



**DEVELOPMENT AND NUTRITIVE VALUE ANALYSIS OF A HERBAL HYPOLIPIDEMIC HEALTH MIX**

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**ABSTRACT**

Human lifestyle development is related to different physiological or social lifestyle disorders, and hyperlipidemia is one of them which requires rapid attention. Present study is carried out to fortify a traditional Assamese breakfast item *Sandoh guri* (roasted parboiled rice powder) with green gram *Dal*, *Arjuna*, cinnamon and fenugreek to put in hypolipidemic property into it. All ingredients are washed, sundried, roasted and powdered. Powdered parboiled rice, green gram *Dal*, *Arjuna*, cinnamon and fenugreek are mixed together in proportion of 70:30:2:2:2. The proximate composition of the mix and values of a few micronutrients in the mix are found out through standard biochemical methods and calculations using standard nutritive value of ingredients present. Per 100 grams of the mix contain 74.75 g carbohydrates, 12.92 g protein, 1.07 g fat (0.45 g saturated, 0.4 g monounsaturated and 0.51 g polyunsaturated fatty acids) and 7.13 g dietary fibre. Main nutrients with antioxidant properties in the mix are vitamin A (29.8 IU), vitamin E (0.57 mg), vitamin C (0.16 mg), selenium (11.2 mcg), copper (193.4 mcg), zinc (529.2 mcg), iron (2531 mcg) and manganese (810.7 mcg). The nutritive value analysis verifies that this developed health mix is a much better breakfast alternative for a hyperlipidemic person compared to any other commonly used breakfast food items.

**KEYWORDS:** Antioxidant, Health mix, Hyperlipidemia, Micronutrients, Nutritive value.

**INTRODUCTION**

Progresses in technological development, industrialization and economic conditions have increased the standard of living of people with change in food habits and life style leading to health problems. The health problems that parallel to economic development are largely those of chronic disease, such as coronary heart disease (CHD), hypertension, diabetes mellitus and cancer [1]. Hyperlipidemia is one of the major medical as well as social problems of recent time. Higher than the normal levels of biological lipid substances except high density lipoproteins, such as cholesterol, triglycerides and low density lipoproteins is called hyperlipidemia. It is often associated with obesity, diabetes, atherosclerosis and other cardio vascular diseases. Several factors likely to have contributed to accelerate hyperlipidemia and some of them are wrong dietary habits, faulty life style, lack of physical activity and various stresses. Management of hyperlipidemia through good selection of food and high-quality life style is essential to prevent other life threatening disorders. In the last few years, a large number of people are developing interest in more holistic, natural, healthful and preventative approaches of wellness and healthcare. Now, there is a much renewed interest in alternative medicines. Therefore, medicinal plants could be the best source to obtain varieties of drugs [2]. Generally, herbal drugs are easily available, safe, less expensive, efficient, and rarely have side effects. Today the pendulum is swinging back and researchers are confirming that the spice rack can be as potent as a medicinal chest.

As of today, more and more women are working outside and families are becoming nuclear. People are

looking for convenient, easy-to-cook and ready-to-eat foods which require less time to prepare than traditional home-cooked foods. Consumption of processed food has been increased particularly in urban areas. Modern commercial processed foods are generally refined and a majority of them are rich in fat and/or salt/sugar and are calorie dense [3]. Lack of dietary fibre and micronutrients is a major dietary drawback of processed foods if it constitutes a major part of the meal of a person.

Keeping in mind, the increased demand for processed, ready-to-eat and convenience foods in modern lifestyle, the traditional ready to eat food products may be bolstered with different herbs and spices which improves the nutritive value of the health mix. In view of the medicinal uses of spices and herbs, in this study, value addition of spices is done to traditional Assamese instant breakfast item *Sandoh guri* (roasted parboiled rice powder) by fortifying it with green gram *Dal*, *Arjuna*, cinnamon and fenugreek. In this health mix, fenugreek, cinnamon and *Arjuna* are added to slot in hypolipidemic effect as dietary factors like antioxidants, dietary fibres etc. have great impact on hyperlipidemia [4] whereas green gram *Dal* is added to increase the protein content of the product.

