Analysing the Nutritional Value of *Panchamutti Kanji*, a Siddha Dietary Supplement using HPLC

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Introduction:

Malnutrition is a common complication in people of all ages. Nutritional intervention is necessary to promote increased functional status. Protein- and energy-dense oral nutritional supplements are effective for preventing weight loss in malnourished patients. Several studies have reported the beneficial effects of such specialized protein rich oral nutritional supplements in promoting health. It is clinically important because under nutrition can lead to decreased tolerance to diseases and increased infectious complications. However these energy supplements are costly and not easily available to remote areas. Hence we aim to investigate the nutritional values of *Panchamutti Kanji,* an oral nutritional supplement mentioned in classical Siddha texts for malnourished persons. It can easily be prepared by the family of the individual with the available ingredients and hence cost effective.

Aim:

To evaluate the nutritional value of *Panchamutti Kanji* through HPLC and suggest it to be an effective supplement.

Materials and Methods:

Panchamutti Kanji is a dilute gruel that contains 5 ingredients namely, *Pachcharisi*(raw rice), *Paasi payaru* (green gram), *Kadalai paruppu* (Bengal gram), *Ulundhu* (black gram) and *Thuvaram paruppu* (red gram). On HPLC analysis, this *Panchamutti Kanji* is found to contain 8 essential amino acids out of nine and 4 conditional amino acids out of 8 in optimal levels. Also the proximate analysis reveals that its overall nutritional content is satisfactory.

Keywords: Siddha, malnutrition, *Panchamutti Kanji*, HPLC, essential amino acids

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Conclusion:

The above study proves that *Panchamutti Kanji* will be a good nutritional support that supplies essential amino acids which cannot be synthesized by the body and can be considered as a cost effective nutritional supplement.

Introduction:

Malnutrition is the most devastating childhood problem in many Asian countries particularly India. According to World Health Organization, protein energy malnutrition (PEM) refers to "an imbalance between the supply of protein and energy and the body's demand for them to ensure optimal growth and function".[1]. In India, the prevalence of stunting among the children below five years is 48% and wasting in that population is19.8% and the underweight prevalence is about 42.5%. It is the highest in the world level data (2). Particularly in children, infections lead to malnutrition due to poor food intake, digestion and absorption which in turn causes reduced work tolerance, altered functional capacity, negative protein and energy balance and abnormal metabolism. Moreover many childhood infections like Diarrhoea, Measles and Pneumonia occur in malnourished children and contribute to about 70% of mortality. This vicious cycle of malnutrition and disease can only be cut off through appropriate feeding with nutritional supplements.

Dietary supplements are meant to increase lean body mass, through adequate supply of energy giving essential nutrients like amino acids, essential fatty acids and micronutrients. Among the nutrients proteins are said to be the building blocks. They are also the constituents of various enzymes those catalyze the basal metabolism. Hence protein supplements are much needed both during health and diseased conditions. Even though several supplements are available, still there is a need for cost effective nutrient formulations. Among vegetable sources legume proteins are found to be useful in treatment of protein malnutrition (3). However they are deficient in sulphur amino acids. More amounts of sulphur amino acids is present in rice protein. Hence rice complements the deficiency of sulphur amino acids in legume proteins of the diet pattern of humans. Thus this combination has a larger amino acid score than either rice or legume giving alone (4).

Panchamutti Kanji, (PMK) is recommended in Siddha medicine as food supplement to break the fast and to alleviate tiredness and fatigue (*Aayaasam* and *ilaipu*), (5). It fulfils this combination of rice and legumes. All the ingredients are household consumables and easily available. Also the method of preparation is easier and does not involve any complicated procedures. Hence the author has chosen to investigate the proximate composition and nutritional value of PMK, so that it can be recommended for public usage after further analysis.

Aim and Objective:

To evaluate the nutritional and amino acid content of *Panchamutti Kanji* and suggest it to be a cost effective, indigenous nutritional supplement.

Materials and Methods:

Method of Preparation of PMK:

5 g of each ingredient was taken and shallow fried in a dry hot pan. Then they were covered in a piece of thin white cotton cloth and knotted. The bound mass was dipped into 500 ml of water and allowed to boil. When the water level reduces to 1/8 part, the knotted mass was taken out and the kanji was filtered (6).

Nutritional analysis of PMK:

Proximate analysis which quantitatively analyse the various macro nutrients present in the kanji was given in table 1. It was done in accordance with the standard methods of AOAC. Moisture content and total ash were analysed through thermogravimetry. Protein content was measured through Kjeldahl method. Carbohydrates values were calculated by finding the difference between the obtained values. It showed that this kanji consists of all the basic macro nutrients in adequate amounts. However individual amino acid value is more important than the total protein levels. Hence amino acid analysis was done using High Performance liquid Chromatography as per methods of Association of Official Analytical Chemists 2000 (7). A protein sample is first hydrolyzed (*e.g.* using a strong acid) to release the amino acids, which are then separated using HPLC.

Results and Discussion:

Proximate Analysis Report: (Table 1)

S.No.	QCL No	Name of the sample	Moisture (%)	% on Dry matter basis				
				Crude Protein	Crude Fibre	Ether extract*	Total Ash	NFE*
1	SF/246	*Panchamutti Kanji*	96.80	19.80	0.32	1.47	12.64	65.77

* NFE – Nitrogen free extract (represents digestible carbohydrates like sugars and starch)

* Ether extract indicate crude fat content.

