

GLOBAL JOURNAL OF ADVANCED ENGINEERING TECHNOLOGIES AND SCIENCES**EFFECT OF CINNAMON EXTRACT ON PHYSICOCHEMICAL PROPERTIES OF LOW FAT YOGHURT****S. Shampavi*, R. A. U. J. Marapana¹**

* Department of Food Science and Technology, Faculty of Applied Sciences, University of Sri Jeyewardenepura, Gangodawila, Nugegoda, Sri Lanka

¹Department of Food Science and Technology, Faculty of Applied Sciences, University of Sri Jeyewardenepura, Gangodawila, Nugegoda, Sri Lanka**ABSTRACT**

A study was carried out to find out the effect of quality variation on cinnamon extract incorporated yoghurt. Four types of low fat yoghurt were prepared with skim milk as a main ingredient (With or without full cream milk powder and with or without sugar). Sensory analysis was carried out and best final products were selected. Proximate composition (fat, protein, moisture, total solids and ash) and Physical parameters (pH and Acidity) of the final products were measured using AOAC procedures. Minerals such as Calcium and phosphorous were analyzed from the AAS. The proximate analysis revealed that all the products contain fat between 0.3-0.5%, Protein 3-3.5%, Moisture 76-79%, Ash 0.7-0.72%, Total solid 20-23%, Calcium 13-18mg/100g and Phosphorous 169-324mg/100g. pH was less than normal yoghurt and Acidity was higher than the normal yoghurt.

KEYWORDS: Cinnamon Extract, Low fat Yoghurt, physicochemical properties.**INTRODUCTION**

Yoghurt is a coagulated fermented milk product obtained by lactic acid fermentation through the action of *Lactobacillus bulgaricus* and *Streptococcus thermophilus* (Robinson, 2003) and it has medicinal and nutritional value. The preferable and important features at better storage that of fresh milk and in the presence of active culture, better digestibility and new taste sensations. Researches are carried out many attempts to use herbal additives in order to promote taste and medicinal values to improve the health of the consumers. In this research cinnamon water extract and Cinnamon oil extract are taken as additive to give a good aroma, taste and increase the medicinal values. Cinnamon contains many nutritive substances such as polyphenols, dietary fibre, and minerals like Manganese (Mn), Calcium (Ca), Copper (Cu) and Zinc (Zn). In addition to these, it contains cinnamic acid, cinnamaldehyde and tannin (Shumaila Gul and Mahpara Safdar, 2009). The polyphenols the anti-oxidants which boost the levels of three key proteins. There are playing important role in insulin signaling Glucose transport (blood sugar) and inflammatory response. The proanthocyanidin a type of phenol which activates insulin receptors. These chemicals help to lower the blood sugar level as much as 30% (Khan *et al.* 2003).

The anti-inflammatory compound is present in cinnamon it relieves arthritis, helping to prevent urinary infections tooth decay and gum diseases (Sampathkumar *et al.*, 2010). In addition to these it acts as strong anti-microbial substance and it can kill bacteria especially *E.coli* (Rao and Gan, 2014). As the cinnamon has distinct aroma, flavor, spicy and sweet properties, it may have uses in food beverage, sweet and confectionery industries. It is used as flavoring agent in soft drinks and sweets, tear and bakery products. The delicious Indian curries also have the additives of cinnamon. Even the meat too flavored with powdered cinnamon. From the ancient time it medicinal value was realized by the native physicians and used to cure many illnesses. Presently its chemical constituents are studied and the use of cinnamon is enroots in the field of medicine. Fiber cinnamon provides relief from constipation and diarrhea, Cinnamon takes a place in perfumery industry too (Rao and Gan, 2014). Generally new raw bark is taken for industrial purposes. But the industrial waste to could be make useful and valuable. Using the waste for other purposes should be taken for scientific technological consideration. Especially the dietary fibre content, mineral content, and polyphenol content. When adding cinnamon extract to yogurt the consumers can enjoy the taste and flavor and they would get medicinal benefits, especially for diabetes and cholesterol. Introducing the cinnamon to yoghurt which will promote the yoghurt industry in many ways. Yoghurt production is being done at industrial level, and at cottage level, when the yoghurt is more palatable, it will move fast. Generally economically vulnerable group proceed in small scale for their day to day needs money. Once cinnamon added yoghurt is in the market which will move faster and the income of the producer would be improved. Cinnamon added yoghurt would be a supportive nutrition to keep the health condition well who consumes it.

