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Comparative study on different local hydrocolloids on quality of set-type yoghurt made from bovine milk

Ibhaze, G.A., Olatunji, D. I., Onibi, G.E. and Adebayo, O. A.
Department of Animal Production and Health, Federal University of Technology, Akure, Ondo State, Nigeria.
Email: gaibhaze@futa.edu.ng

Abstract
Yoghurt is fermented and coagulated milk product which is often produced with the incorporation of stabilizer to improve the textural quality of the product. This study investigated the effects of cassava (T1), corn (T3) and potatoe(T5) starches as well as gelatin (T4, positive control) as stabilizers on the proximate, physical and antioxidant properties of set-type yoghurt. A stabilizer free yoghurt(T2) to serve as the negative controlwas also made. Raw milk from Bunaji cow was clarified, homogenized and pasteurized at 82°C for 3 minutes. Sucrose (5%) was then added per litre of milk, thereafter cooled to 42°C for inoculation. The corn, potatoe and cassava flour at 20 g each was dissolved into 200 mls of water and bring to a boil to form a paste. A 20 g paste of each of the stabilizer as well as the gelatin were measured into 1000mls of the milk. Starter culture (5g/L) was added and mixed thoroughly and incubated at 43°C until a coagulum was formed. Results showed that moisture significantly (P<0.001) increased from 67.43 - 79.67 % as the storage period progressed, while the ash, protein, fat and carbohydrate significantly decreased with storage time. Treatments had highly significant (P<0.001) effect on the proximate composition with highest moisture content (74.07%) in the control sample. (T2). Protein and carbohydrate were highest (4.48 % and 21.06 %) in cassava starch (T1) and potatoe starch (T5)respectively. The interaction between storage periods and treatments showed highly significant (P<0.0001) effect.
Physical property revealed that water holding capacity and whey drainage had the same trend of increase as the storage time increased while syneresis and viscosity showed decrease as storage time progressed. Treatment effect showed that yoghurt with corn starch recorded the highest water holdingcapacity (97.89 %)and viscosity (84.18dPas), least syneresis (9.73 %) and whey drainage (0.81%). The interaction between storage periods and treatments showed that the highest water holding capacity (98.67%) was obtained in corn starch while the syneresis (29.20%), whey drainage (3.57%) were superior in cassava starch at day 14. The utmost value for viscosity (89.04 dPa.s) was noted for corn starch at 7 days of storage. The antioxidant indicated that the DPPH had the highest (35.73 %) scavenging potential at day 1 of storage. Treatment effect showed significant (P<0.0001) increase in the control sample (40.76%) while the least value (28.72 %) was obtained in corn starch. Similar trend was observed in the interaction effect as the control sample at day 1 of storage had the highest (41.60 %) DPPH value. Conclusively, corn starch can be used as natural hydrocolloids in reduction of syneresis , improved viscosity and higher concentration of antioxidants in the yoghurt samples as it competed favourably with gelatin, a conventional synthetic stabiliser.

Key words: *Yoghurt, stabilizers, physical, proximate, antioxidant, synthetic*

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I. Introduction

Milk is the origin of all dairy products. Due to its high nutrient concentration, it easily undergoes spoilage, hence can be processed into other products like yoghurt in order to retain its basic nutrients [1]. Yogurt and its related products are popular worldwide. [2]. The major concern in the yoghurt industry is the production and maintenance of a product with optimum consistency and stability [3]. The highest production or consumption of yoghurt is in Mediterranean, Asian countries and in Central Europe [4]. The consumption of functional food products is currently on the rise[5].Yoghurt is a fermented milk product, which is produced by fermenting milk with lactic acid bacteria, which are responsible for development of typical yoghurt flavor [6].It is highly nutritious, cherished and easily digestible due to the predigested nutrients by the starter culture.The texture of yogurt is as important as its taste and flavor in terms of consumer preferences[7] **.**

Stabilizers, also called thickeners, geling agents or hydrocolloids, can be obtained from different sources including animal connective tissues, sea and land plants andmicroorganisms [8]. They have gelling, thickener and stabilizer properties [9;6]. Stabilizers are commonly used in cultured products to control texture and reduce whey separation since they impart good resistance to syneresis and a smooth sensation in the mouth by binding water to reduce water flow in the food matrix space [10].Sodium caseinate and gelatin increase the density ofthe protein network in the gel microstructure [11;12]. Some may interact with protein in the food matrix and hence further increase hydration behaviour. The properties of the milk used in yoghurt production, the production and storage conditions or the transportation to far sales points can lead to textural defects such as viscosity variations and syneresis [13;14). Various stabilizers are used to prevent these problems and to create desirable textural characteristics [15;16]. Stabilizers, also called thickeners, gelling agents or hydrocolloids, can be obtained from different sources including animal connective tissues, sea and land plants and microorganisms [8]. They have gelling,thickener and stabilizer properties [9;6].Type of hydrocolloids used in yoghurt production could affect the stability and functional properties of the product. Synthetic hydrocolloids have reportedly been used in yoghurt production [17;18; 14], however, in recent years there is an increasingly negative consumers" perception on their use.

