period.

RESULTS AND DISCUSSION

Effect of storage period on the chemical properties of camel milk set type yoghurt with or without stabilizer:

Protein content: The results indicated that the mean protein content of camel milk set yoghurt samples was affected by storage period,there was significant($p > 0.05$) difference between various storage period in most camel milk yoghurt samples **(**table1). However, camel milk set yoghurt sample without stabilizer was gradually increased according to progress of storage period. While that of camel milk set yoghurt samples without stabilizer was increased until 21 days, after which decreased, whereas the protein content of control yoghurt was increased until 14 days, after which decreased. These findings were in agreement with Ibrahim (2015) who found that the protein of camel milk set yoghurt increased with the progress of storage period and disagree with Kavas *et al.* (2016) who found the reduction in the protein during the course storage period. Also, Results were similar to those found by Hattem and Jerro (2020) who found that the protein percentage increased in all yoghurt treatments during storage, moreover, the highest increases in protein content of camel milk yoghurt produced without stabilizer was observed by sample $Y_{1.5sch+1.5\%smp(a)}$ (0.028)/day, while the lowest (0.013)/day was found in $Y_{3\% SMP(a)}$ $Y_{3\%Sch(a))}$, $Y_{2\%sch+1\%smp(a)}$ and $Y_{1\%sch+2\%smp(a)}$ were increased with same level of (0.015)/day . In addition to samples $Y_{3\%Sch(a)}$ and $Y_{1.5sch+1.5\%smp(a)}$ which displayed great homogeneity (R^2=0.95) in their increase during storage period followed by $Y_{1\%sch+2\%smp(a)}$ (0.94), $Y_{3\%Sch(a)}$ (0.84) and lastly $Y_{3\% SMP(a)}$ (0.79). On other hands the highest increases in protein content of camel milk yoghurt produced with stabilizer was found in $Y_{3\%Sch(b)}$, while other samples was obtained lowest increases, therefore, $Y_{3\%Sch(b)}$ were displayed bitter homogeneity (R^2=0.63) in their increase during the test period, while the others samples were displayed unhomogeneity.

1n general the protein content increases in camel milk yoghurt samples produced with stabilizer were found to be higher than the increases in camel milk yoghurt sample produced without stabilizer.

In conclusion the increases of protein content shown to be associated with combined use of starch and SMP, that may be attributed to the interactions between gum Arabic and modified starch contributed to absorb water.. The result is similar to the reported by Elawad *et al.,* (2021) who reported that the, addition of gum Arabic resulted in slightly increase in protein content during the storage periods.

Table (1) Effect of storage period on the protein contents of camel milk set yoghurt with or with out stabilizer:

Characteristic	Storage time	Control	Treatment(A) $Y_{3\%Sch(a))}$	$Y_{2\%sch+1\%smp(a)}$	$Y_{1.5sch+1.5\%smp(a)}$	$Y_{1\%sch+2\%smp(a)}$	$Y_{3\%\ SMP(a)}$	Treatment(B) $Y_{3\%Sch(b)}$	$Y_{2\%sch+1\%smp(b)}$	$Y_{1.5sch+1.5\%smp(b)}$	$Y_{1\%sch+2\%smp(b)}$	$Y_{3\%\ SMP(b)}$	
Protein %	0 time	$(3.22)^{d}$ ±.045	$(3.35)^{e}$ ±.036	$(3.63)^{c}$ ±.130	$(4.15)^{d}$ ±.055	$(4.46)^{d}$ ±.020	$(4.56)^{c}$ ±.035	$(3.48)^{d}$ ±.01	$(4.09)^{c}$ ±.05	$(4.21)^{b}$ ±15	$(4.49)^{b}$ ±.01b	$(4.51)^{c}$ ±.05	$(4.02)^{e}$ ±0.11
	7days	$(3.39)^{b}$ ±.02	$(3.52)^{d}$ ±.02	$(3.65)^{c}$ ±.072	$(4.23)^{d}$ ±.030	$(4.57)^{c}$ ±.015	$(4.70)^{b}$ ±.010	$(3.60)^{c}$ ±.01	$(4.21)^{b}$ ±.08	$(4.60)^{a}$ ±.011	$(4.81)^{a}$ ±.23	$(5.14)^{b}$ ±.04	$(4.23)^{d}$ ±0.11
	14days	$(3.57)^{a}$ ±.01	$(3.64)^{c}$ ±.030	$(3.76)^{c}$ ±.025	$(4.43)^{c}$ ±.091	$(4.71)^{b}$ ±.075	$(4.79)^{b}$ ±.175	$(3.94)^{a}$ ±.00	$(4.44)^{a}$ ±.03	$(4.56)^{a}$ ±.06	$(4.94)^{a}$ ±.01	$(5.25)^{a}$ ±.015	$(4.37)^{c}$ ±0.11
	21days	$(3.39)^{b}$ ±.03	$(3.74)^{b}$ ±.02	$(4.63)^{b}$ ±.035	$(4.73)^{b}$ ±.035	$(4.75)^{b}$ ±.025	$(4.83)^{b}$ ±.020	$(3.95)^{a}$ ±.02	$(4.46)^{a}$ ±.05	$(4.62)^{a}$ ±.010	$(4.95)^{a}$ ±.01	$(5.27)^{a}$ ±005	$(4.49)^{a}$ ±0.11
	30days	$(3.33)^{c}$ ±.01	$(3.81)^{a}$ ±.00	$(4.85)^{a}$ ±.040	$(4.92)^{a}$ ±.035	$(4.93)^{a}$ ±.035	$(4.98)^{a}$ ±.010	$(3.87)^{b}$ ±.05	$(4.07)^{c}$ ±.06	$(4.23)^{b}$ ±.08	$(4.43)^{b}$ ±.06	$(5.16)^{b}$ ±.01	$(4.42)^{b}$ ±0.11
	Regression analysis												
	R Square	0.052	0.95	0.95	0.84	0.94	0.79	0.63	0.014	0.000	0.001	0.470	0.40
	Intercept	3.35	3.40	4.1	3.40	4.47	4.59	3.557	4.23	4.449	4.74	4.81	3.621
	X-coeff.	0.003	0.015	0.028	0.015	0.015	0.013	.015	.002	-.028	-.001	0.002	.114
Protein	**SE-Y**	0.053	.018	.032	.018	.019	.033	.056	.083	.092	.114	.097	.074
	SE-X	0.003	.001	.002	.001	.001	.002	.003	.005	.005	.006	.005	.011

Mean (±SE). a,b,c Values in the same row having different superscripts differ significantly ($p < 0.05$).
Treatment A=camel milk yoghurt processed without stabilizer
Treatment B= camel milk yoghurt processed with stabilizer
$Y_{3\%Sch=}$-camel milk yoghurt prossea wih 3% starch, $Y_{2\%sch+1\%smp=}$ camel milk yoghurt prossea wih 2%starch+1%skim milk, $Y_{1.5sch+1.5\%smp(=}$camel milk yoghurt prossea wih 1,5%starch+1.5%skim milk, $Y_{1\%sch+2\%sm=}$ camel milk yoghurt prossea wih 1%starch+2%skim milk and $Y_{3\%\ SMP=}$ camel milk yoghurt prossea wih 3%skim milk
R^2 =the correlation coefficient; which reflects the status of homogeneity, intercept= the expected value corresponding to day zero, x-coefficient= the constant rate of decrease or increase/day
(SE-X) the standard error in X variable
(SE-Y) the standard error in Y varia

Total solid content: The results indicated that the mean total solids content of camel milk set yoghurt samples was affected by storage period,t here was significant($p > 0.05$) difference between various storage period in most camel milk yoghurt samples(table 2). However, the means of total solids contents of camel milk set-yoghurt samples with or without stabilizer was gradually increased with increasing storage period as compared with the control samples, which was increased until 14 days, after which they decreased. These results were in line with Ibrahim (2015) who found that the total solids contents of camel milk set yoghurt increased with the progress of storage period, which may be due to loss of moisture and that was refer to water-absorbing capacities of gum Arabic. The results were in agreement with Abdalrhman (2018). Furthermore, the highest initial totol solid (17.22) was found in $Y_{3\%\ SMP(a)}$ while the lowest (14.17) was found in control the yoghurt samples . However, at the end period $Y_{3\%\ SMP(a)}$ and $Y_{1\%sch+2\%smp(a)}$ had the highest totol solid values 19.47 and 19.20, respectively, while the control yoghurt samples observed the lowest (15.17). In addition to the highest total solid increases in camel milk yoghurt without stabilizer was obtained by $Y_{1\%sch+2\%smp(a)}$ (0.085) followed by $Y_{3\%\ SMP(a)}$ (0.078), , $Y_{2\%sch+1\%smp(a)}$ (0.075), $Y_{1.5sch+1.5\%smp(a)}$ (0.072) amd lastly $Y_{3\%Sch(a)}$ (0.033). on other hand samples $Y_{3\%Sch(a)}$ was displayed great homogeneity (R^2=0.97) in their increase during the test period followed by $Y_{2\%sch+1\%smp(a)}$ (0.94),$Y_{3\%\ SMP(a)}$(0.91),$Y_{1.5sch+1.5\%smp(a)}$(0.90)and lastly $Y_{1\%sch+2\%smp(a)}$$Y_{3\%\ SMP(a)}$ (0.85) .Moreover, the highest total solids increases content was obtained by $Y_{3\%\ SMP(b)}$ (19.04), $Y_{1\%sch+2\%smp(b)}$ (18.01), $Y_{1.5sch+1.5\%smp(b)}$ (17.84), $Y_{2\%sch+1\%smp(b)}$ (17.22) and finally $Y_{3\%Sch(b)}$ (17.11). In spite of the highest amount of increase in total solids content in camel milk set yoghurt with stabilizer was determined in $Y_{3\%\ SMP(b)}$ (0.070) followed by $Y_{1\%sch+2\%smp(b)}$ (0.066) and $Y_{2\%sch+1\%smp(b)}$ (0.049), while, $Y_{3\%Sch(b)}$ and $Y_{1.5sch+1.5\%smp(b}$ were shown the lowest(0.044).