MATERIALS AND METHODS

Cinnamon bark

Starter Culture (*Lactobacillus bulgaricus*, *Streptococcus thermophilus*)

Preparation of cinnamon water extract: Water extraction of Cinnamon bark was carried out as the method described by Amal Bakr Shori and Ahmad S.Baba, 2011) Ten grams of *Cinnamomum zeylanicum* were ground and mixed thoroughly with 100ml of distilled water. The mixture was incubated overnight in a water bath at 70°C followed by centrifugation (10,000rpm) for 15 minutes at 4°C. The clear supernatants were harvested and used as *Cinnamomum zeylanicum* water extracts in the making of herbal yoghurts.

Preparation of cinnamon yoghurt: Full Cream milk Powder, Sugar and Cinnamon Water Extract have been taken as factors for this research. First, Skim milk is added with full cream milk powder and other without full cream milk powder. Each of these has two subsets with sugar and without sugar. And cinnamon extract was added in following quantities 5ml, 10ml, 15ml to the above subsets, thus gives twelve samples for those samples Sensory Analysis was carried out. Best for samples were selected and analysis carried out. Analysis was carried out for the control of selected sample and compared with each other.

Determination of Cinnamaldehyde : GC-MS Analysis - Agilent 6890/HewlettPackard 5975 GC – MS Model was used and it was fitted with electron impact (EI) mode for the GC-MS analysis of Cinnamon water extract and oil Extract. The Helium was used as the carrier gas at a flow rate of 1mL/min. The temperature was programmed at 50°C for 2 minutes then increased to 280°C at the rate of 10°C/min and then to 280°C for 2.5minutes at the rate of 20°C/min. The temperature of injector and EI detector (70eV) were 275°C and 300°C, respectively. Each Cinnamon extract of 1µL was injected with a Hamilton syringe to the GC/MS manually.

Sensory Analysis: Sensory evaluations were conducted to find out the best sample from each type. Thirty untrained panelists participated for the sensory evaluation. Results were analyzed using Kuskalwallis non-parametric method in MINITAB software.

Proximate Analysis: Total solids, Fat, Protein, Moisture and ash content of cinnamon yoghurt were determined by the method described by AOAC 2005.

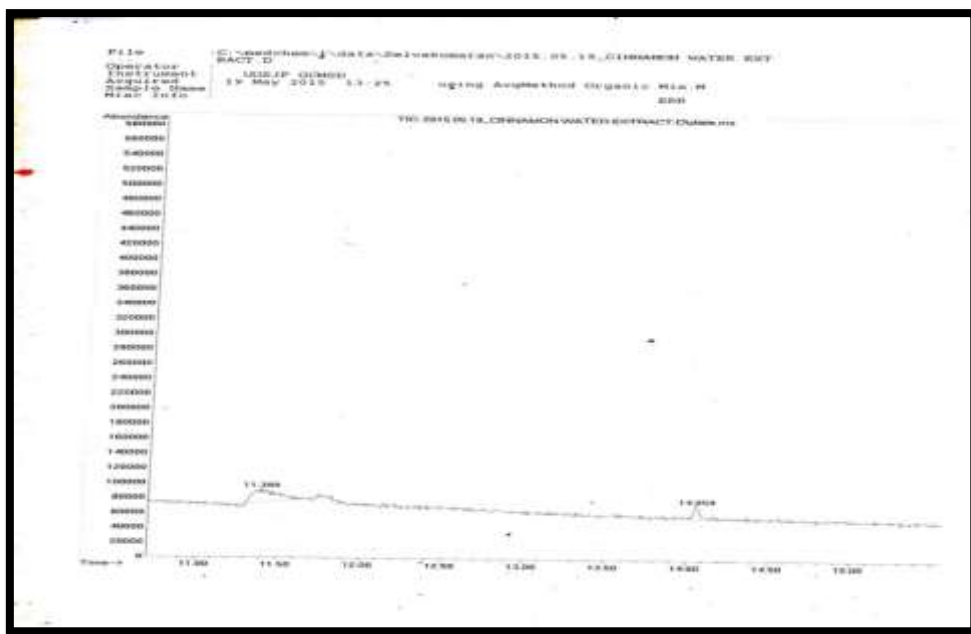
Determination of Minerals: To find out the mineral contents: Ca - By Vogel's Method, 1989 and P - By ASEAN Manuals, 2011 were used.

pH and Acidity measurement: To determine the shelf life of yoghurt the pH and Acidity test was carried out by the method describe by Akpakpunam and Safa-Dedeh (1995).

