

NOVEL NON-DAIRY YOGHURT FROM PIGEON PEA MILK

A.O. Yusuf, F. Shode and O.A. Ijabadeniyi

**Department of Biotechnology and Food Technology, Durban
University of Technology, South Africa**



INTRODUCTION

- **Pigeon pea (*Cajanus cajan*): under researched, under utilized, drought tolerant (Naylor et al. 2004)**
- **Nutrient profile**
 - **Protein (20 to 32%)**
 - **Carbohydrate (49 to 60%)(Saxena et al. 2008),**
 - **Lysine of pigeon pea (7.79) is superior to that of soya (6.1) (Akande et al. 2010; Sigh 1999)**
- **Utilization**
 - **Traditional medicine**
 - **Culinary use**
 - **Other uses**



Fig 1: Pigeon pea grains



Fig 2: Soy bean grains

Table 1 :Amino acid composition of some legumes protein¹

Legume type	ASP	GLU	LYS	HIS	ILE	LEU	MET	VAL
Pigeon pea^b	11.56	9.23	7.79	3.66	3.47	6.78	1.19	5.85
Bambara groundnut^a	9.6	15.4	6.3	3.0	3.8	7.3	1.8	4.3
Soya bean ^f	11.4	16.9	6.1	2.5	4.6	7.7	1.2	4.6
Peanut ^g	12.1	21.1	3.8	2.5	3.5	7.0	1.3	3.9
Cowpea ^e	12.2	18.9	6.9	2.5	4.6	7.7	1.2	5.4
FAO/WHO			5.8	1.9	2.8	6.6	1.7	3.5

NON DAIRY YOGHURTS

- **Yoghurt : Fermented semi fluid milk product (Falade et al. 2014).**
- **Types**
- **Limitations of dairy yoghurt**
- **Non dairy yoghurt**
 - **Soy**
 - **Bambara**
 - **Corn**

PREVIOUS RESEARCH ON NON DAIRY YOGHURTS

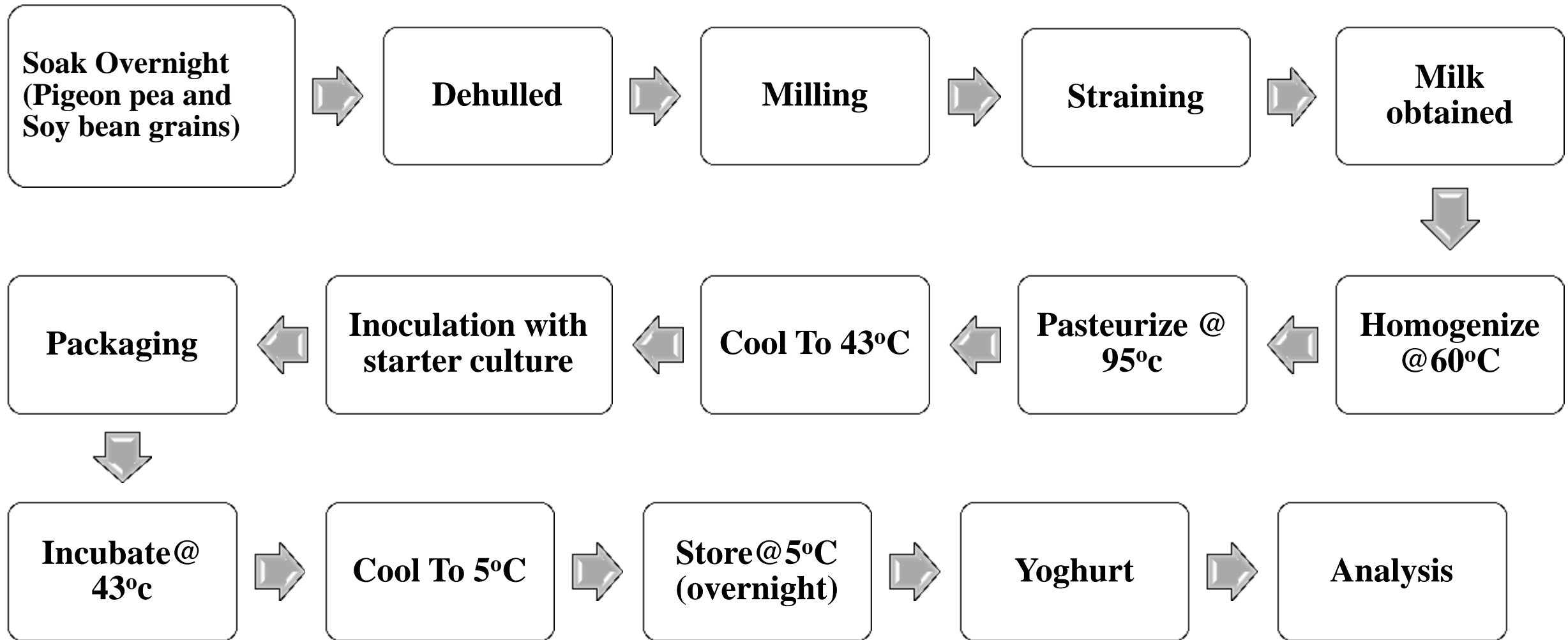
- **Bambara yoghurt was reported to have better sensory properties than soy yoghurt (Falade et al. 2014)**
- **Variation in total solids with temperature was reported for both bambara and soy yoghurts**
- **Lactic acid bacteria were reported to be the predominant organisms in yoghurt samples**