Additionlly, the sample $Y_{2\%sch+1\%smp(b)}$ displayed great homogeneity (R^2=0.88) in their increase during the studied period followed by $Y_{3\%Sch(b)}$ (0.78), $Y_{1\%sch+2\%smp(b)}$ (0.73), $Y_{3\%\ SMP(b)}$ (0.70) and lastly $Y_{1.5sch+1.5\%smp(b)}$ (0.58). In general camel milk yoghurt samples without stabilizer exhibited the highest increase in total solids than yoghurt samples with stabilizer; that may be due to lipolytic effect of yoghurt cultures. According to EI-Salam *et al.* (1996) who reported that the type of stabilizer had no effect on the development of acidity and the trends of total solids during the course of yoghurt storage.

Table (2) Effect of storage period on the total solids contents of camel milk set type yoghurt with or with out stabilizer:

Characteristic	Storage time	Control	Treatment(A)					Treatment(B)					Mean effect
			$Y_{3\%Sch(a))}$	$Y_{2\%sch+1\%smp(a)}$	$Y_{1.5sch+1.5\%smp(a)}$	$Y_{1\%sch+2\%smp(a)}$	$Y_{3\% SMP(a)}$	$Y_{3\%Sch(b)}$	$Y_{2\%sch+1\%smp(b)}$	$Y_{1.5sch+1.5\%smp(b)}$	$Y_{1\%sch+2\%smp(b)}$	$Y_{3\% SMP(b)}$	
Total solids %	0 time	(14.16)^{c}±.020	(15.80)^{e}±.03	(16.27)^{d}±.02	(16.64)^{d}±.03	(16.91)^{c}±.000	(17.22)^{d}±.21	(15.58)^{d}±220	(15.82)^{d}±.16	(16.45)^{c}±.20	(16.76)^{e}±.03	(15.76)^{d} ±.16	(16.13)^{e} ±..080
	7days	(15.41)^{a}±.02	(16.72)^{d}±.01	(17.26)^{c}±.050	(17.64)^{c}±.030	(17.06)^{b}±.54	(17.85)^{c}± 030	(16.13)^{c}±.035	(16.32)^{c}±.02	(16.61)^{c}±.015	(16.84)^{d}±.05	(17.72)^{c} ±.000	(16.85)^{d} ±..080
	14days	(15.27)^{ab}±.17	(16.88)^{c}±061	(17.24)^{c}±.085	(17.59)^{c}±.345	(18.49)^{ab}±.03	(18.50)^{b}±.03	(16.24)^{c}±.035	(16.44)^{b}±.01	(16.44)^{c}±.115	(17.06)^{c} ±.040	(17.83)^{c} ±.145	(17.09)^{c} ±..080
	21days	(15.17)^{b}±175	(17.75)^{b}±.01	(17.83)^{b}±.03	(18.45)^{b}±150	(18.77)^{a}±.09	(19.16)^{a}±.02	{16.63)^{b}±.02	(16.67)^{b}±.07	(17.01)^{b}±.015	(17.38)^{b}±.02	(18.29)^{b} ±.06	(17.56)^{b} ±..080
	30days	(15.17)^{b}±.01	(18.29)^{a}±.00	(18.73)^{a} ±.02	(18.91)^{a}±.10	(19.20)^{a}±.00	(19.47)^{a}±591	(17.11)^{a}±.01	(17.22)^{a}±.01	(17.84)^{a}±.030	(18.01)^{a}± .01	(19.04)^{a} ±.02	(18.15)^{a} ±..080
							Regression analysis						
	R Square	.581	.97	.94	.90	.852	.91	.78	.88	.58	.73	.70	0.37
	Intercept	14.56	14.56	16.393	16.809	16.848	17.320	15.75	15.741	16.238	16.071	16.930	15.763
	X-coeff.	.033	.033	.075	.072	.085	.078	.044	.049	.044	.066	.070	.078
Total solids	**SE-Y**	.140	.073	.095	.117	.176	.126	.044	.076	.126	.091	.082	.187
	SE-X	.008	.004	.005	.007	.010	.007	.002	.004	.007	.005	.005	.023

Mean (±SE). a,b,c Values in the same row having different superscripts differ significantly ($p < 0.05$).
Treatment A=camel milk yoghurt processed without stabilizer
Treatment B= camel milk yoghurt processed with stabilizer
$Y_{3\%Sch=}$-camel milk yoghurt prossea wih 3%starch, $Y_{2\%sch+1\%smp=}$ camel milk yoghurt prossea wih 2%starch+1%skim milk, $Y_{1.5sch+1.5\%smp(=}$camel milk yoghurt prossea wih 1,5%starch+1.5%skim milk, $Y_{1\%sch+2\%sm=}$ camel milk yoghurt prossea wih 1%starch+2%skim milk and $Y_{3\% SMP=}$ camel milk yoghurt prossea wih 3%skim milk
R^2 =the correlation coefficient; which reflects the status of homogeneity, intercept= the expected value corresponding to day zero, x-coefficient= the constant rate of decrease or increase/day
(SE-X) the standard error in X variable
(SE-Y) the standard error in Y variable

Fat contents: The results indicated that the fat contents of all camel milk set -yoghurt samples decreased with increasing storage period (table 3). These results contracted with (Elawad *et al.,* 2021; Abdalrhman, 2018). That may be due to lipolysis in yoghurt and /or lipase activity of lactic acid bacteria or antioxidant properties of gum Arabic roles in the metabolism of lipids (Tiss et al., 2001).

The decrease of fat content was affect by the fortification type and level of the ingredients, therefore, fat contents in the control samples decreased to (3.16) after 30 days with a constant rate of decrease (0.01/day).

It was displayed homogeneity (R^2=0.70) in their decrease during the test period as compared to others yoghurt samples. In treatment(B) $Y_{2\%sch+1\%smp(b)}$ and $Y_{1.5sch+1.5\%smp(b)}$ highest value(3.45) of fat content was absorved followed by $Y_{1\%sch+2\%smp(b)}$ (3.42), $Y_{3\%\ SMP(b)}$,(3.38) and lastly $Y_{3\%Sch(b)}$ (3.24). However, the highest amount of decrease in fat content was found in $Y_{3\%\ SMP(b)}$ (-0.011) followed by $Y_{1\%sch+2\%smp(b)}$ (-0.009), $Y_{2\%sch+1\%smp(b)}$ (-0.007), $Y_{3\%Sch(b)}$ (-0.006) and lastly $Y_{1.5sch+1.5\%smp(b)}$ (-0.005). Therefore, the highest decreases in fat contnets in $Y_{3\%\ SMP(a)}$ and $Y_{3\%\ SMP(b)}$ may be justified by the high count of lactic acid bacteria in the yoghurt samples. Moreover, these results indicated that the highest decrease of fat content in yoghurt sample was related to ratio of skim milk powder, therefore camel yoghurt fortified with 3% starch in both treatments were obtained the lowest decreases in fat content during storage period, that maybe due to low fat content in the samples. Using fat replacers viz modified starch was another effort to reduce fat content in yoghurt. Castilla *et al.* (2003), generally, the level of fat reduction was found to be higher in camel milk yoghurt with stabilizer than yoghurt without stabilizer that may be due to interactions between gum Arabic and stabilizers.

Lactose contents: Lactose levels decreased in all camel milk set type yoghurt samples from zero time to the end of the storage period (table 4). These results were in agreement with Kavas *et al.* (2016) who found that the lactose contents of camel milk set yoghurt decreased with the progress of the storage period. Also the result is similar to the reported by (Elawad *et al.,* 2021; Abdalrhman, 2018).

