Assiut J. Agric. Sci., (47) No. (3) 2016 (1-8) *ISSN: 1110-0486*
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Assessment of Chemical Composition, Minerals and Amino Acid Content of Farmhouse Concentrate Fermented Milk (laban zeer) Manufactured in Minia Province

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Received on: 6/3/2016 **Accepted for publication on:** 17/4/2016

Abstract

Ten samples of laban zeer were collected from different locations of Minia province, and analyzed for chemical composition, minerals and amino acids content. Results indicated that the average gross composition of Laban Zeer was: 25.98%, total solid, 4.30% fat, 12.81% total protein, 4.25%ash and 4.58% salt. Mineral composition also indicated that laban zeer is an excellent source of Ca, Mg. Zn and selenium and contained an appreciable amount of Mn, Cu and Fe, while Na content was very high. Laban zeer was found to be a rich in most of essential amino acid exclusive methionine. It could be concluded that laban zeer is very nutritive fermented milk product with a wide range of composition which demonstrate the obvious need for criteria or standardization of manufacturing method.

Keywords*: (laban zeer, farmhouse, Minia Governorate)*

Introduction

Laban zeer is a concentrated fermented milk product prepared at the farmhouse by pouring sour Butter milk, Laban khad into porous earthenware jar named (zeer) which filtrate some of its water and the product become thick (El-Gendy, 1983, Abou Dania, 1984, Ibrahim, *et al.*,1999). The origin of this poduct is the Middle of Upper Egypt mainly in Minia and Assuit governorate. It is usually consumed as such or as a salad dish after addition of herbs, spices and olive oil and also used for making Kishk, which is a dried fermented milk-cereal mixture and possess a high nutritive volue.

Laban zeer provides man with energy, protein, calcium, phosphorus and vitamins (Tamime, Robinson, 1978. Rao *et al.*, 1987). Milk and milk products contain some major elements such as, Potassium, Phosphorous and Maganesium, in addition to sodium, chlorine and wide range of microelements and even heavy metals. In addition, it contains more than twenty different trace elements most of them essential and very important for human and animals such as Copper, Zinc, Manganese and Iron (Farid *et al.*, 2004, Anna Haug *et al.*, 2009).

Although metals are essential nutrients, have a variety of biochemical functions in all living organisms and important industrial uses, their potential toxicity to human and animals is a source of concern.

Pollution of the environment with heavy metals is a worldwide problem such as lead and cadmium.

Since Laban Zeer considered the most popular traditional Egyptian milk product and played an important role in diet of low income and the majority of people living in the rural areas.

This study provides information about the chemical characteristics, trace elements and some heavy metal contaminants in Laban zeer. So the objective of this study was to examine:

1- Chemical composition of Laban Zeer samples collected from Minia province.
2- The amino acid content.
3- Some of the essential elements such as Ca, Na, Cu, Fe, Zn and selenium.
4- Some of heavy metals such as of Cd and Pd.

Materials and Methods

1- Laban zeer samples:-

Laban zeer samples were obtained from the local market of Minia province.

2- Analytical method:-

- Proximate analysis of total solids, fat, total protein and ash content were determined as described by Ling (1963).
- Hydrogen ion concentration was determined using an F 512 type pH meter.
- Salt content was determined according to Simov (1980).
- Miniral content were determined according to the method described by James (1995). The obtained ash was dissolved in 5 ml HCl (36.6%) and the volume was completed to 50 ml by distilled water. The dilutions applied to ICAP6200 (ICP-OES) laboratory of chemical analysis, faculty of agriculture, sohag university
- Amino acids content were determined by the method described by (AOAC, 2012).

Table 1. compositional analysis of Laban zeer samples.

Analysis	Range %	Average %
Total solids	19.74-30.50	25.98
Fat	2.50-6.50	4.30
Total protein	8.55-14.68	12.81
Ash	1.97-5.88	4.25
Salt	2.06-5.80	4.28
Salt/moisture	2.6-8.3	6.25
pH	3.26-3.39	3.31

Results and Discussion

The compositional analysis of ten Laban zeer samples are presented in Table (1). Wide variations between samples were observed. These variations not surprising as primitive method is used for preparation of this product and could be also due to the variations in the composition of the initial milk used, as well as to the age of The final products. The results indicated that total solids content ranged from 19.74-30.50% with average 25.98%, this is more or less similar to the compositional ranges reported by Tamime and Ribonson (1988) for Labneh and Zahran *et al*.,

(1990) and Ibrahim (1991) for Laban Zeer. The fat content ranged from 2.50 - 6.59% with an average of 4.30%. These results were higher than recorded by Zahran *et al*., (1990) and Ibrahim (1991), who reported an average fat content ranged between 2.58% and 2.92%. The variation in total protein content was from 8.55-14.68%, with an average of 12.81%. These data are similar to finding of Ibrahim (1991), being 12.13%, and lower than reported by Ibrahim *et al*., (1999) being 17.14%.

