



## PHYSIO CHEMICAL ANALYSIS AND SHELF LIFE STUDY OF “NUTRIMIX” A FUNCTIONAL FOOD FORMULATION FOR TYPE 2 DIABETIC SUBJECTS

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**Abstract:** *The incidence of diabetes has reached alarming levels worldwide and there is high risk of developing associated disorders in diabetic subjects, one of them is dyslipidemia. The best way to combat diabetes is through dietary management. In the present study a functional food was formulated to cater blood glucose and lipid levels of the diabetic subjects. This formulation was subjected to physicochemical analysis which included determination of ash, moisture, fiber and polyphenolic content. Shelf life study was done by microbial analysis of nutrimix for 2 months. Results of the study physicochemical parameters from the nutrimix were determined whereas shelf life study assessed the keeping quality of the product which determined the interval in which nutrimix to be distributed to the diabetic subjects for feeding trials.*

**Key Words:** *Nutrimix, Diabetes, Microbial analysis, polyphenols.*

### Introduction

The high blood sugar level of diabetes is associated with long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels. The risk of developing type 2 diabetes increases with age, obesity, and lack of physical activity. Insulin resistance is a fundamental aspect of the aetiology of type 2 diabetes. Insulin resistance has been shown to be associated with atherosclerosis, hypertriglyceridaemia, glucose intolerance, dyslipidaemia, hyperuricaemia, hypertension and polycystic ovary syndrome. (El Dib R.et.al, 2015) The best way to keep all diabetic complications at bay is by controlling blood sugar and maintaining its optimum level, which is best done with food. In the present study a functional food was formulated called diabetic Nutrimix with an objective of supplementing it to diabetic patients. The same Nutrimix was subjected to physio chemical analysis which helped in understanding the proximate composition of product like moisture, protein, fiber and polyphenol content. Shelf life study was done by microbial analysis like total plate count by analyzing

no.of colonies which gave an idea about wholesomeness of the product with time.

### Methodology

The nutrimix was first prepared, ingredients of were oats, ragi, cumin seeds, apple peel and tender mango leaves powder, all were pre processed and made into powder.the ingredients were mixed in pre determined proportion.

### Pre Processing

Each ingredient of the nutrimix had to undergo different type of processing like:

Tender mango leaves and appel peel were collected, washed, dried in shade and ground to powder.

Ragi was washed, soaked, sprouted, dried and milled to flour.

Breakfast oats were taken and ground into fine powder.

Cumin seeds were dry roasted till change in colour and fragrant.

### Physiochemical Parametres

Moisture content was determined LOD method (loss on drying) (<http://www.academia.edu>) where the sample is dried in hot air oven. Weight of the sample is taken before and after drying and the difference is calculated and and expressed in

percentage of moisture. Fibre content was done by filter bag technique where the sample was digested known concentration of H<sub>2</sub>SO<sub>4</sub> and NaOH, the residue was turned to ashes which determined the crude fibre. The nutrimix was subjected to HPLC for qualitative and quantitative analysis of nutrients and polyphenol.

**Microbial Analysis**

The nutrimix sample was stored in aseptic condition. Total plate count (TPC) was performed on the sample at certain interval (15 days).suitable media i.e agar media was prepared for TPC. Serial dilutions were employed to obtain TPC, 10-3 dilutions were taken.

**Statistical Analysis**

The results obtained were tabulated and analyzed using appropriate statistical technique.