Table (3) Effect of storage period on the fat contents of camel milk set yoghurt with or with out stabilizer:

Characteristic	Storage time	Treatment(A)						Treatment(B)					Mean effect
		Control	$Y_{3\%Sch(a))}$	$Y_{2\%sch+1\%smp(a)}$	$Y_{1.5sch+1.5\%smp(a)}$	$Y_{1\%sch+2\%smp(a)}$	$Y_{3\% SMP(a)}$	$Y_{3\%Sch(b)}$	$Y_{2\%sch+1\%smp(b)}$	$Y_{1.5sch+1.5\%smp(b)}$	$Y_{1\%sch+2\%smp(b)}$	$Y_{3\% SMP(b)}$	
Fat contents %	0 time	$(3.27)^a \pm .015$	$(3.29)^a \pm .025$	$(3.45)^a \pm .040$	$(3.49)^a \pm .005$	$(3.49)^a \pm .020$	$(3.64)^a \pm .035$	$(3.42)^a \pm .025$	$(3.55)^a \pm .005$	$(3.53)^a \pm .032$	$(3.57)^a \pm .015$	$(3.52)^a \pm .135$	$(3.46)^a \pm .007$
	7days	$(3.24)^a \pm .02$	$(3.14)^b \pm .100$	$(3.42)^a \pm .050$	$(3.46)^b \pm .015$	$(3.48)^a \pm .020$	$(3.51)^b \pm .010$	$(3.32)^b \pm .025$	$(3.42)^b \pm .020$	$(3.54)^a \pm .010$	$(3.51)^{ab} \pm .10$	$(3.57)^a \pm .025$	$(3.39)^b \pm .007$
	14days	$(3.23)^a \pm .035$	$(3.06)^b \pm .005$	$(3.37)^a \pm .015$	$(3.44)^b \pm .015$	$(3.43)^b \pm .020$	$(3.47)^b \pm .005$	$(3.32)^b \pm .052$	$(3.46)^b \pm .010$	$(3.50)^a \pm .010$	$(3.46)^b \pm .01$	$(3.38)^b \pm .015$	$(3.32)^c \pm .007$
	21days	$(3.23)^a \pm .026$	$(3.06)^b \pm .010$	$(3.29)^a \pm .170$	$(3.44)^b \pm .015$	$(3.40)^b \pm .005$	$(3.38)^c \pm .000$	$(3.23)^c \pm .049$	$(3.46)^b \pm .040$	$(3.49)^a \pm .030$	$(3.43)^b \pm .015$	$(3.39)^b \pm .01$	$(3.27)^d \pm .007$
	30days	$(3.16)^b \pm .050$	$(3.01)^b \pm .010$	$(3.19)^a \pm .112$	$(3.29)^c \pm .010$	$(3.42)^b \pm .025$	$(3.34)^c \pm .041$	$(3.24)^c \pm .017$	$(3.45)^b \pm .030$	$(3.45)^a \pm .030$	$(3.42)^b \pm .020$	$(3.38)^b \pm .010$	$(3.25)^d \pm .007$
						Regression analysis							
	R Square	.70	.76	.90	.89	.82	.86	.88	.85	.71	.46	.87	0.23
	Intercept	3.270	3.195	3.195	3.401	3.468	3.436	3.467	3.508	3.546	3.604	3.650	3.440
	X-coeff.	-0.01	-.003	-.003	-.008	-.006	-.009	-.006	-.007	-.005	-.009	-.011	-.007
Fat contents	**SE-Y**	.018	.015	.010	.022	.015	.027	.015	.019	.010	.012	.013	.018
	SE-X	.001	.001	.001	.001	.001	.002	.001	.001	.001	.001	.001	.001

Mean (±SE). a,b,c Values in the same row having different superscripts differ significantly ($p < 0.05$).

Treatment A=camel milk yoghurt processed without stabilizer

Treatment B= camel milk yoghurt processed with stabilizer

$Y_{3\%Sch=}$camel milk yoghurt prossea wih 3%starch, $Y_{2\%sch+1\%smp=}$ camel milk yoghurt prossea wih 2%starch+1%skim milk, $Y_{1.5sch+1.5\%smp(=}$camel milk yoghurt prossea wih 1,5%starch+1.5%skim milk, $Y_{1\%sch+2\%sm=}$ camel milk yoghurt prossea wih 1%starch+2%skim milk and $Y_{3\% SMP=}$ camel milk yoghurt prossea wih 3%skim milk

R^2 =the correlation coefficient; which reflects the status of homogeneity, intercept= the expected value corresponding to day zero, x-coefficient= the constant rate of decrease or increase/day

(SE-X) the standard error in X variable

(SE-Y) the standard error in Y variable

Furthermore, the decrease levels of lactose content during storage period were affected by the fortification type and level of the ingredients which added. Therefore in the control samples lactose level decreased to 2.84 at end of the storage period with consistant rate of decrease (0.048) and it was displayed great homogeneity(R2=0.83) in their decrease during the studied period. The lowest value of lactose obtained in the control when compared with treatment (A) and (B) that was associated with the low lactose content in the composition of milk protien (39%) and addition of gum Arabic which may lead to lactose reduction. In treatment (A) the highest value of lactose at the end storage period was recorded in $Y_{3\%\ SMP(a)}$ (4.23) followed by $Y_{1.5sch+1.5\%smp(a)}$ (4.14) , $Y_{1\%sch+2\%smp(a)}$ (3.29) $Y_{2\%sch+1\%smp}$ (3.14) and $Y_{3\%Sch(a)}$ (3.03). Inspite of the highest amount of decrease in lactose content was determined in $Y_{2\%sch+1\%smp(a)}$ (0.048) followed by $Y_{3\%Sch(a)}$ (0.045), $Y_{1\%sch+2\%smp(a)}$ (0.042), $Y_{3\%\ SMP(a)}$ (0.022) and finally $Y_{1.5sch+1.5\%smp(a)}$ (0.016). The effect of storage period in lactose values was found to be significant (P>0.05). The decrease in lactose content in Y2%sch+1%smp(a) and Y3%Sch(a) was considered to be related to the combined use of starch and SMP, that may be due to the increase in sugar concentration within the milk and /or the hydrolysis of starch during fermentation affect the acidity. Increases in acidity led to decrease in lactose content during storage period. Kavas et *al.* (2016) studied produced yoghurt from camel's milk with the addion of 9% (w/v) skim milk powder (SMP), 9% (w/v) native rice flour and 4.5% (w/v) SMP+4.5% (w/v) NRF mixture found that lactose contents of camel milk set yoghurt decreased with the progress of storage period, therefore T9%NRF had higher decrease in lactose contents than T9% SMP andT4.5% SMP+4.5% NRF,that may also related to the starch content of the rice flour. Whereas, The highest value of lactose content at the end of the storage period in treatment(B) was observed in Y1% sch+2% smp(b) (4.20) followed by Y2% sch+1% smp(b) (4.15), Y1.5sch+1.5% smp(b) (3.74), Y 3% SMP(b) (3.65) and lastly Y3% Sch (b) (3.53). Additionly the highest rate of reduction in lactose was determined in Y3% smp(b) (0.040) Y1.5sch+1.5% smp(b) (0.027), Y1% sch+2% smp (b) (0.017), Y2% sch+1% smp (b) (0.009) and finally Y 3% Sch(b) (0.012) The high level reduction in lactose and protein contents in Y3% SMP(b) was considered to be related with the interaction between SMP, sugar (sucrose/or dextrose) and milk protien in the stabilizer composition,which associated with the high rate of lactic acid content in the Y3% SMP(b). Moreever, the camel milk yoghurt samples with stabilizer exhibited the lowest decrease in lactose content than yoghurt samples without stabilizer; that may be related to high fat conten in yoghurt sample with stabilizer. Acordding to Median *et al.* (2007) the increase in milk fat content influences the growth and activity of starter cultures. The decreasing trends of lactose in camel milk yogurt are attributed to its conversion by LAB into product formation. The results are in accordance with the findings of Khaliq *et al*. (2022).