Aim

To develop and investigate quality attributes of Pigeon pea based yoghurt.

OBJECTIVES

- To determine the proximate composition of yoghurt samples.**
- To determine storage stability, pH and titratable acidity of yoghurt.**
- To determine the consumer acceptability of yoghurt .**



- Fig 3: Flow chart of yoghurt production
- Modified method (Tammime and Robinson 1999)

- **PRODUCTS**
- 50% pigeon pea + 50% soya milk
- 100% pigeon pea
- 100% soya milk

- **ANALYSIS**
- Proximate
- Storability
- Consumer acceptability



Fig 4a: Raw pigeon pea milk



Fig 4b: Pasteurisation of milk in progress



Fig 4c: Yoghurt during incubation



Fig 4d: Yoghurt samples: SM/PY, SMY & PPYP.

RESULTS AND DISCUSSION

Table 2: Proximate composition for milk and yoghurt produced from pigeon pea and soya milk

Samples	Total solid	Solid-non-fat	Moisture	Crude fat	Crude protein	Ash	Carbohydrate
Soymilk	15.0 ± 0.16^a	13.03 ± 0.97^a	84.9 ± 0.16^a	2.00 ± 0.04^a	9.3 ± 0.50^a	0.65 ± 0.00^{bc}	0.52 ± 0.00^a
Pigeon pea milk	12.54 ± 0.25^b	12.20 ± 0.57^a	87.46 ± 0.25^a	0.56 ± 0.00^a	7.49 ± 0.63^{a,b}	0.58 ± 0.08^b	3.70 ± 1.70^b
Soymilk yoghurt	18.29 ± 0.00^c	16.13 ± 0.23^b	81.71 ± 0.00^a	1.99 ± 0.24^b	4.54 ± 0.05^{ab}	1.03 ± 0.00^c	10.74 ± 0.19^c
Soy/pigeon pea milk yoghurt	18.43 ± 0.37^d	17.41 ± 0.66^b	81.83 ± 0.09^a	0.76 ± 0.67^{cd}	5.00 ± 0.00^{ab}	0.72 ± 0.01^c	11.70 ± 0.69^{cd}
Pigeon pea milk yoghurt	18.17 ± 0.00^d	16.92 ± 0.18^b	81.83 ± 0.00^c	1.25 ± 0.18^{de}	5.02 ± 0.04^c	0.61 ± 0.00^b	11.26 ± 0.18^{cd}

