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Development and Evaluation of Ready-to-Cook Premix of Modified *Ashtaguna Manda*- An Ayurvedic Nutraceutical Appetizer

Research Article

Mrudul Chitrakar[1]*, Mahesh Kumar Harit[2], Vinay Pawar[3], Vedvati Bhapkar[4]

1. Professor, Department of Swasthavritta & Yoga, All India Institute of Ayurveda, Goa, India.
2. Professor, 3. Associate Professor, Department of Sanskrit Samhita Siddhant,
4. Assistant Professor, Department of Rasashastra & Bhaishajya Kalpana
D. Y. Patil deemed to be University School of Ayurveda, Nerul, Navi Mumbai, Maharashtra, India.

Abstract

The science of life, Ayurveda touches upon all aspects of our living, including diet and nutrition. The Ayurvedic '*Pathya Kalpana'* offers various recipes with usage guidance. There have been efforts to present some of these recipes in a contemporary form. Hereby we present a unique diet formulation '*Ashtaguna Manda'* in a modified, yet classically rooted form. This was the pioneer effort in such modification as a ready-to-cook premix of *Ashtaguna Manda*. This study indicated that slight technology modification in conventional method yielded comparable outcomes in terms of physico-chemical characteristics as well as sensory evaluation. More such Ayurvedic diet recipes can be sought from Ayurveda treasure in future in a similar manner. The Ayurveda offers numerous tasty and health promoting diet recipes. The current era requires another aspect, i.e., ease of preparation. In the present work, we modified a traditional Ayurveda recipe, viz., *Ashtaguna Manda* and converted it in a ready-to-cook premix form. Care was taken to preserve principles of Ayurveda while creating a consumer-friendly product. The reconstituted product was also compared with the conventionally prepared one through analytical and sensory evaluation. It was observed that the premix as well as reconstituted modified *Ashtaguna Manda* was comparable to the conventionally prepared. Additionally, there was enhanced shelf life, ease of usage and good acceptability by end users. This study provides a lead towards incorporating many such treasured Ayurveda-based diet recipes to preserve health and manage diseases.

Keywords: *Ayurveda Ahara, Manda, Pathya,* Premix, Rice, Ready-to-cook.

Introduction

Utilization of diet in prevention and therapeutic management of diseases is a discerning feature of Ayurveda. (1) The Ayurvedic *'Pathya Kalpana'* (wholesome dietary practices) skillfully amalgamate the realms of '*Aushadha'* (medicine) and '*Ahara'* (food). They provide numerous options to devise a customized diet regimen considering an individual's *Dosha* status, health status and even specific taste preferences. (2)

There is a popular trend to utilize diet in form of nutraceuticals, functional foods, etc. for its health promoting and medicinal benefits. (3) Ayurveda has potential to contribute to this, by providing classically documented, socially acceptable, culturally suitable, and delicious recipes. In fact, several diet preparations in Ayurveda, such as *Manda* (rice water), *Peya* (thin gruel) etc. have rich nutritional as well as medicinal benefits. Their ingredients are mostly staple food items, such as grains, pulses, and spices. Also, their preparation is quite simple and requires just basic cooking skills. (4) Still, the demands of current fast, urbanized lifestyle have restricted their widespread usage. For dealing with the time constraints and imparting hassle-free processing, modifying their preparation and presentation techniques is the need of hour. Ready-to-cook (RTC) premixes provide a great option in such scenario, as in minimal cooking efforts, fresh food can be prepared quickly. (5) Many Indian recipes, such as curry, snacks and soups are available in market in this form and have good consumer acceptance. Thus, present work was planned to convert a '*Pathya'* recipe in preservative-free, ready-to-cook form, befitting current demands without compromising health and nutrition benefits.

'*Ashtaguna Manda*,' is a classical '*Pathya'* recipe containing diet ingredients, viz., *Shali* (rice), *Mudga* (green gram), *Shunthi* (dry ginger), *Marich* (black pepper), *Pippali* (long pepper), *Dhanyaka* (coriander seeds), and *Saindhava* (rock salt). The processing is conventionally done by cooking the ingredients in water with tempering of *Tila Taila* (sesame oil) and *Hingu* (asafetida). (6) It is an excellent wholesome diet recipe for healthy and diseased individuals. It is also included in *Samsarjana Krama* (post purification therapy diet regimen) for revival of energy and restoration of digestive power. In order to enhance its health benefits,

*** Corresponding Author:**
Mrudul Chitrakar
Professor,
Department of Swasthavritta & Yoga,
All India Institute of Ayurveda, Goa, India.
Email Id: mrudulmlonkar@gmail.com

we rationally modified this classical formulation by adding *Amalaki* (gooseberry), in the present study.