Effect of storage period on the glucose and sucrose content of camel milk set yoghurt samples with or without stabilizers:

Glucose contents: The results indicated that the glucose content means of camel milk yoghurt with or without stabilizer as well as the control was gradually decreased with the progress of the storage period (table 5).The effect of storage period on the changes in glucose values was found to be significant (P>0.05) between most camel milk yoghurt samples. However, the highest glucose content mean (0.52) was observed at the beginning of the storage period, while the lowest (0.24) was found at the end the storage period. Furthermore, the highest initial glucose was found in $Y_{3\%\ SMP(a)}$ and $Y_{3\%\ SMP(b)}$, while the lowest (0.37) was found in $Y_{2\%sch+1\%smp(b)}$. Whereas, at the end of the storage period the highest glucose (0.37) was obtained by $Y_{3\%Sch(b)}$ the lowest glucose(0.10) was observed by control yoghurt. Morever, camel milk set yoghurt samples with stabilizer and control were displayed great homogeneity with range of (R^2=0.92-0.99) in their glucose reduction during the experimental period. Whereas, camel milk set yoghurt samples without stabilizer displayed great homogeneity in range of (R^2= 0.80- 0.96) in their glucose reduction except $Y1_{\%sch+2\%smp(a)}$, displayed lowest homogeneity (R^2=0.60). In addition the highest decreases in glucose content for camel milk yoghurt produced without stabilizer was found in sample $Y_{3\%\ SMP(a)}$ (-0.013). , while the lowest was found in $Y_{1.5sch+1.5\%smp(a)}$ (- 0.009).. Whereas, for camel yoghurt produced with stabilizer sample $Y_{3\%\ SMP(b)}$ had the highest reduction(-0.011), while the lowest (-0.005) was obtained by $Y_{2\%sch+1\%smp(b)}$ and $Y_{3\%Sch\ (b)}$. In general the resuls indicated that camel milk yoghurt samples produced without stabilizer had the higher reduction in glucose content than that produced with stabilizer. However, the higher decreases were found in $_{Y3\%\ SMP(a)}$ and $Y_{3\%\ SMP(b)}$ could be justified by the high count of lactic acid bacteria in sample.

Table (4) Effect of storage period on the lactose contents of camel milk set yoghurt with or with out stabilizer:

Characteristic	Storage time	Treatment(A) Control	$Y_{3\%Sch(a))}$	effect $Y_{2\%sch+1\%smp(a)}$	$Y_{1.5sch+1.5\%smp(a)}$	$Y_{1\%sch+2\%smp(a)}$	$Y_{3\% SMP(a)}$	Treatment(B) $Y_{3\%Sch(b)}$	$Y_{2\%sch+1\%smp(b)}$	$Y_{1.5sch+1.5\%smp(b)}$	$Y_{1\%sch+2\%smp(b)}$	$Y_{3\% SMP(b)}$	Mean
	0 time	$(4.35)^{a}\pm.010$	$(4.43)^{a}\pm.00$	$(4.47)^{a}\pm .01$	$(4.55)^{a}\pm .01$	$(4.68)^{a}\pm.0040$	$(4.91)^{a}\pm.000$	$(3.91)^{a}\pm.010$	$(4.47)^{a}\pm.000$	$(4.59)^{a}\pm.010$	$(4.70)^{a}\pm.060$	$(4.88)^{a}\pm.030$	$(4.54)^{a}\pm.050$
	7days	$(3.78)^{b}\pm.100$	$(4.17)^{b}\pm.13$	$(4.44)^{b}\pm .02$	$(4.42)^{a}\pm .040$	$(4.49)^{b}\pm.010$	$(4.58)^{b}\pm.100$	$(3.78)^{b}\pm.020$	$(4.44)^{a}\pm.040$	$(4.50)^{a}\pm.020$	$(4.58)^{b}\pm.020$	$(4.59)^{a}\pm.050$	$(4.34)^{b}\pm.050$
Lactose contents%	14days	$(3.75)^{b}\pm.030$	$(4.00)^{c}\pm.02$	$(3.71)^{c}\pm .01$	$(4.39)^{ab}\pm.010$	$(4.38)^{c}\pm.020$	$(4.36)^{c}\pm.020$	$(3.69)^{c}\pm.100$	$(4.49)^{a}\pm.010$	$(4.47)^{a}\pm.000$	$(4.36)^{c}\pm.080$	$(4.35)^{a}\pm.990$	$(4.18)^{c}\pm.050$
	21days	$(3.17)^{c}\pm.110$	$(3.64)^{d}\pm.10$	$(3.46)^{d}\pm .005$	$(3.97)^{b}\pm.571$	$(4.18)^{d}\pm .020$	$(4.17)^{d}\pm050$	$(3.65)^{c}\pm.010$	$(4.39)^{a}\pm.070$	$(4.38)^{a}\pm.020$	$(4.23)^{d}\pm.030$	$(4.05)^{a}\pm.030$	$(4.03)^{d}\pm.050$
	30days	$(2.84)^{d}\pm.005$	$(3.03)^{e}\pm.010$	$(3.14)^{e}\pm .011$	$(4.14)^{ab}\pm.020$	$(3.29)^{e}\pm.070$	$(4.23)^{d}\pm.011$	$(3.53)^{d}\pm.110$	$(4.15)^{b}\pm.030$	$(3.74)^{b}\pm.577$	$(4.20)^{d}\pm.020$	$(3.65)^{a}\pm.050$	$(3.63)^{e}\pm.050$
							Regression analysis						
	R Square	.94	.94	.93	.35	.85	.800	.000	.63	.51	.89	.58	0.37
lactose contents	**Intercept**	4.138	4.325	4.450	4.295	4.601	4.549	3.839	4.292	4.488	4.487	4.713	4.562
	X-coeff.	-.048	-.045	-.048	-.016	-.042	-.022	.000	-.009	-.024	-.017	-.040	-.029
	SE-Y	.104	.141	.135	.223	.178	.241	.211	.190	.200	.183	.155	.052
	SE-X	.006	.008	.008	.013	.010	.014	.012	.011	.011	.010	.009	.003

Mean (±SE). a,b,c Values in the same row having different superscripts differ significantly ($p < 0.05$).
Treatment A=camel milk yoghurt processed without stabilizer used
Treatment B= camel milk yoghurt processed with stabilizer used
$\mathbf{Y_{3\%Sch=}}$-camel milk yoghurt prossea wih 3%starch, $\mathbf{Y_{2\%sch+1\%smp=}}$ camel milk yoghurt prossea wih 2%starch+1%skim milk, $\mathbf{Y_{1.5sch+1.5\%smp(=}}$camel milk yoghurt prossea wih 1,5%starch+1.5%skim milk, $\mathbf{Y_{1\%sch+2\%sm=}}$ camel milk yoghurt prossea wih 1%starch+2%skim milk and $\mathbf{Y_{3\% SMP=}}$ camel milk yoghurt prossea wih 3%skim milk
R^2 =the correlation coefficient; which reflects the status of homogeneity, intercept= the expected value corresponding to day zero, x-coefficient= the constant rate of decrease or increase/day
(SE-X) the standard error in X variable
(SE-Y) the standard error in Y variable

Table (5) Effect of storage period on glucose content of camel milk set yoghurt samples with or without stabilizer:

Characteristic	**Storage time**	Treatment						Treatment					
		Control	$Y_{3\%Sch(a)}$	$Y_{2\%sch+1\%smp(a)}$	$Y_{1.5sch+1.5\%smp(a)}$	$Y_{1\%sch+2\%smp(a)}$	$Y_{3\% SMP(a)}$	$Y_{3\%Sch(b)}$	$Y_{2\%sch+1\%smp(b)}$	$Y_{1.5sch+1.5\%smp(b)}$	$Y_{1\%sch+2\%smp(b)}$	$Y_{3\% SMP(b)}$	Mean effect
Glucose	0 time	$(0.41)^{a}$±006	$(0.50)^{a}$±.006	$(0.51)^{a}$±.006	$(0.51)^{a}$±.010	$(0.50)^{a}$±.006	$(0.68)^{a}$±.006	$(0.52)^{a}$±.010	$(0.37)^{a}$±.010	$(0.52)^{a}$±.010	$(0.57)^{a}$±.010	$(0.61)^{a}$±.010	$(0.52)^{a}$±.081
	7days	$(0.34)^{b}$±006	$(0.38)^{b}$±.00	$(0.50)^{a}$±.006	$(0.48)^{b}$±010	$(0.49)^{a}$±.000	$(0.62)^{b}$±.010	$(0.49)^{b}$±.006	$(0.37)^{a}$±.010	$(0.50)^{b}$±.006	$(0.52)^{b}$±.006	$(0.55)^{b}$±.031	$(0.48)^{b}$±.081
	14days	$(0.28)^{c}$±006	$(0.35)^{c}$±.010	$(0.48)^{b}$±.012	$(0.49)^{b}$±.000	$(0.41)^{b}$±.006	$(0.48)^{c}$±.010	$(0.44)^{c}$±.000	$(0.32)^{b}$±.012	$(0.45)^{c}$±.006	$(0.49)^{c}$±.000	$(0.46)^{c}$±.020	$(0.42)^{c}$±.073
	21days	$(0.22)^{d}$±006	$(0.33)^{d}$±.010	$(0.37)^{c}$±.0125	$(0.40)^{c}$±.006	$(0.49)^{a}$±.010	$(0.37)^{d}$±.012	$(0.41)^{d}$±.015	$(0.28)^{d}$±.006	$(0.38)^{d}$±.006	$(0.45)^{d}$±.000	$(0.33)^{d}$±.015	$(0.37)^{d}$±.075
	30days	$(0.10)^{e}$±.000	$(0.13)^{e}$±.012	$(0.21)^{d}$±.006	$(0.23)^{d}$±.010	$(0.16)^{c}$±.006	$(0.32)^{e}$±.000	$(0.37)^{e}$±.010	$(0.24)^{e}$±.006	$(0.28)^{e}$±.000	$(0.31)^{e}$±.010	$(0.32)^{d}$±.017	$(0.24)^{e}$±.084
						Regression analysis							
Glucose	**R Square**	.991	.90	.856	.803	.596	.962	.972	.936	.958	.920	.914	0.90
	Intercept	.415	.491	.562	.550	.547	.679	.519	.384	.544	.583	.609	.335
	X-coeff.	-.010	-.011	-.010	-.009	-.010	-.013	-.005	-.005	-.008	-.008	-.011	.012
	SE-Y	.005	.018	.562	.022	.039	.013	.004	.006	.009	.012	.016	.020
	SE-X	.000	.001	-.010	.001	.002	.001	.000	.000	.000	.001	.001	.003

