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Promotion of millets and pulses based health mix for nutritional security through front line demonstration

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Abstract

A study was conducted during 2018-19 in the guidance of ICAR-KVK, Vamban, Pudukkottai District, Tamil Nadu Agricultural University, Coimbatore. The purpose of study was to promote consumption of millets and pulses based health mix to achieve the nutrition security through Front Line Demonstration and by capacity building program. The problems in adopting millet crops and utilization of millets were also analyzed through pre-structured schedule. The training was conducted to randomly selected beneficiaries. Results revealed that the millet and pulse based health mix compared to farmer's local practice. Lack of millet processing industries, problem in marketing of millets, Lack of nutritional knowledge and health benefits, lack of acceptance as regular food and lower economic returns were the major problems as expressed by the farmers in adopting millets. To enhance the consumption of millet and pulse based health mix were demonstrated in capacity building programmes. The nutritional component of health mix was analyzed and packed in high density poly ethylene packaging and stored at room temperature.

The health drink was prepared from health mix with palm sugar and white sugar and sensory evaluated by an individual with scored higher mean value for the period of six months. The health mix was introduced by TNAU Scientists during Scientific Advisory Committee meeting at KVK, Vamban on 14.03.2019.

Keywords: Front line demonstration-health mix-nutritional analysis and sensory evaluation

Introduction

Millets are small-seeded with different varieties such as pearl millet (*Pennisetum glaucum*), finger millet (*Eleusine coracana*), kodo millet (*Paspalum setaceum*), proso millet (*Panicum miliaceum*), foxtail millet (*Setaria italic*), little millet (*Panicum sumatrense*) and barnyard millet (*Echinochloa utilis*) (Kaur *et al.*, 2012) [15]. Millets, pulses and oil seeds are rich in nutritional characteristics. Value addition to food has assumed critical importance in the last decade due to socio-economic and industrial factors. Hence the present study aimed in promotion of millets and pulses based health mix for nutritional security through front line demonstration. The major factor discouraging its cultivation and consumption with improvement in living standard or urbanization is the drudgery associated with its processing (Vanithasri and Kanchana, 2013) [15]. Over the past three decades cultivation and production of nutritious cereals is decreasing significantly, because of poverty, shifting consumption pattern from a balanced diet, widespread prevalence of nutritional deficiencies and also low consumption of nutritious cereals (Seetharama and Rao, 2004) [10]. The present study was carried out with objectives are preparation of health mix based on millets, pulses, oilseeds and spices. Evaluation of sensory acceptability and nutrient content. Determination of the shelf life and cost analysis of health mixes.

Materials and Methods

The ingredients such as Cereals, Millets, Pulses, nuts, oil seeds and spices were purchased from the local market as given in Table 1. The ingredients were cleaned to remove dust and other foreign materials. The ingredients were roasted one by one except dried ginger, cardamom and grinded in a commercial roller mill and add sugar powder, milk powder. The combined health mix was sieved using a BS 40-mesh sieve to obtain fine flour and was stored in air tight containers or high density polyethylene package or card board container. The health drink was prepared from health mix and evaluated for its sensory attributes by a panel of 10 members using a nine point hedonic scale (Watts *et al.*, 1989) [16]. Three categories of respondents were selected to study the acceptability of the health mix.

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10 KVK Scientists, 20 Government officials and 200 farmers those who are attending to study the acceptability of health mix. The health mix was analyzed for their nutrient content. The proximate principles like energy, carbohydrate, protein,

fat, crude fiber, calcium, iron and potassium were analyzed using standard procedures. The detail of methods of analysis is given in Table 2.

Table 1: Formula used for preparation of health mix

Sl. No.	Ingredients	-	Quantity	Sl. No.	Ingredients	-	Quantity
1.	Wheat	-	200 g	9.	Soya beans	-	22.5 g
2.	Ragi	-	200 g	10.	Groundnut	-	22.5 g
3.	Cumbu	-	200 g	11.	Badam	-	22.5 g
4.	Cholam	-	200 g	12.	Cashew nuts	-	22.5 g
5.	Maize	-	100 g	13.	Dried ginger	-	5.0 g
6.	Green gram	-	100 g	14.	cardamom	-	2.5 g
7.	Chickpea	-	22.5 g	15.	Sugar powder	-	99 g
8.	Peas	-	22.5 g	16.	Milk powder	-	99 g

Procedure for preparation of health mix

The entire ingredients were cleaned well and roasted mildly in one by one an iron pan at temperature from 60 °C to 70 °C for 5min except dried ginger, cardamom, sugar powder and milk powder. After roasting the grains were cooled and mixed with dried ginger and cardamom and ground into fine flour form using bur mill (60mm). After milling sieved the flour, add sugar powder and milk powder and stored in air tight container.



