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# Assessment of the Chemical Properties and Microbial Analysis of Some Powdered Sachet Milk Brands Sold in Owerri, Imo State

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**Abstract:- Physicochemical and microbial analysis of some powdered sachet milk brands sold in Owerri, Imo State were evaluated. The results revealed significant different (P≤0.05) in variations of the physical and chemical values of the powdered milk brands. Powdered milk brand sample E recorded the highest values in most of the evaluated parameters such as: protein (10.46%), fat (4.44%), moisture (1.92%) and total solids (8.13%). Powdered milk brand sample D had the highest in acidity value of 0.77%. Samples A, D and E had the least value of ash (0.05%), while samples B, D and E had the highest value of reducing sugar (4.05%). The sucrose content of the powdered milk brand samples showed that samples A, B, C, D and E had sucrose content of 6.91, 6.26, 6.05, 5.56 and 6.37% respectively. The sucrose of the samples was significantly different (P≥0.05). The following organisms were isolated *Staphylococcus aureus, Streptococcus sp, Bacillus cereus, Shigella sp, Penicilium*. The results shows that the physicochemical values of the powdered sachet milk samples were within the standard for powdered sachet milk as recommended by the regulatory agency.**

***Keywords:-*** *Physicochemical, Microbial Analysis, Powdered Milk, Cow's Milk, Protein.*

## I. INTRODUCTION

Milk is a secretion of the mammary glands of animals which suckle their young. It is an exceptionally good source of protein which is of high biological value in promoting the growth and regeneration of cells (Ihekoronye and Ngoddy, 1985). Milk is the lacteal secretion, practically free from colostrums which are obtained from milking healthy cow (Vasavada, 1988). Cow's milk is considered as one of the main constituents of the human diet in many parts of the world, it is ranked foremost in the world. It contains all essential nutrients. Most cows' milk is consumed in the fresh or processed state. Processing treatments, with the aim of extending shelf life, have direct influences on the nutritional, biological and microbiological properties of milk nutrients (Murwan *et al*., 2009). The manufacture of powdered milk is a simple process which is now carried out on a larger scale. This involves the gradual and frugal removal of water at the lowest possible cost under stringent measures and hygienic conditions while at the same time, retaining all the desirable natural properties of the milk viz a viz: colour, flavour, solubility and nutritional value. The milk powder contains lactose (38%), protein (26%), fat (26%) and ash (6%) in the same proportions as fluid milk (Murwan *et al*., 2009). The manufacture of powdered milk has been found abundantly in many developing countries because of reduction in transportation and storage costs. Standard powders, because of their fine dusty nature, do not reconstitute well in water. Agglomerated and instant powder was specially developed to counter this problem (Eckles, 2001). Powdered milk is produced in three forms, full cream (26% fat), partially skimmed (8-24% fat) and skimmed (1.5% fat). Milk powders with a standard fat content usually traded commercially for a variety of dairy and food application end uses (Keogh, *et al*., 2003). The primary objectives for the thermal processing and drying of milk, in general, are to reduce natural pathogenic and spoilage microorganisms, to extend the shelf life of the milk and to ensure the safety of milk for human consumption. So, that the product can be consumed while still remaining safe, retaining acceptable quality and meeting customer expectations (Murwan *et al*., 2009). However, some factors could contribute to changes in the physical and chemical properties of powdered milk, which could reduce its shelf-life and thus its commercial value. Different researchers agree that the hygienic conditions under which raw milk is produced are the main factor affecting powdered milk quality. Storage temperature and transportation may also influence the properties of milk powder, especially its solubility index and acidity (Fernandes de Oliveira *et al*., 2000; Eckles, 2001). To evaluate the physicochemical and microbiological properties of powdered milk brands, it is important to identify the characteristics of the constituents, the process and the storage conditions. (Fernandez-Molina *et.al*, 2005). Milk powders should be evaluated organoleptically, physicochemically and microbiologically to fully determine the quality and condition (USDEC, 2001). In the recent years, many factories in Nigeria had licenses for packaging international brands of milk powders, such as Peak, Loya, Cowbell, Dano, Nido, Milkisi etc. However, little information is available on the quality of milk powders packaged in Nigeria. Therefore, the aim of this study is to evaluate the physicochemical and microbial analysis of

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some powdered milk brands sold in Owerri, Imo State, Nigeria.

## II. MATERIALS AND METHODS

Sources of samples: Six different brands of powdered milk samples coded as sample A, B, C, D and E were purchased from Owerri Municipal of Imo State. The powdered milk samples were taken to Food Laboratory for Analysis.

