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PRODUCTION AND EVALUATION OF IMMUNITY BOOSTING INSTANT SOUP MIX FROM *MORINGA OLEIFERA* LAM.POD POWDER

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Abstract

Standardizationof best combination for the development of immunity boostinginstant soup mix, various quality parameters, the storage stability and cost estimation of product were evaluated. Protein in instant soup ranged from 9.76 to 11.89 percent in different formulations of instant soup mix. Formulation MPP4 (11.89) had significantly maximum protein content followed by MPP3, MPP2, MPP1 and control with the minimum protein content. The original immunity boostinginstant soup mix (control) exhibited highest carbohydrate content (61.52%) followed by MPP1, MPP3, MPP4, and MPP2 with lowest content. The evaluated scores of control for colour and appearance, taste, flavour, consistency, after taste and overall acceptability were 8.36, 8.50, 8.60, 8.90, 8.76 and 8.63, respectively.

Introduction

Traditionally Moringa is known as mystical miracle tree or the tree of life. Soup can be classified as an appetizer, warm food during cold and sick. Moringa can withstand both severe drought and mild frost conditions and hence widely cultivated across the world. In India, Thailand and the Philippines, moringa tree is commonly grown in home gardens and the leaves and immature pods are sold in the local markets as soup ingredient. Various parts *Moringa oleifera* plant such as the leaves, roots, seed, bark, fruit, flowers and immature pods are being used since ancient times. It is highly rich in vital nutrients and medicinal value, known to heal and ease many diseases namely from various inflammations to parasitic diseases, diabetes, cardiac, circulatory stimulants, antipyretic, antitumor, anti-inflammatory, antiepileptic, diuretic, antiulcer, antispasmodic antihypertensive, cholesterol lowering, antidiabetic, antioxidant, antibacterial, hepatoprotective, antifertility, antifungal activities and cancer else (Shah *et al.* 2016).

In the modern world commercially prepared instant soup has replaced homemade soup as preparing a soup is a time consuming process (Niththiya *et al.* 2014). The working persons consume foods that requires less preparation time without considering the health benefits. Instant soups play an important role in balancing the nutrients required for the people to stay healthy and can become an alternative food for breakfast (Mathangi *et al.* 2017).Dried soup powders have an advantage of protection from enzymatic and oxidative spoilage and flavor stability at room temperature over long periods of time (6-12 months). In addition, they are ready for reconstitution in a short time for working families, hotels, hospitals, restaurants, and institutional use as well as to military rations. Moreover, they exert light weight for shipping and availability at all time of the year (Rekha 2010). Hence in the present study standardization of best combination for the development of immunity boosting instant soup mix was carried out.

Materialsand Methods

Moringa oleifera pods was collected from College of Agriculture, JNKVV, Jabalpur. Sugar, corn starch, cumin, black pepper, salt, green pea, cabbage, carrot, coriander, garlic, onion, tomato, lentil, sanwa millet, citric acid, sodium benzoate were collected from market of Jabalpur. Good

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quality of Moringa pods were cleaned properly by removing the insect damaged and deteriorated, stem and the good quality parts were selected for drying.

The cleaned pods were blanched by steam for 3 min. And pods dried in hot air oven at 55°C for 16 hrs (Parvathi *et al.* 2015). The fresh spices and vegetables were cleaned, chopped into small pieces and dried in hot air oven at 65°C for 5-6 hrs.

A proportion of ingredients, sample combinations, cooking and accordingly percentage of supplementation were established through sensory evaluation. Several compositions of raw materials and main ingredients were tried to arrive at the desired formulation with optimum percentage as recommended by acceptability studies. All experimental samples were prepared using the method of Amal *et al.* (2014) with slight modification.Various acceptability parameters such as consistency, colour, appearance, flavour, taste, after taste and overall acceptability were considered as deciding factors by using the method of Amerine *et al.* (1965).

The reconstitution index (R1) of the samples was determined according to method described by Onwuka (2005). The gain in mass was the water absorption capacity *(WAC)*of the soup sample. The volume difference gave the volume of water absorbed by 1g of the test sample. Absorption capacity is expressed in grams of water absorbed per gram of sample (Onwuka 2005). For Bulk density (BD) determinationa graduated cylinder (10 ml) was gently filled with the flour sample. The bottom of the cylinder was then tapped gently on a laboratory bench several times. This continues until no further diminution of the test flour in the cylinder after filling to mark, was observed (Onwuka 2005). Rehydration ratio (RR) was defined as the ratio of weight of rehydrated samples to the dry weight of the sample (Krokida and Marinos-Kouris, 2003). The method as described by Ukpabi and Ndimele (1990) was used in the determination of the swelling index*(SI)*. Colour measurement of different instant soup mixes was done by using a Hunter colour measuring system and expressed in terms of L*, a*, b*, according to the CIE method (1976).