RESULTS & DISCUSSION

GC-MS ANALYSIS

Figure i:



GC-MS analysis for cinnamaldehyde present in the cinnamon oil

Figure (i) show the retention time for the cinnamaldehyde present in the cinnamon water extract is 11.399.

PROXIMATE ANALYSIS*Table 3.1: Results of the proximate analysis for the different yoghurt samples*

| Constituents % | T1 | Control 1 | T2 | Control 2 | T3 | Control 3 | T4 | Control 4 |
|----------------|------------|------------|------------|-----------|-----------|------------|-----------|-----------|
| Fat | 0.5±0.07 | 0.4±0.07 | 0.3±0.07 | 0.2±0.07 | 0.4±0.07 | 0.3±0.07 | 0.5±0.07 | 0.4±0.07 |
| Protein | 3.12±0.2 | 3.03±0.12 | 3.03±0.12 | 2.99±0.12 | 3.3±0.6 | 3.2±0.12 | 3.42±0.15 | 3.3±0.6 |
| Ash | 0.72±0.01 | 0.71±0.01 | 0.71±0.01 | 0.69±0.01 | 0.72±0.01 | 0.79±0.01 | 0.72±0.01 | 0.7±0.01 |
| Moisture | 78.45 ±0.3 | 74.77 ±0.5 | 79.66 ±0.5 | 76.6±1.2 | 79.8±0.1 | 78.46 ±0.5 | 76.46±0.5 | 74.35±0.5 |
| Total Solid | 21.55±0.3 | 25.23±0.5 | 20.34 ±0.5 | 23.4±1.2 | 20.2±0.5 | 21.54±0.5 | 23.54±0.5 | 25.65±0.5 |

Table 3.1.shows the proximate composition of yoghurt samples. The results of the proximate composition of the different yoghurt samples is shown in Table 1.From the results the nutrients like protein ,fat ,ash and Moisture are slightly higher than the control. Because the presence of soluble nutrient in cinnamon water extract. Fat also slightly higher than the control may be the reason presence of cinnamaldehyde.Cinnamon water extract is present in cinnamon yoghurt so moisture is high.

PRESENCE OF MINERALS*Table 3.2.Results for the presence of Minerals in each Yoghurt type.*

| Constituents % | T1 | Control 1 | T2 | Control 2 | T3 | Control 3 | T4 | Control 4 |
|-----------------|--------|-----------|--------|-----------|-------|-----------|--------|-----------|
| <u>Minerals</u> | | | | | | | | |
| Calcium | 13.6mg | 44mg | 10.4mg | 29.6mg | 16mg | 18.4mg | 16.6mg | 32.4mg |
| Phosphorous | 354mg | 366mg | 169mg | 234mg | 267mg | 335mg | 324mg | 354mg |

Table 3.2.shows the presence of minerals in cinnamon yoghurt. Minerals like calcium and phosphorous are less than the control because the presence of milk. Major minerals present in milk are calcium and phosphorous.

PH AND ACIDITY MEASUREMENT*Table 3.3.Results for the shelf life analysis - pH and Acidity (For storage period of 14 Days)*

| Constituents % | T1 | Control 1 | T2 | Control 2 | T3 | Control 3 | T4 | Control 4 |
|----------------|-------------|-------------|------------|-----------|-------------|------------|-------------|-------------|
| pH | 4.74 - 4.33 | 4.76 - 4.38 | 4.6-4.22 | 4.65-4.27 | 4.9-4.29 | 4.95-4.33 | 4.94-4.44 | 4.99-4.45 |
| Acidity | 0.661-0.96 | 0.661- 0.95 | 0.66-0.984 | 0.65-0.95 | 0.638 -0.91 | 0.62 -0.89 | 0.637-0.896 | 0.637-0.946 |

