

Formulation of RTS health mix for menopausal women

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The present study was undertaken to develop ready to serve (RTS) health mix for menopausal women. RTS health mix was prepared using functional foods such as, rajkeera seed, soybean, ragi, flax seed and oats. The RTS health mix was developed for menopausal women by using calcium rich foods like ragi, rajkeera seeds and isoflavone rich foods such as soybean and oats and phytoestrogen rich food, flaxseed. The acceptability of RTS health mix was studied by using five point ranking test (Ranganna *et al.*, 1979). Nutrient content of highly accepted developed ready to eat health mix was analyzed by applying standard methods. Highly accepted health mix was stored in airtight polyethylene pouches, one at room temperature and another at refrigerator for two months and evaluated for its shelf -life. Overall acceptability of developed RTS health mix was ranging from 3.53 to 4.96. Highly accepted developed RTS health mix contain good amount of protein (16.7 ± 0.35), calcium (201.8 ± 0.06) and isoflavone 28 mg. It was found that RTS health mix stored at refrigerator temperature for 60 days had low microbial count than that of stored at room temperature. Even after two months of storage RTS health mix found to have low microbial count therefore considered as microbial safe for consumption.

Key Words : Menopause, RTS health mix, Sensory evaluation, Nutrient analysis and shelf-life

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INTRODUCTION

Menopause is the permanent cessation of menstruation resulting from the loss of follicular activity of the ovaries (WHO, 1996) which is recognized to have occurred after 12 consecutive months of amenorrhea. The menopausal phase is now recognized as a time of decreased hormonal production with associated physical and psychological problems that reduce the quality and length of life for a large number of women (Sellmayer *et al.*, 2001) and may increase the risk of osteoporosis and possibly coronary heart disease (Farida *et al.*, 2011).

All psychological and physiological changes of the menopausal women have an impact on their food intake and

food choices (Javoor, 2006). Many physical and mental problems of the menopausal women may be prevented or cured by proper nutrition. Following a healthy lifestyle, including a healthy eating pattern and regular exercise, can offer numerous benefits to menopausal women, helping to attain or maintain a healthy body weight and there by improving overall quality of life.

It is an established fact that a well-balanced diet is important for good health and it may also provide other benefits, such as alleviating the severity of some menopause-related symptoms (Francesca, 2011).

Calcium and soy isoflavones are two essential components on top of the list for women's health. Calcium is the most important bone builder mineral and Isoflavones and lignans are natural phytoestrogens found in many foods which tailor the menopausal therapy in a natural way (Carusi, 2000 and Goyal, 2009). Among the legumes soybean is the richest source of Isoflavones. Besides this flax seeds, ragi, oats, and finger millet are regarded as a functional food. Flaxseed is one of the richest sources of lignans. Lignans are phytoestrogens which have chemical structures similar to the human hormone estrogen (Fransesca, 2011). It can control

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renal diseases and combat menopausal symptoms (Sahar, 2005 and Dhutmal, 2008). Finger millet (*Eleusinecoracana*) or ragi is a rich source of several phytochemicals. Oats (*Avena sativa*) also contain many powerful phytochemicals, phenolics and ligans. Amaranth, commonly known as rajkeera considering its high protein content, fibre, calcium, iron, magnesium, zinc, vitamin A, C and several B vitamins.

Hence, the present study was undertaken to develop health foods for menopausal women using functional foods and to evaluate its nutritional and keeping quality.

METHODOLOGY

The RTS health mix was developed for menopausal women by using calcium rich foods like ragi, rajkeera seed, and phytoestrogen rich foods such as soybean, oats and flaxseed. The acceptability of RTS health mix was studied by using five point ranking test (Ranganna *et al.*, 1979). Nutrient content of highly accepted developed ready to eat health mix was analyzed by applying standard methods. Moisture, fat, crude fibre and total minerals were estimated by AOAC method (1990). The carbohydrate content was calculated by difference method (Raghuramalu *et al.*, 1983). The energy content of developed RTS was computed by summing up the values obtained by multiplying the values with at water constant for carbohydrate, crude fat and protein with 4, 9 and

4, respectively. Protein was found out by micro Kjeldhal method. The highly accepted developed ready to serve health mix (100g) was packed in airtight polyethylene pouch and stored one at room temperature (28-32°C) and another at refrigerator for two months. Keeping quality of the product was studied by carrying out organoleptic evaluation at every 15 days. Simultaneously determination of total bacterial count was carried out by DMC method (direct method for counting). The microbial population was analyzed at thirty days of interval over a period of two months by using standard procedure. The developed RTS health mix can be consumed by dissolving it in luke warm water or milk. It can be prepared without sugar also. The data generated was analyzed statistically by using ANOVA and 't' test to find out the significant differences between various aspects.