Mean (±SE). a,b,c Values in the same row having different superscripts differ significantly ($p < 0.05$).
Treatment A=camel milk yoghurt processed without stabilizer
Treatment B= camel milk yoghurt processed with stabilizer
R^2 =the correlation coefficient; which reflects the status of homogeneity, intercept= the expected value corresponding to day zero, x-coefficient= the constant rate of decrease or increase/day
(SE-X) the standard error in X variable
(SE-Y) the standard error in Y variable

Sucrose contents: Sucrose content of camel milk set yoghurt samples during storage period at refrigeration conditions (5°C) for 0 day, 7 days, 14 days, 21 days and 30 days was presented in (table 6). Therefore, the sucrose content of camel milk yoghurt with or without stabilizer as well as the control was gradually decreased with the progress of storage period, the effect of storage period on the changes in sucrose values was found to be significant ($P>0.05$). However, the highest sucrose content mean (0.72) was observed at the beginning of the storage period, while the lowest (0.35) was found at the end of the storage periods. However, the highest initial sucrose (0.85) and (0.79) was found in $Y_{3\%\ SMP(a)}$ and $Y_{3\%\ SMP(b)}$, respectively, while, the lowest was found in $Y_{2\%sch+1\%smp(b)}$ .whereas, at the end of the storage period the highest sucrose(0.58) was obtained by $Y_{1.5sch+1.5\%smp(b)}$, while the lowest(0.25) was observed by the control yoghurt. Moreever, $Y_{2\%sch+1\%smp(a)}$ and $Y_{3\%Sch(a)}$ displayed lowest homogeneity in their sucrose decrease ($R^2=0.65$) and($R^2=0.67$) respectively , while others camel milk set yoghurt samples and control) displayed great homogeneity in their sucrose decrease in range of ($R^2=0.91-0.99$).In comparison, the highest reduction in sucrose content) (-.019)/day was achieved by $Y_{3\%\ SMP(a)}$ over the other camel milk yoghurt samples, while $Y_{2\%sch+1\%smp(b)}$ displayed the lowest reducton in sucrose content (-.007/day). In general camel milk set yoghurt samples produced without stabilizer scored highest reduction in sucrose content compared to that produced with stabilizers. That could be justified by the high count of lactic acid bacteria in samples.

Effect of storage period on the physical properties of camel milk set yoghurt with or without stabilizer:

pH value: The result indicated that the pH values means of camel milk yoghurt with or without stabilizer as well as control was decreased slightly during the storage periods (table 7). The effect of storage period on the changes in pH values was found to be significant ($P>0.05$) between most camel milk yoghurt samples.

Therefore, the highest pH value (4.47) of all camel milk yoghurt samples was observed at the beginning of the storage period, while the lowest (4.24) was found at the end of the storage period. However, the highest initial pH value (4.51) and (4.50) was found in $Y_{3\%\ SMP(a)}$ and control yoghurt samples, respectively, while the lowest (4.45) was found in $Y_{3\%Sch(b)}$. Whereas, at the end of the storage period the highest pH value (4.28) was obtained by the control yoghurt, while the lowest (4.19) was observed by $Y_{3\%\ SMP(a)}$.

Table (6) Effect of storage period on sucrose content of camel milk set yoghurt samples with or without stabilizer:

Characteristic	Storage time	Treatment(A)						Treatment(Z					Mean effect
		Control	$Y_{3\%Sch(a)}$	$Y_{2\%sch+1\%smp(a)}$	$Y_{1.5sch+1.5\%smp(a)}$	$Y_{1\%sch+2\%smp(A)}$	$Y_{3\%\ SMP(a)}$	$Y_{3\%Sch(b)}$	$Y_{2\%sch+1\%smp(b)}$	$Y_{1.5sch+1.5\%smp(b)}$	$Y_{1\%sch+2\%smp(B)}$	$Y_{3\%\ SMP(b)}$	
Sucrose	0 time	(0.61)^{a} ±.010	(0.71)^{a} ±.010	(0.72)^{a} ± .000	(0.72)^{a} ± .012	(0.71)^{a} ± .006	(0.85) ^{a}± .046	(0.73) ^{a} ±.000	(0.54) ^{a} ±.010	(0.70) ^{b}± .010	(0.76) ^{a}± .012	(0.79) ^{a}± .015	(0.72)^{a} ±.080
	7days	(0.44)^{b} ±.010	(0.42)^{d} ± .005	(0.71)^{a} ± .015	(0.68)^{b} ± .015	(0.69)^{b}± .000	(0.79)^{b} ±.006	(0.69)^{b} ± .006	(0.45)^{b} ± .000	(0.53) ^{c}± .006	(0.73) ^{b}± .029	(0.73) ^{b}± .006	(0.65)^{b} ±.118
	14days	(0.38)^{c} ±.006	(0.47)^{c} ± .006	(0.67)^{b}± .010	(0.68) ^{b}± .000	(0.58)^{c} ± .006	(0.51)^{c} ±.010	(0.62)^{c} ±.012	(0.32)^{d} ±.006	(0.43) ^{d}± .012	(0.58) ^{c}± .017	(0.61) ^{c}± .012	(0.55)^{c} ±.092
	21days	(0.35)^{d} ±.000	(0.49)^{b} ± .006	(0.40)^{c} ± .000	(0.42)^{c} ± .012	(0.50)^{d}± .006	(0.43)^{d} ± .017	(0.54)^{d} ±.010	(0.40)^{c} ± .006	(0.38) ^{e}± .012	(0.47) ^{d}± .006	(0.52) ^{d}± .000	(0.44)^{d} ±.068
	30days	(0.25)^{e} ±.000	(0.29)^{e} ± .006	(0.31)^{d} ± .006	(0.35)^{c} ± .006	(0.30)^{e}± .006	(0.33)^{e} ±.000	(0.42)^{e} ±.010	(0.45)± .091	(0.56)± .150	(0.41) ^{e}± .006	(0.41) ^{e}± .000	(0.35)^{e} ±.057
Regression analysis													
Sucrose	**R Square**	.914	.667	.868	.861	.937	.929	.979	.648	.938	.958	.990	0.054
	Intercept	.562	.628	.785	.766	.753	.853	.749	.549	.749	.777	.797	.472
	X-coeff.	-.011	-.011	-.015	-.014	-.014	-.019	-.010	-.007	-.013	-.013	-.013	.012
	SE-Y	.017	.037	.030	.027	.018	.026	.008	.025	.017	.013	.006	.026
	SE-X	.001	.002	.002	.002	.001	.001	.000	.001	.001	.001	.000	.004

Mean (±SE). a,b,c Values in the same row having different superscripts differ significantly ($p < 0.05$).
Treatment A=camel milk yoghurt processed without stabilizer
Treatment B= camel milk yoghurt processed with stabilizer
R^2 =the correlation coefficient; which reflects the status of homogeneity, intercept= the expected value corresponding to day zero, x-coefficient= the constant rate of decrease or increase/day
(SE-X) the standard error in X variable
(SE-Y) the standard error in Y variable

On the other hands the result revealed that the highest reduction in pH values of camel milk set yoghurt produced with or without stabilizer was found in $Y_{3\%\ SMP(a)}$ (-0.010) /day and lowest decrease in pH was obtained by $Y_{3\%Sch(b)}$ (- 0.006) /day, while $Y_{1\%sch+2\%smp(a)}$, $Y_{1.5sch+1.5\%smp(a)}$, $Y_{2\%sch+1\%smp(b)}$, $Y_{3\%\ SMP(b)}$, $Y_{1.5sch+1.5\%smp(a)}$ and the control demonstrated the same level of pH decrease (-0.008)/day. Also $Y_{3\%Sch(a)}$, $Y_{1.5sch+1.5\%smp(b)}$ and $Y_{1\%sch+2\%smp(b)}$ had the same level of pH decrease(-0.007 /day). Consequently, camel milk set yoghurt samples with or without stabilizer as well as the control were displayed great homogeneity (R^2=0.92-0.99) in their pH decrease during the studied storage period. That pH values reduction could be due to excessive sugar fermentation and presence of lactic acid (Mohammed, 2008). Therefore, the highest decreases in pH-values in $Y_{3\%\ SMP(a)}$ may be due to the increased level of concentration of lactose which is the starting material for the production of lactic acid through fermentation process. In general the reduction in pH values of camel milk set yoghurt samples produced with stabilizer was found to be lower than that produced without stabilizer.However, these findings revealed that pH values of all camel milk yoghurt indicated at end period was found to be lower (4.24) than the mean of pH values (4.62) ,(4.65) and (4.55) were indicated by Ibrahim (2015) for camel milk yoghurt fortified with different levels of whey protein concentrate (WPC), sodium caseinate (SCN) and skim milk powder (SMP),respectively, during storage period of 21 days Also it was lower than pH value mean (4.38) indicated by Alaa and Salah (2015) for camel milk yoghurt produced with various stabilizers at 21 days of storage .This could be due to variation in type and levels of ingredients added to camel milk or may due to the longer periods of the storage.

