International Journal of Food Science and Nutrition
ISSN: 2455-4898
Impact Factor: RJIF 5.14
www.foodsciencejournal.com
Volume 2; Issue 6; November 2017; Page No. 181-186

Determination of physical, chemical and sensory characteristics of instant curry mix for vegetarian recipes

[*1] SV Karadbhajne, [2] Neha A Saraf
[1] Assistant Professor, Department of Food Technology, Laxminarayan Institute of Technology, R.T.M Nagpur University, Nagpur, Maharashtra, India
[2] B. Tech Food Technology students, Laxminarayan Institute of Technology, RTM Nagpur University, Nagpur, Maharashtra, India

Abstract
Spices mix is a new type of convenience food. The objective of this study is to standardize recipe of spices mix without addition of class II preservatives, thus producing ready to eat or instant curry mix. Also analyzing chemical, physical attributes and sensory evaluation of prepared sample were part of it. Study of rheological properties and changes during storage with respect to some parameters was also carried out. Firstly the spice mix formulation was standardized including ginger garlic paste (1.6:1) and paste of selective spices. The spices were oil roasted before preparing paste and later ginger- garlic paste and spices paste (1:6) were partially cooked and mixed (70-80˚C) and allowed to cool to room temperature before packing. The spice mixes were then enriched with additives like Makhana flour (5%), corn flour (5%) and edible gum (0.5%). All this four samples were tested and compared with respect to physical, chemical and rheological properties. Also storage observation of fifteen days and sensory evaluation were carried out and compared. The sample having Makhana flour as additive showed satisfactory results comparatively hence could be selected as better among all other.

Keywords: curry mix, rheological properties, physico chemical analysis, sensory evaluation

1. Introduction
Indian cuisines are a vast array of spicy delicacies. Every food product acquires its final profile principally from two components, namely, ingredients and processing methods. Traditional Indian delicacies require processing of varieties of spices including one or more of unit operations such as roasting, frying, powdering, etc. in order to obtain an appropriate flavour profile from spices. These flavour profiles are caused by thermal effects and interactive effects due to processing of spices [1]. A kitchen preparation is prone to variations due to regional and ethnic practices and to subjective factors such as the skill and style of the chef. The ‘recipe product in a commercial sense, should possess certain attributes such as a well-defined product profile, a scheduled manufacturing procedure, uniform quality and specified shelf-life, all of which are essential for organized trade [2]. Thus, there is a need for a pre-processed ready-to-use and shelf-stable spice mix formulation for the preparation of varieties of plant-based and muscle-based food products in order to minimize the drudgery of processing in kitchen and food preparation time to cater to the needs of increasing population of working couples, single persons living, etc. The curry paste usually consists of green chilli, galangal rhizome, shallot, cumin, lemon grass, kaffir lime, garlic and black pepper. The spices/ingredients used in the curry paste may differ from home to home or region to region. Many ingredients used in the curry paste have been found to contain antimicrobial, antioxidant, and have medicinal value. Garlic, one of the ingredients, is reported to possess allicin, a highly reactive volatile compound, which is unstable in the presence of heat. It has antimicrobial and antioxidant compounds with health benefits [17-19].

Spices mix is a new type of convenience food. Spices mix has been used in cooking for vegetarian and non- vegetarian recipes [3]. They are prepared domestically in Indian families also they are manufactured commercially. The commercial demand of these ready mix spices has increased significantly throughout the years as need of urban or faster life style. Use of such products avoids collection and preparation for individual items. *Pulihora* mix is a popular South Indian household item is cumbersome, lengthy and time consuming. The instant pulihora mix made by dehydrated raw green mango powder was a convenient ready mix [6]. Pickles and chutneys are another popular adjuncts with snack foods and breakfast foods such as poha, pakoda, upama, idali doas. Several standard blends of chutney powders are based on tamarind leaf, curry leaf, pudina and hibiscus species, raw tamarind leaf and raw mango were reported in literature [7, 8]. These products are versatile and can be used in households or institutional feeding.

Growing population, changing lifestyles and increased consumerism have increased the consumption of such products over the last few years. With growing demand for it, there is a good scope for a spices mix. Apart from individual households, other customers for the product include caterers, restaurants, etc. Attractive packaging and catering to the local taste are important factors to boost the sales of the product.

