**Journal of Food and Dairy Sciences**

**Journal homepage: www.jfds.mans.edu.eg**
**Available online at: www.jfds.journals.ekb.eg**

# Comparative Study on Certain Milk Constituents Estimated by Different Methods and Devices

**Ali, H. M. ***

Dairy Department, Faculty of Agriculture, Al Azhar University, Cairo, Egypt.


## ABSTRACT

Present study was carried out to elucidate the variations in certain milk constituents estimated by the different ordinary methods and devices. To achieve this purpose, Whole buffaloe's milk was used. Three treatments were prepared, $T_1$ from fresh whole buffaloes' milk, $T_2$ from fresh whole buffaloes' milk to which 50% tap water was added and $T_3$ from fresh skim buffaloes' milk to which 1% starch was added. Moisture, total solids, fat, protein, ash and lactose contents were determined in the examined treatments by the Laboratory methods, U.S.A. OHAUS compared with corresponding values obtained by using Bulgarian Lacto Scan and Dane Milko Scan. The results revealed that the difference ratio between the different methods and devices used for estimating certain milk constituents were 15.96%, 9.1%, 4.17% , 29.27% and 35.93%, respectively.

***Keywords:*** milk, chemical composition, milk protein, milk fat, lactose and Laboratory methods.

## INTRODUCTION

Milk is a heterogeneous mixture defined as a complex chemical constituted from three phases, namely emulsifying (fat emulsified as globules), colloidal (casein of the major milk protein) and true solution (minerals, soluble whey proteins and lactose (Mehta 2015). The composition and properties of fresh milk are not constant, which is a challenging task for manufacturers of milk products. There are various factors which cause such variability. The main factors are genetic factors (e.g., breed and individual), stage of lactation, health status of the animal, and environmental factors (e.g., climate, feed, method of milking) (Nickerson 1995) and (laben 1963). Therefore, there are many different methods and devices that are used to estimate the components of milk, such as moisture, total solids, fat, protein, ash and lactose. So the aim of this paper was to compare the different methods and devices used for estimating some milk components.

## MATERIALS AND METHODS

Milk used in this work is fresh whole buffaloe's milk, fresh skim buffaloes' milk obtained by separation the fresh buffaloes' milk; supplied by the farm of Faculty of Agriculture, Al-Azhar University, Cairo, Egypt. Food grade corn starch as a stabilizer was purchased from Tag EL Melouk Company for food industries 6th of October city. Tap water. Chemicals and reagents used in the analytical methods (analytical grade) were purchased from The Nile Commercial CO. Cairo .Egypt and from El-Gamhouria trading chemicals and drugs co., EL-Amirya, Cairo, Egypt.

Moisture, total solids, fat, protein, and ash contents of milk used in the examined treatments were determined according to A.O.A.C. (2012). The protein content was calculated by multiplying the percentage of T.N. content by 6.38 for milk ingredients and by 6.25 for plant ingredients. Total carbohydrate content was calculated by difference of [100 – (moisture + protein + fat + ash contents) (Apurba et. al. 2012). Furthermore, moisture, total solids, fat, protein, , ash and lactose contents of milk treatments were also determined by using the device Milko Scan FT3, Serial NO. 91860734, made in Denmark. Moisture, total solids, fat, protein, , ash and lactose contents of milk treatments were also determined by Lacto Scan Ultrasonic Milk Analyzer, Serial NO. 70158, made in Bulgaria. Moisture was determined by OHAUS, Serial NO.26286, manufactured by Ohaus Scale Corporation Florham Pake, N.j.U.S.A., also.

## RESULTS AND DISSCUSSION

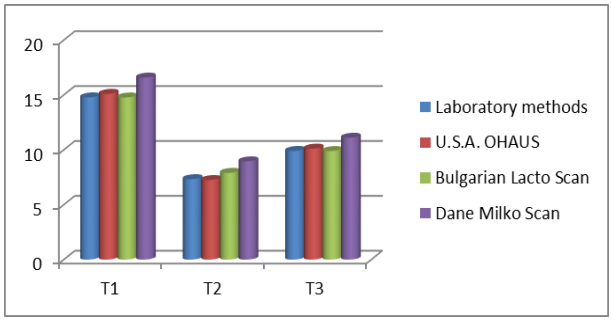
Total solids content determined in the examined treatments by different methods and devices is presented in Table (1) and Fig.(1). Results show an increase in the total solids content estimated by the Dane Milko Scan and the U.S.A. OHAUS, compared with that estimated by the laboratory methods, followed by that estimated by the Bulgarian Lacto scan in $T_1$ and $T_3$. However, $T_2$ recorded the lowest value when estimated by the U.S.A. OHAUS. The detected variation between the obtained concentration of total solids by using the laboratory methods and devices used was 15.96%. These results are in agreement with those reported by (Ling Zhou2018).