Total ash content ranged from 1.97-5.88% with an average 4.25%, this high ash content might be related to the added salt during Laban Zeer manufacture. These values were in the range obtained by Zahran *et al.* (1990), who found that the ash content was 3.3%.

PH was in the range of 3.26-3.90 with an average 3.31. These values were in agreement with the result obtained by Abd El-Malek and Demerdash (1970), Zahran *et al*., (1990) and Abd El-Kariem (1997), who found that the pH of Laban Zeer were 3.50-3.80, 3.10-3.70 and 3.60 respectively.

Mineral content:

The major mineral (calcium, sodium and magnesium of ten Laban zeer samples are presented in Table (2). The level of calcium ranged from 104.2 – 258.0 mg/100g with an average of 171 mg/100g. These value are considerably higher than those reported by Rao *et al.*, (1987) for Labneh, being 110 mg/100g, and Abd El-Kariem (1997) who found that the average calcium content in Laban Zeer was 147mg/100g.

Sodium level was very high ranging from 490.3 – 1855.3 mg/100g with an average of 1269.5 mg/100g. The high sodium content of Laban Zeer is expected as about 4% NaCl is normally added during preparation of this product to control fermentation, prolonging the keeping quality and to give the product the desirable taste (Ibrahim, 1991, Abd El-Kariem 1997).

Table 2. Major mineral content of Laban zeer samples (mg/100g).

Element	Range	Average
Calcium	104.2 – 258.0	171.0
Sodium	490.3 – 1855.3	1269.5
Magnesium	9.44 – 29.06	17.3

The level of Magnesium content was ranged from 9.44 – 29.06 mg/100g with an average 17.3 mg/100g. These values are lower than that obtained by Ibrahim (1991) and Abd El-Kariem (1997), who found that the content of Mg was 52 and 50 mg/100g respectively.

Trace elements and heavy metals in Laban Zeer samples:

Table 3. Trace elements and heavy metals contents of Laban zeer samples (mg/100g).

Element	Range	Average
Manganese	0.371 – 0.999	0.737
Copper	0.0134 – m0.786	0.278
Iron	0.184 – 1.607	0.964
Zinc	0.109 – 0.235	0.150
Selenium	0.0542 – 0.546	0.0664
Lead	0.004 – 0.142	0.112
Cadmium	0.0164 – 0.0218	0.0197

The level of trace elements and heavy metals in ten Laban zeer samples are listed in Table (3). The level of Mn ranged from 0.371 – 0.999mg/100g that average of 0.737 mg/100g, while Cu content ranged from 0.0134 – 0.786 mg/100g and average of 0.278 mg/100g. The average content of Cu was coincided with results obtained by Ibrahim (1991), who found that the average of Cu was 0.280 mg/100g. The iron content was ranged between 0.184 and 1.607 mg/100g, with an average of 0.964 mg/100g. While level of Zinc was in the range of 0.109 – 0.235 mg/100g, with average of 0.150 mg/100g. Zinc is an essential part of several enzymes and metalloprotein, also Zinc has several functions in the body such as immune and antioxidants system, DNA synthesis and DNA repair (Anna Haug, 2009), milk is good Zinc source containing 4 mg/L (about 0.4 mg/100g). The level of selenium is ranged from 0.0542 – 0.546 mg/100g, with average of 0.0664 mg/100g. There is no information was found in literature about the content of selenium in Laban zeer.

Heavy metals that may be contaminate different cattle's feed and environment such as lead, cadmium, chromium, nickel and cobalt could be excreted into milk and had been in dairy products at various levels and causing serious problems (Abou Arab *et al*., 1994 and Shaymaa, 2012). Results listed in Table (3) showed the levels of lead (Pb) ranged from 0.004 – 0.214 mg/100g, with an average of 0.112 mg/100g. The average content of (Pb) for laban zeer was (0.112 mg/100g) lower than that obtained by Ateteallah, 2014, for Kariesh cheese (0.1841 mg/100g) and higher than that reported for laban Rayeb produced in some villages of Sohag and Qena governorates (0.0065 mg/100g). While the level of Cd ranged from 0.0164 – 0.0218 mg/100g with average of 0.0197 mg/100g. These values were the higher than those reported for both Kariesh cheese (0.0061 mg/100g) and Laban Rayeb (0.022 mg/100g) produced in some villages in Sohag and Qena governorates (Ateteallah, 2014).

According to the reports mentioned by FAO/WHO (1989) the provisional weekly intake of (Pb) must not exceed 0.005 ppm / body weight. Also, Carl (1991) postulated that the acceptable limits of Pb in the range of 0.05 to 0.2 ppm. Also, the permissible values of Cd in food stuff were 0.05 to 1.5 ppm (Wahab, *et al*., 2006 and Ateteallah, 2014). Romanian regulation reported that the maximum limit for milk and cheese is 0.05ppm.

