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To progress food sustainability and develop poly herbal formulation “Nutriprash”: Enrichment of nutri rich flaxseed powder and by product orange peel powder

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Abstract

In Developing countries, like India is the leading producer of grains as well as fruits and vegetable, milk and milk products and animal foods but due to the poverty, low dietary knowledge and poor health and sanitization practices it produces malnutrition in various forms and metabolic diseases like cancer, PCOS and Diabetes mellitus. According to the Global Hunger index 2019 report, Country India ranks 103rd out of 119 qualifying countries with a score of 31.1, which indicate India suffers from a serious level of hunger. Thus it demands essential strategies to combat this crisis situation and also resolved future food sustainability. During COVID times, the main emphasis of research is to formulate the product which could set the best example of management of By-products as waste material and to promote health boosting option for every age group.

Nutriprash formulation is based on traditional Polyherbal formulation, which can be widely used as tonic, rejuvenator, immunomodulator and memory enhancer, ayurvedic antiaging, dietary supplement and immunity booster product fortified with various herbs, herbal extracts that are rich in antioxidant and minerals. Nutriprash incorporated with antioxidant and fiber rich fruits foods T₂ (Amla + Apple pulp+ Orange peel powder + flax seed powder in the ratio of 75:15:4:6) had the highest score. the mean scores of “*Nutriprash*” in relation to sensory attributes such as colour and appearance, body and texture, taste and flavor and overall acceptability followed by T₁(Amla + Apple pulp+ Orange peel powder+ flax seed powder in ratio of 85:10:2:3), T₃ (Amla + Apple pulp+ Orange peel powder+ flax seed powder in the ratio of 65:20:6:9). The chemical composition of the best product (T₂) increased with the incorporation of prepared mix powder, the moisture content in *Nutriprash* on applying the ‘t’ test it was found that moisture, ash, fiber, carbohydrate, energy, calcium, iron, content significantly increased. Nutriprash should be recommended for all age groups as it is helps to boost immunity and also improves physical growth, good memory and also control infectious seasonal disease. Incorporation of flax seed powder and orange peel powder will enhance the nutritive value of traditional recipes by improving their micronutrient content also overcome nutrient deficiency.

Keywords: Ayurveda, Covid times, by-product utilization, food sustainability, nutriprash, immunity booster

Introduction

In this century, unparalleled medicinal inventions have been achieved to resolve incalculable diseases, including cancer and AIDS. The synthetic drugs may be effective on one sickness and cause another trouble. Traditionally life threatening diseases have been dealt with herbal medicines which are taken as food not as medicine or drug such products include Chyawanprash Pachan Goliyan, Hamraaj Churna etc. Nutriprash also called Chyawanparsh, chyawanprasha, chyawanprasham, chyawanprash. Nutriprash is an ayurvedic antiaging, dietary supplement and immunity booster product fortified with various herbs, herbal extracts that are rich in antioxidant and minerals. It is traditional herbal recipe that can generate the income source for various unemployed women as it follows the simple procedure, needs herbal natural ingredient and can be consumed by all age groups as dietary supplement with the consistency of jam taste sweet, sour and spicy. Nutriprash traditional Polyherbal formulation, which can be widely used as tonic, rejuvenator, immunomodulator and memory enhancer. In chyawanprash honey which works as a ‘A carrier of herbs’, called as yogavahi, helps an absorption of various herbs deep into the tissues [1]. In Ayurveda, Chyawanprash is classified under the category of rasayana which aims at maintaining physique, vigour and vitality, while delaying the ageing process. It is a comprehensive herbal tonic, which serves as

a nutrient for healthy includes individual 30 herbs and can be consumed in all seasons, as it contain ingredients, which are weather friendly nullifying the unpleasant effects due to extreme environmental and climatic conditions.