**Table 1. Total solids% by different methods and devices for some different milk samples.**

| Samples | Different methods and devices | | | | Difference ratio |
|---|---|---|---|---|---|
| | Laboratory methods | U.S.A. OHAUS | Bulgarian Lacto Scan | Dane Milko Scan | |
| $T_1$ | 14.78 | 15.1 | 14.77 | 16.58 | 15.96% |
| $T_2$ | 7.33 | 7.25 | 7.9 | 8.95 | |
| $T_3$ | 9.9 | 10.11 | 9.89 | 11.1 | |

**$T_1$; fresh whole buffaloes' milk.$T_2$; fresh whole buffaloes' milk added to it 50% tap water.$T_3$; fresh skim buffaloes' milk added to it 1% starch.**

* **Corresponding author.**
**E-mail address: heshamsary77@gmail.com**
**DOI: 10.21608/jfds.2021.149465**




**$T_1$; fresh whole buffaloes' milk.$T_2$; fresh whole buffaloes' milk added to it 50% tap water.$T_3$; fresh skim buffaloes' milk added to it 1% starch.**

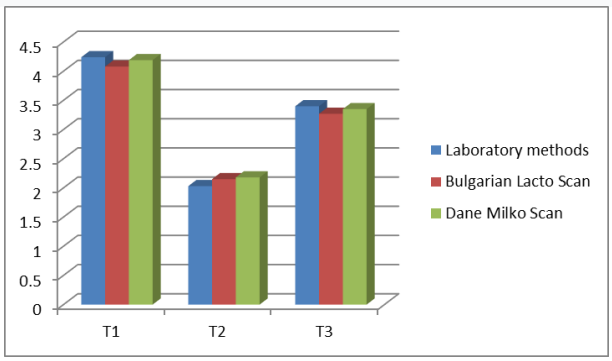
**Fig. 1. Total solids% by different methods and devices for some different milk samples.**

Protein content of the examined treatments of milk samples estimated by different laboratory methods and devices is shown in Table(2) and Fig.(2). According to the obtained results, it could be observed that the protein content, estimated by the Laboratory methods was higher than that estimated by the Dane Milko Scan. which was higher than that estimated by the Bulgarian Lacto Scan in $T_1$ and $T_3$ other than$T_2$ .It could also be observed that the difference ratio between the methods and the devices used was 4.17%. These results are in agreement with those reported by (Pilla & Moioli, 1993) and (Asif & Sumaira 2010).

**Table 2. Protein% by different methods and devices for some different milk samples.**

| Samples | Different methods and devices | | | Difference ratio |
|---|---|---|---|---|
| | Laboratory methods | Bulgarian Lacto Scan | Dane Milko Scan | |
| $T_1$ | 4.24 | 4.08 | 4.19 | 4.17% |
| $T_2$ | 2.03 | 2.15 | 2.18 | |
| $T_3$ | 3.4 | 3.27 | 3.35 | |

**$T_1$; fresh whole buffaloes' milk.$T_2$; fresh whole buffaloes' milk added to it 50% tap water.$T_3$; fresh skim buffaloes' milk added to it 1% starch.**




**$T_1$; fresh whole buffaloes' milk.$T_2$; fresh whole buffaloes' milk added to it 50% tap water.$T_3$; fresh skim buffaloes' milk added to it 1% starch.**

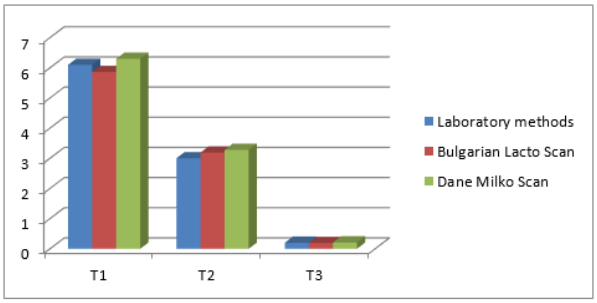
**Fig. 2. Protein% by different methods and devices for some different milk samples.**

Fat content estimated in certain milk samples by different laboratory methods and devices is indicated in Table (3) and Fig.(3). The obtained data reveal that higher fat content estimated by the Dane Milko Scan than that estimated by the Laboratory methods, which was higher than that estimated by the Bulgarian Lacto Scan for all treatments . It could also be observed that the difference ratio between the methods and the devices used was 9.1% . These results are in agreement with those reported by (Holt 1985) and (Larson 1985).