Keeping the above facts in view the main of the work was to standardization of recipe of spices mix, to determine the effect of processing on pH, and additives on physicochemical characteristics of instant curry mix to produce acceptable, shelf stable product that can retain the delicate spice odour of

spices in curry and to study sensory attribute for consumer acceptance.

2. Materials and methods

The materials used for the preparation of the instant curry mix were ginger, garlic, onion, groundnut, dalia, chilli and its powder, coconut, turmeric, salt, dry mango powder, makhana, corn starch, edible gum, cumin seeds, cinnamon, black cardamom, coriander seeds and sunflower oil were procured from local market.

2.1 Preparation of Ginger garlic Paste

Fresh ginger rhizomes were procured from market. The rhizomes were broken into pieces to expose the crevices and then washed in running water to remove the adhering mud. Again the cleaned rhizomes were scraped with a knife to remove dirt as well as spoiled portion. Ginger was peeled using a vegetable peeler and cut into small pieces. Garlic bulbs were subjected to mild pressure by hand to separate the cloves. Cloves were dried in a tray drier at 40^0C for 30 min. to facilitate peeling. Peeling was done manually.

A paste of ginger and garlic was prepared by mixing them in ratio of (1.6: 1) by weight, cumin seeds was added as additional flavoring agent by observing Indian cuisines and passed through wet grinder to obtain the product with uniform consistency. Sodium chloride (0.01%) was added as a stabilizer. Prepared 100 gm paste was packed in sealed pouch and used in Instant Curry Mix preparation [4].

2.2 Preparation of spice mix

Vegetable oil (Sunflower oil) having acid value (0.1), iodine value (125), sap. value (188) was used for roasting of spices. For 100 gm curry mix, 10gm sunflower oil was heated to 80^0C temperature in a pan, first diced onions were added and fried for 5mins then (as per formulation) coconut, red chilies, groundnuts, Dalia, coriander seeds, khakhas, veldoda, dalchini were fry for another 8 mins till brownness at same temperature. Oil roast spice mix was then allowed to cool at 27 ± 2^0C temperature. After cooling, mix was passed to wet grinder to obtained smooth paste. A pouch made of aluminum foil was used for packing which retard oxidation, colour and flavour loss of Spices [5].

2.3 Preparation of Instant Curry Mix

Instant curry mix was prepared by oil cooking of spice mix and ginger garlic paste along with seasonings at temperature of about 120^0C in a pan for 5-6 minutes. In curry preparation, spice mix to ginger garlic paste ratio used was (4:1). 50 gm sunflower oil was heated in a pan to 120^0C temperature. In hot oil first ginger garlic paste was added to cook for 5 min till brownness then spice mixture was added to oil to cook for another 7min. Then red chili powder, common salt, turmeric and coriander powder were added, mixed well and cooked well for 5mins until released of oil from paste to pan. Allow to cool the curry at 27 ± 2^0C temperature further curry was kept at ambient temperature for 4-5 hr for conditioning and stabilization of flavor. Then instant curry was packed in aluminum pouch and stored at room temperature. No preservatives and colour was added to curry.

After standardization of recipe, four samples were prepared by adding makhana flour, corn starch and edible gum (gum arabica) for consistency, body formation, and texture after reconstitution of mix.

2.5 Preparation of Makhana flour

Makhana was roasted at temperature of 70-75º C for 7-8 minutes and allowed to cool at room temperature. Roasting reduces the moisture content and makes them crisp which facilitated smooth uniform grinding. Flour was immediately packed in air tied container for further application. (Ref. Table No.1)

3. Proximate analysis

The proximate analysis of the prepared mix was carried out. The parameters considered were moisture content, pH, acidity, TSS and total oil content.

3.1 Moisture content

The moisture content was determined using contact moisture analyzer (CA-123, Contact Instrumentation Ltd, India). 1.5-2 gm of sample was measure for determination of moisture content.

3.2 Titratable Acidity and pH

Titratable acidity in instant curry mix was measured in terms of citric acid following the method described by (Ranganna 1986) [11]. For measuring titratable acidity, 5gm mix were diluted with 95 ml distilled water making the volume to 100 ml (5%), then filtered through Whatman no. 41 filter paper and titrated against 0.01 N NaOH using phenolphthalein indicator. Acidity was expressed as percent citric acid by weight.

The curry mix (5 g) was diluted with 45 ml distilled water making 50 ml volume (10%), pH was measured with glass electrode.