The present work was carried out with an objective to present this modified *Ashtaguna Manda* (mAM) in a RTC premix form to enhance its compliance and ease of usage. The determination of analytical and safety attributes of developed product was carried out. The reconstituted mAM was also compared with the attributes of conventionally prepared mAM, to ensure appropriateness of processing techniques and overall acceptability by end users. This was a unique effort in '*Pathya'* recipe modification not just for benefit enhancement but, in terms of a progressive presentation.

Materials and methods

The literary search of Ayurveda classics revealed hardly any information regarding ingredient quantities and stepwise instructions of preparation of *Ashtaguna Manda*. Thus, there was possibility for individualist interpretations and confounding outcomes regarding nature of certain ingredients, time required for cooking, organoleptic characters of finished product, etc. Hence, content selection and quantification were done in the first stage for preparation of mAM in conventional manner. Subsequently, RTC premix was prepared and its stability was evaluated. Finally, the reconstituted mAM was compared with conventionally prepared recipe regards their physico-chemical properties and sensory evaluation.

Sourcing of raw materials & content selection

The raw materials required in preparation were procured from trusted sources dealing in organic foods. The organic brown parboiled Basmati rice (*Oryza sativa*) was selected and procured. Whole green gram, coriander seeds, dry ginger, black pepper and long pepper, compounded asafetida and cold pressed sesame oil were also procured. Apart from rice and green gram, other whole ingredients were converted to fine powdered form and stored separately. Along with classically mentioned ingredients, powder of '*Amalaki'* (gooseberry) was procured from authentic sources. The rational for this modification was to harness immunomodulator properties of *Amalaki.* (7) Moreover, this is a rich source of Vitamin C. (8) Apart from many health benefits, it is also a common ingredient in Indian cuisine owing to its characteristic sour-astringent taste. Thus, this addition was also done for taste enhancement.

Quantification of ingredients and conventional preparation of mAM

The classical reference for *Manda* preparation mentions that quantity of water as 14 times that of other ingredients together. There individual quantities are not mentioned. Thus, the quantities of each ingredient were determined based on discussion with Ayurveda experts. Conventionally the food ingredients are taken in larger quantities and spices and condiments in adequate quantity not to overpower and imbalance the taste palate. The final ingredients with their quantities were as presented in Table 1.

Table 1: Quantities of ingredients of modified *Ashtaguna Manda*

Ingredient	Latin name	Quantity
Basmati Rice	*Oryza sativa* L.	10 gm
Green gram	*Phaseolus mungo* (L) MANT.	10 gm
Shunthi	*Zingiber officinale* ROSC.	2 gm
Marich	*Piper nigrum* L.	
Pippali	*Piper longum* L.	
Asafetida	*Ferula narthex* BOISS.	200 mg
Rock salt	-	2 gm
Coriander seeds	*Coriandrum sativum* L.	2 gm
Amalaki	*Emblica officinalis GAERTN.*	2 gm
Sesame oil	*Sesamum indicum* L.	4 gm
Water	-	448 ml

Various recipes from Ayurveda use whole green gram in different forms, such as whole or coarsely ground, prewashed or soaked etc. Thus, pilot experiments were carried out to determine the form of green gram to be used for obtaining better finished product in terms of quantity, consistency and even taste. On basis of these criteria, we decided to use prewashed and coarsely ground green gram for further procedure.

Conventional method of preparation of mAM-

1. Rice and green gram were prewashed separately and then dried using soft muslin cloth. Dried green gram was grounded to coarse powder.
2. In a cooking pan, sesame oil was heated on low flame. The spice mix containing dry ginger powder, black pepper powder, long pepper powder, asafoetida, coriander powder and rock salt were added to it. Care was taken to stir the mixture continuously and to not let it burn.
3. The prewashed rice, coarsely powdered green gram and *Amalaki* powder were added to the mixture. All the ingredients were mixed thoroughly.
4. Water was added and mixture was cooked on medium flame without covering it. The cooking was done for about 20 minutes till the water was reduced to half and rice was cooked completely.
5. Once cooking was done, it was strained. The filtrate was separated as modified *Ashtaguna Manda.*

Quantification of ingredients and preparation of RTC premix of mAM

For each serving, the quantities of ingredients were taken same as per conventional preparation, except for asafetida (400 mg). To impart more flavor, the quantity was doubled as compared to conventional method.