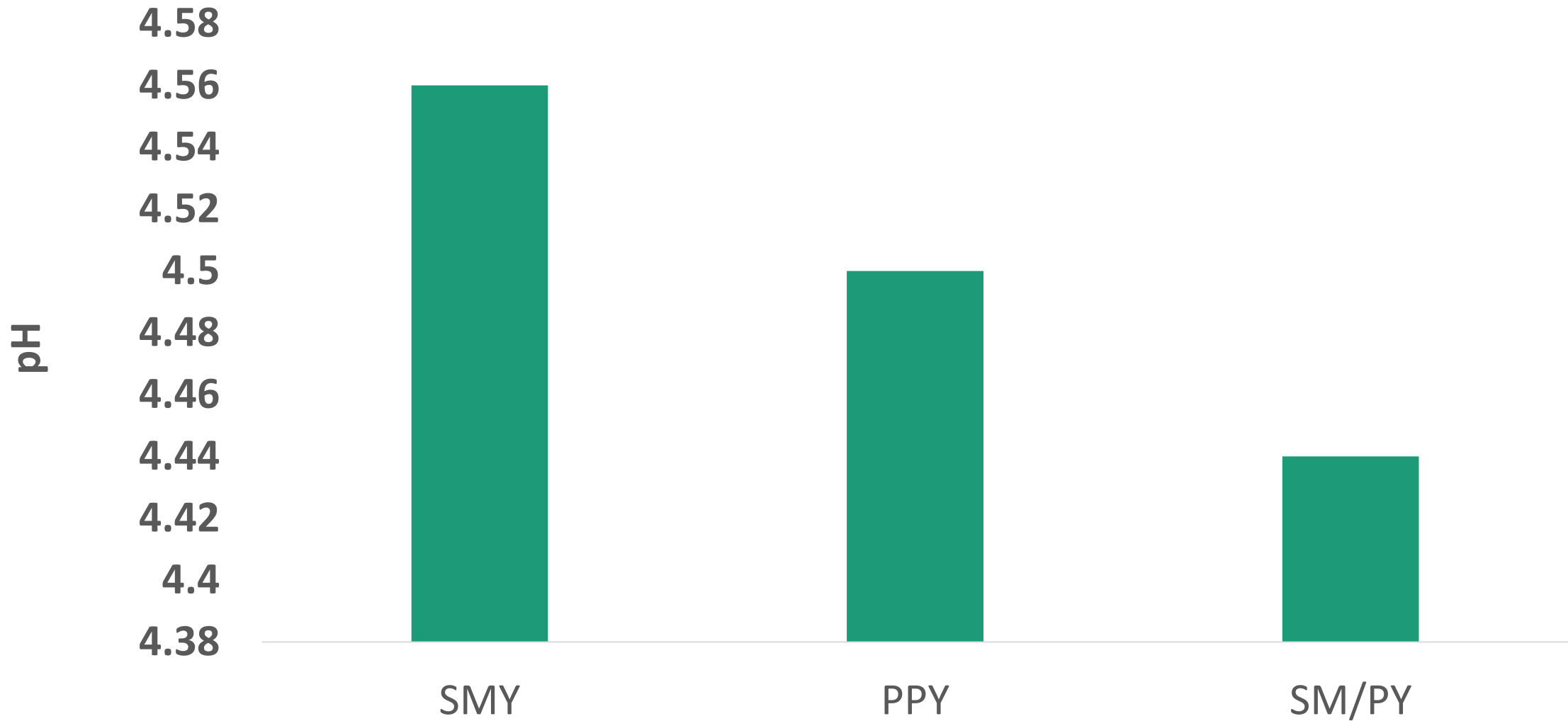


Fig. 5 : Termination pH of yoghurt samples

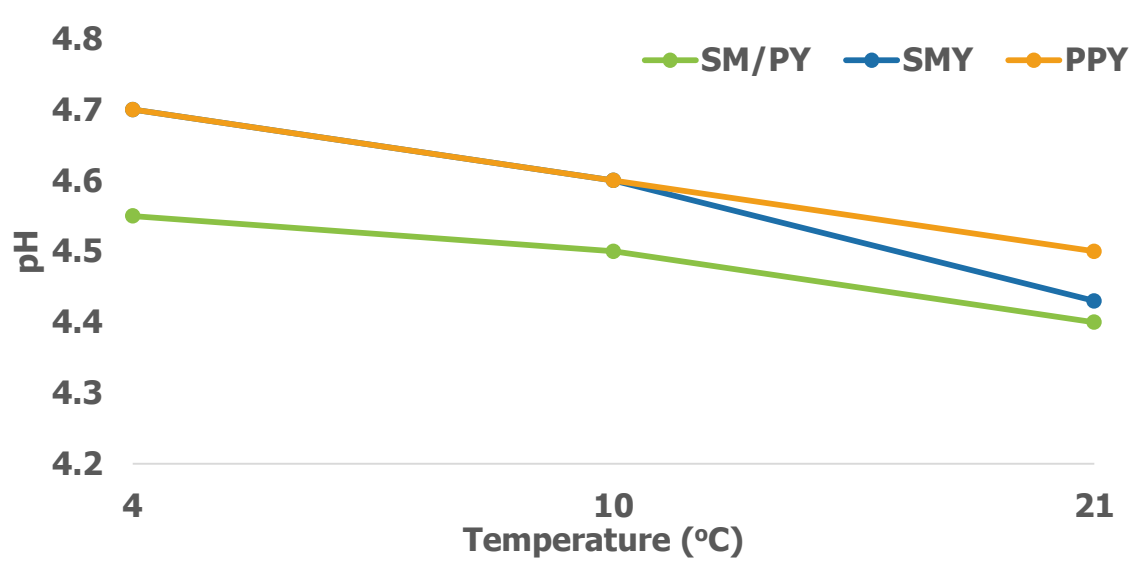


Fig 6a: pH of yoghurt samples – week 1