3.3 Total Soluble Solids (TSS)

Total soluble solids (°Brix) were determined with a digital Refractometer at 20^0C (AtagoCo., Ltd., Tokyo, Japan).The TSS of sample was determined by preparing 30% solution of it and the observing in 0-32 range spectrometer (Ranganna 1986) [11].

3.4 Total Oil Content

The total oil content of sample was determined by AOAC method (1965) [12], oil extraction was done by Soxhlet Extraction method. In Soxhlet apparatus 5gm sample was weighted in thimble and hexane is used as solvent for extraction. Hexane removes the total oil content from sample in extraction which was calculated by change in weight.

4. Rheological properties of paste

The rheological characteristics of mix prepared were studied like viscosity, colour value and volatile oil content.

4.1 Viscosity

Consistency and flow property of curry by preparing sample's 10 % solution and evaluated. The viscosity was determined using Ford cup by employing a viscometer with a cup no. 4 attachment. The curry was placed in a cup, curry surface was

made flat by tapping and the rheological parameters for curry were studied at the temperature of 30^0C temperature [13].

4.2 Colour Measurement

The colour value was determined of the mix by lovibond reflectance tintometer (RT series, model 962, Canada) and *L, a, b* values were obtained. Colour measurement was done by the method of Hunt (1991). Curry colour was measured based on three colour coordinates namely L, a, and b. The instrument is calibrated using a standard white (L = 90.70, a = -1.08. b = 0.65) and blank reference tile under illuminated conditions. The colour values given by L, a, b is generally expressed as total colour of the sample. "L" represents the lightness index, "a" represents red-green, whereas "b" represents yellow-blue colour components.

4.3 Volatile Oil Content

Volatile oil was extracted using Clevenger's distillation or hydro distillation. About 25 g of curry mix were weighed in a 250 ml round bottom flask and adequate amount of water was added. The distillation was carried out for 4–5 h for isolation of volatile oil[16]. The oil was measured and percent volatile oil was calculated using

$$\text{Volatile oil} = \frac{\text{Volume of oil collected}}{\text{Total weight of sample}} \times 100$$

5. Results and discussions

5.1 Standardization of Instant Curry Mix

The unit operation involve in the preparation of the standardized Instant Curry Mix is presented in Fig 1. The ginger garlic paste and spice mix was blended and cooked together in oil to obtain Instant curry mix. The composition of Instant Curry Mix is reported in table No. 1. Formulation was set for 150gm ICM (after cooking).

5.2 Physicochemical Characteristics

The proximate analysis of prepared curry mix formulation was carried out and results are presented in table No. (2). The moisture content of sample 4 (30.96%) was found to be higher compared to sample 3 (22.45%) and Sample 2(15.68%), sample1 (19.24%). The high moisture content of sample 4 was observed due to high water holding capacity of nature gums which was followed by makhana flour, additive in sample 3. The natural gum has been widely used as a food additive due to its very high viscosity in aqueous media, even at low concentrations. It has been used also as a versatile thickener and/or stabilizer for ice cream, baked goods, sauces and beverage[9]. The TSS of samples 1, 2 3, and 4 were 3, 4.5, 4 and 3.5(^{0}Brix) respectively. Natural sugars of makhana increases the TSS of curry compared to edible gum thus enhances the sensory attributes of curry mix made with makhana. Titratable acidity in the processed curry was measured in terms of citric acid. Sample 4 has acidity (0.38%) which decreased to (0.26%) sample 1. It could also be indicated from its pH as it has lowest pH that is more acidic in nature. (Ref. Table No.2)

5.3 Rheological Properties

Rheological properties includes viscosity, colour value and volatile oil content of curry mix, was evaluated and presented in table no. (3). From the table it is clear that the viscosity of sample 3 was (149.80cp) maximum due to incorporation of starch from makhana. The colour (L, a, b) values of curry mix were 19.76, 12.59 and9.63, respectively for sample 3. The colour values a was maximum representing redness of curry and b (yellow) decreased due to low pH compared to sample 1, whereas the L (lightness)values increased with decrease in pH in respect to rest of the three sample (Table No 3). Slight decrease in lightness was observed in sample 1, 2, and 4 variant additives. The 'a' value of the curry decreases by addition of sodium chloride and citric acid. Hence, the acidic condition of curry considerably favoured the formation of green pigment by decreasing redness. Increased concentration of polyphenol components is also responsible for alteration of colour during storage [15]. In practice, any changes in a- and b-values are associated with simultaneous change in the L-value. Representation of quality in terms of colour combinations may therefore be more relevant from the processing viewpoint. The faster colour degradation was due to heat induced browning was also been reported in earlier studies on ginger garlic paste during storage [4-10]. The volatile oil content in sample 3 and 4 was same where as decreased in sample 1and sample 2 respectively. Similar result was reported in domestic cooking methods [18]. There was no significant decrease in volatile oil content of samples. The hot cooking method reduces the volatile oil content of curry which was same in every curry sample preparation. (Ref. Table No.3)