Procedure to prepare RTC premix-

1. Rice and green gram were prewashed separately and then dried using soft muslin cloth.
2. They were cooked together in adequate water for 10 minutes, till partially cooked mixture was obtained.

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3. Excess water was drained from this mixture. It was then sundried till completely dry. Care was taken to preserve hygiene and any contamination was avoided.
4. To this dried mixture, spice mix (dry ginger powder, black pepper powder, long pepper), asafetida, coriander powder, *Amalaki* powder and rock salt were added and uniformly mixed.
5. Sachets were prepared, each containing 32 gm of premix as a single serving. Sealed heat resistant and an aseptic packaging was done to conserve original soft texture and taste of grains of rice and green gram for an extended period of time and to protect from microbial contamination.

Procedure for preparation of reconstituted mAM from RTC premix-

1. In a pan, 5g (~ one teaspoon) of sesame oil was added and heated over low flame for 10 seconds.
2. In the heated oil, contents of a single sachet were added and mixed completely.
3. 350 ml water was added to mixture and boiled on medium flame for 10 minutes, while keeping the vessel uncovered and stirring intermittently.
4. After complete cooking, it was strained and the filtered liquid consumed when still hot.

Shelf-life study of RTC premix of mAM

Accelerated shelf-life study of RTC premix was carried out at a recognized laboratory. For this, packets were stored at 40^0C temperature and 75% relative humidity. Parameters, viz., moisture content (Test method- A.O.A.C 17th edition, 2000 Official Method 968.11), total ash and total viable count were studied to determine shelf life.

Analysis of various attributes of reconstituted & conventionally prepared mAM

Comparison of mAM prepared conventionally and reconstituted from RTC premix were carried out. All tests were carried out according to standard procedures mentioned in Food Safety and Standards Authority of India (FSSAI) standards. (9) Following parameters were studied for the same

1. Organoleptic characteristics- color, odor, consistency
2. Physico-chemical parameters- pH (IS 4309), Refractive index (AOAC 17th edn, 2000, Official method 921.08), Viscosity (IS 12869-1), Specific gravity (IS 1122), Total solid content (IS 13815: 1993), Saponification value, Iodine value, Acid value, Weight per ml, (10) Total ash, Acid insoluble ash, Water soluble ash. (IS 1011: 1992)
3. Nutritional analysis- Energy, Carbohydrate (Anthrone method), Fiber (IS 11062), Protein (IS 7219), Fat (IS 5960-3), Vitamin C (FSSAI.VMP-FRK.16.009.2023), Iron (FSSAI.FRK.16.007.2023) and (Calcium IS 1493-1)
4. Phytochemical analysis- Presence or absence of tannin, alkaloid, steroid, glycoside, phenol, amino acid, saponin, flavonoid and terpenoid (11)
5. Anti-oxidant activity by DPPH method (12)-

DPPH, i.e., 1,1-diphenyl-2- picryl-hydrazil was used to evaluate antioxidant activity by measuring free radical scavenging activity. The ascorbic acid was used as a standard for comparison. It was dissolved in water and diluted in methanol to get concentrations of 100µl, 200µl, 300µl, 400µl and 500µl. Similar procedure was carried out for both test samples. 0.004% DPPH (2000 µl) was added to each dilution. All prepared samples were incubated at room temperature for 15 mins in a dark place to complete the reaction. The absorbance of the solution was measured at 517 nm using a spectrophotometer against blank. The percentage (%) antioxidant activity was calculated.

6. Microbial load- For this, Nutrient agar and Sabourauds agar were used as media, in 20 ml volume and 10^{-3}, 10^{-5}, 10^{-7} dilutions. Study was carried out at 37^0 C temperature. The nutrient agar plates were observed 24 hours and Sabourauds agar plates 48 hours after the inoculation with the sample.
7. Sensory evaluation of mAM reconstructed from ready-to-cook premix

The sensory evaluation was done by 40 volunteers by scoring the reconstituted mAM and conventionally prepared mAM on a 9-point Hedonic scale (1=Extremely dislike, 5=neither like nor dislike, 9=Extremely like), for appearance, odor, taste, consistency, and mouthfeel. They were also asked to provide remarks regarding specificity of colour, odour, taste, consistency (thick/watery) and mouthfeel (creamy/powdery/smooth).

Results

The results obtained from various experimental analyses and sensory evaluation indicated negligible difference in mAM reconstituted from premix and prepared conventionally. Additionally, the shelf life of premix was quite long and it could be stored in contamination-free manner.

Shelf life of RTC premix of mAM

The results indicate shelf life of the premix as nine months. The data obtained is mentioned in table 2.