Cornstarch is a carbohydrate extracted from the endosperm of a maize grain. The increased concentrate of starch enhanced the consistency index, and reduce the emulsion droplet size, there by improving the emulsion stability [19]. Also, potatoe starch is useful in yoghurt production, because it serves as a binder to reduce defect and cracks on the surface curd by making textures of manufactured yoghurt appealing [20]. Cassava flour has a high hydrocolloid property which makes it a good binder when used in yoghurts, creams and desserts [21].The thrust of this study was to investigate the effects of these different local hydrocolloids (cornstarch, potato starch and cassava starch) on some characteristics of set-type yogurt made from cow's milk.

II. Materials And Method

Experimental site

The study was carried out in the Nutrition and Microbiology Laboratories of the Department of Animal Production and Health, Federal University of Technology, Akure, (FUTA), Ondo State. Akure is located on latitude 7.491780 ^{0}N and Longitude 4.944055 °'E and 5.82864 ^{0}E with the annual rainfall ranging between 1,300mm and 1650mm average maximum and minimum daily temperature of 38 ^{0}C and 27 ^{0}C respectively [22].

Experimental Materials

Fresh milk from lactating White Fulani cows was obtained from the Fulani herdsmen at Ipinsa, Akure, Ondo State. Sucrose was purchased from reputable store in Akure while the starter culture, gelatin and corn starch were purchased from Lagos. The potato, cassava and corn starch were hygienically produced.

Preparation of Local Hydrocolloids from Potatoes and Cassava tubers

Sweet potato and cassava tubers were obtained from the market and cassava processing centre respectively. The sweet potato (white variety) was washed, peel, sliced and sundried. The dried potato chips were milled, sieved using a filter to obtain the powder and stored in an airtight polythene bag. The cassava tuber was peeled, washed and soaked for three days to reduce the antinutrients (Hydrocyanide) and thereafter, sundried. The dried cassava was milled and sieved using a filter to obtain cassava flour and the product was packaged in an airtight polythene bag.

Production of yoghurt

Fifteen liters of Fresh cow's milk was clarified, homogenized and pasteurized at 82°C for 3 minutes. Sucrose (5%) was then added as sweetener per liter of milk. The milk was thereafter cooled to 42°C for inoculation. The corn, potato, and cassava starch at 20geach was dissolved into 200 mls of water and bring to a boil to form a paste. A 20g paste of each of the stabilizer was measured into 1000mls of the milk and thoroughly mixed. Thereafter, 5g of commercially freeze-dried starter culture was added to the mixture and stirred. A 20ml of reconstituted banana flavour was added to 1 litre each of the inoculated milk. Gelatin served as positive control while the sample with no stabilizer served as negative control. Immediately, the yoghurt was kept in an incubator (Gallenkamp cooled incubator model) at 43°C until a coagulum was formed at 14hrs. The yoghurt was refrigerated at 4°C for 1, 7 and 14 days for further analysis.

Laboratory analyses

Proximate composition analysis

The proximate constituents were determined according to the method of [23].

Determination of viscosity

The viscosity of the yogurt sample at $5°C$ was measured using a rotational viscometer (Fungilab, ALPHA H, Spain) at the speed of 100 rpm at 30 second with spindle 7 as P. The samples were analyzed by a texture profile analyzer using TA4/1000 probe [24].

Whey drainage

Whey drainage was removed from the Yogurt, using a syringe within 24h after the yoghurt fermentation was completed. The relative amount of whey drained off (in mL per 100ml of initial sample) was calculated as the whey drainage [25].

Water Holding capacity
A 10-g sample was centrifuged at 3,000 rpm for 60 min at 10^0C. The supernatant was removed within 10 min and the wet of the pellet was recorded . the water holding capacity was expressed as percentage of pellet weight relative to the original weight of yoghurt [26]

Syneresis
An amount of 20g of the yoghurt was spread in a thin layer to cover the surface of the filter paper. The yoghurt was filtered under vacuum for 10mins. The liquid that passed through the filter paper was collected and recorded. The Percentage of Syneresis (PS) was calculated as the weight of the liquid divided by the weight of the initial sample multiplied by 100 [27].