OBSERVATIONS AND ASSESSMENT

The composition of developed RTS health mix for menopausal women is given in Table 1. A total five variations were developed using puffed rajkeera seeds flour, soyabean flour, ragi malt, oat meal flour, flax seed flour, powdered sugar, skim milk powder and cardamom powder in various proportions.

The mean values of organoleptic scores for the acceptability of developed RTS health mix for menopausal

Table 1 : Composition of developed RTS health mix for menopausal women

Sr. No.	Ingredients	Amount (g) of ingredients used in variations of health mix				
		I	II	III	IV	V
1.	Puffed rajkeera seeds flour	30	29	28	27	26
2.	Soybean flour	19	18	17	16	15
3.	Ragi flour	17	16	15	14	13
4.	Oat meal flour	14	14	14	14	14
5.	Flax seed powder	5	8	11	14	17
6.	Powdered sugar	9	9	9	9	9
7.	Skim milk powder	5	5	5	5	5
8.	Cardamom powder	1	1	1	1	1

Table 2 : Mean values of organoleptic scores for the acceptability of developed RTS health mix for menopausal women

Variations	Mean value of organoleptic scores of RTS health mix				
	Colour	Texture	Flavour	Taste	Overall acceptability
I	3.73	3.90	3.66	3.50	3.53
II	4.33	4.16	4.26	4.16	4.13
III	4.56	4.70	4.40	4.40	4.60
IV	4.93	4.86	4.93	4.83	4.96
V	4.13	4.00	3.90	3.80	3.86
Mean	4.34	4.32	4.23	4.14	4.22
F value	10.49**	6.73**	16.21**	20.63**	29.72**
S.E. ±	0.13	0.16	0.12	0.11	0.10
C.D. (P=0.05)	0.38	0.46	0.33	0.31	0.29

** indicates of significance of values at P=0.05, respectively

women is presented in Table 2. Wide variations were noticed in the mean scores of colour of RTS health mix prepared. The highest (4.93) score was obtained by IV variation of RTS health mix. Statistical analysis revealed that the mean scores obtained by IV variation were significantly more than other variations. The highest score 4.86 was recorded by IV variation of RTS health mix for texture which was significant statistically. The mean score obtained for flavour of developed RTS health mix at different variations was found to be varying. The highest value (4.93) was recorded for flavour by IV and V variations of developed RTS health mix. Maximum scores (4.38) for the taste was recorded by the IV variation of RTS health mix. While minimum scores (3.66) was secured for I variation of RTS health mix. Significant difference was noticed in the score obtained for taste of all variations.

The mean value for overall acceptability of developed RTS health mix with different variations was ranging from 3.53 to 4.96. Statistical analysis showed that mean score of overall acceptability of different variations of RTS health mix was found to be differ significantly. On the whole, IV variation of developed RTS health mix secured highest score for all the organoleptic parameters. Hence, it is considered to be the most accepted health mix suitable for menopausal women.

The proximate nutrient composition and mineral composition of the highly accepted developed RTS health Mix (per 100 g.) is presented in Table 3. The results indicated that moisture (g %), protein (g %), fat (g %), carbohydrate (g %), fibre (g %) and ash content (g %) were 6.96 ± 0.05 , 16.66 ± 0.35 , 8.78 ± 0.16 , 64.07 ± 0.26 , 1.16 ± 0.06 and 2.37 ± 0.05 ,

respectively. The content of minerals (mg %) of highly accepted developed RTS health mix were iron (4.88 ± 0.25), calcium (201.8 ± 0.06), magnesium (153.69 ± 0.62), manganese (2.4 ± 0.06), zinc (2.2 ± 0.09) and copper (0.7 ± 0.04). On the other hand, the computed value of isoflavone (mg %) of the highly accepted developed RTS health mix was 28 mg. It was concluded that the highly accepted developed RTS health mix can provide good amount of protein, iron and isoflavone.