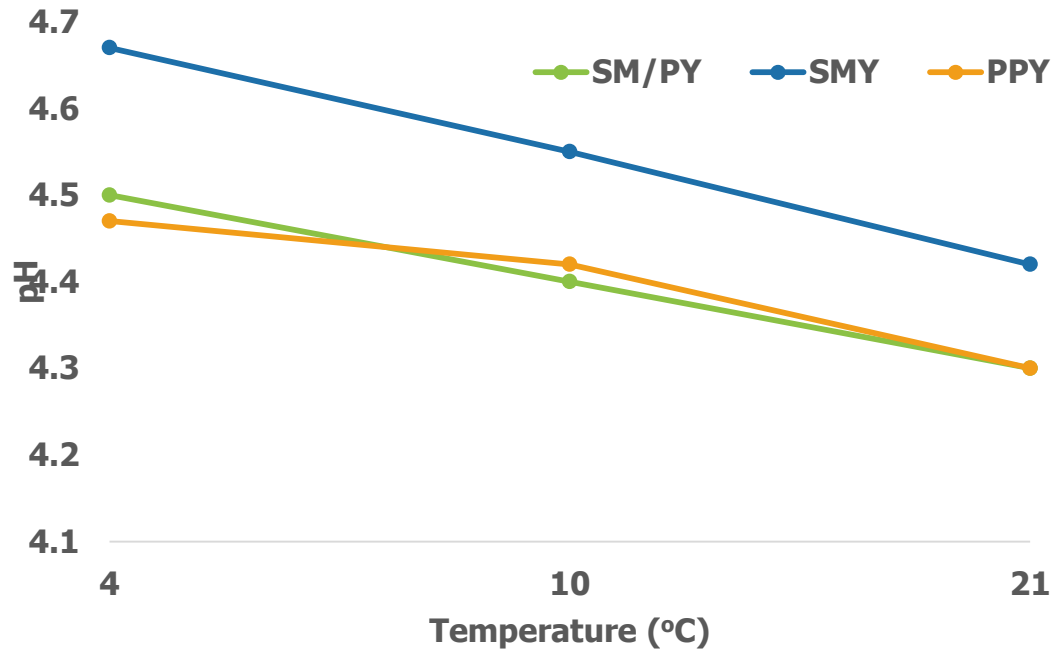


Fig 6c: pH of yoghurt samples - week 3

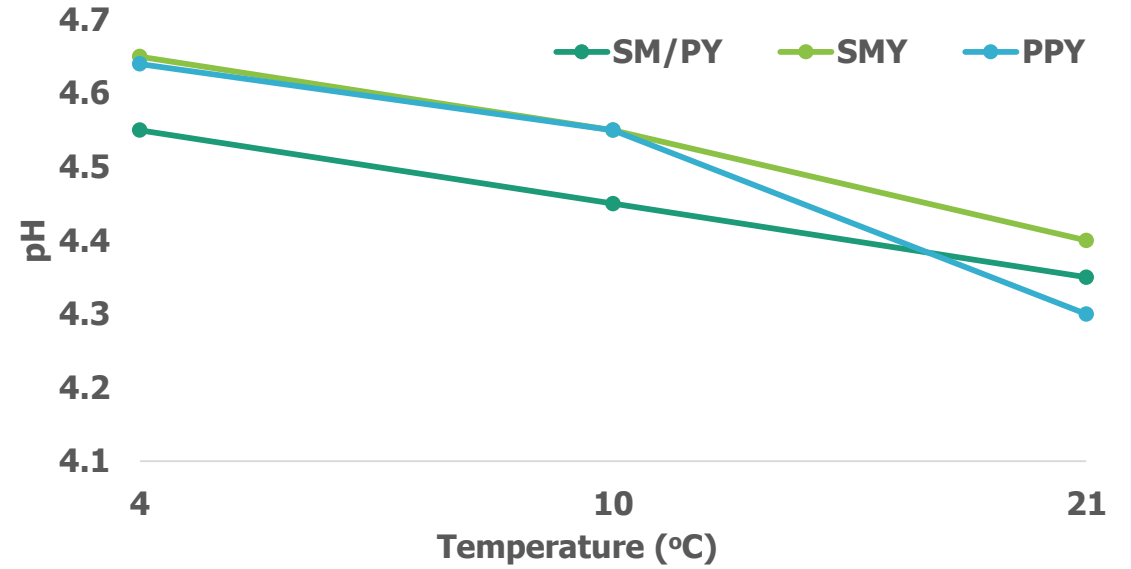


Fig 6b: pH of yoghurt samples - week 2

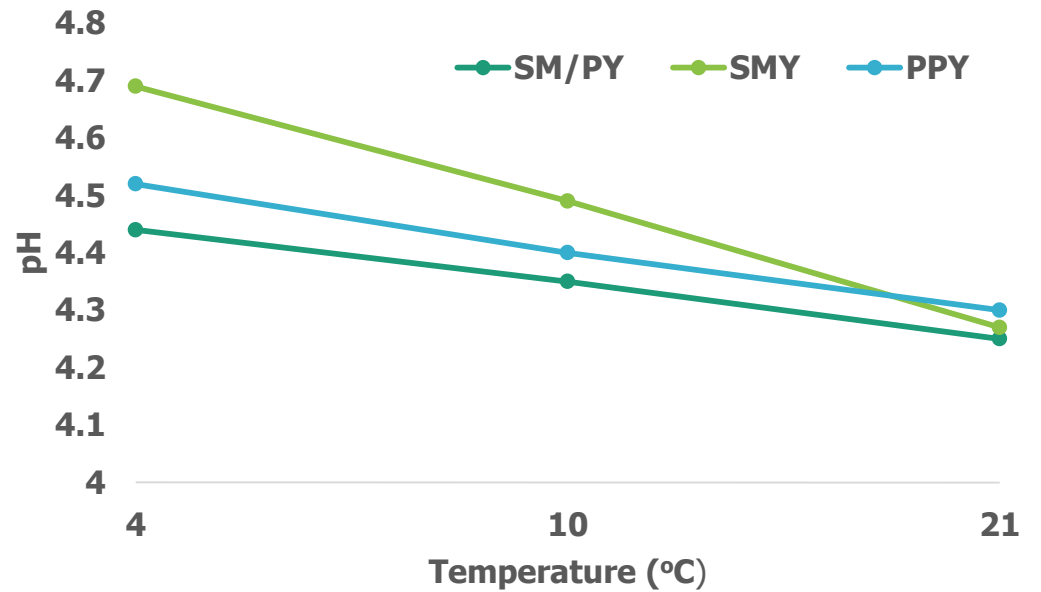