T1 - Cinnamon Yoghurt with skim milk, full cream milk powder and sugar (65ml: 15ml)
 T2 - Cinnamon Yoghurt with skim milk, sugar and without, full cream milk powder (65ml: 15ml)
 T3 - Cinnamon Yoghurt with skim milk and without full cream milk powder and sugar (70ml: 10ml)
 T4 -Cinnamon Yoghurt (with skim milk, full cream milk powder and without sugar (70ml: 10ml)
 Control 1 - Yoghurt with skim milk, full cream milk powder and sugar (65ml: 15ml)
 Control 2 - Yoghurt with skim milk, sugar and without, full cream milk powder (65ml: 15ml)
 Control 3 – Yoghurt with skim milk and without full cream milk powder and sugar (70ml: 10ml)
 Control 4 - Yoghurt (with skim milk, full cream milk powder and without sugar (70ml: 10ml)
 Control means without cinnamon Extract.

Table 3.3 shows the pH and acidity during the storage period of time. The pH of the cinnamon yoghurt is less than the control and the titrable acidity of the cinnamon yoghurt is high than the normal yoghurt during the storage period of 14 days.

Yoghurt has smooth viscous gel structure and has specific taste and flavor. Under normal fermentation condition, the main products of metabolisms are lactic acid, acetic acid, acetaldehyde, ethanol and diacetyl all of which contributed to the specific sour flavor of fermented yoghurts. Phytochemicals present in herbs are responsible for the undesirable organoleptic properties of herbal-yoghurts (KeerthiYadav and Sangeeta Shukla, 2014). Because of this most herbs contain a unique richness and diversity of metabolites responsible for their taste and flavor. Cinnamon water extract incorporated yoghurt was considered by the panelist more the most desirable in taste and aroma than control. And cinnamon incorporated yoghurt has high medicinal value than the normal yoghurt.

CONCLUSION

It is found from this research that the cinnamon yoghurt contains essential nutrients including protein, fat and ash and also it has good odor, taste and has good shelf life period for about fourteen days.

Cinnamon yoghurt has more beneficial properties than the normal yoghurt. It has not only the good medicinal properties but also has the higher nutrient contents and it could reduce malnutrition too.

As the cinnamon contains cinnamaldehyde, by its medicinal properties the cinnamon yoghurt could reduce cholesterol and diabetes II.

REFERENCE

1. ASEAN Manual of Nutrient analysis. 2011. Regional Centre of ASEAN Network of Food Data System, Institute of Nutrition, Mahidol University, Thailand.
2. AOAC, 2005. Official Method of Analysis. 15th Edn., Association of office Analytical Chemist, Washington D.C.
3. KeerthiYadav and SangeetaShukla. (2014). Microbiological, physicochemical analysis and sensory evaluation of herbal yogurt. *The Pharma Innovation Journal*. 10 (3), 1-4.
4. K. P. Sampath Kumar*1 ,Debjit Bhowmik2 , Chiranjib2 , Biswajit2 and M.R.Chandira2. (2010). Medicinal uses and health benefits of Honey: An Overview. *Journal of Chemical and Pharmaceutical Research* . 1 (2), 385-395.
5. MeenaVangalapati,* SreeSatya N, Surya Prakash DV, SumanjaliAvanigadda. (2012). A Review on Pharmacological Activities and Clinical effects of Cinnamon Species. *Research Journal of Pharmaceutical, Biological and Chemical Sciences*. 3 (1), 653 -661.
6. PasupuletiVisweswaraRao and SiewHuaGan. (2014). Cinnamon: A Multifaceted Medicinal Plant. *Evidence-Based Complementary and Alternative Medicine*. 1 (1), 1-12.
7. PriyangaRanasinghe. (2012). Effects of Cinnamomumzeylanicum (Ceylon cinnamon) on blood glucose and lipids in a diabetic and healthy rat model. *Pharmacognosy Research*. 4 (2), 73-79.
8. ShumailaGul and MahparaSafdar. (2009). Proximate Composition and Mineral Analysis of Cinnamon. *Pakistan Journal of Nutrition*. 8 (1), 1456-1460.
9. Y.C.Won g*, M. Y. Ahmad -Mud zaqqir and W.A. Wan -Nurdiyanaurdiyana. (2013). Extraction of Essential Oil from Cinnamon (Cinnamomumzeylanicum). *ORIENTAL JOURNAL OF CHEMISTRY*. 30 (1), 37-47.