**Result and Discussion**

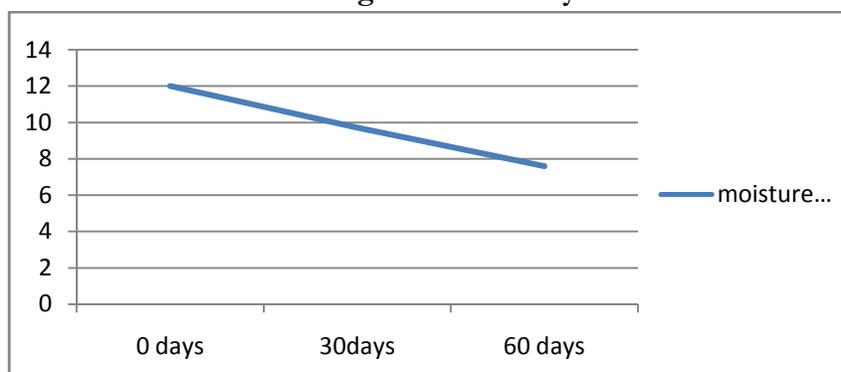
**Moisture Content**

The physical and chemical characteristics were analyzed and tabulated. The data in table no. 1 regarding moisture content showed moisture level on 0 day, 30 days and 60days which are 12.0±0.65, 9.7±0.51and 7.59±0.16 respectively. Significant decrease in moisture occurs during storage period. It might be due to the presence of germinated ragi flour. Hussain et.al (2011) conducted a storage study on malted and non malted wheat flour where it was observed that malted wheat showed gradual decrease in moisture content with increase in storage period.

**Table 1: Moisture content of Nutrimix during shelf life study**

| NUTRIMIX | MOISTURE CONTENT<br>mean±S.D |          |           | F value | Sig.  |
|----------|------------------------------|----------|-----------|---------|-------|
|          | 0 days                       | 30 days  | 60 days   |         |       |
|          | 12.0±0.65                    | 9.7±0.51 | 7.59±0.16 | 61.82   | 0.000 |

**Figure 1: Moisture content of Nutrimix during shelf life study.**



**Crude Fibre Content**

Analysis of fiber was done by filter bag technique where the nutrimix was digested by both sulphuric acid and sodium hydroxide one after the other. This process removes all the protein, carb, lipids, sugar and starch only the fiber residue predominantly cellulose and lignin remain. (www.ankom.com). The residue of sample after digestion was transferred to a crucible and dried in hot air oven. The sample was weighed and the contents were ashed in muffle furnace, obtained ash

was then measured and calculations were done to obtain amount of crude fibre (C.F)

$$C.F = 100 \times \frac{W2 - W3}{W1 - W}$$

Where,

W= wt. of empty crucible.

W1=wt. of crucible with sample

W2= wt. of dish with oven dry sample

W3=wt. of dish with ash

$$C.F = 100 \times \frac{27.6 - 27.2}{32.1 - 27.1}$$

$$= 100 \times 0.45/5$$

$$= 9 \%$$

### Polyphenol Profile

The qualitative and quantitative analysis of Nutrimix was done through HPLC (AOAC, 18TH edition). HPLC is an advanced technique of column liquid chromatography, where the solvent is forced

into the column under high pressure, So that sample can be separated into different constituents with the help of difference in relative affinities. The following table shows the polyphenols profile along with quantity present in the sample.

**Table 2: Qualitative and Quantitative analysis of Polyphenols**

| Sl. No | Parameters                | Result |
|--------|---------------------------|--------|
| 1      | Retinol IU                | 2256   |
| 2      | Ascorbic acid mg/100g     | 132    |
| 3      | Tocopherol IU             | 30     |
| 4      | Cholecalciferol IU        | ND     |
| 5      | Trans Resveratrol mg/100g | 28.2   |
| 6      | Resveratrol mg/100g       | 105    |
| 7      | Alpha lipoic acid IU      | 21.6   |
| 8      | Anthraquines mg/100g      | 20.5   |
| 9      | Amino acids mg/100g       | 14.2   |
| 10     | Theogallin mg/100g        | 8.7    |
| 11     | Linolic acid mg/100g      | 11.4   |
| 12     | Deanol mg/100g            | 7.54   |
| 13     | Hyluronic acid mg/100g    | 0.4    |
| 14     | L- glycin mg/100g         | 8.58   |
| 15     | L- prolin mg/100g         | 7.17   |
| 16     | L- glutathione mg/100g    | 2.1    |
| 17     | Deferuloylmethane mg/100g | 2.8    |
| 18     | Punicalgin mg/100g        | 21.4   |
| 19     | Ginko- bilaba mg/100g     | 5.2    |
| 20     | Ellagic acid mg/100g      | 18.5   |
| 21     | Lecithin mg/100g          | 5.3    |
| 22     | Phytic acid mg/100g       | 2.2    |
| 23     | Morusalba mg/100g         | 1.6    |
| 24     | Niacinamide mg/100g       | 3.8    |