As it is prevailed by the Global hunger index 2018 report, Country India ranks 103rd out of 119 qualifying countries with a score of 31.1, which indicate India suffers from a serious level of hunger [2] and during COVID the rate of malnutrition and poor health outcomes as arises worstly due to the lockdown and unemployment which is leading cause of associated factors of various forms of malnutrition. Bad mental health and poor dietary habits demands the greater opportunity and better option for the product formulation which is based on Ayurveda and can bring positive outcomes which contains essential properties like easy to consume, good sensory attributes and nutritionally rich. During COVID, we had faced lots of food crisis that forced every food scientist and researchers to focus on the whole food utilization so not a single food particle from the food ingredient recognized as waste material. Food waste is considered not only a sustainability problem related to food security, but also an economic problem since it directly impacts the profitability of the whole food supply chain. In developed countries, consumers are one of the main contributors to food waste and ultimately pay for all wastes produced throughout the food supply chain [3].

Phytochemical studies on Amla disclosed major chemical constituents including tannins, alkaloids, polyphenols, vitamins and minerals. Gallic acid, ellagic acid, emblicanin A & B, phyllembein, quercetin and ascorbic acid are found to be biologically effective as diuretic, laxative, liver tonic, refrigerant, stomachic, restorative, anti-pyretic, hair tonic, ulcer preventive and for common cold, fever; as alone or in combination with other plants [4]. Flaxseed is one of the oldest crops, having been cultivated since the beginning of civilization The Latin name of the flaxseed is *Linum usitatissimum*, which means "very useful". Flaxseeds have nutritional characteristics and are rich source of ω -3 fatty acid: α -linolenic acid, short chain polyunsaturated fatty acids, soluble and insoluble fibers, proteins and an array of antioxidants [5].

Orange peel is a rich source of non-soluble polysaccharides (type of dietary fibers) like pectins, tannins and hemicellulose. Orange peel contains nobiletin, which are found to exert positive effect on the heart, lower your risk of heart disease and inflammation in addition to lowering the blood cholesterol levels (LDL) in the body [6]. Sesame oil has been used by Indians as an antibacterial mouthwash, to relieve anxiety and insomnia [7]. Apples contain a variety of phytochemicals, including quercetin, catechin, phloridzin and chlorogenic acid, all of which are strong antioxidants [8]. Honey is used not only as a nutritional product but also described in traditional medicine as an alternative treatment for clinical conditions. Traditionally, honey is used in the treatment of eye diseases, bronchial asthma, throat infections, tuberculosis, fatigue, dizziness, hepatitis, constipation, healing of ulcers, and used as a nutritious supplement [9, 10]. The Specific objectives included for the following study are as follows:

1. To formulate the antioxidant and fiber rich herbal products.
2. To evaluate the organoleptic attributes of the prepared herbal products.
3. To find out the nutritive value and antioxidant content of

the prepared products.

4. To assess the cost of the prepared products.

Materials and Methods

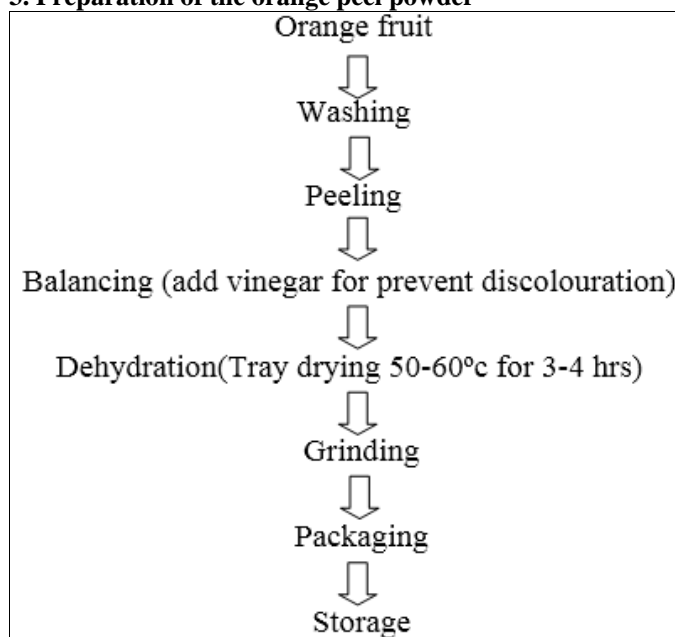
1. Experimental site

The study entitled "Enrichment Of Antioxidant, Fiber Rich Flaxseed Powder And By Product Orange Peel Powder To Develop Polyherbal Formulation: Nutriprash" was conducted in the Nutrition Research Laboratory, Department of Food Nutrition and Public Health, Ethelind Collage of Home Science, SHUATS, Prayagraj-211007, U.P. India.