Fig 6d: pH of yoghurt samples - week 4

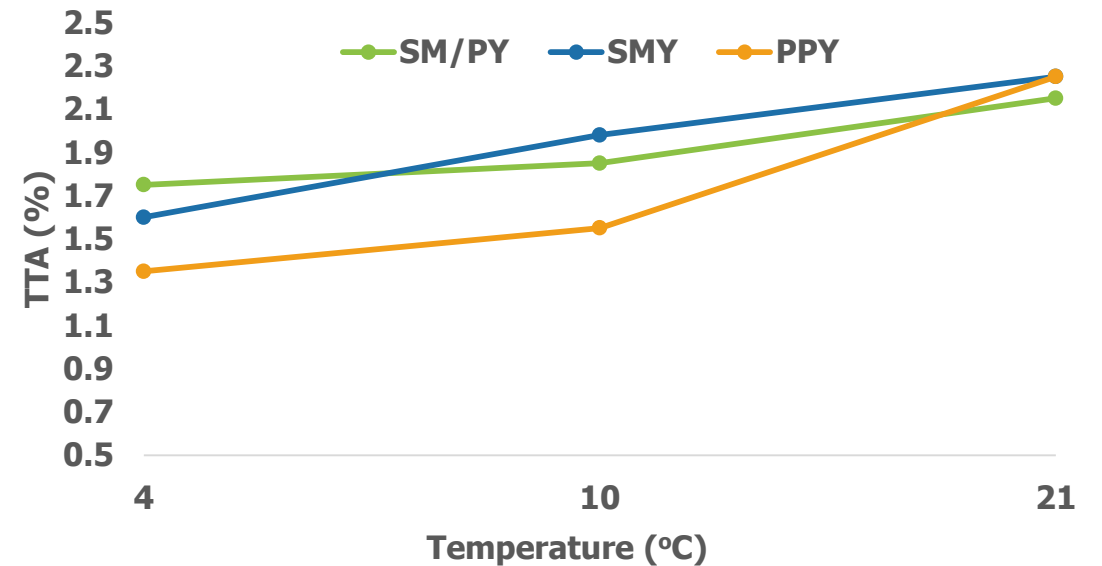
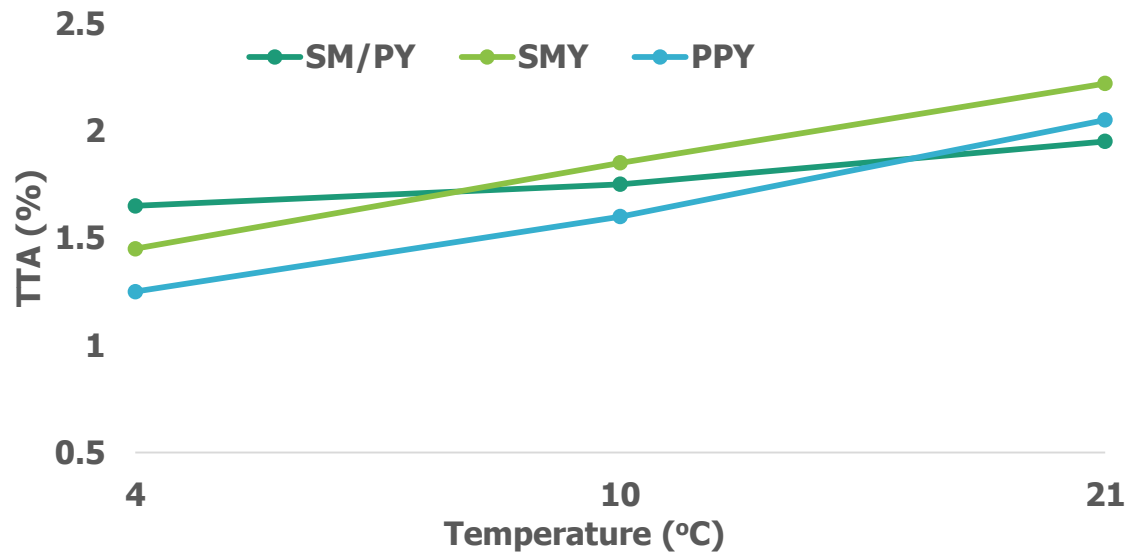
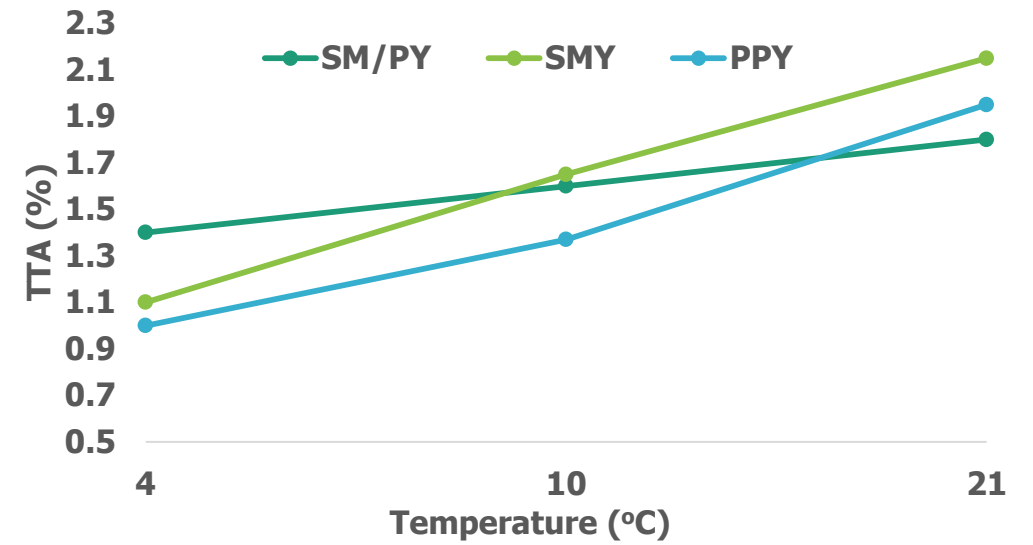