Table 2: Shelf-life study data of RTC premix of mAM

Duration (In days)	Moisture (%)	Total Ash (%)	Total Viable count (No. of colonies) for 10^{-3} dilution	
			Bacteria	Mold
0	5.23	2.15	Too low	Too low
15	5.23	2.15	Too low	Too low
30	5.70	2.15	Too low	Too low
45	5.72	2.18	Too low	Too low
60	5.75	2.18	Too low	Too low
75	5.80	2.20	Too low	Too low
90	5.92	2.20	Too low	Too low
105	6.05	2.20	Too low	Too low
120	6.80	2.20	Too low	Too low
135	7.02	2.20	Too low	Too low

Analysis of various attributes of reconstituted & conventionally prepared mAM

Organoleptic characteristics

The organoleptic characteristics of conventionally prepared and reconstituted mAM were not different, as shown in Table 3.

Table 3: Organoleptic characteristics of conventionally prepared and reconstituted mAM

Parameter	Conventionally prepared mAM	mAM Reconstituted from RTC premix
Color	Yellowish Green	Yellowish Green
Odor	Savory	Savory
Consistency	Watery	Watery

Physico-chemical parameters-

Various physico-chemical parameters for conventionally prepared and reconstituted mAM were comparable with negligible difference, as shown in Table 4.

Table 4: Physico-chemical attributes for conventionally prepared and reconstituted mAM

Parameters	Conventionally prepared mAM	mAM Reconstituted from ready-to-cook premix
pH	7.2	6.8
Refractive index	1.474	1.372
Viscosity	2.3	2.5
Specific gravity	1.061	1.137
Total solid content	16%	12%
Saponification value	162.90	123.30
Iodine value	6.79	7.26
Acid value	3.80	3.82
Weight per ml	1.64 gram	1.52 gram
Total Ash	2.07%	2.15%
Acid insoluble ash	0.04%	0.04%
Water soluble ash	0.12%	0.12%

Nutritional analysis

The nutritional components and their quantities were similar in both conventionally prepared and reconstituted mAM. The results are shown in table 5.

Phytochemical analysis

The phytochemicals present in conventionally prepared and reconstituted mAM were assessed to ascertain their preservation in RTC premix. They were found to be similar, thus ensuring appropriateness of premix preparation procedure. The evaluation is presented in table 6.

Anti-oxidant activity by DPPH method

The anti-oxidant potential as free radical scavenging potential is presented in table 7.

Table 5: Nutritional analysis of conventionally prepared and reconstituted mAM

Parameters	Conventionally prepared mAM	mAM Reconstituted from RTC premix
Energy	149 Kcal	152.21 Kcal
Carbohydrate	22 g	27 g
Fiber	5 g	5 g
Protein	6.9 g	7.5 g
Fat	1.5 g	1.8 g
Vitamin C	2.9 mg	3.8 mg
Iron	8 mg	11 mg
Calcium	62 mg	68 mg

Table 6: Phytochemical analysis of conventionally prepared and reconstituted mAM

Phytochemical	Conventionally prepared mAM	mAM Reconstituted from ready-to-cook premix
Tannin, Alkaloid, Steroid, Saponin	Absent	Absent
Glycoside, Phenol, Amino acid, Flavonoid, Terpenoid	Present	Present

Table 7: Anti-oxidant activity of conventionally prepared and reconstituted mAM

Anti-oxidant activity (µg/ml)	Conventionally prepared mAM	mAM Reconstituted from RTC premix
	62.5	50.8

Microbial load analysis

For conventionally prepared as well as reconstituted mAM, the plates with both Agar media in all dilutions had CFU lesser than 30 per mL. These results are deemed too low to count and thus, without any significance.

Sensory Evaluation of mAM reconstituted from ready-to-cook premix

The data retrieved from sensory evaluation of reconstituted mAM revealed its good scope for acceptance. Majority of the volunteers 'very much liked' the appearance, mouthfeel, taste, and consistency while 'moderately liked' the aroma. Around 45 % volunteers found it 'very much acceptable', while 35 % opined as 'moderately' acceptable. The product received an overall acceptance of 7.3 out of 9 on the 9-point hedonic scale.

The data for sensory evaluation is presented in table 8.