From the forgoing results, it appears that laban zeer is an excellent source of some minerals such as Ca, Mg, Zn and selenium. Rao *et al*., (1987) attributed the high level of these minerals in concentrated fermented milk (Labneh) to the concentration of product even though some of these minerals take their way to the whey during period. On the other hand, although Laban zeer is a highly nutritive milk food, it is seemly necessary to warn about the hazardous effect of the toxic heavy metal elements. The high values of heavy metals in Laban zeer may arisen from the contaminations during handling, equipments and mainly from the greater pollution of the environment, exactly roads with heavy car traffic.

The amino acid content:

The amino acid content (mg/100g) in laban zeer samples are presented in Table (4). It is shown that the essential amino acids leucine, lysine and valine were higher than the other amino acids, their values were 86.91, 75.94 and 65.54 mg/100g protein respectively.

Table 4. Amino acid composition of Laban Zeer samples (mg/100g).

Amino acid	Sample 4	Sample 5	Sample 9	average
Essential amino acid:				
Valine	68.33	66.10	61.92	65.54
Isolencine	52.29	49.63	48.37	50.10
Leucine	89.44	86.89	84.39	86.91
Lysine	79.44	75.66	72.73	75.94
Methionine	0	0	0	0
Phenylalanine	54.26	10.94	48.89	51.36
Histadine	30.37	29.59	27.96	29.31
Threonine	40.93	36.52	41.34	39.60
Non essential amino acid:				
Cysteine	0	0	0	0
Tyrosine	60.74	58.05	60.72	59.84
Arginine	33.52	35.21	30.87	33.20
Alanine	33.33	35.77	37.39	35.50
Aspartic	70.0	67.04	68.10	68.10
Glutamic	197.22	188.39	191.08	192.23
Glycine	19.07	20.41	10.07	19.85
Proline	99.07	102.28	95.54	98.96
Serinr	50.37	49.63	51.80	50.6

The average of total protein for three samples = 55.23% as dry basis.

Also their values were higher than those obtained by (Ibrahim *et al.*, 1999), who found that the content of valine, Isoleucine+ leucine and lysine were 49.4, 54.6 and 47.2 mg/100g protein respectively.

The high concentration of amino acids in this study may be attributed to the high percentage of the total protein for selecting Laban Zeer samples (as averaged of 55.23% on dry matter basis). Also, showed to the ab-

sence of methionine and cysteine, this may be due to that the major contents protein are caseins which is no contain the cysteine or contain a very low value of cysteine.

The present data are more or less similar to that reported by Ibrahim *et al.*, (1999), for cysteine, where they found that the concentration of cysteine was 0.98 mg/g protein. El-Erian *et al.*, (1974) found that the leveling off. Cysteine may due to its conversion by streptococci.

As for the concentration of non-essential amino acids it was shown in the same Table (4) that glutamic, proline and aspartic acids were higher than others amino acids, while glycine, alanine and arginine were in low concentration. The low level of arginine was in agreement with Ibrahim *et al.*, (1999) who found that the concentration of arginine was 26.4 mg/g protein. The low level of arginine may due to the presence of streptococci in laban zeer which were capable for converting the arginine to ornithine (Silverman and kossikowski, 1956)

From the forgoing results it could be considered that laban zeer is a good source of all essential amino acids exclusive methionine.

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تقييم التركيب الكيميائي والمعدني والمحتوى من الاحماض الامينية للبن المتخمر المركز (لبن الزير) المصنع ريفياً بمحافظة المنيا

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الملخص

تم تجميع عشر عينات لبن زير من مناطق مختلفة بمحافظة المنيا وتحليلها لدراسة التركيب الكيميائي والمحتوى المعدني (بعض العناصر الكبرى والصغرى) وقد أشارت النتائج إلى ان لبن الزير يحتوى على٢٥.٢٩ % جوامد صلبة و ٤.٣٠ % دهون و١٢.١٨١ % بروتين كلى و٤.٢٥ % رماد و ٤.٥٨ % ملح وقد اشار التركيب المعدني ايضاً إلي ان لبن الزير مصدر ممتاز للكالسيوم والمغنسيوم والزنك والسلينيوم وكذلك احتوى على كميات ملحوظة من المنجنيز والنحاس والحديد في حين كان محتواه من الصوديوم عالي جدا وقد وجد ان لبن الزير غنى بكل الاحماض الامنية الضرورية عدا الميثيونين.

ويمكن ان نلخص ذلك بان لبن الزير منتج لبني متخمر عالي القيمة الغذائية يحتاج لمعايير قياسية تعبر عنه.