

Health Mixes with Coconut Milk Powder

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Introduction

Coconut milk is the liquid obtained by manual or mechanical extraction of grated coconut meat. Approximately 50% of the fatty acids in coconut fat is lauric acid. Coconut milk powder is an excellent substitute for fresh coconut milk as it is rich in proteins, vitamins and minerals.

Malnutrition in children and women remains as one of the greatest challenges in India. Malnutrition remains as a major threat to the survival, growth and development of children. It may occur due to lack of available food sources and inability to absorb nutrients or poor feeding. This necessitates the search for low cost, readily available, easy-to-prepare alternatives to cater for the nutritional needs of children.

A food supplement provides nutrients that may be lacking in the diet. The nutrient density must be sufficient to permit adequate protein, vitamin and mineral intake to meet the nutrient intake of children. Formulation of health mix with coconut milk powder provides a nutritious and cost effective alternative commercial health mixes. This value addition further increases the use of coconut and benefit the farmer.

Selection of ingredients for Health Mix

Coconut milk powder, millets namely ragi, bajra, and jowar, pulses namely roasted Bengal gram, sprouted green gram and nuts namely peanuts, almonds and cashew nuts were selected for formulation of health mix. All the food samples were cleaned and dried. Millets and nuts were roasted and finely ground in a mill. Cane sugar and cardamom (for flavor) were procured from reputed departmental stores.

Formulation of Health Mixes

Five different variants A1, A2, A3, A4, and A5 (Table: 1) were formulated by adding 10- 50 % of coconut milk powder in the mix.

The ingredients were mixed together as per the proportion given in Table-I and packed in HDPE packages, sealed, labelled and stored at room temperature.

Table: I. Composition of Health Mix

Ingredients	Quantity (gm/100g)					
	Standard	AV1	AV2	AV3	AV4	AV5
Coconut Milk Powder	-	10	20	30	40	50
Ragi	20	20	20	15	10	10
Bajra	20	20	20	15	10	10
Jowar	20	20	20	15	10	10
Roasted Bengal gram	15	10	5	7.5	10	5
Sprouted Green gram	15	10	5	7.5	10	5
Peanuts	5	5	5	5	5	5
Almond	2.5	2.5	2.5	2.5	2.5	2.5
Cashew nut	2.5	2.5	2.5	2.5	2.5	2.5
Cardamom	1	1	1	1	1	1

Preparation of Porridge

Porridge was prepared by dissolving 50 g formulated health mix with 150 ml boiling water. It was cooked for five minutes in a low flame and served warm. Sugar was added for taste. Organoleptic evaluation of the prepared porridge was carried out by 10 semi trained panel members using a 9 point scorecard.

Nutrient Composition

Nutrients namely carbohydrate, protein, fat, fiber and energy were calculated using nutritive value for Indian Foods (ICMR, 2012).

Shelf life study of the formulated health mix

The formulated health mixes were stored at room temperature for three months. The samples were drawn at regular intervals of 7 days for microbial analysis. Organoleptic evaluation of the porridge was carried out every 15 days to find out its acceptability.

In vivo analysis of the formulated health mix

Twenty one days old weanling rats were selected for carrying out Protein Efficiency Ratio (PER) of the health mix. PER is defined as unit weight gain per unit protein intake.

The weanling rats (Sprague Dawley) were procured

from PSG IMSR Animal Facility and housed in polypropylene cages, maintained on standard pellet diet and water ad libitum. The rats were acclimatized for a period of seven days to laboratory conditions (temperature $25 \pm 2^\circ\text{C}$) and 12 h light/dark cycle. The rats were then divided into 5 groups and housed separately. The formulated food was fed to the weanling rats as per Table-II.

Groups	Diet administrated
Control	100 % standard food (20 g protein)
Group- 1	75 % Standard food + 25% Formulated food (19 g of protein)
Group- 2	50 % Standard food + 50% Formulated food (19.3 g of protein)
Group- 3	25%Standard food + 75% Formulated food (18.3 g of protein)
Group- 4	100% Formulated food (18.7 g of protein)

The rats were weighed every alternate day to measure the weight gained at the end of the feeding period. The amount of food served and the leftover food were weighed every day to find out the amount of the food consumed. Protein intake was calculated on the basis of protein in the consumed diet by the rats. From the above data, PER was found out.

PER is based on the weight gain of a test subject divided by its intake of a particular food protein during the test period.

PER=	Gain in body weight (g)/
	Protein intake(g)

The obtained results were analysed by relevant statistical tools namely general linear model, t- test, post hoc test and ANOVA.

Results

Nutrient Content of Health Mix

Health mix	Nutrients/100g				
	Energy (kcal)	Carbohydrate (g)	Protein (g)	Fat (g)	Fibre (g)
Standard	378.0	65.0	17.0	3.0	6.0
AV4	534.68	44.45	14.74	30.1	1.38

The carbohydrate and protein content (Table - III) of

AV4 was 44.45g% and 14.74g% respectively which was lesser than the standard. AV4 is low in protein content, yet the quality of protein is good as it comes chiefly from coconut milk powder. Therefore it can be recommended for children. The fat content of the AV4 was 30.1g% which is much greater than standard and this fat is chiefly constituted by medium chain triglycerides (MCT's) and the major fatty acid is lauric acid. Organoleptic Scores of Health Mix

The mean score obtained for colour by AV4 was maximum (8.75 ± 0.43) which was greater than the other variants and standard (8.4 ± 0.48). The mean scores obtained for texture by both standard and AV4 were the same (8.8 ± 0.4). AV4 had got maximum score (8.8 ± 0.35) for taste and overall acceptability (8.8 ± 0.4) compared to standard and other variants which is due to the addition of coconut milk powder. The variant AV3 had got the maximum score (8.8 ± 0.35) for flavour. The results of one way ANOVA showed that there was a significant difference observed between groups for all the criteria except for the texture.