All the experiments were carried out in duplicate and mean values have been reported. The nutritional evaluation of instant soup mix with respect to various constituents was carried out by the following procedures. The moisture content of the sample was determined by using moisture meter. The protein content in sample was determined by using conventional Micro-Kjeldhal digestion and distillation procedure as given in AOAC (1992) using Pelican's Kel Plus digestion and distillation assembly. The fat content of the sample was determined by the procedure as described in AOAC (1992) using Pelican's Socks plus automatic fat analysis system. The ash content present in the sample was determined according to the procedure given in AOAC (1992) using Muffle furnace. The crude fibre was determined by the method as described in AOAC (1992) using automatic fibre analysis system- Fibra Plus (Make- Pelican). Total carbohydrate was estimated by subtracting the sum of moisture, protein, fat, ash and crude fibre from 100 (Merrill and Watt 1973).

All samples were drawn periodically after 0, 30, 60, 90 days and analyzed for sensory qualities, moisture, microbial count and hunter colour analysis. The total plate count was done by using the method of Aneja (2003).

The sensory quality characteristics were evaluated by Amerine *et al.* (1965). A complete randomized design was adopted for statistical analysis of data by following the procedure as described by Panse and Sukhatme (1985).

Results and Discussion

A number of trials were conducted by taking different *Moringa oleifera* parts and other ingredients. Accordingly soup was prepared using basic recipe for soup with 10 to 30% Moringa parts, 10 - 38% lentil, 2 to 5% salt and sugar 7 to 10% cornstarch (Table 1).

Table 1. Different formulations of instant soup mix with Moringa pod powder.

Formulations	Control	MPP (%)	MPP (%)	MPP (%)	MPP (%)
MPP	0	20	22	24	26
Citric acid	0.25	0.25	0.25	0.25	0.25
Sodium benzoate	0.30	0.30	0.30	0.30	0.30
Sugar	2	2	2	2	2
Corn starch	8	8	8	8	8
Cumin	0.3	0.3	0.3	0.3	0.3
Black pepper	0.5	0.5	0.5	0.5	0.5
Salt	4	4	4	4	4
Green pea	4	4	4	4	4
Cabbage	0.3	0.3	0.3	0.3	0.3
Carrot	4	4	4	4	4
Coriander	0.35	0.35	0.35	0.35	0.35
Garlic	1.30	1.30	1.30	1.30	1.30
Onion	2	2	2	2	2
Tomato	10	10	10	11	11
Lentil	35	15	13	11	09
Sanwa millet	25	25	25	24	24
Total	100	100	100	100	100

Finally soups were prepared using the optimum level of ingredients arrived at desired formulations from the earlier results of acceptability studies of soup formulations.

In the preliminary sensory evaluation test different soups were prepared from different formulations and were evaluated by panelists. The score for the product with 16 - 22% Moringa leaf/flower, 20 -26 % Moringa pod powder, 24 to 25%sanwa millet , 13 - 35% lentil powder,10 - 11% tomato powder were are acceptable in terms of all sensory attributes. Panelists suggested the 4g of salt and sugar, 0. 5 g black pepper, 10 to 11% tomato powder for improving the taste and colour of modified instant soup mixes .They also suggested to take 8 g of corn starch for instant medicinal soup mix as the soup with 10% corn starch was too thick and 7 g of corn starch was too thin. They also suggested increasing the cooking time of instant soup mix up to 6 min. The use of green pea grits was recommended in place of whole seed in the formulations. On the basis of above findings the levels of ingredients and method of preparation was finalized.

The observed Reconstitution Index with different combinations of instant soup in pod powder soup mix, the rehydration ratio was found to be highest in MPP4 (17.50 g/ml) and lowest in control (14.30 g/ml) (Table 2). The WAC in Moringa pod instant soup mix, ranged from 270 to 290 ml/100 g and the highest value of WAC was found in control (290 ml/100 g) followed by MPP4 (285 ml/100 g) and lowest in MPP1 (270 ml/100 g) (Table 2).