➢ *Determination of Physicochemical Properties*

The AOAC, (2010) method was used in the determination of the parameters for the physico chemical analysis which include Titratable Acidity (TTA), Moisture, Protein, Fat and Ash, Reducing sugar, Total solids and sucrose.

➢ *Microbial Analysis*

The method of ICMSF, (2000) was used to determine the microbial analysis of the powdered milk samples which include the total plate count and coliform bacteria count in the samples. Biochemical test was used to characterize the isolated micro-organisms.

➢ *Statistical Analysis*

The data obtained was analyzed using the SPSS (Statistical Package for the Social Sciences) software, Version 20 to separate the means using analysis of variance (ANOVA at $P \leq 0.05$).

## III. RESULTS AND DISCUSSION

➢ *Physiochemical Properties of Powdered Milk Brands Sold in Owerri, Imo State.*

The result of the physiochemical properties of powdered milk brands is shown in Table 1. The physicochemical parameters evaluated were Acidity, protein, fat, moisture, ash, reducing sugar, total solids and sucrose. The acidity content of the powdered milk brands samples ranged from 0.63% for the powdered milk brand sample A to 0.77% for the sample D. The acidity content of the samples was significantly different ($P \leq 0.05$). The protein content of the powdered milk brand samples ranged from 7.82% for the powdered milk brand sample C to 10.45% for the sample E. The protein sample E was highest. The protein content of the powdered milk brand samples was significantly different ($P \geq 0.05$). The protein content of the sample A had protein content of 8.47%, the sample B had protein content of 8.48% and the sample C had protein content of 7.82%. The protein content of powdered milk brand sample D had the protein content with the value 8.10%. Sample E had the highest protein content with the value of 10.46%. Also the result showed that the consumption of the sample E milk will help to supply adequate amount of amino acids to the body.

Fat content of the powdered milk samples from ranged from 0.42% for the sample D to 4.44% for sample E. The sample D had the least fat content which could be attributed to the fat content of the sample. The sample E had the highest fat content. There was significant difference ($P \leq 0.05$) in the powdered milk brand samples. Fat content in the powdered milk samples were low.

The moisture content of the powdered milk samples ranged from 0.95% for the powdered milk sample A to 3.11% for the sample C. The moisture content of the samples was significantly different ($P \leq 0.05$). The sample D had the least moisture content. Ash content of the powdered milk samples from ranged from 0.05% for the sample A to 0.06% for sample D. The sample A had the least ash content which could be attributed to the ash content of the sample. The sample D had the highest fat content. There was no significant difference ($P \leq 0.05$) in the powdered milk samples. Reducing sugar content of the powdered milk samples from ranged from 3.92% for the sample C to 4.05% for sample D and E. The sample C had the least reducing sugar content which could be attributed to the reducing sugar content of the sample. The sample E had the highest reducing sugar content. There was significant difference ($P \leq 0.05$) in the powdered milk samples.

The Total soluble solids (TSS) content which is the soluble solids found in the samples. Total soluble solids (TSS) content of the powdered milk samples showed that, the powdered milk brand sample A had total soluble solids content of 8.03%. The sample B had total soluble solids content of 8.11%, sample C had total soluble solids content of 8.06, sample D had total soluble solids content of 7.85, sample E had was 8.13.

The Total soluble solids of the samples were significantly different ($P \geq 0.05$). The total soluble solids of the powdered milk brand samples were very low indicating that the samples were filtered.

The sucrose content of the powdered milk brand samples showed that, the powdered milk sample A had sucrose content of 6.91. The sample B had sucrose content of 6.26, sample C had sucrose content of 6.05, sample D had sucrose content of 5.56, sample E had reducing sugar content of 6.35 and sample E had a sucrose content of 6.37%. The sucrose of the samples was significantly different ($P \geq 0.05$). The sucrose content of the powdered milk samples were very high indicating that the samples contain sucrose.

➢ *Total Viable Count of the Powdered Milk Brands Sold in Owerri, Imo State.*

Presented in Table 2 below is the different milk samples sold in Owerri Imo State. The total viable count of the samples purchased ranged from $3.7 \times 10^8$cfu/g for the sample E to $4.8 \times 10^4$cfu/g for sample C.