Thus it is clear that AV4 containing 40% of coconut milk powder had obtained maximum scores in the sensory attributes namely colour, texture, taste and overall acceptability. Therefore AV4 was selected to evaluate the shelf life, nutrient content and determine the PER in rats.

Shelf Life Study of AV4 and Standard

The mean organoleptic scores of the standard and AV4 gradually decreased over the storage period and were the least on 90th day with 3.6 ± 0.48 and 3.9 ± 0.53 respectively. The mean scores for texture of the standard and AV4 which were 8.5 and 8.6 on 0th day respectively, gradually decreased to 3.5 and 3.8 on 60th day respectively. The scores started decreasing gradually and was least for the standard (2.9 ± 0.7) compared to AV4 (3.5 ± 0.67) on the 90th day. The decrease in the mean organoleptic scores was marginal on the 15th day (8.6 ± 0.48), thereafter the decrease was sharp every 15th day and was 5 points lesser on the 60th day compared to the 0th day. The mean scores gradually declined over the storage period and were 3.8 ± 0.74 and 4.1 ± 0.53 on the 90th day.

Microbial Analysis

The results of microbial analysis revealed that the growth of microorganisms till 70th day was within the permissible limit according to BIS standards (IS 11536:2006). The results also depicted that there was not much contamination till 14th day of storage as the colony count was less than 1 CFU/ g. The maximum range of permissible limit of microorganisms was reached only after 77th day (1.1×10^4 CFU/ g). Therefore, it is recommended that the product could be consumed till 70 days of storage if stored at appropriate conditions.

Results of PER

Table – IV Mean scores of PER			
Group	Average protein intake	Average total weight gain	PER
Control	40.65	139.62	3.43
Group 1	39.08	123.5	3.15
Group 2	37.45	107.5	2.86
Group 3	34.5	109.5	3.17
Group 4	32.35	108.37	3.34

Rats of control group (Table-IV) showed the highest protein intake followed by the rats of Group 1. The protein intake was the least in Group 4, yet the PER value was only marginally lower than control. This shows the high quality of protein in the formulated food that has helped in the growth and development of rats of Group 4. The PER of Group 4 which was fed with 100% of coconut milk powder was the highest (3.34) among the experimental groups. This indicates that the incorporation of coconut milk powder at 100% level had

promoted substantial growth. This also confirms that coconut milk powder can be added to the health mix of children as it has such enormous growth potential.

Conclusion

Health mix prepared with coconut milk powder is a power packed supplement which is good for health. The proteins present in coconut will promote the growth of the growing children to attain their growth for age. The formulated health mixes are a combination of conventional foods and no artificial additives or supplements have been added to enhance its nutritional quality. The health mixes thus prepared with coconut milk powder can be promoted as a nutritious health drink for children.

Reference

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and for high value crops. High level of management is needed and drip irrigation is suitable in arid/ drought hit areas where sufficient water is not available in summer months for irrigation.

Drip feasibility in coconut gardens of Kerala

Field level observations reveal that drip system of irrigation has not become popular among coconut farmers in Kerala. A careful consideration of the drip irrigation and nature of coconut gardens in Kerala show that the advantages of drip irrigation can be well utilised and its disadvantages can be minimised by the selective adoption of this system of irrigation in chosen areas. The major justifications for adoption of drip irrigation in coconut gardens of Kerala are briefed below:

The coconut palms of Kerala during every year faces moisture stress from November to May and respond well to irrigation during this period. Spacing of this crop is wide enough to make the cost of the system to be lowest. Since it is a cash crop additional return can pay back the system cost quickly. The labour cost is high in the state. The saving in labour costs will be an added incentive. Generally, soils of Kerala are highly infiltrative and the surface system will waste water. Drip can avoid this. In coastal areas saline water can be effectively used for irrigation through drip system since salt accumulation near root zone is prevented by the continuous application of water near root zone through drip. In most of homestead farms irrigation is well-based where the quality of water ensures less clogging. More homestead farms in existence are with intensive cropping systems. So the intercrops also can be irrigated. With the fragmentation of holdings, part time cultivators are more in the state. They can well adopt such labour saving irrigation system. Certain areas of the state like Kollam, Pathanamthitta and Palakkad districts can very well adopt this system as water is very scarce there.

There is ample scope for wide adoption of this system of irrigation in coconut gardens of Kerala. Institutional agencies finance drip irrigation especially in areas of scanty rainfall and water scarcity. The Government of India has been implementing centrally sponsored scheme through the state government promoting adoption of micro irrigation with the objective to enhance water use efficiency in agriculture section by promoting appropriate technology interventions like drip irrigation technology thereby encouraging farmers for adoption by extending financial and technical support. It is necessary to educate the coconut growers on the viability of drip irrigation system and motivate them to adopt the same in their coconut gardens. However, today, many progressive farmers have shown keen interest and are adopting drip irrigation system in their coconut gardens. Large scale adoption of this technology will make a break through in the production of coconut in the state.