**Table 3. Fat% by different methods and devices for some different milk samples.**

| Samples | Different methods and devices | | | Difference ratio |
|---|---|---|---|---|
| | Laboratory methods | Bulgarian Lacto Scan | Dane Milko Scan | |
| $T_1$ | 6.1 | 5.86 | 6.30 | 9.1% |
| $T_2$ | 3 | 3.19 | 3.28 | |
| $T_3$ | 0.2 | 0.19 | 0.21 | |

**$T_1$; fresh whole buffaloes' milk.$T_2$; fresh whole buffaloes' milk added to it 50% tap water.$T_3$; fresh skim buffaloes' milk added to it 1% starch .**




**$T_1$; fresh whole buffaloes' milk.$T_2$; fresh whole buffaloes' milk added to it 50% tap water.$T_3$; fresh skim buffaloes' milk added to it 1% starch .**

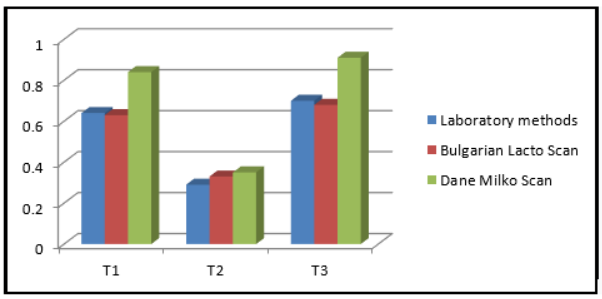
**Fig. 3. Fat% by different methods and devices for some different milk samples.**

According to results shown in Table (4) and Fig. (4), it could be seen that the ash content estimated by the Dane Milko Scan was higher than that estimated by the Laboratory methods, which was higher than that estimated by the Bulgarian Lacto Scan in treatments $T_1$ and $T_3$ . For $T_2$, the Laboratory methods recorded the lowest value. Furthermore, the difference ratio between the methods and the devices used was 29.27% . These results are in agreement with those reported by **(Bei-Zhong Han2007).**

**Table 4. Ash% by different methods and devices for some different milk samples.**

| Samples | Different methods and devices | | | Difference ratio |
|---|---|---|---|---|
| | Laboratory methods | Bulgarian Lacto Scan | Dane Milko Scan | |
| $T_1$ | 0.64 | 0.63 | 0.84 | 29.27% |
| $T_2$ | 0.29 | 0.33 | 0.35 | |
| $T_3$ | 0.7 | 0.68 | 0.91 | |

**$T_1$; fresh whole buffaloes' milk.$T_2$; fresh whole buffaloes' milk added to it 50% tap water.$T_3$; fresh skim buffaloes' milk added to it 1% starch .**




**$T_1$; fresh whole buffaloes' milk.$T_2$; fresh whole buffaloes' milk added to it 50% tap water.$T_3$; fresh skim buffaloes' milk added to it 1% starch .**

**Fig. 4. Ash% by different methods and devices for some different milk samples.**

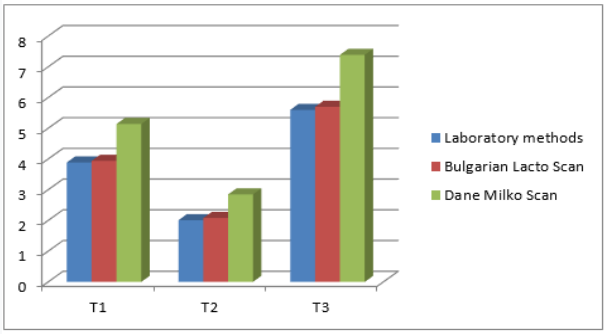
Lactose content of the examined treatments estimated by different laboratory methods and devices is presented in Table(5) and Fig.(5). An increase in the concentration of lactose estimated by the Dane Milko Scan than that detected by the Bulgarian Lacto scan, followed by

that estimated by laboratory methods. The difference between the methods and the devices used was 35.93%. These results are in agreement with those reported by Holt (1985), Larson (1985)and( Bei-Zhong Han2007).

