Formulation and Evaluation of Functional food Health mixes

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ABSTRACT

Over the last few years consumer’s interest in health and functional foods has increased considerably in industrialised countries, thus offering an opportunity for the agro-food sector to add value to agricultural commodities. Any unprocessed or processed functional foods are health-promoting or disease-preventing property ahead of the primary function of the supply of nutrients. Functional foods offer potential health benefits that could enhance the well-being of consumers and reduce the economic and social costs of treating non-communicable diseases (Das et al., 2010).

Today the world appears to be increasingly interested in the health benefits of foods and have begun to look beyond their essential nutritional benefits to disease prevention and health enhancement. Traditional systems of medicine owe their significance to the bioactive components that have their origin in plant sources and most of them were associated with routine food habits. Functional food is any fresh or processed food claimed to have a health-promoting or disease-preventing property beyond the basic function of supply of nutrients. A functional food is any food or food ingredient that provides health benefit beyond the traditional nutrients it contains. Food supplementation is one of the effective ways of improving the health status of handloom weavers by means of increasing the serum calcium level, regulating the blood glucose and blood pressure. Keeping all these points in mind the investigator selected low cost, locally available ingredients and foods familiar to the community to formulate food supplements to manage diseases like diabetes, hypertension and musculoskeletal disorders. The functional foods are amla, flax seeds, soya, blue berry, carrot, cruciferous vegetables, fish, garlic, whole grams, oats, oranges, spinach etc. The present study was carried out to formulate and preparation of health mixes, assess the nutrient content of health mixes, analysis of anti nutritional factors of health mixes. Overall findings revealed the functional food health mixes are reduced the risk of CVD, Diabetes mellitus, hypertension, cancer and osteoporosis.

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INTRODUCTION

Over the last few years, consumer's interest in health and functional foods has increased consider-
in plant sources, and most of them were associated with routine food habits (Ullah and Khan, 2008).

Functional food is any food or food ingredient that provides health benefit beyond the traditional nutrients it contains (Earl et al., 1994). Research study stated that functional foods influence specific functions in the body and thereby offer benefits for health, well being or performance beyond their regular nutritional value (Phillips and Rimmer, 2013).

The advent of functional foods and nutraceuticals on the market has blurred the distinction between pharma and nutrition (Eussen et al., 2011). The concept of foods promoting health is not new. In 400 b.c., Hippocrates already stated that ‘Let food be thy medicine and medicine be thy food’ (Smith, 2004). Currently, the improvement of functional foods is one of the most demanding areas of food product improvement universal; opening multiple challenges for countries with vast biodiversity and historical use of plant extracts (Williams et al., 2006).

Some of the functional foods are amla, flax seeds, soya, blueberry, carrot, cruciferous vegetables, fish, garlic, whole grams, oats, oranges, spinach etc. In the present research, several low cost locally available functional foods were selected and used for the formulation and preparation of health mixes.

The beneficial effects of functional foods and nutraceuticals can be concluded that reduced risk of cardiovascular diseases, reduced risk of cancer, weight loss/ management, reduced osteoporosis, improved memory, quicker reaction time, improved fetal health and reduced risk of many other diseases. Functional foods and nutraceuticals will be hopeful to good health in the future; it has been convincingly demonstrated to be beneficial for their intended purposes when consumed as part of a generally well-balanced and healthful diet (Sohaimy, 2012).

A significant number of phytochemicals and bioactive are present in foods of plant origin as well as seafood and other animal-based products. The synergistic effects rendered by a combination of the bioactive present in source materials and the complementary nature of phytochemicals from different sources are important factors to be considered in the formulation of functional foods and the choice of a healthy diet (Shahidi, 2012).

Bearing in mind all the health benefits of functional food ingredients Bengal gram, black gram, tomato, cauliflower leaves, carrot, amla, flax seeds, soya, cumin seeds, pepper and coriander seeds were selected for the development of health mixes. The present study was carried out with the following objectives.