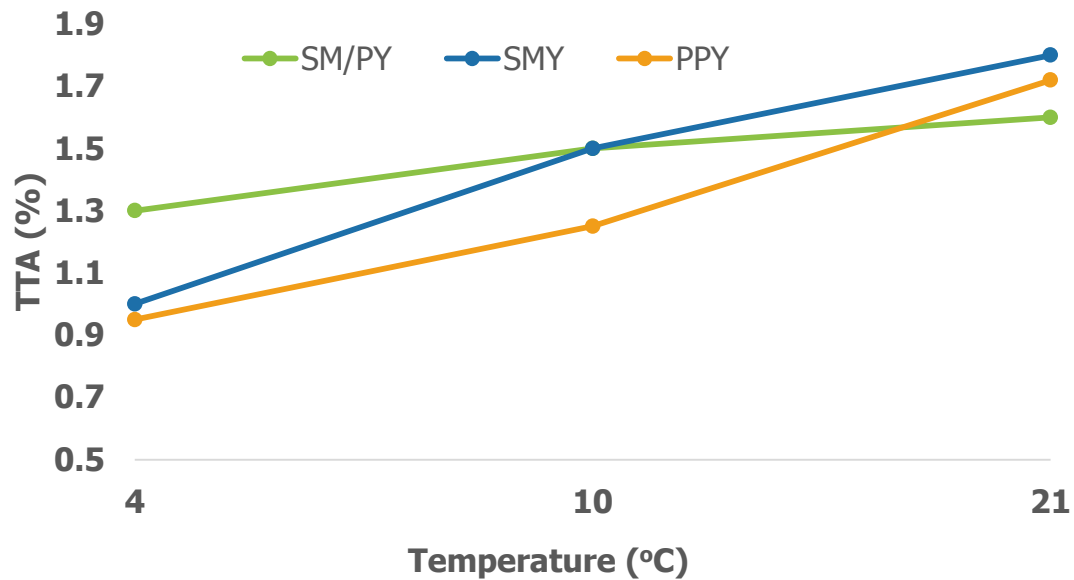


Fig 7c: TTA of yoghurt samples - week 3

Fig 7d: TTA of yoghurt samples - week 4

Table 3a: Storage stability of yoghurt samples at 4, 10 and 21°C.