5.4 Sensory Evaluation

The standardized formulations were evaluated for sensory[14-20]. The sensory evaluation was carried out by panel of 10 members on 0-9 hedonic scale by judging on the parameters like appearance, flavour, colour, texture, taste, after taste, mouth feel and overall acceptability. Result was reported in table no. 4. Sample 3 scores highest as appearance (7.67), flavor (8.42), colour (8.33), texture (7.83), taste (8.16), after taste (8.16), mouth feel (8.21) and overall acceptability (8.33) compared to other samples. (Ref. Table No.4)

Table 1: Formulations for preparation of Instant curry mix

Raw material	Sample 1 Weight(gm)	Sample 2 Weight(gm)	Sample 3 Weight(gm)	Sample 4 Weight(gm)
Onion	45.78	45.78	45.78	45.78
Groundnut	6.68	6.68	6.68	6.68
Dalia	4.11	4.11	4.11	4.11
Ginger	6.44	6.44	6.44	6.44
Garlic	4.72	4.72	4.72	4.72
Salt	4.1	4.1	4.1	4.1
Dry mango powder	1	1	1	1
Turmeric powder	0.5	0.5	0.5	0.5
Chilli	3.9	3.9	3.9	3.9
Chilli powder	1.7	1.7	1.7	1.7
Oil	40	40	40	40
Cumin seeds	2	2	2	2
Coconut	5.74	5.74	5.74	5.74
Khaskhas	1.76	1.76	1.76	1.76
Veldoda	1.84	1.84	1.84	1.84
Dalchini	1.33	1.33	1.33	1.33
Coriander seeds	2.31	2.31	2.31	2.31
Water	31.25	31.25	31.25	31.25
Additives	-	3.25(Corn Starch)	3.25 (Makhana Flour)	0.50 (Edible Gum)

Table 2: Proximate analysis of instant curry mix

Parameter	Sample 1	Sample 2	Sample 3	Sample 4
Moisture (%)	19.24±0.16	15.68±0.11	22.45±0.45	30.96±0.13
TSS (^{0}Brix)	3.14±0.21	4.5±0.26	4±0.22	3.5±0.20
pH	5.81±0.19	4.76±0.18	4.80±0.29	4.66±0.17
Acidity (% citric acid)	0.26±0.26	0.34±0.11	0.31±0.19	0.38±0.18
Total oil (%)	16.95±0.10	16±0.19	19.4±0.17	21.45±0.11

Mean values ±SD are presented, n= 3

Table 3: Rheological properties of instant curry mix

Parameter	Sample 1	Sample 2	Sample 3	Sample 4
Viscosity (10% solution)	141.95 cp	134.05 cp	149.80 cp	105.90 cp
Colour value	L=20.55 *a*=12.35 *b*=9.98	L= 17.61 *a*=10.67 *b*=8.10	L=*22.24* *a*=12.59 *b*=9.63	L=19.76 *a*=12.12 *b*=10.47
Volatile oil	4.42%	4.1%	5.37%	5.4%

Table 4: Sensory evaluation of instant curry mix

Parameters	Sample 1	Sample 2	Sample 3	Sample 4
Appearance	8.45±0.51	7.4±0.19	7.67±0.24	7.26±0.14
Colour	8.7±0.16	7.16±0.27	8.33±0.17	7.23±0.22
Flavour	8.3±0.26	7.18±0.15	8.42±0.31	7.26±0.25
Texture	7.23±0.18	7.33±0.16	7.83±0.23	6.83±0.29
Taste	8.2±0.28	7.16±0.21	8.16±0.18	7.31±0.15
After taste	7.83±0.31	6.8±0.36	8.16±0.11	6.93±0.16
Mouth feel	7.66±0.29	6.73±0.35	8.21±0.41	7.04±0.27
Overall acceptability	7.66±0.33	7.11±0.28	8.33±0.14	6.9±0.37