HPLC Spectrum of Amino acids of PMK (Table 2)

S.No	Name of the amino acid	Amount (n moles / ml)
1.	Aspartic acid	428
2.	Glutamic acid	3
3.	Serine	332
4.	Histidine	231
5.	Glycine	87
6.	Threonine	142
7.	Arginine	526
8.	Alanine	589
9.	Tyrosine	621
10.	Methionine	118
11.	Valine	129
12.	Phenylalanine	159
13.	Isoleucine	31
14.	Leucine	25
15.	Lysine	86

Classification of Amino Acids of PMK (Table 3)

Essential amino acids	Conditional amino acids	Non essential amino acids
Histidine (231 n moles / ml	Glycine (87 n moles / ml)	Aspartic acid
Threonine(142 n moles / ml)	Arginine (526 n moles / ml)	Glutamic acid
Methionine(118 n moles/ ml	Tyrosine (621 n moles / ml)	Alanine
Valine (129 n moles / ml)	Serine (332 n moles / ml)	
Phenylalanine(159 n moles/ ml		
Isoleucine (31 n moles / ml)		
Leucine (25 n moles / ml)		
Lysine (86 n moles / ml)		

Proteins are primary structural and functional components of every living cell. Plant or vegetable proteins are not of the same quality because of their low content of some of the essential amino acids. However, a combination of cereals, millets and pulses provides most of the amino acids, which complement each other to provide better quality proteins (8). Thus PMK which is a combination of rice and pulses make an apt choice as a nutritional supplement.

Among the 20 amino acids, the basic units of proteins, 9 are said to be essential amino acids and cannot be synthesized by the body. As a result, they must be supplied from food (9). Except tryptophan all the other essential amino acids are present in PMK. (table 3). Among them, histidine, threonine, methionine, valine and phenylalanine are present in high levels. There are 8 conditional amino acids which are usually not essential, except in times of illness and stress (9). PMK contains high amounts of four of the eight conditional amino acids. (table3)

Other nutrients present in the ingredients of PMK (Table 4)

S.No	Name of the nutrient	Present in
1.	Iron	Bengal gram
2.	Alpha linolenic acid (Omega3 Fatty acid)	All pulses
3.	Riboflavin	Bengal gram. Green gram
4.	Calcium	Bengal gram
5.	Folic acid	Bengal gram, Black gram
6.	Flavonoids	All pulses

As per WHO, digestibility appears to be the most important factor determining the capacity of the protein sources in a usual mixed diet to meet the protein needs. Since PMK is prepared as the water extract of rice and pulses, it can be assumed as to have a good digestibility. More over from olden days, parboiled rice, powdered rice gruel and rice water have been successfully given as supplements in non-infectious diarrhoea. It is found to be helpful as starch has a lower osmolality than glucose and provides four times more energy than standard glucose oral rehydration solution (10). In this perspective PMK can be used as a dietary supplement during illness.

All the ingredients are used as staple food in south India. Among the ingredients red gram is considered in Siddha system as *paththiya unavu* (i.e., diet pattern to be followed during diseased conditions) and is indicated to be given in *suram* (fever) and *muppini* (bed ridden and cachectic condition) (11). Black gram is said to strengthen the hip bones, promote vitality and control bone loss (11). In addition to the above amino acids and other basic nutrients the pulses of PMK have other nutrients like alpha linolenic acid (one of the omega – 3 fatty acids), calcium, iron and flavanoids (3). More over among the ingredients red gram and black gram have low glycemic index. Hence this can be suggested for malnourished children and adolescents during disease and convalescence.

Conclusion:

This paper was aimed to do a preliminary nutritional analysis of PMK. It clearly showed that PMK is a rich source of essential and conditional amino acids. Further clinical studies should be conducted to determine the *in vitro* protein digestibility, the exact dose, duration of intake and to find out associated benefits.

Centers where the analyses done:

1. Proximate analysis was done in Madras Veterinary College, Vepery, Chennai
2. HPLC analysis was done in Sri Nathella Sampatthu Chetty Clinical Laboratory (Unit of Medical Research Foundation), SankaraNethralaya, 16, College Road, Chennai.

Reference:

1. Onis MD, Blossner M. WHO global database on child growth and malnutrition. *WHO*. 1997. [Last retrieved on 2010 Oct 01]. Available from: http://whqlibdoc.who.int/hq/1997/WHO_NUT_97.4.pdf .
2. Protein Energy Malnutrition in India: The Plight of Our Under Five Children, Dechenla Tshering Bhutia, J Family Med Prim Care. 2014 Jan-Mar; 3(1): 63–67.
3. Indian food Composition tables, T.Longvah, R.Anandhan, K.Bhaskarachary,
4. K.Venkaiah, National Institute of Nutrition 2017
5. Nutritional and Microbiological Evaluation of Fermented Cereal Weaning Foods, Wilbald S.M.Lorri (Department of Food Science) Göteborg : Chalmers University of Technology, 1993. ISBN: 91-7032-783-1. [Doctoral thesis])
6. Pathaarthaguna Sinthamani - Moolamum Uraiyum, Kasim Mohideen Rawthar,
7. B.Rathina Nayikar & Sons, Chennai, 1932, Pg 396
8. Tamil – English Dictionary, T.V. Sambasiva Pillai, Pg 69,Volume - V, The Research Institute of Siddhar's Science, Madras
9. A.O.A.C (2000): Official Method of Analysis. Association Of Official Analytical Chemist. Washington D.C.
10. Dietary guidelines for Indians - A Manual, II edition, 2011, National Institute of Nutrition
11. Medline Plus Medical Encyclopaedia, National Institute of health, U.S. National Library of Medicine
12. Rice based oral rehydration solution decreases the stool volume in acute diarrhoea,
13. A.M.Molla etal., Bull. World Health Organisation, 1985; 63 (4): 751 -6
14. Noi illa neri, Dr.G. Durairajan, 3rd Edition, 1996, Directorate of Indian Medicine and Homeopathy.