	WEEK 1	(4°C) log (cfu/ml)			
Products	Mould	Total plate count	Lactic acid bacteria	E.coli	Aerobic spore former
SMPY	ND	7.39	7.51	ND	ND
SMY	ND	7.01	7.31	ND	ND
PPY	ND	7.22	7.36	ND	ND
		(10°C) log (cfu/ml)			
SMPY	ND	8.85	8.72	ND	ND
SMY	ND	8.77	8.75	ND	ND
PPY	ND	8.59	8.57	ND	ND
		(21°C) log (cfu/ml)			
SMPY	ND	8.89	8.79	ND	ND
SMY	ND	8.75	8.66	ND	ND
PPY	ND	8.76	8.76	ND	ND

Where: **SM/PY**: 50 % soymilk + 50 % pigeon pea milk yoghurt, **SMY**: Soymilk yoghurt, **PPY**: Pigeon pea milk yoghurt, ND: not detected.

Table 3b

	WEEK 2	(4°C) log (cfu/ml)			
Products	Mould	Total plate count	Lactic acid bacteria	E.coli	Aerobic spore former
SMPY	0.79	7.39	7.51	ND	ND
SMY	0.88	7.01	7.31	ND	ND
PPY	0.92	7.22	7.36	ND	ND
		(10°C) log (cfu/ml)			
SMPY	1.13	8.88	8.91	ND	ND
SMY	1.11	8.79	8.63	ND	ND
PPY	1.07	8.66	8.72	ND	ND
		(21°C) log (cfu/ml)			
SMPY	1.23	8.88	8.77	ND	ND
SMY	1.15	8.89	8.81	ND	ND
PPY	1.11	8.85	8.62	ND	ND

Where: **SM/PY**: 50 % soymilk + 50 % pigeon pea milk yoghurt, **SMY**: Soymilk yoghurt, **PPY**: Pigeon pea milk yoghurt, **ND**: not detected.

Table 3c

	WEEK 3	(4°C) log/cfu			
Products	Mould	Total plate count	Lactic acid bacteria	E.coli	Aerobic spore former
SMPY	1.21	6.84	6.94	ND	0.85
SMY	1.13	6.57	6.83	ND	0.80
PPY	1.05	6.83	6.79	ND	0.85
		(10°C) log (cfu/ml)			
SMPY	1.33	6.86	6.92	ND	1.0
SMY	1.37	6.81	6.92	ND	0.95
PPY	1.29	6.92	6.88	ND	0.95
		(25°C) log (cfu/ml)			
SMPY	1.35	6.85	6.87	ND	1.2
SMY	1.39	6.91	6.88	ND	1.2
PPY	1.32	6.86	6.88	ND	1.2

Where: **SM/PY**: 50 % soymilk + 50 % pigeon pea milk yoghurt, **SMY**: Soymilk yoghurt, **PPY**: Pigeon pea milk yoghurt, ND: not detected.

Table 3d

	WEEK 4	(4°C) log (cfu/ml)			
Products	Mould	Total plate count	Lactic acid bacteria	E.coli	Aerobic spore former
SMPY	1.60	6.83	6.92	ND	1.2
SMY	1.66	6.53	6.83	ND	1.2
PPY	1.62	6.80	6.73	ND	1.2
		(10°C) log (cfu/ml)			
SMPY	1.66	6.81	6.92	ND	1.4
SMY	1.69	6.81	6.92	ND	1.5
PPY	1.69	6.90	6.83	ND	1.5
		(25°C) log (cfu/ml)			
SMPY	1.87	6.85	6.87	ND	1.8
SMY	1.73	6.71	6.82	ND	1.9
PPY	1.75	6.76	6.87	ND	1.9

Where: **SM/PY**: 50 % soymilk + 50 % pigeon pea milk yoghurt, **SMY**: Soymilk yoghurt, **PPY**: Pigeon pea milk yoghurt, ND: not detected.

Table 4: Consumer Acceptability Test

Sample	Colour	Aroma	Taste	Mouth feel	Overall acceptability
SMY	6.82 ± 1.8 ^{a,b}	6.29 ± 2.0 ^a	6.12 ± 2.4 ^a	6.67 ± 2.0 ^a	6.80 ± 2.1 ^b
PPY	7.27 ± 1.4 ^b	6.35 ± 1.6 ^a	5.76 ± 1.9 ^a	6.88 ± 1.3 ^a	6.49 ± 1.7 ^{a,b}
SM/PY	6.10 ± 2.7 ^a	6.08 ± 2.4 ^a	6.08 ± 2.3 ^a	6.60 ± 1.8 ^a	6.54 ± 2.3 ^{a,b}

Means values followed by different superscript letters are significantly different.