Titratable acidity%: The titratable acidity% was gradually increased according to progress of storage periods (table 8). However, the effect of storage period on the changes in acidity values was found to be significant (P>0.05) between most camel milk yoghurt samples. The lowest titratable acidity% mean of all camel milk set yoghurt samples was obtained at the beginning of the storage period (1.1), while the highest (1.26) was obtained at the end of the storage periods. The titratable acidity % of all camel milk set yoghurt samples with or without stabilizer had the highest titratable acidity% when compared with the control yoghurt samples which obtained the lowest acidity (1.15).

Table (7) Effect of storage period on the PH value of camel milk set yoghurt samples with or without stabilizer:

Characteristic	Storage time	Treatment(A)						Treatment(B)					Mean effect
		Control	$Y_{3\%Sch(a))}$	$Y_{2\%sch+1\%smp(a)}$	$Y_{1.5sch+1.5\%smp(a)}$	$Y_{1\%sch+2\%smp(a)}$	$Y_{3\% SMP(a)}$	$Y_{3\%Sch(b)}$	$Y_{2\%sch+1\%smp(b)}$	$Y_{1.5sch+1.5\%smp(b)}$	$Y_{1\%sch+2\%smp(b)}$	$Y_{3\% SMP(b)}$	
PH value	0 time	$(4.50)^a$ ±..010	$(4.47)^a$±v.006	$(4.49)^a$±.000	$(4.49)^a$ ±.006	$(4.49)^a$±.006	$(4.51)^a$ ±.012	$(4.45)^a$±.000	$(4.49)^a$±.000	$(4.46)^a$±.010	$(4.47)^a$±.006	$(4.47)^a$±.010	$(4.47)^a$ ±.016
	7days	$(4.43)^b$ ±..010	$(4.42)^b$±.010	$(4.44)^b$±.006	$(4.45)^b$ ±.006	$(4.45)^b$±.000	$(4.47)^b$ ±.010	$(4.44)^a$±.000	$(4.48)^a$±.000	$(4.42)^b$±.006	$(4.46)^a$±.010	$(4.42)^b$±.010	$(4.43)^b$±.015
	14days	$(4.36)^c$ ±..006	$(4.36)^c$±.006	$(4.39)^c$±.006	$(4.40)^c$ ±.000	$(4.41)^c$± .010	$(4.41)^c$ ±.010	$(4.36)^b$±.006	$(4.39)^b$±.006	$(4.39)^c$±.006	$(4.39)^b$±.006	$(4.40)^c$±.000	$(4.39)^c$±.025
	21days	$(4.29)^d$ ±..015	$(4.32)^d$±.006	$(4.36)^d$±.015	$(4.34)^d$ ±.010	$(4.34)^d$±.015	$(4.33)^d$ ±.012	$(4.35)^c$±.000	$(4.35)^c$±.008	$(4.33)^d$±.006	$(4.35)^c$±.012	$(4.37)^d$±.010	$(4.35)^d$±.018
	30days	$(4.28)^d$ ±..006	$(4.24)^e$±.006	$(4.24)^e$±.021	$(4.24)^e$ ±.006	$(4.24)^e$±.035	$(4.19)^e$ ±.012	$(4.27)^d$±.012	$(4.27)^d$±.010	$(4.21)^e$±.006	$(4.27)^d$±.010	$(4.22)^e$ ±.010	$(4.24)^e$±.034

Regression analysis

PH value	**R Square**	. 0.92	. 0.99	0.94	0.97	. 0.95	0.97	0.94	0.97	0.95	0.93	0.98	0.002
	Intercept	4.482	4.468	4.501	4.501	4.508	4.533	4.463	4.508	4.486	4.487	4.485	4.372
	X-coeff.	-.008	-.007	-.008	-.008	-.008	-.010	-.006	-.008	-.007	-.007	-.008	.001
	SE-Y	.011	.004	.010	.007	.010	.011	.007	.007	.007	.010	.014	.014
	SE-X	.001	.000	.001	.000	.001	.001	.000	.000	.000	.001	.001	.002

Mean (±SE). a,b,c Values in the same row having different superscripts differ significantly ($p < 0.05$).
Treatment A=camel milk yoghurt processed without stabilizer
Treatment B= camel milk yoghurt processed without stabilizer
R^2 =the correlation coefficient; which reflects the status of homogeneity, intercept= the expected value corresponding to day zero, x-coefficient= the constant rate of decrease or increase/day
(SE-X) the standard error in X variable (SE-Y) the standard error in Y variable

Additionally, camel milk set yoghurt samples with or without stabilizer were displayed great homogeneity (R^2=0.90-0.99) in their titratable acidity% increase during the storage period. There were no significant (P>0.05) differences in acidity found between thecontrol yoghurt and all others camel milk yoghurts at the end of the storage periods. The highest titratable acidity% of camel milk set yoghurt samples produced without stabilizer was obtained by sample $Y_{3\%\ SMP(a)}$ (1.35) followed by $Y_{1\%sch+2\%smp(a)}$ (1.32) , $Y_{2\%sch+1\%smp(a)}$ (1.31), $\mathbf{Y_{1.5sch+1.5\%smp(a)}}$ (1.27) and lastly $\mathbf{Y_{3\%Sch(a))}}$ (1.24).whereas, the highest titratable acidity% of camel milk set yoghurt samples produced with stabilizer was observed for $Y_{3\%\ SMP(b)}$ (1.28) followed by $\mathbf{Y_{1.5sch+1.5\%smp(a)}}$ (1.27) and the lowest was obtained by $\mathbf{Y_{3\%Sch(b)}}$ (1.19) while, samples $Y_{2\%sch+1\%smp(a)}$ and $Y_{1\%sch+2\%smp(a)}$ showed similar acidity% with (1.26) at the end of the storage periods investigated. Thus these results indicate that camel milk yoghurt without stabilizer possesses higher acidity than camel milk yoghurt with stabilizer. According to Hashim et al. (2009) found that the use of stabilizers at different level could not impart any variation in acidity of yoghurt made from camel milk. Incontrast Alaa and Salah (2015) stated that stabilizers type and addition rate had significant effects of on acidity, it was noticed the decrease of the acidity % with increase of the added stabilizer to camel milk yoghurt. The results also indicated that 3% skim milk powder added to camel milk yoghurt resulted in the highest level of acidity increase in both treatments. However, camel milk with 3% modified food starch demonstrated the lowest increase in acidity as compared to addition of 3% skim milk powder. Whereas, the combined used of skim milk powder and starch caused highest acidity as compared to additional starch, thus increasing could be related to addition of skim milk was might be due to the highest level of lactose which was the starting material for the production of lactic acid through fermentation process. The lower increase in the control acidity comparing to others camel milk yoghurt samples bovine milk could be related to addition of milk protein concetratation (MPC), which may be due to higher buffering action of whey proteins. According to Salaün *et al.* (2005) who stated that buffering capacity was a major factor affecting the variations in pH of dairy products. Furthermore, it has been also suggested that addition of WPC to yoghurt increases the buffering capacity at around pH of 4.

These findings were in agreement with Ibrahim (2015) who reported that camel milk bio-yoghurts supplemented with 4% whey protien concetratation (WPC) had shown lower acidity (1.15) than the skim milk powder (1.23) during aperiod of 21 days.