Mean values ±SD are presented, n= 10

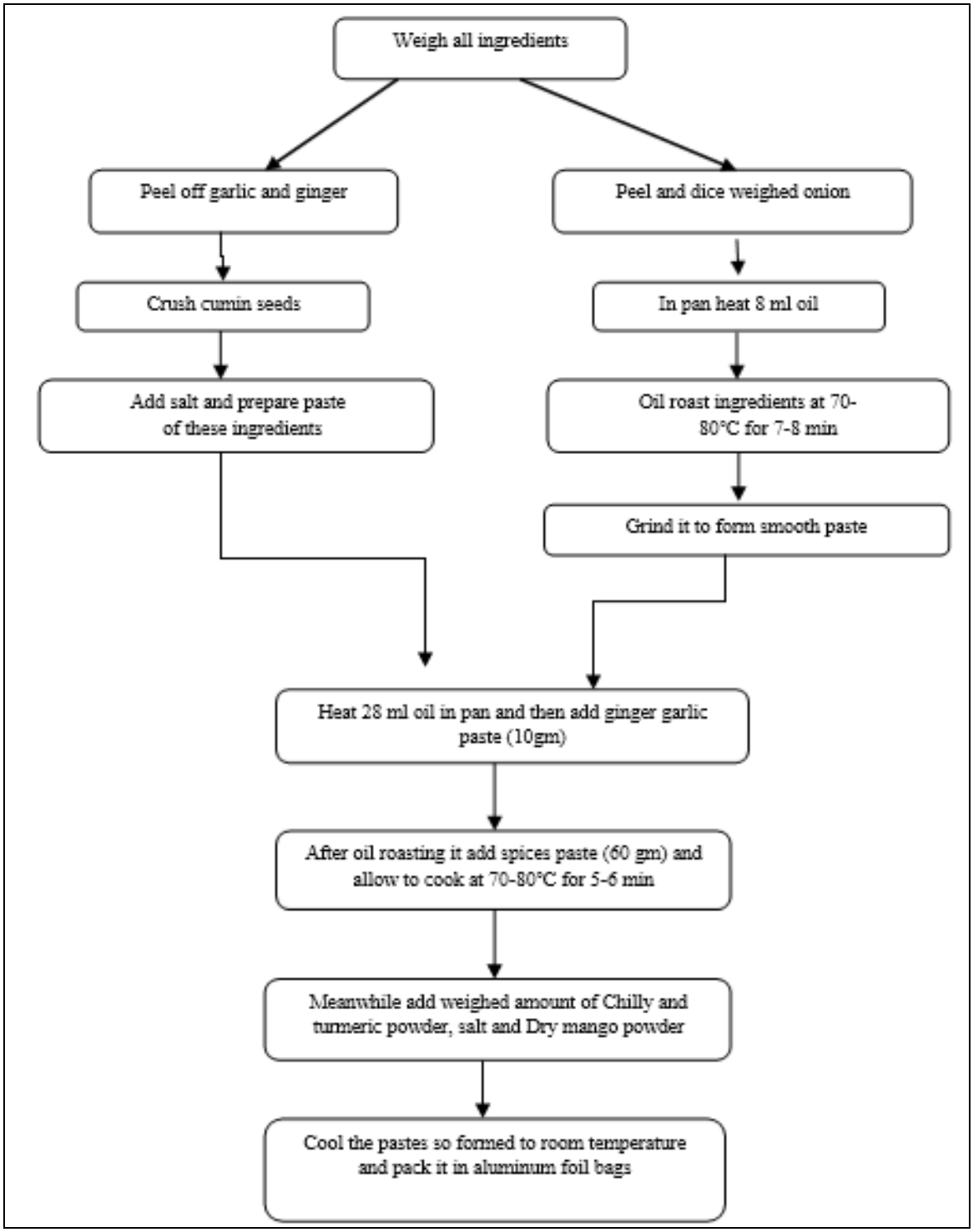

Fig 1: Flow Chart of Instant curry mix preparation

Conclusion

Result concludes that preparation of Instant curry mix and its application is feasible. The prepared curry mix can be preserved without any artificial preservatives at ambient temperature conditions, the amount of oil is sufficient to preserved curry mix. In market gravy mixes and wet spices blend are available, but these contain class II preservatives. There was no alteration of flavor during storage. Among the additives used to improve consistency, flow properties and body formation, makhana flour scores highest in sensory. Thus introduction of makhana flour can be possible without imparting any after taste. Makhana is rich in macro and micro nutrients which also make curry more nutritious.