Antioxidant activity
The antioxidant activity of the different yoghurt samples was measured using the DPPH method. The free radical scavenging ability of the yoghurt against DPPH (1, 1- diphenyl-2-picryhydrazyl) was determined using the method described by [28]. 1 mL of the yoghurt sample was mixed with 1 mL of the 0.4 mM methanolic solution of the DPPH. The mixture was left in the dark for 30 minutes before measuring the absorbance at 516 nm. The scavenging activity percentage was determined thus: DPPH Scavenged (%) = A Control – A test / A Control × 100.

Experimental design and statistical analysis

The experimental design was completely randomized design in a 5×3factorial arrangement. Data obtained were subjected to two-way analysis of variance and significant means were separated using Duncan's multiple range tests using the [29] version 9.2 software. Where there was significant difference, Duncan's multiple range test of the same statistical package was used to separate the means.

III. Results

Table1: Proximate Composition (%) of Yoghurt at different periods of storage

Parameters	Moisture	Ash	Fat	Protein	Carbohydrate
Storage Periods (SP)					
1	67.43±0.26^c	1.02±0.04^a	2.68±0.12^a	5.29±0.09^a	22.82±0.39^a
7	69.53±0.28^b	0.88±0.06^b	2.13±0.07^b	4.64±0.10^b	22.46±0.35^a
14	79.67±0.44^a	0.84±0.06^b	1.93±0.15^c	3.08±0.15^c	12.43±1.15^b
	0.0001	0.0001	0.0001	0.0001	0.0001
Treatments (T)					
T1-Cassava starch	71.03±1.92^d	0.98±0.02^b	2.16±0.07^{bc}	4.48±0.24^a	20.71±1.65^{ab}
T2-Control	74.07±2.15^a	0.98±0.02^b	2.16±0.07^{bc}	4.19±0.54^b	15.38±2.83^d
T3-Corn starch	71.69±1.71^c	0.58±0.07^d	2.59±0.17^a	4.38±0.26^{ab}	20.18±1.44^b
T4-Gelatin	72.96±1.85^b	1.15±0.05^a	2.41±0.18^{ab}	4.27±0.37^{ab}	18.85±0.46^c
T5-Potato starch	71.30±1.83^d	0.87±0.02^c	1.91±0.28^c	4.34±0.31^{ab}	21.06±1.23^a
P - value	0.0001	0.0001	0.0001	0.0001	0.0001
SP*T					
1*T1	66.34±0.19^i	1.04±0.02^c	2.35±0.17^c	5.21±0.11^c	24.40±0.22^a
7*T1	68.11±0.06^g	0.96±0.03^d	2.05±0.03^g	4.58±0.29^h	23.60±0.30^b
14*T1	78.63±0.32^c	0.94±0.02^d	2.10±0.05^f	3.66±0.08^j	14.13±0.07^g
1*T2	68.47±0.24^g	1.04±0.02^c	2.35±0.17^c	5.51±0.26^b	21.64±0.32^d
7*T2	71.22±0.12^d	0.96±0.03^d	2.05±0.03^g	4.98±0.01^f	20.43±0.22^e
14*T2	82.53±0.27^a	0.94±0.02^c	2.10±0.05^f	2.10±0.05^n	4.08±0.04^i
1*T3	67.49±0.25^h	0.84±0.02^e	3.12±0.06^a	5.15±0.08^d	22.67±0.33^c
7*T3	69.13±0.08^f	0.46±0.03^g	2.30±0.25^d	4.55±0.28^i	23.30±1.00^b
14*T3	78.45±0.23^c	0.43±0.02^g	2.36±0.23^c	3.45±0.02^k	14.58±0.31^g
1*T4	68.45±0.23^g	1.24±0.12^a	3.11±0.05^a	5.54±0.27^a	20.99±0.05^e
7*T4	70.14±0.07^e	1.13±0.06^b	1.94±0.03^h	4.20±0.10^b	22.50±0.32^c
14*T4	80.29±0.15^b	1.07±0.03^c	2.17±0.11^e	3.05±0.03^m	13.08±0.10^h
1*T5	66.41±0.20^i	0.94±0.02^d	2.50±0.31^b	5.02±0.01^e	24.43±0.29^a