The bulk density of instant mixes was found to range from 0.67 -0.72 g/ml in *Moringa* pod powder. The rehydration ratio of *Moringa* pod powder instant soup mix varied from 2.5 to 6.63 and was highest in MPP4 and lowest in control Table (6-8). In pod powder soup mix, the swelling index was found to be highest in MPP4 (1.71) and lowest in control (1.33). Instant soup mix from MPP showed highest value of lightness in control followed by MPP1 (51.70), MPP4 (51.12), and MPP3 (50.80) while the lowest value (50.44) was obtained from MPP2. The highest a* and b* values of soup obtained from control and lowest by MPP4 (7.23, 12.98 respectively). Significant difference was observed between the treatments (Table 3).

Table 2.Physical attributes of instant soup mixes.

Formulations	Reconstitution Index(g/ml)	Water absorption capacity(ml/100g)	Bulk density (g/ml)	Rehydration ratio	Swelling index
CONT	14.30	290	0.72	2.5	1.33
MPP1	14.46	270	0.65	4.5	1.53
MPP2	17.30	274	0.66	4.66	1.66
MPP3	17.40	277	0.67	5.26	1.69
MPP4	17.50	285	0.66	6.63	1.71
SEM	0.321	0.856	0.004	0.214	0.050
CD at 5%	1.025	2.733	0.014	0.682	0.161

Table 3. Hunter colour analysis of instant soup mixes.

Formulations	L*	a*	b*
CONT	75.12	9.42	15.69
MPP1	51.70	8.19	13.06
MPP2	50.44	8	13.19
MPP3	50.80	7.98	13.05
MPP4	51.12	7.23	12.98
SEM	0.900	0.331	0.381
C.D. at 5%	2.873	1.058	1.216

It is apparent from Table 4 that protein ranged from 9.76 to 11.89 percent in different formulations of instant soup mix. Formulation MPP4 (11.89) had significantly maximum protein content followed by MPP3, MPP2, MPP1 and control with the minimum protein content. All formulations differed significantly from each other. The range of fat content was found to be 1.40 to 2.59 percent in various instant soup mix formulations. MPP2 exhibited maximum fat content as compared with other formulations and it was statistically superior to rest. The original instant soup mix (control) exhibited highest carbohydrate content (61.52%) followed by MPP1, MPP3, MPP4, and MPP2 with lowest content. Control was statistically superior to other formulations. The crude fibre content of instant soup mix ranged from 4.13 to 5.62 percent in various formulations. MPP4 exhibits maximum fibre content compared to the rest; hence it is statistically superior to other formulations. The ash content in different blends of instant soup mix ranged from 8.69 to 9.95 percent. MPP4 was numerically superior to rest of the formulations.

The initial values were recorded by treatment CONT (8.36) and gradually decreased up to 8.22 on 90^{th} day of storage and treatment MPP4 (8.02) decreased upto 7.80 in PP at the end of storage (Table 5). The data revealed that an initial value of 8.60 (CONT) decreased gradually up to 8.34 in PP on 90th days of storage. The modified soup mix MPP4 decreased from 8.04 to 7.75 in PP at the end of storage. The taste of CONT (8.50) decreased up to 8.30 in PP on 90th day of storage and treatment MPP4 (8.01) decreased up to 7.72 in PP at the end of storage. The mean value of the CONT and MPP4 was 8.90 and 8.05, respectively at initial stage and decreased during the period of storage upto 8.70 and 7.71, respectively in PP on 90th day of storage. Decreasing trend in value of the CONT and MPP4 was 8.76 and 8.03, respectively at initial stage and decreased during the period of storage upto 8.60 and 7.74, respectively in PP on 90th day of storage.

Table 4. Proximate analysis of instant soup mixes.

Formulations	Moisture (%)	Protein (%)	Fat (%)	Crude fibre (%)	Carbohydrate (%)	Ash (%)
CONT	8.41	09.76	1.40	4.13	61.52	8.69
MPP1	8.53	11.40	2.42	5.03	60.03	9.76
MPP2	8.62	11.56	2.49	5.11	59.04	9.83
MPP3	8.73	11.81	1.52	5.49	60.84	9.91
MPP4	8.77	11.89	1.59	5.62	59.93	9.95
SEM	0.010	0.359	0.168	0.173	0.355	0.050
CD at 5%	0.031	1.147	0.538	0.551	1.134	0.161

Table 5. Sensory attributes of instant soup mix during storage.