2. Procurement of raw materials

Indian gooseberry, flaxseeds powder, orange peel, sesame seed oil, and other raw materials were purchased from the local market of Allahabad (U.P.)

3. Preparation of the orange peel powder



Source: Srivastava and Kumar (2009) [11]

4. **Preparation of food products:** Preparation of herbal food products *Nutriprash* with the incorporation of Indian gooseberry, apple pulp, flaxseeds powder, orange peel, sesame seed oil, and other raw materials. For each basic recipe (Control To) has three variations T₁, T₂, T₃ respectively, where the amount of one or more ingredients was varied.

5. **Treatment of *Nutriprash*:** Treatment of *Nutriprash* has been shown in Table 1.

Table 1: Treatment for *Nutriprash*

Treatments	Amla(%)	Apple pulp (%)	Orange peel powder (%)	Flax seed powder (%)
To	100	-	-	-
T1	85	10	2	3
T2	75	15	4	6
T3	65	20	6	9

To: control

T₁, T₂, T₃: Treatments

6. **Sensory evaluation of developed herbal food products:** Sensory evaluation of the food products for

their acceptability done by a panel of judges. The score card based on the 9 point Hedonic scale was used for sensory evaluation on the basis of evaluation of attributes like colour and appearance, texture, taste and flavor and overall acceptability^[12].

7. **Determination of nutrient content of prepared herbal food Products:** Methods described by^[13] were used for determination of nutritional composition of the developed extruded products. This included estimation of moisture, ash, fat, crude fibre, and protein, iron, calcium and vitamin C of the products.
8. **Calculation of the cost of prepared product:** Cost of the prepared products was calculated taking into account the cost of individual raw ingredients used in the preparation of food products as the prevailing market prices,
9. **Statistical Analysis:** The data was analyzed by Analysis of variance technique (ANOVA), Critical Difference and other appropriate statistical analytical methods and interpret the data^[14].

Preparation of Nutriprash

In absence of standard operating procedure in ancient times, the method of preparation of chyawanprash varies from manufacture to manufacture. Standard method of preparation of nutriprash is described as follows: Nutriprash prepared by using different ratios of antioxidant and fiber rich fruits and by product of fruits. Chyawanprash is a classical Ayurvedic formulation comprising ingredients such as Amla, Dashmula, Wala, Karakata Shringi, Jivanti, Agarkasta, kachur, Hari pinki, Gurchi, Vashak, Neelkamal, kakasa, Pastimadhu, Barahikanda, Bidarikanda, Satawara, Ashwagandha, Tejpatta, Vanshlochan, Akarkara, Naagkeshar, Chandansaar, Daalchini, Peepar, Sonth, Badi ilaichi, Choti ilaichi, Ghee, Til ka tel, Shahad. In the current study, Nutriprash formulated by adding some extra nutrient rich powder like flax seed powder, orange peel powder and other fruit pulp i.e. apple pulp. Clean the Gooseberry and apple pressure cook it in water till 2 whistle. Taking the "for the spices" ingredients and grind them to a powder. Once the Gooseberries and apple are cooked let them cool and de-seed them, mash the Gooseberries and apple pulp. Take a non-stick pan and heat the ghee in it. Add the mashed Gooseberry and apple pulp and mix it till the oil leaves the sides of the pan. Add the jaggery and suger into this mash and let it cook for about 4-5 mins. Now add the ground dry spice mixture, mix honey and sesame oil in it and let it cook till the contents get a bit sticky and come off the sides of the pan. Nutriprash incorporated with antioxidant and fiber rich fruits foods have shown in {figure 1}