**Table 5. Lactose% by different methods and devices for some different milk samples.**

| Samples | Different methods and devices | | | Difference ratio |
|---|---|---|---|---|
| | Laboratory methods | Bulgarian Lacto Scan | Dane Milko Scan | |
| $T_1$ | 3.89 | 3.94 | 5.14 | 35.93% |
| $T_2$ | 2.01 | 2.08 | 2.85 | |
| $T_3$ | 5.6 | 5.7 | 7.39 | |

**$T_1$; fresh whole buffaloes' milk.$T_2$; fresh whole buffaloes' milk added to it 50% tap water.$T_3$; fresh skim buffaloes' milk added to it 1% starch .**




**$T_1$; fresh whole buffaloes' milk.$T_2$; fresh whole buffaloes' milk added to it 50% tap water.$T_3$; fresh skim buffaloes' milk added to it 1% starch .**

**Fig.5: Lactose% by different methods and devices for some different milk samples.**

## REFERENCES


AOAC, Association of Official Analytical Chemists, (2012). Official Methods of Analysis. 18 ed., Benjamin Franklin Station Washington ,D.C., USA.

Apurba Giri, H.G. Ramachandra Rao and V. Ramesh, 2012. Effect of partial replacement of sugar with stevia on the quality of kulfi. J. Food Sci. Technol., DOI 10.1007/s13197-012-0655-6.

Asif M. and Sumaira U.(2010). A Comparative Study on the Physicochemical Parameters of Milk Samples Collected from Buffalo, Cow, Goat and Sheep of Gujrat, Pakistan. Pakistan Journal of Nutrition 9 (12): 1192-1197, 2010.

Bei-Zhong Han(2007). A survey on the microbiological and chemical composition of buffalo milk in China. Food Control Volume 18, Issue 6, June 2007, Pages 742-746.

Holt C (1985) The milk salts: their secretion, concentrations and physical chemistry. In: Fox PF (ed) Developments in dairy chemistry. Lactose and minor constituents, vol 3. Elsevier Applied Science, London, pp 143–181.

Laben R.C.(1963).Factors Responsible for Variation in Milk Composition.Journal of Dairy Science Volume 46, Issue 11, November 1963, Pages 1293-1301.

Larson B (1985) .Biosynthesis and cellular secretion of milk. In: Larson BL (ed) Lactation. The Iowa State University Press, Ames, IA, pp 129–163

Ling Zhou, Qingfeng Tang, Muhammad Wasim Iqbal, Zhongsheng Xia, Feng Huang, Lili Li, Mingzhen Liang, Bo Lin, Guangsheng Qin & Caixia Zou (2018) .A comparison of milk protein, fat, lactose, total solids and amino acid profiles of three different buffalo breeds in Guangxi, China, Italian Journal of Animal Science, 17:4, 873-878, DOI: 10.1080/1828051X.2018.1443288

Mehta B.M. 2015 .Dairy Chemistry Department, SMC College of Dairy Science, Anand Agricultural University, Anand, Gujarat, India.

Nickerson S.C. (1995) Milk production: Factors affecting milk composition. In: Harding F. (eds) Milk Quality. Springer, Boston, MA. https://doi.org/10.1007/978-1-4615-2195-2_2.

Pilla, A. M. & Moioli, B. M. 1993. Factors affecting fat percentage, protein percentage and fat/protein ratio in buffalo milk. In *Prospects of Buffalo Production in the Mediterranean and the Middle East*, pp. 238–241 (Eds Shafie, M. M., Barkawi, A. H., Ibrahim, S. A. and Sadek, R. R.). Wageningen: Pudoc (*EAAP Publication* no.


## مقارنة بين الطرق والاجهزة المختلفة المستخدمة في تقدير بعض مكونات اللبن

**هشام محمد علي**

**قسم الالبان- كلية الزراعة – جامعة الازهر بالقاهرة**

أجريت الدراسة الحالية لمقارنة الطرق والأجهزة المختلفة والمستخدمة في تقدير بعض مكونات اللبن و لتحقيق الهدف من هذا البحث تم تحضير ثلاث معاملات من اللبن السائل. المعاملة الاولي كانت عبارة عن لبن جاموس طازج كامل الدسم و المعاملة الثانية كانت عبارة عن لبن جاموس طازج كامل الدسم مضاف إليه 50٪ ماء صنبور و المعاملة الثالثة كانت عبارة عن لبن جاموس طازج منزوع الدسم مضاف إليه نشا بنسبة 1٪. تم تقدير الرطوبة والمواد الصلبة الكلية والدهن والبروتين والرماد واللاكتوز لجميع المعاملات السابقة بالطرق المعملية وجهاز ال OHAUS الامريكي الصنع و جهاز ال Lacto Scan البلغاري الصنع وجهاز ال Milko Scan الدنماركي الصنع. أظهرت النتائج أن نسبة الاختلاف بين الطرق المختلفة والأجهزة المستخدمة لتقدير بعض مكونات البن كانت 15.96٪ و 9.1٪ و 4.17٪ و 29.27٪ و 35.93٪ على التوالي.