1. Formulation and preparation of health mixes
2. Analysis of the nutrient content of the health mixes
3. Evaluate the anti-nutritional factors of the functional food mixes

MATERIALS AND METHODS

Bengal gram dhal consumption is reported to have some physiologic benefits that may reduce the risk of chronic diseases and optimise health and hence considered as a 'functional food' in addition to their accepted role of providing proteins and fibre (Kerem et al., 2007). Black gram (Phaseolus mungo) known as urad dhal is one of the important pulse crops in India, which is the largest producer and consumer of a Black gram in the world. It comprises around 26 per cent protein which is almost three intervals than that of cereals. Black gram supplies a significant share of the protein requirement of the vegetarian population of the country (Kavitha et al., 2013). Black gram (Phaseolus mungo) known as urad dhal is one of the important pulse crops in India, which is the largest producer and consumer of a Black gram in the world. It consists of nearly 26 per cent protein it is very nearly three times more than cereals. Cauliflower has the highest wastage index, that is in the ratio of non-edible to edible portion after harvesting (Kulkarni et al., 2001). It is considered as a rich source of dietary fibre and possesses both antioxidant and anti-carcinogenic properties. Phenolic compounds and vitamin C are the significant antioxidants of brassica vegetables due to their high content and high antioxidant activity (Anna, 2005; Horwitz and Aoac, 2000; Raghuramulu et al., 2003; Williams et al., 2006). Flax (LinumUsitatissimum) is a blue flowering crop that produces small, flat seeds that range in colour from golden yellow to reddish-brown. Flaxseed is commonly found as whole or ground seed or flaxseed oil. Whole Flaxseed contains 41 per cent fat, 28 per cent dietary fibres, 21 per cent protein and minerals, vitamins and carbohydrates (Morris, 2001).

Origination and Preparation of Health Mix based on Functional Foods.

For the formulation of Basic Health mix Bengal gram dhal, black gram dhal, cumin seeds, pepper, coriander seeds and chilli powder were procured from departmental stores. Tomato, Carrot, cauliflower leaves and amla were purchased from the local vegetable marketplace. Flaxseed was well-ordered in early payment and got from departmental stores located at Coimbatore.

Bengal gram dhal and black gram dhal were roasted...
and powdered separately. Carrots and tomatoes were sliced. Cauliflower leaves were disembowelled free from foreign matters and thick stems. All the vegetables were sun-dried on a clean plastic sheet until the moisture content significantly reduced. Then the ingredients were milled using a pulveriser to obtain the respective powders. All the spices were roasted and powdered using a pulveriser. Various proportions of ingredients were tried out, and acceptability tests were done to find out the best ratio. On behalf of the Basic, Health mix 30g Bengal gram dhal flour; 15g black gram dhal flour and 5g each of all the spices and 5g each of all the vegetable powders were mixed equally to get 80g of the mix which had an excellent satisfactoriness. Along with essential health mix, 15 g of flaxseed powder were added to get variation 1.

Figure 1 presents the steps involved in the preparation of the Basic Health Mix with flax seed powder. The composition of ingredients for the health mixes is given in Table 1.

### Nutrient Analysis of Health Mixes

#### Nutrient Analysis

The Basic Health mix and the three variations were analysed for their nutrient content. The proximate principles like energy and carbohydrate were analysed using NIN (Raghuramulu et al., 2003) procedures and protein, fat, moisture, crude fibre and minerals were analysed using the AOAC (Horwitz and Aoac, 2000) procedures. All the minerals like calcium, phosphorus, sodium, potassium, iron, magnesium and vitamins such as vitamin A, C and E were analysed using the ISI procedure.

### Ethical Clearance of the research work

The blueprint of the study was presented before the Avinashilingam University Ethical Committee and got Clearance with the number HEC.2011.33.

### RESULTS AND DISCUSSION

#### Nutrient analysis of the Health mixes

Table 1 depicts the analysed values of proximate principles present in the formulated functional food mixes. Among the food mixes developed, essential health mix and variation 3 provided 384 Kcal of energy per 100g followed by variation 1 and variation 2, which provided 333 and 368 Kcal of energy respectively. The total carbohydrate content of essential health mix and variation 1 was 47.42g of carbohydrate per 100g, respectively. The protein content of mixes ranged from 12.8 to 18.6g per 100g, with maximum content in variation 1. About total fat content, variation 1 possessed the maximum of 11.52g per 100g due to the incorporation of Flaxseed in this mix.

The dietary fibre content of variation 1 was the maximum with 8.4 per 100g. The mineral content of the developed functional food mixes is given in Table 2. Among the minerals, variation 1 contained a higher amount of calcium 527mg per 100g. About potassium content, variation 1 had 13.2mg per 100g. Sodium level of variation 1 was originated to be the maximum with 7.2mg per 100g. Other variation and basic health mix had 5.3 to 6.0mg per 100g of sodium. Variation 1 had a higher amount of 4.4mg per 100g of iron, whereas basic health mix had only 2.0 mg. Magnesium content was found to be more in variation 1 with 206mg. Essential health mix has a lesser amount of magnesium of 110mg per cent only. About phosphorus, the content was more in variation 1 with 80mg. Essential health mix has only 68mg per cent of phosphorus. In general, the functional food variation had more mineral content than the Basic health mix, which might be due to the incorporation of specific functional foods in variation.