**MATERIALS AND METHODS**

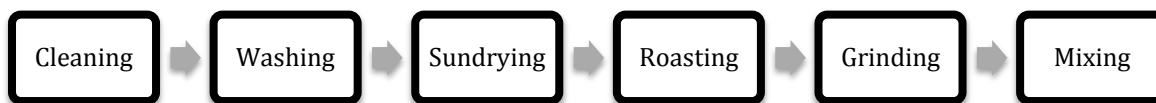
**Development of the health mix**

Cereal- pulse combination has better nutritive value than cereal or pulse only. Cereals are deficient in lysine and pulses are deficient in methionine, but in combination both supplements each other. Cereal- pulse combination is relatively cheap, but a rich source of

energy, protein, carbohydrates, dietary fibre, vitamins and minerals. Owing to low moisture content, cereals and pulses are relatively stable during storage and processing is also easy.

**Processing**

All food materials are possessed as follows.

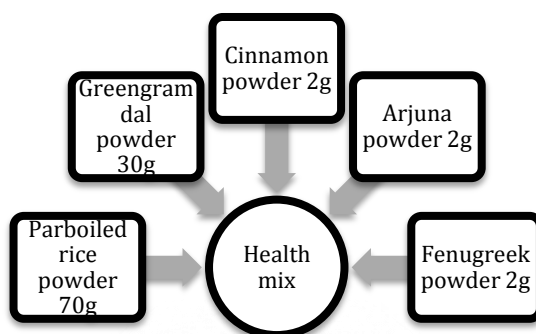


**Selection of the ingredients**

For development of the health mix, five ingredients are used namely, parboiled rice, green gram Dal, cinnamon, fenugreek and Arjuna.

**Composition of the Mix**

Powdered parboiled rice, green gram Dal, Arjuna, cinnamon and fenugreek are mixed together in proportion of 70:30:2:2:2.



**Biochemical Analysis**

Estimations of total carbohydrate, fat, protein, moisture and fatty acids are done by using standard laboratory methods, and estimations of dietary fibre and vitamin A, E and C are done by using standard nutritive values.

**RESULTS AND DISCUSSION**

**Physiological properties of the health mix**

The product is slightly creamy white in colour and has malt and cinnamon flavour, which makes it more alluring. The product does not have any specific taste so it can be mixed with sugar and salt as per personal likes and dislikes for eating purpose. Roasting reduces the moisture percentage and also improves the texture as well as keeping quality of the product. The physiological properties of the health mix are shown in Table 1.

**Table 1: Physiological properties of the health mix**

Colour	Off white
Texture	Free flow, smooth powder
Flavour	Cinnamon and malt flavour
Taste	Bland

**Nutritive value of the product**

The health mix is a good source of carbohydrate (74.75 g) and protein (12.92 g) and at the same time contains very less quantity of fat (1.07 g) per 100 grams. Out of the total fat, the ratio of saturated fatty acids (SFA), monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA) is approximately 17: 46.5: 36.5, respectively. The total dietary fibre in 100 g mix is 7.13. It also contains vitamin A (29.8 IU), vitamin C (0.16 mg), vitamin E (0.57 mg), selenium (11.2 mcg), copper (193.4 mcg), zinc (529.2 mcg), iron (2531 mcg) and manganese (810.7 mcg). The moisture percentage of the mix is 8.93%. The nutrients present in per 100g of the developed health mix are shown in Table 2.

**Table 2: Nutrients present in per 100g of the health mix**

Carbohydrates	74.75 g
Proteins	12.92 g
Fat	1.07 g
Saturated fatty acids	254 mg
Mono unsaturated fatty acids	671 mg
Poly unsaturated fatty acids	526 mg
Moisture percentage	8.93%
Dietary fibre	7.13 g
Vitamins & Minerals with antioxidant properties	
Vitamin A	29.8 IU
Vitamin C	0.16 mg

Vitamin E	0.57 mg
Selenium	11.2 mcg
Copper	193.4 mcg
Zinc	529.2 mcg
Iron	2531 mcg
Manganese	810.7 mcg