Results and discussion of organoleptic evaluation of Nutriprash

Nutriprash prepared using different ratios of antioxidant and fiber rich fruits and by product of fruits. The acceptability of food products was judged by the panel of ten semi-trained

members. Sensory evaluation using Nine Point Hedonic Scale revealed that 70 per cent of panelists liked extremely the Nutriprash incorporated with antioxidant and fiber rich fruits foods T₂(Amla + Apple pulp+ Orange peel powder + flax seed powder in the ratio of 75:15:4:6) had the highest score. the mean scores of "Nutriprash" in relation to sensory attributes such as colour and appearance, body and texture, taste and flavor and overall acceptability followed by T₁(Amla + Apple pulp+ Orange peel powder+ flax seed powder in ratio of 85:10:2:3), T₃ (Amla + Apple pulp+ Orange peel powder+ flax seed powder in the ratio of 65:20:6:9).{fig 2}

In case of Nutriprash T₂ scores the best with regard to all sensory characteristics viz. colour and appearance (8.2±0.09), body and texture (8.5±0.12), taste and flavor (8.5±0.2) and overall acceptability (8.4±0.13). (fig 2)

The chemical composition of the best product (T₂) increased with the incorporation of prepared mix powder, the moisture content in *Nutriprash* was found to be 25.23percent, Ash content was found to be 5.6g/100g, Protein content is 3.26g/100g, Fat content was 2.17g/100g, Fibre in the product found to be 3.87g/100g, Iron and Calcium were found 1.01/100g and 164.56mg/100g, Carbohydrate content in product is 131.3g/100g, Polyphenol was found to be 1229.92mg/100g and DPPH radical scavenging activity was found to be 285.7 percent. On applying the 't' test it was found that moisture, ash, fiber, carbohydrate, energy, calcium, iron, content significantly increased. (table 2, 3)

Table 4. Shows that the cost of the *Nutriprash* per 100g of dry ingredients at the prevailing cost of the raw materials was T₀ (control) Rs. 32.57, Rs. 29.98 for T₁, Rs.30.08 for T₂ and Rs.30.27 for T₃. This shows that as the incorporation levels of flax seed powder, orange peel powder and apple pulp increased the cost also increased but it is cheaper than the control comparatively even though it was marginal.

To conclude, On the basis of findings, Amla, apple pulp, flax seed powder, orange peel powder was found to be rich in iron, calcium, fiber, protien and antioxidant and it can be successfully incorporated in the preparation of the herbal products like *Nutriprash*. Sensory evaluation showed that the treatment T₂ (Amla + Apple pulp+ Orange peel powder + flax seed powder in the ratio of 75:15:4:6) was the most acceptable in *Nutriprash* showed that the treatment T₂ was found most highly acceptable. The content of iron, calcium, carbohydrate, potassium and zinc increased significantly in *Nutriprash*. The antioxidant content such as total polyphenol and anti-radical scavenging activity were also increased significantly in *Nutriprash*. The incorporation levels of flax seed powder, orange peel powder and apple pulp increased the cost also increased but it is comparatively cheaper than the control even though it was marginal. Nutriprash should be recommended for all age groups as it helps to boost immunity and also improves physical growth, good memory and also control infectious seasonal disease. Nutriprash enriched with various nutrients, so it work as antiaging, tonic, rejuvenator, anabolic, immunomodulator and memory enhancer, cancer preventive therefore it can be included in daily intake for desirable action under body.

Table 2: The average nutritional composition of control and the best treatment samples of 'Nutriprash' (per 100 g)

Nutrients	(T ₀)	(T ₂)	Difference (T ₂ -T ₀ =D)	t(calculated)	t(tabulated value at 5%)	Results
Moisture (%)	24	25.23	1.23	13.98	4.303	S
Ash (g)	4.85	5.6	0.75	7.91	4.303	S
Protein (g)	1.28	3.26	1.98	3.07	4.303	NS
Fat (g)	1.4	2.17	2.12	4.0	4.303	NS
Crude fibre (g)	1.8	3.87	2.07	32.61	4.303	S
Carbohydrates(g)	84.11	89.68	5.57	32.26	4.303	S
Energy(kcal)	359.04	391.25	32.21	10.70	4.303	S
Iron (mg)	0.79	1.01	0.22	21.84	4.303	S
Calcium (mg)	63.3	131.3	51	36.27	4.303	S
Vitamin C	3.7	4.16	0.46	1.73	4.303	NS