Table 3 : Nutrient content of the developed RTS health mix (per 100 g)

Nutrient	Mean \pm SD
Moisture (g).	6.96 ± 0.05
Protein (g).	16.66 ± 0.35
Fat (g).	8.78 ± 0.16
Carbohydrate (g).	64.07 ± 0.26
Fibre (g).	1.16 ± 0.06
Ash (g).	2.37 ± 0.05
Iron(mg)	4.80 ± 0.25
Calcium (mg)	201.76 ± 0.06
Magnesium (mg)	153.69 ± 0.62
Manganese (mg)	2.4 ± 0.06
Zinc (mg)	2.2 ± 0.09
Copper (mg)	0.7 ± 0.04
Isoflavone	28*
Energy (Kcal)	370*

*Computed value

Table 4 : Mean scores for overall acceptability of developed RTS health mix stored at refrigerator and room temperature for varying periods

Sr. No.	Storage period	Mean scores of overall acceptability for developed RTS health mix		't' value
		Refrigerator mean \pm SD	Room temperature mean \pm SD	
1.	Initial	4.96 ± 0.48	4.96 ± 0.48	NS
2.	15 days	4.94 ± 0.23	4.75 ± 0.74	0.64 ^{NS}
3.	30 days	4.88 ± 0.12	4.63 ± 0.66	0.92 ^{NS}
4.	45 days	4.85 ± 0.2	4.56 ± 0.75	1.67 ^{NS}
5.	60 days	4.78 ± 0.5	4.0 ± 0.57	2.47*

NS- non significant, * indicates of significance of values at P=0.05, respectively

't' values for refrigerator		't' values for room temperature	
I vs. II	0.6 ^{NS}	I vs. II	4.3*
II vs. III	0.57 ^{NS}	II vs. III	4.0*
III vs. IV	0.7 ^{NS}	III vs. IV	3.8*
IV vs. V	0.5 ^{NS}	IV vs. V	4.4*
V vs. I	0.58*	V vs. I	5.2*

* indicates of significance of values at P=0.05, respectively

Table 5 : Microbial content of highly accepted developed RTS health mix after storage

Element	0 day	After 30 days of storage		After 60 days of storage	
		Refrigerator temp.	Room temp.	Refrigerator temp.	Room temp.
Total bacterial count (TBC)	BDL	BDL	BDL	1×10^{-2} CFU/ml	2×10^{-2} CFU/ml

The mean scores for overall acceptability of developed RTS health mix stored in refrigerator and room temperature for varying periods are presented in Table 4. The mean scores of overall acceptability of developed RTS health mix stored in room temperature for varying periods were ranging from 4.96 ± 0.48 to 4.0 ± 0.57 . Overall acceptability scores of developed RTS health mix stored at refrigerator temperature for one to two months was found to be significantly more than that of stored at room temperature. It was also observed that score secured by developed RTS health mix stored at room temperature found to be significantly decreased as period of storage was increased. But similar trend was not noticed in the developed RTS health mix stored at refrigerator temperature. On the whole the developed RTS health mix stored in refrigerator temperature had a better acceptability than those stored at room temperature.

The microbial load of developed RTS health mix on storage is presented in Table 5. The microbial analysis was done for total bacterial count (TBC) for highly accepted developed RTS health mix. The microbial population was analyzed at thirty days of interval over a period of two months by using standard procedure. Initial and after 30 days of storage bacterial count (TBC) in RTS health mix was found to be nil or below detectable level (BDL) at room temperature and refrigerator temperature. Total bacterial count (TBC) for highly accepted developed RTS health mix stored at refrigerator temperature was increased to 1×10^{-2} CFU/ml from 30 to 60 days. However, in case of storage at room temperature the bacterial count was found to be more, which increased to 2×10^{-2} at the end of the storage period. It was found that RTS health mix stored at refrigerator temperature had low microbial count than that of stored at room temperature. Even after two months of storage found to have low microbial count. Hence RTS stored for 60 days can be considered as microbial safe for consumption.

On the whole, the findings of the present study revealed that developed RTS health mix for menopausal women was very well accepted and it contains good amount of protein, calcium and isoflavone. Even after two months of storage it was accepted and found to have low microbial count. Thus consumption of developed RTS health mix should be

encouraged among menopausal women to have sound health.

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