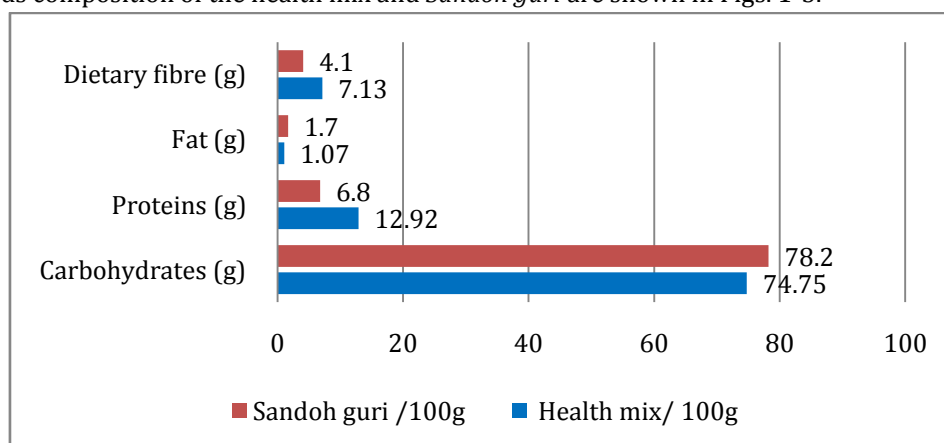
The overall nutritive value of the *Sandoh guri* has been improved by fortification with green gram *Dal*, cinnamon, fenugreek and *Arjuna* powder. However, a decrease in the values of vitamin E, zinc and selenium has been noticed. The ratio of carbohydrate to protein increases remarkably due to the addition of green gram *Dal*. 100 g of green gram contains 24.5 g protein. Pulses are also good sources of vitamin B, but not good source of vitamin A and C. Different studies demonstrate that an increase in the proportion of protein to carbohydrate in the diet has positive effect on body composition, blood lipids and glucose homeostasis, and also minimizes other cardio vascular risks [5-8]. Normally 100 g *Sandoh guri* contains 6.8 g protein and 78.2 g carbohydrates. But in case of the developed health mix, the amount of protein and carbohydrates present per 100 g are 12.92 g and 74.75 g, respectively. *Sandoh guri* holds 1.7 g fat per 100 g, out of which 0.45 g saturated 0.4 g monounsaturated and 0.51 g polyunsaturated fatty acids. While 100 g of the health mix contains 1.07 g fat and quantities of saturated, monounsaturated and polyunsaturated fatty acids are 0.25 g, 0.67 g and 0.52 g, respectively. The health mix contains high amount of unsaturated fatty acid and reduced amount of saturated fatty acid compared to *Sandoh guri*. The comparison of nutrients present in the developed health mix and *Sandoh guri* is shown in Table 3.

**Table 3: Comparison of nutrients present in the developed health mix and *Sandoh guri***

Nutrients	Health mix/ 100g	<i>Sandoh guri</i> /100g
Carbohydrates (g)	74.75	78.2
Proteins (g)	12.92	6.8
Fat (g)	1.07	1.7
Dietary fibre (g)	7.13	4.1
Saturated fatty acids (g)	0.254	0.45
Monounsaturated fatty acids(g)	0.671	0.4
Poly unsaturated fatty acids (g)	0.526	0.51
Vitamin A* (mg)	8.94	0
Vitamin C (mg)	0.16	0
Vitamin E(mg)	0.57	0.73
Selenium (mg)	11.2	14.35
Copper (mg)	0.193	0.164
Zinc (mg)	0.529	0.542
Iron (mg)	2.53	0.35
Manganese (mg)	0.811	0.455

\*Vitamin A: 1 IU is the biological equivalent of 0.3 mcg retinol.

According to ICMR guide lines [3], an adult Indian needs minimum 12 g to maximum 20 g fat per day. High intake of fat especially saturated fat is associated with elevated blood cholesterol levels [9-10]. The quantity and quality of fat intake influences the blood lipid and intake of MUFA and PUFA helps in lowering cholesterol level [11]. So, the health mix is a better eating option as it contains higher per cent of unsaturated fatty acids than saturated fatty acids for patients with hyperlipidemia. The graphical representations of carbohydrates, proteins, fat and dietary fibre content; antioxidants present; and fatty acids composition of the health mix and *Sandoh guri* are shown in Figs. 1-3.