Attributes	0 days		30 days		60 days		90 days	
	CONT	MPP4	CONT	MPP4	CONT	MPP4	CONT	MPP4
Aluminium foil								
Colour & appearance	8.36	8.02	8.36	8.02	8.36	8.02	8.30	7.98
Flavour	8.60	8.04	8.60	8.04	8.60	8.04	8.42	7.88
Taste	8.50	8.01	8.50	8.01	8.50	8.01	8.44	7.96
Consistency	8.90	8.05	8.90	8.05	8.90	8.05	8.82	7.88
After taste	8.76	8.03	8.76	8.03	8.76	8.03	8.66	7.94
Over all acceptability	8.63	8.06	8.63	8.06	8.63	8.06	8.58	7.94
LDPE								
Colour & appearance	8.36	8.02	8.30	7.96	8.28	7.88	8.26	7.84
Flavour	8.60	8.04	8.52	7.92	8.48	7.87	8.40	7.80
Taste	8.50	8.01	8.44	7.89	8.40	7.84	8.35	7.78
Consistency	8.90	8.05	8.82	7.92	8.78	7.82	8.74	7.76
After taste	8.76	8.03	8.70	7.94	8.66	7.83	8.61	7.80
Over all acceptability	8.63	8.06	8.60	7.98	8.58	7.82	8.52	7.75
PP								
Colour & appearance	8.36	8.02	8.28	7.92	8.25	7.83	8.22	7.80
Flavour	8.60	8.04	8.50	7.86	8.41	7.82	8.34	7.75
Taste	8.50	8.01	8.40	7.82	8.34	7.80	8.30	7.72
Consistency	8.90	8.05	8.78	7.86	8.73	7.77	8.70	7.71
After taste	8.76	8.03	8.66	7.90	8.60	7.78	8.60	7.74
Over all acceptability	8.63	8.06	8.56	7.95	8.53	7.76	8.46	7.70

It was observed from the data that there was a significant difference among the all packaging materials. The scores of CONT (8.63) and MPP4 (8.06) decreased gradually up to 8.46 and 7.70, respectively at the end of storage in PP.

Microbial analysis showed increase in total plate count during storage but it was found to be under acceptable limit (Table 6). The total plate count was negligible up to 30 days of storage of instant soup mixes packed in aluminium foil and very less count was observed on 90th day of storage in all soup samples. The total plate count was too less to count in all packaging materials on 0 day of storage. The yeast and mold counts were absent during storage.

Table 6. Total plate counts of instant soup mixes during storage.

Treatment	Mesophilic count			
	0 days	30 days	60 days	90 days
PPCON	TFTC	1.3×10^2	2.2×10^3	3.2×10^3
PPMPP	TFTC	1.3×10^2	2.2×10^3	3.3×10^3
LDCON	TFTC	1.3×10^2	2.2×10^3	3.8×10^3
LDMPP	TFTC	1.3×10^2	2.2×10^3	4.0×10^3
ALCON	TFTC	1.3×10^2	2.2×10^3	2.1×10^3
ALMFP	TFTC	TFTC	1.3×10^3	2.2×10^3

TFTC=Too few to count.

According to Luh and Woodroof (1975), moisture content is an important factor of microorganism's growth. Microorganisms cannot grow when moisture content is below 8%. The data revealed that moisture content of instant soup mixes (control) had an initial value of 8.41 percent which was increased gradually up to 8.64 in PP at the end of storage and in modified instant soup mixes, it ranged from 8.77 to 8.92 in MPP4 packed in PP at the end of storage as depicted in Table 7.

Table 7. Moisture content of instant soup mixes during storage.

Treatments	Moisture			
	0 days	30 days	60 days	90 days
AL CONT	8.41	8.44	8.47	8.50
ALMPP4	8.77	8.79	8.80	8.82
LD CONT	8.41	8.47	8.52	8.58
LDMPP4	8.77	8.81	8.87	8.91
PPCONT	8.41	8.49	8.55	8.64
PPMPP4	8.77	8.80	8.86	8.92

Itmay be inferred that, enriched *Moringa* based soup mixes prepared by drying could be adopted for the development of soup mixes and supplementing soup mix with *Moringa* pod as a valuable food addition to enhance nutritional and sensorial profile of the instant soup. During the 90 days storage period the instant soup mix in alluminium foil was found to be best in the context of overall acceptability with the intervals of 0 days 8.06, 30 days 8.06, 60 days 8.06 and 90 days 7.94 scores, respectively. The cost of production was also found to be in acceptable level. The developed soup mix is more convenient than traditional product and this will improve its popularity among the younger generation and is a novel one holds good branding and marketingscope.

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