Table 2: Method of Analysis

Sl. No	Parameters	Methods
1.	Carbohydrate (%)	IS 1656:2006
2.	Protein (%)	AOAC, 20 th Edition 2016 Method 2001.11
3.	Fat (%)	IS 12711: 1989 Reaff. 1994
4.	Crude fiber (%)	IS 12711: 1989 Reaff. 1994
5.	Calorific value (kcal/100g)	DGHS Method
6.	Calcium (mg/100g)	DGHS Method
7.	Iron (mg/100g)	DGHS Method
8.	Potassium (mg/100g)	DGHS Method

Results and Discussion

It is observed from the Table 3 that marketing problem (100%) in their area was the major problem expressed by farmers followed by lack of millet processing techniques and industries (95%), lack of acceptance as regular food (75%), lack of nutritional knowledge and health benefits (60%) and lower economic returns (55%).

Incorporation of millets in the conventionally used refined wheat flour can improve nutritional quality (Shrestha and Srivastava, 2015) [13]. Vanishree *et al.*, (2018) [14] observed that lack of millet processing industries (100%) in their area was the major problem expressed by farmers followed by marketing problem (26.00%), availability of High Yielding Varieties (25.00%), lower economic returns (24.00%) and lack of acceptance as regular food (76.66%).

Table 3: Problems identified in growing and utilization of millets by farmers N=100

Sl. No	Problems	No. of farmers
1.	Lack of millet processing techniques and industries	95 (95%)
2.	Problem in marketing of millets	100 (100%)
3.	Lack of nutritional knowledge and health benefits	60 (60%)
4.	Lack of acceptance as regular food	75 (75%)
5.	Lower economic returns	55 (55%)

Nutrient content of health mix

The nutritional compositions of the health mix are presented in Table 4. The Energy, Carbohydrate, protein, fat, crude fibre, calcium, iron and potassium content of health mix were 387.39K.Cal., 74.23g, 13.10g, 4.23g, 3.12g, 217.29mg, 12.41mg and 637.46mg respectively. Nwanekezi and Okorie (2002) reported that the commercial weaning food mix prepared from malted and fermented maize with groundnut contained crude protein (12%), crude fibre (4.9%), fat (7.9%), carbohydrate (17.3%), and energy 400.3 K.cal. Shilpi and Shashi (2003) reported that instant convenience infant food mix had higher levels of carbohydrate (77.37g/100g). Similar trend was observed in the present investigation. Nithya (2004) observed that the nutrient content of the stored beverage mix ‘Nutrimix’ packed in pet jar, Metalized polypropylene pouches, polyethylene bag with vacuum and without vacuum for the period of 120 days. Lakshmidevi and Khader (1997) [6] reported that the porridge mix prepared from cereals and pulses combination contained 7.0g of protein.

Table 4: Nutrient content of health mix per 100g

Parameters	Energy (Kilo calories)	Carbohydrates (g)	Protein (g)	Fat (g)	Crude fibre (g)	Calcium (mg)	Iron (mg)	Potassium (mg)
Health mix	387.39	74.23	13.10	4.23	3.12	217.29	12.41	637.46

Sensory characteristics of health drink with palm sugar

Table 5 shows that the sensory characteristics like colour and appearance, flavor, texture (consistency), taste and overall acceptability of the health drink with palm sugar scored

higher values. The initial score value was 9.0 for all sensory characteristics and at the end of the storage period (180th day) the colour and appearance, consistency and overall acceptability was 8.0 and 7.0 for flavour and taste. The health

mix was acceptable up to 180 days stored in High Density Poly Ethylene (HDPE) packaging for the storage period. Sharma *et al.* (1995) [11] studied about the change in color, taste, flavor and overall acceptability of reconstituted samples

of instant mix stored at room temperature (37 °C) in various packaging materials and reported that initially the instant mix had an overall acceptability score of 7.9 on a 9 point hedonic score.

Table 5: Mean value for sensory evaluation of health drink with palm sugar

Storage Days	Sensory Characteristics				
	Colour and appearance	Flavor	Texture (consistency)	Taste	Overall acceptability
Initial	9	9	9	9	9
60 th day	9	9	9	9	9
120 th day	8	8	7	8	8
180 th day	8	7	8	7	8

Sensory characteristics of health drink with white sugar

Table 6 shows that the sensory characteristics like colour and appearance, flavor, texture (consistency), taste and overall acceptability of the health drink with white sugar scored initial values were 8.5, 8.0, 8.5, 8.9 and 8.9 respectively and 8.0, 7.9, 7.9, 7.8 and 7.9 respectively at the end of the storage period. The health mix was acceptable up to 180 days stored

in High Density Poly Ethylene (HDPE) packaging for the storage period. Karupphasamy *et al.*, (2008) [4] reported that the organoleptic characteristics of "pittu, laddu, kuzhapittu and roti prepared from stored multipurpose snack mix packed in different packaging materials. The millet based multipurpose snack mix products had an acceptable score during 90 days of storage period.