Where: SM/PY: 50 % soymilk + 50 % pigeon pea milk yoghurt, SMY: Soymilk yoghurt, PPY: Pigeon pea milk yoghurt, ND: not detected.

Water holding capacity of yoghurt samples

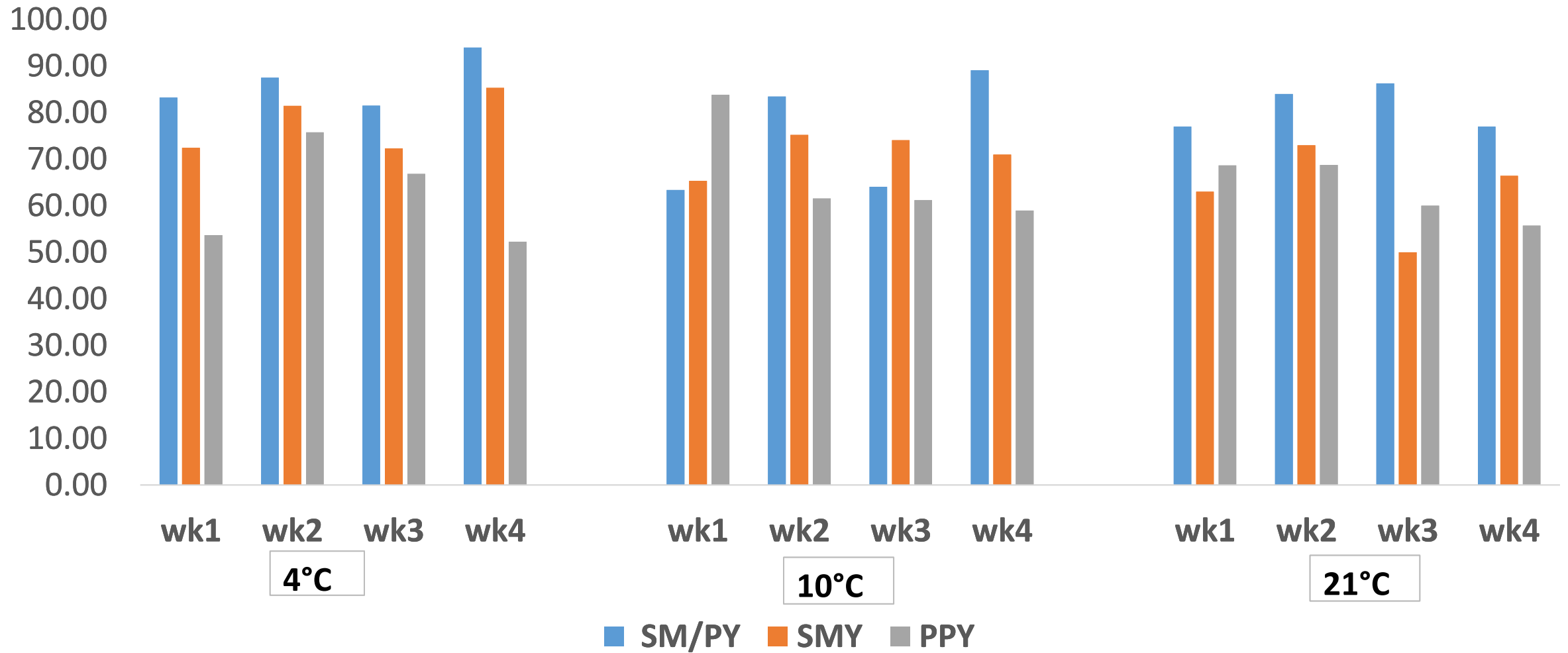


Fig 8: Water holding capacity of yoghurt samples stored at 4 10 and 21oC for 4 weeks

Conclusion

- **Acceptable yoghurt was produced from pigeon pea with comparable quality to soy which serve as control.**
- **Proximate composition was comparable to previous reports. Microbial quality and profile of all the yoghurt samples were similar.**
- **The absence of pathogenic bacteria in all the yoghurt samples confirm their safety.**
- **Soy yoghurt was most acceptable among the yoghurt samples but all the samples had comparable ratings, and these ratings are within commercially acceptable range (4 to 9) for yoghurt.**
- **Storage at 4°C should be the most acceptable, as storage at 21°C encourage proliferation of contaminants.**

THANK YOU FOR LISTENING