**Fig.1: Graphical representation of carbohydrates, proteins, fat and dietary fibre content in the health mix and *Sandoh guri***

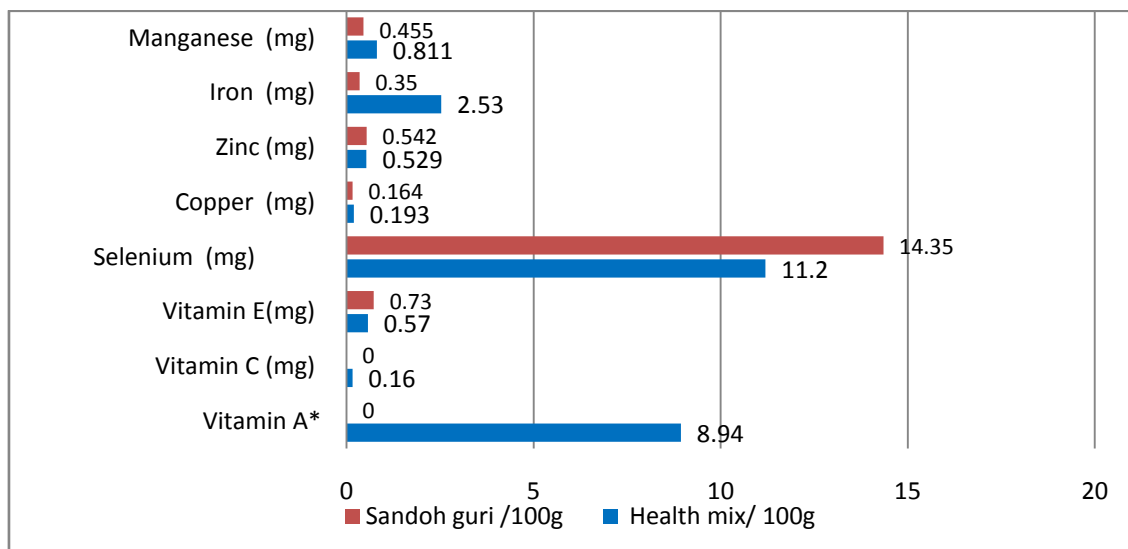


Fig.2: Graphical representation of antioxidants present in the health mix and Sandoh guri

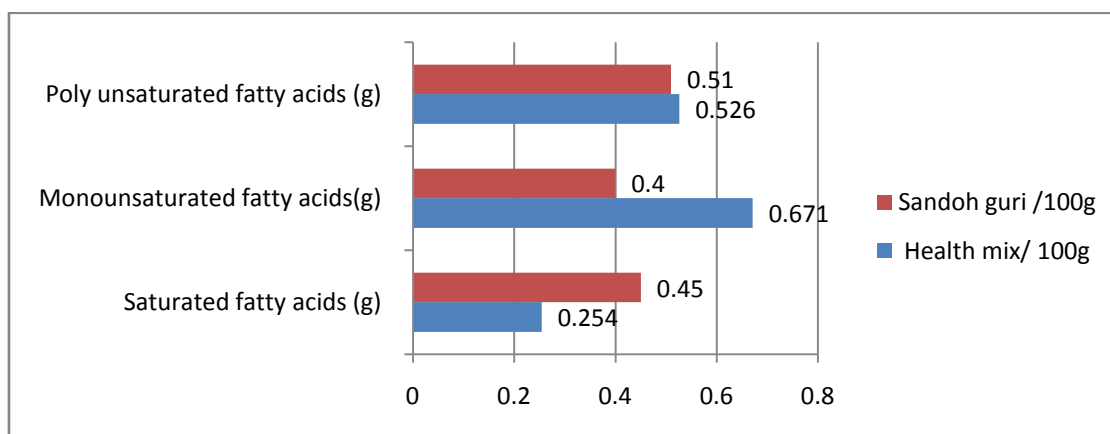


Fig.3: Graphical representation of fatty acids composition of the health mix and Sandoh guri

At an intake of 8 grams soluble fibre per day lowers total cholesterol and low-density lipoprotein (LDL): high-density lipoprotein (HDL) cholesterol ratio [12]. Soluble fibre reduces cholesterol concentrations chiefly through binding of bile acids leading to increase of cholesterol excretion. Soluble fibre appears to be most effective in the context of a diet where saturated fat is low [13]. The dietary fibre content of the health mix (7.13 g) is higher than the Sandoh guri (4.1 g). Thus high fibre content in the health mix along with very low fat content will help in balancing lipid profile in hyperlipidemia.