Viscosity: The viscosity values of camel milk set yoghurt samples with or without stabilizer as well as control was increased up until the first 21 days followed by a decrease at the end of the storage (table 9). It was significantally (P>0.05) increased between zero time and the end of the storage period. However, the highest viscosity mean of all camel milk yoghurt samples was observed at 21st day of the storage period (2.72), while the lowest (2.26) was found at the beginning of the storage period. However, the viscosity of camel milk yoghurt with or without stabilizer was statistically higher than the viscosity of the control. Furthermore, the highest results for camel milk yoghurt viscosity during storage period were found in samples $Y_{2\%sch+1\%smp(b)}$, $Y_{1.5sch+1.5\%smp(b)}$,$Y_{2\%sch+1\%smp(a)}$ and $Y_{3\%SMP(b).}$ While the lowest viscosity were obtained by samples $Y_{1\%sch+2\%smp(a)}$ and $Y_{3\%Sch(a))}$. Moreover, at the end of the storage period the highest level of increase in viscosity for camel milk set yoghurt samples without stabilizer was found in $Y_{2\%sch+1\%smp(a)}$ (0.019)/day followed by $Y_{1.5sch+1.5\%smp(a)}$ (0.015)/day, $Y_{3\%SMP(a)}$(0.014)/day, $Y_{3\%Sch(a)}$(0.013)/day and lastly $Y_{1\%sch+2\%smp(a}$ (0.009)/day. Whereas the highest amount of viscosity increase for camel milk set yoghurt samples with stabilizer was found in $Y_{2\%sch+1\%smp(b)}$ (0.023)/day followed by $Y_{3\%\ SMP(b)}$ (0.015)/day, while $Y_{1\%sch+2\%smp(b)}$ and $Y_{1.5sch+1.5\%smp(b)(b)}$ were observed the same rate of increase(0.010)/day, while the lowest increase was obseved in $Y_{3\%Sch(b)}$(0.009)/day.

These findings indicated that the additional of 2% starch +1% skim milk to camel milk yoghurt resulted enhanced the viscosity in both treatments. As we knew increasing of the concentration of starch increased the viscosity of yoghurt samples. Also the used of 1.5%starch +1.5% skim milk improved the viscosity in both treatments. That might be due to the interactions between casein micelles and corn starch that enhanced the viscosity of the camel milk containing 3% corn starch (Galeboe *et al.,* 2018). However, use of skim milk at a level of 3% skim milk with stabilizer increased the viscosity more than that without stabilizer.

Table (8) Effect of storage period on the titratable acidity% of camel milk set yoghurt samples with or without stabilizer:

Characteristic	Storage time	Treatment(A)						Treatment(B)					
		Control	Y3%Sch(a))	Y2%sch+1%smp(a)	Y1.5sch+1.5%smp(a)	Y1%sch+2%smp(a)	Y 3% SMP(a)	Y3%Sch(b)	Y2%sch+1%smp(b)	Y1.5sch+1.5%smp(b)	Y1%sch+2%smp(b)	Y 3% SMP(b)	Mean effect
Acidity	0 time	(.94)d ±.010	(.99)e ±.000	(1.05)e ±.012	(1.01)e±.012	(1.05)e ±.010	(1.05)e ±.012	(.98)e ±..029	(1.03)e ±..017	(1.04)e ±.006	(1.00)e ± ..000	(1.00)e ± ..010	(1.01)e ±.040
	7days	(.95)cd ±.005	(1.02)d ±.006	(1.14)d ±.000	(1.04)d ±.000	(1.12)d ±.015	(1.16)d ±.000	(1.03)d ±..006	(1.13)d ± .023	(1.14)d ±.010	(1.04)d ± ..012	(1.02)d ± ..000	(1.06)d ±.068
	14days	(.97)c ±.025	(1.05)c ±.006	(1.17)c ±.000	(1.06)c ±.000	(1.19)c ±.006	(1.22)c ±.052	(1.09)c ±..017	(1.16)c ± .006	(1.21)c ±.006	(1.07)c ± ..006	(1.07)c ± ..006	(1.11)c ±.075
	21days	(1.06)b ±.025	(1.10)b ±.006	(1.25)b ±.012	(1.19)b ±.006	(1.25)b ±.010	(1.28)b ±.023	(1.13)b ±..012	(1.21)b ± .029	(1.25)b ±.015	(1.14)b ± ..006	(1.13)b ± ..006	(1.18)b ±.072
	30days	(1.15)a ±.000	(1.24)a ±.015	(1.31)a ±.012	(1.27)a ±.031	(1.32)a ±.021	(1.35)a ±.010	(1.19)a ±..012	(1.26)a ± .015	(1.27)a ±.006	(1.26)a ± ..000	(1.28)a ± ..006	(1.26)a ±.062
					Regression analysis								
Acidity	**R Square**	0.88	0.91	0.99	0.90	0.98	0.93	0.98	0.91	0.91	0.95	0.93	0.017
	Intercept	.912	.964	1.059	.98	1.055	1.071	.99	1.048	1.073	.979	.97	1.102
	X-coeff.	.007	.008	.009	.009	.009	.010	.007	.008	.008	.008	.009	.004
	SE-Y	.013	.013	.007	.015	.006	.013	.005	.012	.012	.010	.013	.018
	SE-X	.001	.001	.000	.001	.000	.001	.000	.001	.001	.001	.001	.003

Mean (±SE). a,b,c Values in the same row having different superscripts differ significantly ($p < 0.05$).
Treatment A=camel milk yoghurt processed without stabilizer
Treatment B= camel milk yoghurt processed without stabilizer
R^2 =the correlation coefficient; which reflects the status of homogeneity, intercept= the expected value corresponding to day zero, x-coefficient= the constant rate of decrease or increase/day
(SE-X) the standard error in X variable
(SE-Y) the standard error in Y variable

These findings were in agreement with the findings of Nazan (2016) who stated that viscosity value was lower in Y_{SMP} than in $Y_{SMP+NRF.}$ Morever, the results stated that the additional of stabilizers to camel milk yoghurt improved the viscosity more than that without stabilizers this probably due to their ability to contribute to the thickening of the gel formed during fermentation process, these findings portrayed similar trends to the findings of other researchers, including Al-Zoreky and Al-Otaibi (2015), Bhattarai *et al.* (2015); Ibrahim and Khalifa (2015); Macit and Bakirci (2017).

Water holding capacity: The Water holding capacity (WHC) of camel milk set yoghurt samples was significantally (P>0.05) increased between zero time and the end of storage period (table 10). There were no significant (P>0.05) differences in WHC values obtained among camel milk set yoghurt, but it was statistically higher than control yoghurt. Therefore, the highest water holding capacity values at end period was obtained by $Y_{2\%sch+1\%smp(b)}$ and $Y_{2\%sch+1\%smp(a)}$ while,the lowest values were found in $Y_{1.5sch+1.5\%smp(a)}$ and $Y_{3\%Sch(a)..}$ .1n Addition to the highest increase in Water holding capacity for camel milk set yoghurt samples without stabilizer was found in $Y_{2\%sch+1\%smp(a)}$ (0.58)/day followed by sample $\mathbf{Y_{1\%sch+2\%smp(a)}}$ (0.554)/day and $\mathbf{Y_{3\%\ SMP(a)}}$ (0.553)/day while the lowest increase was found in $\mathbf{Y_{3\%Sch(a).}}$ whereas, the highest increase in Water holding capacity for camel milk set yoghurt samples with stabilizer was obtained by $Y_{2\%sch+1\%smp\ (b)}$ (0.721)/day followed by $\mathbf{Y_{3\%\ SMP(b)}}$ (0.612)/day, while the lowest was found in $Y_{1\%sch+2\%smp(b)}$ (0.247)/day. In conclusion, the results indicated that the highest water holding capacity in both treatments were obtained when 2% starch + 1% skim milk was added to camel yoghurt samples as compared to those others camel milk yoghurt. Also it was found that the starch at level 3% without stabilizer observed lowest increase in WHC (0.27)/day, when it used with stabilizer obtaind highest increase in WHC (0.612)/day.Whereas, the use of 3% skim milk without stabilizer showed the higher increase in WHC (0.553)/day than that with stabilizer (0.374)/day. Stephen Oselu 2020 who found that the camel milk yoghurt with 3% modified starch had the highest WHC followed by the yoghurt containing 2.5% modified starch, while yoghurt containing 2% corn starch exhibited the lowest WHC Interestingly, the use of 3% skim milk in both treatments had the lowest increase in WHC compared to the addition of 2% starch + 1% skim milk. It was also reported elsewhere that these increases could be due to the combination of starch with skim milk and stabilizer. According to Chandan et al. (2008) who showed that yoghurts containing WPC have a greater water holding capacity than those enriched with SMP. Although Guinee et al. (1995) report the opposite findings.