### Microbial Analysis:

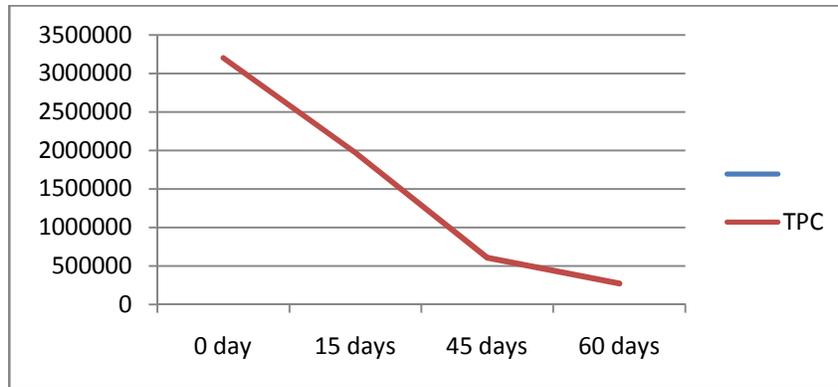
The data regarding Total Plate Count (TPC) shows the colony count on the plates on 0 day, 15 days, 45 days and 60 day which were  $3200 \times 10^3$ ,  $1968 \times 10^3$ ,  $608 \times 10^3$  and  $272 \times 10^3$  respectively. A steady decrease was seen in microbial growth, which may be due to decrease in moisture content of the sample. Moisture plays an important role in storage. (Nasir.et.al, 2013) the fresh nutrimix had 12%

moisture but in duration of 2 months it decreased to 7.59 %. it happened due to presence of germinated ragi flour as germination decreases moisture content with time (Hussain,et.al, 2011). Other reason may be due to production of some acids during germination, this increase in acidity has been strongly suggested to have an inhibitory effect on food spoilage hormones. (Odumodu and Inyang, 2007)

**Table 3: Total Plate Count of Nutrimix**

| No. of days | Colony count       |
|-------------|--------------------|
| 0 days      | $3200 \times 10^3$ |
| 15 days     | $1968 \times 10^3$ |
| 45 days     | $608 \times 10^3$  |
| 60 days     | $272 \times 10^3$  |

Figure 2: Total Plate Count of Nutrimix



### Conclusion

From the above study it can be concluded that the Nutrimix is rich in anti diabetic components and has good shelf life. As it is known that fibre is one non nutritive component which plays a very vital role in controlling blood sugar as well as lipid levels. It is revealed that nutrimix contains good amount of crude fibre. The polyphenolic profile showed a vast array of phenolic compounds and vitamins. Out of which many components are beneficial for diabetes and its complication like trans resvetrol,  $\alpha$  lipoic acid, theogallin and linoleic acid. Most of other phenols act as protein precursors which is again beneficial in

diabetes as they help in synthesis of protein which in turn helps in coping up with muscle wasting in diabetes. The shelf life study showed a steady decline in moisture content over the period of 2 month. Owing to decline in moisture microbial growth also showed decline with time.

Hence the present study suggests that Nutrimix is rich in anti diabetic and hyperlipidemic nutrients and has good keeping quality which makes it suitable supplementary food for diabetic patients and this study also suggests suitable interval at which the nutrimix can be distributed among the patients.

### References

- El Dib R, Gameiro OLF, Ogata MSP, Módolo NSP, Braz LG, Jorge EC, do Nascimento Junior P, Beletate V. Zinc supplementation for the prevention of type 2 diabetes mellitus in adults with insulin resistance. *Cochrane Database of Systematic Reviews* 2015, Issue 5.
- Nasir. M, Butt..M.S, Rashid. M, 2003, Effect of moisture on shelf life on wheat flour, *International Journal of food science and technology*, vol. 46 (9), pg no. 1905-1911.
- Odumodu.C.U, Inyang C.U, 2006, Effects of fermentation on microbial loads of formulated complimentary foods, *Annals of microbiology*, 56, 331-334.