Although Sandoh guri has vitamin E (0.73 mg) but it does not contain vitamin A and C. The health mix contains vitamin A (29.8 IU), vitamin E (0.57 mg) and vitamin C (0.16 mg). Consequently, the health mix is a better source of these vitamins compared to only rice powder. Vitamin A and E are hydrophilic antioxidants and can protect cell membrane peroxidation, while vitamin C is a water-soluble antioxidant and reacts with oxidants in the cell cytosol and the blood plasma. Supplementation of vitamin C has been shown to improve blood glucose regulation and reduce serum cholesterol and triglyceride in humans [14]. It also regulates catabolism of cholesterol to bile acid and is capable of regenerating vitamin E. Vitamin

E is important for the chain-breaking antioxidant within the cell membrane and is proved to reduce LDL cholesterol level [15]. Beta carotene, the precursor of vitamin A can function as effective radical-trapping antioxidants. Carotenoids work in synergy with vitamin E. Dietary supplementation with 0.2 % beta-carotene showed reduction in serum total cholesterol, non-HDL cholesterol, the atherogenic index, and hepatic total lipid. It increases total lipid and cholesterol excretion in the feces [16]. Therefore, this health mix is a much better meal alternative than Sandoh guri or any other breakfast item for hyperlipidemic person.

The antioxidants present in the health mix are vitamin A, C and E and micro minerals such as selenium, copper, zinc, iron and manganese. Optimal levels of Mn, Cu, Zn, Fe and Se help to maintain the efficient levels of endogenous antioxidants in the tissues and optimal nutrient composition allows the food antioxidants to be efficiently absorbed and metabolized. Even though the vitamin E content in the health mix is reduced to 0.57 mg from 0.73 mg per 100 g in rice, but it contains 29.8 IU vitamin A and 0.16 mg Vitamin C. The health mix contains 11.2 mcg selenium, 193.4 mcg copper, 529.2 mcg zinc, 2531 mcg iron and 810.7 mcg manganese per 100 g.

**Picture**

The photographs of the developed health mix and its ingredients are shown in Figs. 4-9.



Fig.4: Photograph of the developed health mix



Fig.5: Photograph of *Sandoh guri*



Fig.6: Photograph of green gram *Dal* powder



Fig.7: Photograph of *Arjuna* powder



Fig.8: Photograph of cinnamon powder

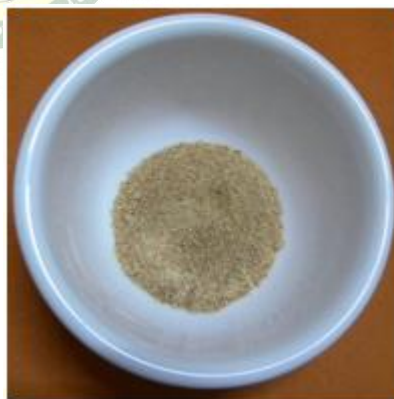


Fig.9: Photograph of fenugreek powder

**CONCLUSION**

From various studies it is apparent that different food components such as fibre, vitamin E, arginine, phytosterols, and phenolic components have individual hypocholesterolemic effects. It was scientifically cleared that there are multiple small effects of vitamins, proteins, fibres, phytochemicals that contribute to lipid-lowering action in blood along with PUFA. Nutrients that we obtain through food have vital effects on body function and health. A diet should hold all essential nutrients in the required amounts based on a person's physical condition. Dietary intakes lower or higher than the body

requirements can lead to under or over nutrition, respectively. Therefore, in development of the hypolipidemic health mix utmost importance has been given on amount of supplementation of different nutrients per feeding. The developed health mix is rich in protein and poses good quantity of antioxidants. It contains saturated, monounsaturated and poly unsaturated fatty acids in 17:47:36 ratio. Diet rich in protein from vegetarian source or high protein low saturated fat diet along with antioxidants has positive effect on dislipidemia. Hence, it is proved that this health mix may be used for

hyperlipidemic patients to correct and maintain the lipid profile.

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