Table 3 depicts the vitamin content of the developed functional food mixes. Total carotenoids content of functional food mixes ranged from 1020 to 1280μg per 100g with a maximum content in variation 1 with flax seed-based mix. Beta carotene content also ranged from 368 to 420 μg per 100g. Vitamin C content in health mixes ranged from 8.78 to 17.28 mg per 100g with a maximum content in essential health mix. Vitamin E content was found to be maximum in variation 1 (0.44μg per cent) which had flax seed as a component.

### Anti-nutritional factors in food mixes

The anti-nutritional factors of the developed functional food mixes are given in Table 4. Among the four samples, variation-1 had the lowest oxalate content of 122.68mg per 100g, followed by Basic health mix, which had 146.08mg per100g. Reports have shown that the lethal dose of oxalate is between 200 and 500mg/100g (Pearson, 1976). Findings of the study noted that the intake of 4 to 5 g of oxalate is the minimum dose that can result in death in an adult human. The amounts of oxalate reported in the present study are safe and within permissible levels (Noonan and Savage, 1999). About phytate content except for variation 1 and Basic health mix had the same range of 0.51g of both combinations.
Figure 1: Steps in the preparation of functional food mixes

| Proximate Principles | Basic Health Mix | Variation - 1 (Flax seed) |
|----------------------|------------------|---------------------------|
| Energy (Kcal)        | 384              | 368                       |
| Carbohydrate (g)     | 69.10            | 47.42                     |
| Protein (g)          | 12.80            | 18.60                     |
| Fat (g)              | 3.00             | 11.52                     |
| Moisture (g)         | 3.07             | 1.63                      |
| Ash (g)              | 8.00             | 12.20                     |
| Dietary fibre (g)    | 8.00             | 8.40                      |
| Crude fibre (g)      | 6.00             | 8.60                      |

| Minerals             | Basic Health Mix | Variation-1 (Flaxseed) |
|----------------------|------------------|------------------------|
| Calcium (mg)         | 180              | 527                    |
| Potassium (mg)       | 12.1             | 13.2                   |
| Sodium (mg)          | 6.0              | 5.3                    |
| Iron (mg)            | 2.0              | 4.4                    |
| Magnesium (mg)       | 110              | 206                    |
| Phosphorus (mg)      | 68.0             | 80.0                   |
Table 3: Vitamin content of the developed functional food mixes (In 100g)

| Vitamins          | Basic Health Mix | Variation-1 (Flaxseed) |
|-------------------|------------------|------------------------|
| Total carotenoids (µg) | 1020             | 1280                   |
| β-carotene (µg)    | 420              | 368                    |
| Vitamin – C (mg)   | 17.28            | 8.78                   |
| Vitamin – E (µg)   | 0.20             | 0.44                   |

Table 4: Anti-Nutritional factors of the developed functional health mixes (In 100g)

| Anti Nutritional Factors | Basic Health Mix | Variation-1 (Flaxseed) |
|--------------------------|------------------|------------------------|
| Oxalate (mg)             | 146.08           | 122.68                 |
| Phytate (g)              | 0.51             | 0.51                   |
| Tannin (µg)              | 53               | 72                     |
| Alkaloids (g)            | 73.90            | 71.15                  |

high amount of phytic acids have been reported to be nearby in fibre-rich foods. Such foods, however, are pharmacologically recommended because they protect human from cardiovascular diseases and some forms of cancer (Norhaizan and Faizadatul-A, 2009). In the case of tannins, variation 1 contained a maximum of 72µg, and essential health mix had a minimum of 53µg per 100g (Aletor and Adeogun, 1995; Pearson, 1976) Studies reported that a high level of tannins (76 to 90g per kg in Diabetes Mellitus) could be lethal if consumed. In the case of alkaloids, variation 1 had 71.15 per cent is the lowest, whereas other variations had 73.90mg per 100g. In wide-ranging, the anti-nutritional factors in Health mixes were found to be within protected levels.

CONCLUSION

It might be concluded that the Functional Food health mixes are rich in vitamins and minerals. The results showed that anti-nutritional factors are found to be a safe level. There is excellent scope to developed health mixes to be used effectively for treating chronic diseases.

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Conflicts of interest

The authors declare no conflicts of interest.

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