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Table 8: Data for sensory evaluation of mAM reconstructed from ready-to-cook premix

Volunteer	Appearance	Aroma	Mouthfeel	Taste	Consistency	Overall
1	9	7	9	9	9	9
2	9	7	9	9	9	9
3	9	7	8	9	9	8
4	9	7	8	9	9	8
5	9	7	8	9	9	8
6	9	7	8	9	9	8
7	9	7	8	9	9	8
8	9	7	8	9	8	8
9	9	7	8	8	8	8
10	8	7	8	8	8	8
11	8	7	8	8	8	8
12	8	7	8	8	8	8
13	8	7	8	8	8	8
14	8	7	8	8	8	8
15	8	6	8	8	8	8
16	8	6	8	8	8	8
17	8	6	8	8	8	8
18	8	6	8	8	8	8
19	8	6	8	8	8	8
20	8	6	7	8	8	8
21	8	6	7	8	8	7
22	8	6	7	8	7	7
23	8	5	7	7	7	7
24	8	5	7	7	7	7
25	8	4	7	7	7	7
26	8	4	7	7	7	7
27	8	4	7	7	7	7
28	7	4	7	7	7	7
29	7	3	7	7	7	7
30	7	3	7	7	7	7
31	7	3	6	6	7	7
32	7	9	6	6	7	7
33	7	9	6	4	7	7
34	7	8	6	4	7	7
35	7	8	6	4	7	6
36	7	8	6	4	6	6
37	7	8	6	4	6	6
38	7	8	6	4	6	6
39	7	8	5	4	6	5
40	7	8	4	3	5	4

Discussion

Healthy, convenient, and nutritious foods are the absolute necessity in today's fast paced world. An exponential upward rise in market for RTC foods is also observed in India, with changing social needs. (13) Indian culinary items are popular in this segment, due to their customer appeal and health benefits. In the present study, we have developed an Indian appetizer gruel with roots in Ayurveda dietetics. The modified *Ashtanguna Manda*, a *Pathya* recipe, was successfully converted and presented in a RTC premix form, while preserving its characteristics, as a convenience food.

The importance of Ayurveda dietetics is well established with formulation of 'Ayurveda *Ahara'* regulations by Food Safety and Standards Authority of India (FSSAI). (14) Along with providing delicious food options, some of these have health benefits too. We identified the need to modulate a classical formulation for quality enrichment and present it in a convenient form, true to its core properties.

In this recipe, rice and green gram are the prime ingredients, that provide nutrition and justify this as a diet. Brown Basmati rice is rich in carbohydrates, minerals and even a good source of gamma-oryzanol, an anti-oxidant. (15) Green gram is a vegan staple food, rich in carbohydrates and even proteins. (16) It is also a very good source for dietary minerals such as Iron, Magnesium, Calcium, Phosphorus etc. (17) The combination of *Shunthi*, *Marich* and *Pippali*, i.e., *Trikatu* is a renowned bioavailability enhancer and helps in improving absorption of amino acids and other nutrients. (18) Rich in polyunsaturated fatty acids (PUFA), sesame oil provides a much-required lipid base and even enhances health benefits of the recipe.

Numerous common and rare rice varieties are cultivated in different parts of India. Ayurveda has elaborated many rice varieties along with their usage and characteristics. Of them, '*Shali'* variety of rice, harvested in autumn-winter season, is considered easily digestible yet strengthening by nature. 'Basmati' (*Oryza sativa* L.) rice variety is traditionally utilized in Indian cooking for its unique satiating aroma, flavor, and appearance. In present study, Basmati rice was used owing to its comparatively lower cooking time, lower glycemic index, and high fiber content than most other

varieties. (19) A previous study concluded that Basmati rice is more suitable for using in instant premixes owing to its lower cooking time and percentage of gruel solid loss. (20)

In the RTC premix, using pre-cooked mixture of rice and green gram lowered the reconstitution time by half without compromising with its ease of digestion. The principles of classical cooking process were thus preserved. It was also ascertained by further physiochemical tests. There was just minute difference between the mAM prepared artificially and reconstituted from RTC premix. Moreover, the long shelf life of nine-months for the premix was an added advantage. The safety of premix was also ensured by negative results for microbial contamination. Most importantly, the sensory evaluation of reconstituted mAM was very encouraging. With an overall rating above seven, the product was 'highly acceptable' among volunteers.

Conclusion

Based on the various studied parameters, we recommend that the RTC premix of mAM can be successfully and conveniently utilized. This study indicated that slight technology modification in conventional method yielded comparable outcomes in terms of physico-chemical characteristics as well as sensory evaluation. Many Pathya recipes from Ayurveda possess high potential for consumer-oriented presentation. We recommend to study, modify, and offer them in such forms to enrich the RTC food options.

Conflict of Interest

The authors declare that they have no conflict of interest.

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