7*T5	69.07±0.04^{f}	0.87±0.03^{e}	2.33±0.23^{c}	4.87±0.06^{g}	22.46±0.28^{c}
14*T5	78.43±0.22^{c}	0.81±0.01^{f}	0.90±0.02^{i}	3.12±0.06^{l}	16.30±0.15^{f}
Pv	0.0001	0.0001	0.0001	0.0001	0.0001

Means along the same column with different superscripts are significantly (p<0.05) different. T1= Cassava starch T2= Control,T3= Corn Starch, T4= Gelatin, T5=Potato starch

Presented in Table1 is the proximate compositions of locally stabilized yoghurt stored for 14 days. Moisture significantly (P<0.001) increased from 67.43 - 79.67 % as the storage period progressed, while the ash, protein, fat and carbohydrate significantly decreased with storage time. Treatments had highly significant (P<0.001) effect on the variables investigated. Highest moisture content (74.07%) was observed in the control sample while the least value (71.03%) was recorded in T1 (cassava starch yoghurt). Ash content was superior in T4 (1.15 %), fat was utmost in T3 (2.59 %) while protein and carbohydrate were highest (4.48 % and 21.06 %) in T1 and T5 respectively. The interaction between storage periods and treatments showed highly significant effect (P<0.0001) as moisture (82.53%) content was highest in T2 at day 14. Ash and protein were at their peak (1.24 and 5.54% respectively) in treatment 4 at day 1, while fat (3.12%) and carbohydrate (24.43%) were superior in T3 at day 1and in treatment 5 at day 1.respectively.

Table 2: Physical Properties of Yoghurt at different periods of storage

Parameters	Water Holding Capacity (%)	Syneresis (%)	Whey Drainage (%)	Viscosity (dPa.s)
Storage period (SP)		80.21±0.86^{c}		
1	79.87±4.27^{c}	19.86±1.85^{a}	1.05±0.22^{c}	80.24±1.14^{b}
7	84.27±4.13^{b}	14.37±1.44^{b}	1.25±0.34^{b}	83.88±1.18^{a}
14	87.73±3.13^{a}	11.97±2.13^{c}	2.85±0.14^{a}	76.58±0.94^{c}
	0.0001	0.0001	0.0001	0.0001
Treatments (T)				
T1- Cassava starch	69.01±3.60^{d}	16.69±2.50^{b}	2.38±0.28^{b}	79.20±1.84^{d}
T2- Control	66.56±2.07^{e}	21.51±2.10^{a}	3.08±0.21^{a}	72.65±0.62^{e}
T3- -Corn starch	97.89±0.26^{a}	9.73±1.69^{d}	0.81±0.34^{e}	84.18±1.27^{a}
T4- -Gelatin	96.56±0.47^{b}	14.52±3.18^{c}	0.97±0.39^{d}	73.75±0.60^{a}
T5- Potato starch	89.78±2.61^{c}	14.53±1.82^{c}	1.34±0.31^{c}	83.82±1.01^{b}
	0.0001	0.0001	0.0001	0.0001
SP*T				
1*T1	54.67±0.33^{j}	14.77±0.39^{g}	2.33±0.03^{c}	72.07±0.07^{i}
7 *T1	75.33±0.33^{g}	20.57±0.30^{e}	3.33±0.33^{a}	76.07±0.07^{g}
14*T1	77.00± 0.58^{f}	29.20±0.20^{a}	3.57±0.03^{a}	73.11±0.11^{h}
1*T2	95.67±0.33^{c}	27.19±0.19^{b}	0.23±0.03^{h}	80.41±0.03^{f}
7*T2	98.33±0.33^{a}	9.31±0.31^{k}	0.13±0.03^{i}	83.08±0.08^{d}
14*T2	95.67±0.33^{c}	7.07±0.07^{l}	2.53±0.03^{b}	77.14±0.14^{g}
1*T3	97.67±0.33^{b}	26.6±0.31^{c}	0.13±0.03^{i}	83.04±0.04^{d}
7*T3	98.67±0.33^{a}	12.77±0.39^{i}	0.13±0.03^{i}	89.04±0.04^{a}
14*T3	97.33±0.33^{b}	10.71±0.29^{j}	2.17±0.03^{d}	80.43±0.29^{f}
1*T4	71.00±0.58^{h}	9.31±0.31^{k}	1.57±0.03^{e}	81.59±0.30^{e}
7*T4	58.33±0.33^{i}	4.11±0.11^{m}	2.13±0.03^{d}	84.04±0.04^{c}
14*T4	70.33±0.33^{h}	15.77±0.40^{f}	3.43±0.13^{a}	71.10±0.02^{j}
1*T5	80.33±0.33^{e}	21.44±0.29^{d}	1.00±0.00^{f}	84.11±0.11^{c}
7*T5	90.66±0.33^{d}	13.08±0.08^{h}	0.50±0.00^{g}	87.15±0.15^{b}
14*T5	98.33±0.33^{a}	9.08±0.07^{k}	2.53±0.03^{b}	80.21±0.21^{f}
PV	0.0001	0.0001	0.0001	0.0001