Table 6: Mean value for Sensory evaluation of health drink with white sugar

Storage Days	Sensory Characteristics				
	Colour and appearance	Flavor	Texture (consistency)	Taste	Overall acceptability
Initial	8.5	8.0	8.5	8.9	8.9
60 days	8.3	8.0	8.0	8.0	8.3
120 days	8.0	8.0	8.0	8.1	8.5
180 days	8.0	7.9	7.9	7.8	7.9

Over all comparison of health with farmer practice

Table 7 shows that the unit production of health mix 500g higher than farmer practice. The organoleptic evaluation of health mix scored higher values than farmer practice. The initial values are 8.9 and 8.5 for health mix and farmer practice respectively and 7.9 and 7.5 at the end of storage

period. The gross cost, gross returns and net returns of the health mix were high than farmer practice. Benefit cost ratio of health mix was high (1.50) than farmer practice (1.25). The cost analysis of the millets and pulse based roasted health mix were given in Table 8.

Table 7: Over all comparison of health with farmer practice

Treatments	Shelf life (days)	Production / Unit (Kgs)	Organoleptic characteristics		Gross cost Rs./ Unit	Gross Returns Rs./Unit	Net Returns Rs./Unit	BC Ratio
			Initial	Final				
Health mix	180	6.0 Kgs	8.9	7.9	1400	2100	700	1.50
Farmer Practice	180	5.5 Kgs	8.5	7.5	1100	1375	275	1.25

Table 8: Cost analysis of the millets and pulse based roasted health mix

Types of Cost	Particulars	Quantity (Kg)	Amount (Rs.)
1. Fixed Cost	Land	-	1,00,000.00
	Building	-	1,00,000.00
	Equipment - Pulverizer	-	50,000.00
	Flour spreading trays	-	2,000.00
	Sealing machine	-	2,000.00
	Vessels	-	1,000.00
	Total Fixed Cost		
2. Variable Cost	Raw materials	50kgs	5611.00
	Labour @ 300 / day / person	2	600.00
	Electricity and fuel	One day	400.00
	Packaging materials - box @ 5	200 Nos	1000.00
	- Pouches @ 1	200 Nos	200.00
Total Variable Cost			7811.00
3. Interest @ 12.5%	12.5 / 100 x 2,55,000 x 1 / 365		87.50
4. Depreciation @ 10%	10 / 100 x 2,55,000 x 1 / 300		85.00
5. Profit 20%	20 / 100 x 7811		1562.00
6. Total Cost	Total variable cost + Interest + Depreciation + Profit 7811+87.50 + 85+ 1562		9546.00
7. GST 5%	(CGST 2.5% and SGST-2.5%) (9546/100x5)		477.00
	Total Cost + GST (9546+ 477)		10023.00
8. Total Unit Cost	For 50 kg		10023.00
	For 1 kg (10023/50)		200.46
	For 100 g (200/10)		20.00

Summary and Conclusion

The farmers expressed by lack of millet processing industries (95%), lack of acceptance as regular food (75%) are the major problems. The nutritional compositions of the health mix were good and more suitable for all age groups. The sensory evaluation of health drink prepared from health mix was scored high values than farmer practice for the period of 180 days in high density polyethylene packaging. The gross cost, gross returns and net returns of the health mix were high than farmer practice. Benefit cost ratio of health mix was high (1.50) than farmer practice (1.25). Introduction of millets and pulses based health mix to farmers can be helpful in increase the utilization of millets and pulses and adopting millet crops. Demand for millets can be increased by creating awareness regarding their environmental sustainability, nutritional and other health benefits. Millet value added products can be included under feeding programmes like mid-day meal and adolescent feeding programmes. Finally prepared millets and pulses based roasted health mix was introduced by TNAU Scientists during 10th Scientific Advisory Committee meeting at KVK, Vamban on 14.03.2019 as given in Pic. 1.



Pic 1: Introducing Millets and Pulses Based Roasted Health Mix during 10th Scientific Advisory Committee Meeting On 14.03.2019

From left to right

1. Dr. M. R. Latha, Programme Coordinator, KVK, Vamban, Pudukkottai.
Dr. S. Porpavai, Soil and Water Management Research Institute, Thanjavur.
2. Dr. Mahendra M. Manivaasan, Board Member of TNAU, Coimbatore.
3. Dr. M. Jawaharlal, Director, Extension Education, TNAU, Coimbatore.
4. Dr. V. Ambethgar, Director, Tamil Nadu Rice Research Institute, Aduthurai.
5. Dr. N. Manivannan, Professor and Head, NPRC, Vamban, Pudukkottai.
Mr. Raju Narasimman, President, Progressive Farmers Association, Tamil Nadu.
6. Dr. P. Karuppasamy, Training Assistant (FSN), KVK, Vamban, Pudukkottai.
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