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**Table 1: Physicochemical Properties of Powdered Milk Brands Sold in Owerri, Imo state.**

| Parameter/Sample | A (%) | B (%) | C (%) | D (%) | E (%) | LSD |
|---|---|---|---|---|---|---|
| Acidity (%) | $0.63^{b}\pm 0.03$ | $0.72^{ab}\pm 0.01$ | $0.74^{ab}\pm 0.00$ | $0.77^{a}\pm 0.02$ | $0.73^{ab}\pm 0.07$ | **0.029** |
| Protein (%) | $8.47^{b}\pm 0.01$ | $8.48^{a}\pm 0.01$ | $7.82^{a}\pm 0.17$ | $8.10^{a}\pm 0.00$ | $10.46^{c}\pm 0.14$ | **0.236** |
| Fat (%) | $2.42^{c}\pm 0.28$ | $4.41^{c}\pm 0.01$ | $3.11^{b}\pm 0.01$ | $0.42^{b}\pm 0.01$ | $4.44^{a}\pm 0.05$ | **0.030** |
| Moisture (%) | $1.23^{d}\pm 0.03$ | $1.65^{b}\pm 0.07$ | $1.25^{d}\pm 0.07$ | $0.95^{e}\pm 0.07$ | $1.92^{b}\pm 0.07$ | **0.040** |
| Ash | $0.05.^{a}\pm 0.00$ | $0.55^{a}\pm 0.00$ | $0.06^{a}\pm 0.00$ | $0.05^{a}\pm 0.07$ | $0.05^{a}\pm 0.04$ | **0.003** |
| Reducing sugar | $4.00^{a}\pm 0.00$ | $4.05^{a}\pm 0.02$ | $3.92^{a}\pm 0.00$ | $4.05^{a}\pm 0.00$ | $4.05^{a}\pm 0.00$ | **0.011** |
| Total solids | $8.03^{a}\pm 0.01$ | $8.11^{a}\pm 0.01$ | $8.06^{a}\pm 0.07$ | $7.85^{a}\pm 0.07$ | $8.13^{a}\pm 0.04$ | **0.012** |
| Sucrose | $3.60^{a}\pm 0.07$ | $3.65^{a}\pm 0.07$ | $3.39^{a}\pm 0.01$ | $3.63^{a}\pm 0.07$ | $3.55^{a}\pm 0.00$ | **0.146** |

**Table 2: Microbial Analysis of Total of the Powdered Milk Brands Sold in Owerri, Imo State.**

| | Total viable Count | |
|---|---|---|
| **Samples Df** | **Total bacteria** | **Isolated organisms** |
| A $10^4$ | $4.3x10^3$ | *Staphylococcus aureus,* |
| B $10^4$ | $4.4x10^3$ | *Bacillus cereus* |
| C $10^4$ | $4.8.x10^3$ | *Penillium,* |
| D $10^4$ | $4.6\ x10^3$ | *Shigella sp* |
| E $10^4$ | $3.7\ x10^3$ | *Streptococcus sp* |
| | | |

Key:
Sample A Milk
Sample B Milk
Sample C Milk
Sample D Milk
Sample E Milk

## IV. CONCLUSION

The results revealed that the milk samples had their physicochemical and microbial properties at variance due to the difference in the brands of the powdered milk samples. The physicochemical and microbial properties of the various brands of sachet powdered milk were of standard values.

## REFERENCES


[1]. Eckles, C.H., (2001) Milk and Milk Products: Technology,Chemistry and Microbiology. *4thEdn,TataMcGraw-HillPublishing.NewDalhi.*

[2]. Fernandes, G.O, Oliveira, R.O and Boekel, A.S (2000). Evaluation of the Kjeldahl factor for conversion of the nitrogen content of milk and milk products to protein content. *Netherlands Milk Dairy J., 40: 315-336.*

[3]. Fernandez-Molina, J.J., Barbosa-Canovas G.V. and Swanson, G.O (2005). Skim milk processing by combining pulse electric fields and thermal treatments. J. Food Process. Preserv., 29: 291-306.

[4]. ICMSF (2000).*International Commission on Microbiology for Specification for Food.* Enumeration. 2nd Edn., University of Toronto Press, Toronto, Canada.

[5]. Ihekoronye, A.I. and Ngoddy, P.O. (1985) Integrated Food Science for the Tropics. *Macmillan publishers limited.* Pp 185-187.

[6]. Keogh, M.K.,. Murra, C.A and Kennedy, B.T. O (2003). Effects of ultra filtration of whole milk on some properties of spray-dried milk powders. Int. Dairy J., 12: 995-1002.

[7]. Murwan, G.O, Thress, U.O Nickerson, S.C.(2009). Milk Production: Factors Affecting Milk Composition. In: Milk Quality, Aspan, H.F. (Ed.). 1st *Edn., Chapman and Hall, Glasgow, Scotland, UK., pp: 3-23.*

[8]. USDEC, (2001) Fundamentals of Dairy Science Powder Milk: USA Standards of Powder Milk. 2nd Edn., FDSPM, New York.

[9]. Vasavada, P.C (1988). Pathogenic bacteria in mlk: a review. Journal of Dairy Science 71(10): 2809-2816.