References

1. Abolhassani Y, Ayub MK, Babji AS. Assessment of microbiological and modified aroma profiles of lactic acid bacteria (LAB) fermented curry paste. As. J Food

Ag-Ind. 2009; 2(02):63-71.
2. Abolhassani Y, Khan MA, Salam AB, Ghasem M. Some physico-chemical qualities and acceptability of fermented curry paste. International Food Research Journal. 2009; 16:581-588.
3. Deogade AH, Zanjad PN, Ambadkar RK, Raziuddin M. Formulation of Spices mixture for preparation of Chicken Curry. Veterinary World. 2009; 1(1):18-20.
4. Jasim Ahmed. Rheological behavior and colour changes of ginger paste during storage. International Journal of Food Science and Technology. 2004; 39:325-330.
5. Kalra CL, Manan JK, Sehgal RC, Kulkarni SG, Berry SK. Studies on preparation, packaging and analysis of ground spice mix. III. Channa masala and meat masala. Journal of Food Science and Technology. 1998; 35(5):408-413.
6. Prabhakaran Rao PG, Narsing Rao G, Jyothirmayi T, Satyanarayana A, Standardization, chemical characterization and storage studies of a *pulihora* mix based on raw mango. Indian journal of Traditional Knowledge. 2012; 11(1):90-95.
7. Satyanarayan A, Giridhar N, Balaswamy K, Shivaswamy, Rao DG. Studies on development of instant chutneys from pudina (Mint, *Mentha spicata*) and Gongura (*Hibiscus sp*), J Food Sci Technol. 2001; 38(5):512-514.
8. Narsing Rao G, Prabhakaran Rao PG, Jyothirmayi T, Rao DG. Chemical composition, standardization and storage studies on raw mango chutney powder, J Food Sci Technol. 2008; 45(5):436-438.
9. Nuno M. Oliveira Fernando Q, Dourado Antonio M, Peres Marta V, Silva Joao M, Maia Jose A. Textural Effect of Guar Gum on the Physicochemical, Thermal, Rheological and Textural Properties of Green Edam Cheese. Food Bioprocess Technol. 2011; 4:1414-1421.
10. Pesek CA, Wilson SA. Spice quality: effect of cryogenic and ambient grinding on colour. Journal of Food Science. 1986; 51(5):1386-1388.
11. Ranganna S, Hand book of analysis and quality control for fruits and vegetable products, IInd edn, Tata McGraw-Hill Publishers, New Delhi, 1986.
12. Anonymous, official method of Analysis, 10th edn, Association of Official Analytical chemists, Washington, DC, 1995.
13. Anonymous, official method of Analysis, 16th edn, Association of Official Analytical chemists, Washington, DC, 1995.
14. Amerine MA, Pangborn RM, Roesssler EB. In: Principles of sensory evaluation of food Academic Press, New York, 1965.
15. Karadbhajne SV, Reddy J. Improvement of Dietary fiber content and antioxidant properties in chapatti with the incorporation of DPPP. International journal of Research publications in Engineering and technology. 2017; 3(6):56-61.
16. Topno PN, Habbankuppe VS, Varadaiah JV, Sheshagiri SH, Srinivas PM, Naidu MM. Ginger–garlic paste in retort pouches and its quality. Journal of food process engineering ISSN 1745-4530.
17. Seah R, Siripongvutikorn S, Usawakesmanee W. Antioxidant and antibacterial properties in Keang-hleung paste and its ingredients. As. J Food Ag-Ind. 2010; 3(02):213-220.
18. Srinivasan K, Sammbaiah K, Chandrasekhara W. Loss of active principles of common spices during domestic cooking. Food Chemistry. 1992; 43:271-274.
19. Siripongvutikorn S, Pengseng N, Ayusuk S, Usawakesmanee W. Development of green curry paste marinade for white shrimp(Litopenaeus vannamei).Songklanakarin J Sci. Technology. 2008; 30:35-40.
20. Yingyongyuth W, Chantrapornchai W, Haruathaitanasan V, Chompreeda P. Determination of physical, chemical and sensory characteristics of *yentafo* sauces. As. J Food Ag-Ind. 2010; 3(01):120-131.