S = Significant, NS = Non- Significant

Table 3: The antioxidants content of the control and best treatment in 'Nutriprash'/100gm

Antioxidants	T ₀	T ₂	difference (t ₀ - t ₂)	T(cal)	T (tab)	Results
Total phenolic content(mg)	1070	1229.92	159.2	1.97	4.303	NS
DPPH radical scavenging activity (%)	142	285.7	143.7	1.59	4.303	NS

S = Significant, NS = Non- Significant

Table 4: Cost of the prepared product 'Nutriprash'

Ingredients	Actual rate/kg (Rs)	T ₀		T ₁		T ₂		T ₃	
		Amt. (g)	Cost (Rs)	Amt.(g)	Cost(Rs.)	Amt. (g)	Cost (Rs)	Amt.(g)	Cost(Rs)
Amla	50	100	5.00	85	4.25	75	3.75	65	3.25
Flax seed	90	-	-	4	0.36	6	0.54	9	0.81
Apple pulp	80	-	-	10	0.8	15	1.2	20	1.6
Orange peel	10	-	-	2	0.02	4	0.04	6	0.06
Sesame oil	25	10	0.25	10	0.25	10	0.25	10	0.25
Herbs & spices	300	40	12	40	12	40	12	40	12
Honey	500	10	5	10	5	10	5	10	5
Jaggery	80	15	1.20	15	1.20	15	1.20	15	1.20
Sugar	40	20	0.8	20	0.8	20	0.8	20	0.8
Tamarind	100	10	1	10	1	10	1	10	1
Ghee	430	10	4.3	10	4.3	10	4.3	10	4.3
Total amount (Rs.)			32.57		29.98		30.08		30.27

T₀: control
T₁, T₂, T₃: Treatments**Fig 1:** Developed Nutriprash with antioxidant and fiber rich fruits and spices

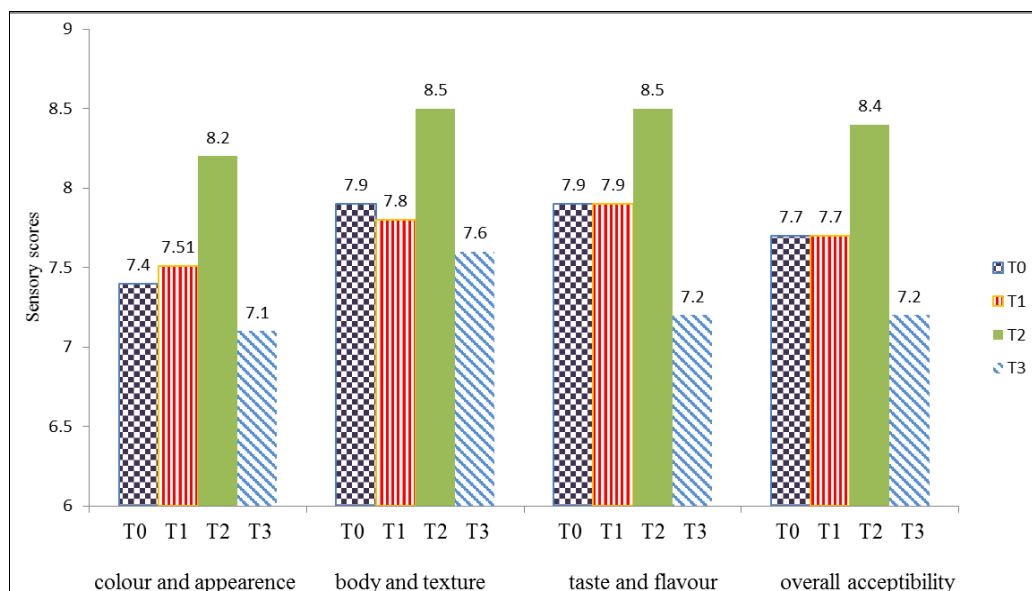


Fig 2: The average sensory scores of different parameters in control and treated sample of 'Nutriprash'

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