The results indicated that the water holding capacity of yoghurts with stabilizers was found to be higher than that without stabilizer, this finding were in agreement with the findings of Alaa and Salah (2015)who found that Addition of stabilizers significantly decreased the syneresis, and increased viscosity and water holding capacity of camel milk yoghurt ($p \leq 0.05$)

CONCLUSIONS

Based on the results obtained in the present study it can be concluded that during storage the pH, fat, lactose, glucose and sucrose contents of the samples of camel milk set type yoghurt decreased, while total solid, titratable acidity and water-holding capacity values increased. Furthermore, viscosity values of camel milk set yoghurt samples with or without stabilizer as well as the control were increased up until the first 21 days followed by a decrease at the end of the storage periods. As a result of this study, it was found that the addition of stabilizer to fortified camel milk enhances its physicochemical properties during storage by improving texture; this study has shown that the fortification of camel milk yoghurt with dietary fibers (gum arabic) produced an acceptable functional product with potential beneficial health effects. Finally we can conclude that yoghurt made from camel milk revealed a longer shelf life than that made from cow milk. Moreover, the natural antimicrobial and antibacterial agents in the camel's milk might also increase its shelf life; hence, the study suggested that due to the addition of gum arabic more research is needed to evaluate the physio-chemical microbial and and quality of camel milk yoghurt during different storage periods as recommended point of view.

Table (9) Effect of storage period on the viscosity of camel milk set yoghurt samples with or without stabilizer

Characteristic	Storage time	Treatment(A)						Treatment(B)					Mean effect
		Control	$Y_{3\%Sch(a))}$	$Y_{2\%sch+1\%smp(a)}$	$Y_{1.5sch+1.5\%smp(a)}$	$Y_{1\%sch+2\%smp(a)}$	$Y_{3\% SMP(a)}$	$Y_{3\%Sch(b)}$	$Y_{2\%sch+1\%smp(b)}$	$Y_{1.5sch+1.5\%smp(b)}$	$Y_{1\%sch+2\%smp(b)}$	$Y_{3\% SMP(b)}$	
Viscosity	0 time	(1.36)^{d}±010	(1.57)^{b}±.18	(2.83)^{b} ±.056	(2.12)^{e} ±..010	(1.70)^{d}±.040	(2.12)^{c} ±..017	(1.79)^{a}±.320	(3.28)^{d} ±.061	(2.97)^{b}±.015	(2.28)^{b}±.252	(2.77)^{c}±.135	(2.25)^{d} ±.61
	7days	(1.47)^{c}±.000	(1.68)^{b}±.006	(2.91)^{b} ±.006	(2.42)^{c} ±..015	(1.77)^{c}±.045	(2.29)^{b} ±..023	(1.97)^{a}±.505	(3.45)^{c} ±.050	(3.15)^{ab}±.228	(2.38)^{ab}±.180	(3.12)^{b}±.110	(2.42)^{c} ±64
	14days	(1.55)^{b}±.015	(1.84)^{a}±.02	(3.11)^{ab} ±.105	(2.50)^{b} ±..000	(1.90)^{b}±.005	(2.42)^{ab} ±..03	(2.02)^{a}±.015	(3.78)^{b} ±.055	(3.26)^{ab}±.050	(2.60)^{ab}±.055	(3.13)^{b}±.085	(2.55)^{b} ±.67
	21days	(1.65)^{a}±.025	(1.95)^{a}±.03	(3.39)^{a} ±.364	(2.66)^{a} ±..010	(2.01)^{a}±.000	(2.59)^{a} ±..202	(2.22)^{a}±.015	(3.94)^{a} ±.015	(3.44)^{a}±.372	(2.68)^{a}±.097	(3.41)^{a}±.100	(2.72)^{a} ±.73
	30days	(1.56)^{b}±.015	(1.92)^{a}±.015	(3.31)^{a} ±.000	(2.55)^{d} ±..021	(1.91)^{b}±.000	(2.51)^{a} ±..045	(2.02)^{a}±.015	(3.90)^{a} ±.006	(3.21)^{ab}±.100	(2.52)^{ab}±.287	(3.21)^{b}±.006	(2.60)^{b} ±.70
Regression analysis													
viscosity	**R Square**	0.64	0.701	0.59	0.69	0.64	0.65	0.50	0.83	0.21	0.24	0.53	0.33
	Intercept	1.411	1.612	2.843	2.241	1.737	2.186	1.867	3.341	3.067	2.350	2.911	1.764
	X-coeff.	.007	.013	.019	.015	.009	.014	.009	.023	.010	.010	.015	.125
	SE-Y	.028	.041	.078	.084	.031	.051	.046	.052	.094	.089	.072	.094
	SE-X	.002	.002	.004	.005	.002	.003	.003	.003	.005	.005	.004	.014

Mean (±SE). a,b,c Values in the same row having different superscripts differ significantly ($p < 0.05$).
Treatment A=camel milk yoghurt processed without stabilizer
Treatment B= camel milk yoghurt processed with stabilizer
R^2 =the correlation coefficient; which reflects the status of homogeneity, intercept= the expected value corresponding to day zero, x-coefficient= the constant rate of decrease or increase/day
(SE-X) the standard error in X variable
(SE-Y) the standard error in Y variable

Table (10) Effect of storage period on the water holding capacity of camel milk set yoghurt samples with or without stabilizer:

Characteristic	Storage time	Treatment(A)						Treatment(B)					Mean effect
		Control	$Y_{3\%Sch(a))}$	$Y_{2\%sch+1\%smp(a)}$	$Y_{1.5sch+1.5\%smp(a)}$	$Y_{1\%sch+2\%smp(a)}$	$Y_{3\% SMP(a)}$	$Y_{3\%Sch(b)}$	$Y_{2\%sch+1\%smp(b)}$	$Y_{1.5sch+1.5\%smp(b)}$	$Y_{1\%sch+2\%smp(b)}$	$Y_{3\% SMP(b)}$	
water holding capacity	0 time	$(36.0)^c \pm .000$	$(38.7)^d \pm 1.15$	$(41.0)^d \pm 1.00$	$(36.0)^c \pm 2.00$	$(36.0)^c \pm 2.00$	$(37.0)^c \pm 1.00$	$(37.3)^d \pm 1.15$	$(41.0)^d \pm 1.00$	$(39.0)^d \pm 1.00$	$(42.3)^d \pm .577$	$(42.6)^d \pm .815$	$(38.8)^e \pm 2.66$
	7days	$(36.7)^c \pm .577$	$(40.7)^c \pm 1.15$	$(43.0)^d \pm 1.00$	$(43.1)^b \pm .370$	$(38.3)^b \pm .577$	$(39.0)^c \pm 1.73$	$(39.0)^d \pm 1.00$	$(43.5)^d \pm 1.50$	$(46.4)^c \pm 3.66$	$(44.6)^c \pm 1.15$	$(44.5)^d \pm .461$	$(41.7)^d \pm 3.27$
	14days	$(39.3)^b \pm .577$	$(42.6)^b \pm 1.15$	$(51.0)^c \pm 1.73$	$(44.0)^b \pm .000$	$(39.6)^b \pm .577$	$(42.7)^b \pm 1.55$	$(42.3)^c \pm 1.15$	$(49.2)^c \pm 1.04$	$(49.9)^b \pm .144$	$(46.3)^{bc} \pm .577$	$(47.3)^c \pm .461$	$(44.9)^c \pm 4.01$
	21days	$(40.3)^a \pm .577$	$(45.0)^a \pm 1.00$	$(54.1)^b \pm 1.55$	$(44.6)^{ab} \pm 1.15$	$(49.5)^a \pm .500$	$(45.4)^b \pm 1.57$	$(46.3)^b \pm 2.88$	$(57.0)^b \pm 1.73$	$(54.0)^a \pm .000$	$(47.6)^b \pm .577$	$(50.0)^b \pm .000$	$(48.5)^b \pm 4.92$
	30days	$(40.7)^a \pm .878$	$(46.6)^a \pm .665$	$(57.2)^a \pm 1.38$	$(47.3)^a \pm 3.05$	$(51.0)^a \pm 1.00$	$(54.0)^a \pm 2.00$	$(56.0)^a \pm 2.00$	$(61.0)^a \pm 1.73$	$(54.0)^a \pm .000$	$(50.0)^a \pm 2.00$	$(53.6)^a \pm 2.08$	$(51.9)^a \pm 5.64$

Regression analysis

water holding capacity	**R Square**	0.85	0.91	0.92	0.71	0.88	0.91	0.88	0.95	0.82	0.88	0.94	0.112
	Intercept	36.10	38.79	40.86	38.38	34.92	35.67	35.38	39.95	41.48	42.63	42.23	41.21
	X-coeff.	.173	.273	.583	.323	.554	.553	.612	.721	.499	.248	.374	.664
	SE-Y	.366	.420	.850	1.033	1.019	.884	1.080	.816	1.156	.447	.455	.994
	SE-X	.021	.024	.048	.058	.057	.050	.061	.046	.065	.025	.026	.147

Mean (±SE). a,b,c Values in the same row having different superscripts differ significantly ($p < 0.05$).
Treatment A=camel milk yoghurt processed without stabilizer
Treatment B= camel milk yoghurt processed with stabilizer
R^2 =the correlation coefficient; which reflects the status of homogeneity, intercept= the expected value corresponding to day zero, x-coefficient= the constant rate of decrease or increase/day
(SE-X) the standard error in X variable
(SE-Y) the standard error in Y variable

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