Means along the same column with different superscripts are significantly (p<0.05) different. T1= Cassava starch T2= Control, T3= Corn Starch, T4= Gelatin, T5=Potato starch

Presented in Table 2 is the physical property of yoghurt stabilized with different local hydrocolloids at 1, 7 and14 days storage periods. Storage period had highly significant (P<0.0001) effect on the parameters. Water holding capacity and whey drainage had the same trend of increase as the storage time increased while syneresis and viscosity showed decrease as storage time progressed. The highest water holding capacity and whey drainage were87.73 and 2.85 % respectively at day 14 whilesyneresis and viscosity had the least values of 11.97 and 76.58dPa.s %) at day 14. Treatment effect showed that yoghurt with corn starch recorded the highest water holding capacity value of 97.89%, least syneresis (9.73 %), whey drainage (0.81%) and superior viscosity (84.18dPa.s). The interaction between storage periods and treatments showedthat the highest water holding capacity (98.67%) was obtained in T3 while the syneresis (29.20%), whey drainage (3.57%) were superior in T1 at day 14. The utmost value for viscosity (89.04 dPa.s) was noted for T3 at 7 days of storage.

Table 3: Antioxidant Properties (%) of Yoghurt at different periods of storage

ParametersDPPH	
Storage Periods (SP)	
1	35.73±1.11[a]
7	33.06±1.25[b]
14	32.77±1.25[c]
	0.0001
Treatments (T)	
T1-Control	40.76±0.25[a]
T2-Cassava starch	34.92±0.30[c]
T3-Corn Starch	28.72±0.34[e]
T4-Gelatin	29.28±0.78[d]
T5-Potato starch	35.61±0.76 [b]
PV	0.0001
SP*T	
1*T1	41.60±0.30[a]
7*T1	40.47±0.24 [b]
14*T1	40.20±0.20 [b]
1*T2	36.03±0.03 [d]
7*T2	34.70±0.15 [e]
14*T2	34.04±0.04 [e]
1*T3	30.07±0.07[g]
7*T3	28.05±0.05 [h]
14*T3	28.02±0.02 [h]
1*T4	32.34±0.33 [f]
7*T4	27.97±0.03[i]
14*T4	27.52±0.29[i]
1*T5	38.61± 0.31 [c]
7*T5	34.11±0.11 [e]
14* T5	34.10±0.10 [e]
PV	0.0001

The antioxidant property (Table 3) of yoghurt stabilized with different local hydrocolloids at 1, 7 and 14 days storage periods revealed the highest (35.73 %) scavenging potential atday 1 of storage. However, significant reduction was observed in the antioxidant capabilities from 35. 73 -32.77 % as storage period increased. Treatment effect showed significant (P<0.0001) increase in the control sample (40.76%) while the least value (28.72 %) was obtained in corn starch. Similar trend was observed in the interaction effect as the control sample at day 1 of storage had the highest (41.60 %) value.

IV. **Discussion**

Proximate Composition

The moisture content is used to assess the storability of a product and provides a measure of the water content [30].The increases in moisture content as storage period increased may be due to the gain of moisture or water from the internal atmosphere of the refrigerator during storage period. [31] reported increase in moisture content due to long period of storage.The moisture content in this study is similar to the findings of [32] who reported values ranging from 71.170- 87.36 % in yoghurt treated with local stabilizers. However, the decline in carbohydrate could be due to the conversion of the carbohydrate (lactose) to lactic acid. This corroborates the reports of [33]. [31] also reported decrease in carbohydrate as storage period increases in carrot and pineapple flavoured yoghurt production. The decline in fat content asstorage progressed, corroborated the report of [34]; these authors reported decrease in fat (from 2.50-2.92%) as storage period increases in papaya yoghurt and cactus pear flavoured yoghurt production. The protein content decreases as the storage period progressed. This result disagreed with the report of [35] who reported that during fermentation process, the *Lactobacillus bulgaricus* and *Streptococcus thermophiles* microbe biomass were increased, thus the sum of microbe protein was increased, that automatically led to increased protein in their yoghurt.The reduction in protein content observed in this study was probably due to activity of proteolytic agents on protein degradation as opined by [36].The highest concentration of ash noted in the gelatin fortified yoghurt could be connected to the mineral content of gelatin which reflected in the product.

Physical Properties

The increase in water holding capacity and whey drainage obtained in this study during storage agrees with the findings of [37] who reported an increase in water holding capacity and whey drainage as storage period increases.The current findings disagreed with the results of [38] and [39] Lubna *et al*. (2020) who reported that water holding capacity values of yoghurt samples decreased due to increase in syneresis during increased storage time. The highest water holding capacity and least syneresis observed in gelatin fortified yoghurt , a conventional stabilizer could as a result of the proteinous nature of gelatin. Proteins have water binding properties and reduce syneresis by increasing the water holding capacity of the yoghurt [40].

Syneresis is considered as a very important physical test for yoghurt quality and is related to the instability of the yoghurt gel network and the impossibility of trapping the serum phase in its gel network [41]. Syneresis in yoghurt occurs due to compression of three-dimensional structure of the protein network that results in decreasing the protein binding \power and exiting the water from yoghurt. Adding the hydrocolloids reduced syneresis of the yoghurt because the hydrocolloids are able to establish the stronger bonds with free water molecules due to high molecular weight.

This increase in viscosity during storage from day 1 to 14 may be due to changes in protein-protein binding in a three-dimensional protein network of yoghurt and their rearrangement [4]. Also, [4]opined that the increase in starch concentration resulted in an increase of viscosity and elastic modulus (G′) due to the uptake of water by swollen starch granules, resulting in the thickening of the continuous phase, and the formation of more particle-particle interactions. [42] reported an increase in the apparent viscosity of concentrated yoghurt during storage and opined that it could be due to the development of gel structure during storage [42; 43]. [44] also reported that the viscosity of the fruit-flavored yogurt (by adding cornelian cherry paste and sugar at different ratios) increase rapidly up to day 7, and continued to increase slowly up to day 14 of storage and afterward decreased slowly.

Antioxidant Properties

Antioxidants are considered important nutraceuticals [45]. They scavenge free radicals generated in the body due to metabolic processes [46]. Antioxidant compounds, particularly those in the flavonoid family, are required to combat free radicals and prevent oxidative stress, leading to degenerative diseases [47]. The use of DPPH as an assay method is due to the good stability, simplicity and feasibility and the ability to form stable radicals [48].Highest DPPH inhibition during first day of storage may be attributed to the metabolically active yoghurt bacteria even at low temperature [49]. Continued microbial growth during refrigerated storage may alter some of the phenolic compounds and hence their antioxidant activities [50]. Antioxidant activities during refrigerated storage of yoghurt is attributed to increasing degradation of phenolic compounds with antioxidant activities [51] and/or increasing milk protein polyphenol interaction [52]. In this regard, the consumption of yoghurt is highly advisable within 7 days after yoghurt-making to benefit from high live bacterial contents [53] and high antioxidant activities useful for protective cardiovascular effect [54].

This result is in accordance with the report of [55], when they studied antioxidant, some flavor components, microbiological and microstructure characteristics of corn milk yoghurt. It was also reported that the antioxidant activities of yoghurts containing both yoghurt culture and probiotic culture, determined by both DPPH and ABTS methods, generally increased during the fermentation period [56]. It has been reported that the unstable changes in ABTS, FRAP and DPPH radical scavenging activity are due to many factors, such as the activity of the microbiota and the antioxidant abilities of the many compounds formed during the fermentation process and because phenolic compounds also play an important role in antioxidant activity [57]. Hydrolysis and release of cell wall components through fermentation causes the release of phenolic compounds from food, which in turn affects antioxidant activity [58]. Higher DPPH value indicates low concentration of antioxidants in the sample.The lower values of DPPH obtained instabilized yoghurts compared with the control indicates that stabilized yoghurt samples have higher concentration of antioxidants.

V. Conclusion

The results obtained from this study indicate that corn, cassava, potatoe starch made into paste can serve as stabilizer as they competedfavourably with the conventional synthetic stabilizer (gelatin) in improving the textural qualities of theyoghurt. However, among the local starches used, corn starch proved to have better impact on the yoghurt quality.

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