The Pharma Innovation

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Formulation and quality evaluation of plant protein rich *Thalipeeth*

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Abstract

Thalipeeth is a famous Maharashtrian dish prepared using cereals, legumes and pulses. In this study Thalipeeth was prepared from Jowar flour, Soybean, Green gram, Horse gram, Moth beans and Bengal gram flour. Soaking treatment was given to soybean, green gram, horse gram and moth beans to remove anti-nutritional factors. Soaking was carried out for 6hrs and 30 min in different bowls in lukewarm water. Moringa leaves were incorporated with concerned to health benefits and high nutritive value including proteins, amino acids, vitamins and minerals. Moringa leaves were washed and soaked in salt water for 2hrs having the concentration of 2%. Dough was prepared by mixing all ingredients. *Talipeeth* was prepared by rolling the dough balls on wet muslin cloth. Baking of *thalipeeth* at 140 °C on the pan was carried out. The added spices, seasonings helped to enhance the taste. Sensory evaluation of prepared *thalipeeth* was carried out based on the 9 point hedonic scale. The study revealed that the prepared *thalipeeth* was a good source of nutrition with carbohydrate (49.29g), Protein (16.94g), fat (4.53g) and energy (313.29 kcal).

Keywords: *Thalipeeth*, moringa, health benefits, sensory, nutritional

Introduction

In recent years, there has been a growing awareness about the nutritional content of foods and how to feed the world's ever-growing population, and how to improve the deficiency of essential nutrients by fortifications and enrichment of food vehicles. Include entire cereals, vegetables, pulses, and legumes, among other foods, to achieve a nutritional balance (Pandey *et al.*, 2006) [6]. A meal like this meets a major amount of our energy, carbohydrate, protein, dietary fibre, amino acid, and mineral requirements. Traditional preparations, such as *thalipeeth*, could be used to boost the nutritional content of meals when combined with plant protein-rich sources.

Thalipeeth is a Maharashtrian traditional unleavened pancake prepared from combination of flour dough. The increased demand for traditional food is because of urbanization and industrialization, however has created a need to mechanize the preparation and process standardization of those foods (Gupta, 2011) [4]. *Thalipeeth* is the combination of cereals, pulses, and legumes. The preparation process of *thalipeeth* is very hectic and takes a longer period for flour preparation, dough formation and baking.

Moringa Oleifera belongs to a family Moringaceae commonly referred to as "The Miracle Tree" (Palada, 1996) [5]. Different parts of this plant contain a profile of important minerals and are good source of protein, vitamins, β-carotene, amino acids and various phenolic compounds. Moringa plant provides a rich and rare combination of zeation, quercetion, kaempferol and many other phytochemicals. It is very important plant for its medicinal value. Various part of plant such as leaves, roots, seeds, bark, fruit, flower and immature pods etc. as cardiac and circulatory stimulant, posses antitumor, antipyretic, antiepileptic, anti inflammatory, antiulcer, antiplasmodic, antihypertensive, antioxidant, antibacterial and antifungal (Bukar *et al.*, 2010) [2].

In light of the importance of traditional food products, present research study was carried out for the preparation of protein rich *thalipeeth* based on the plant sources. Product formulation was carried out with the incorporation of cereals, legumes, pulses and moringa leaves. Quality evaluation of prepared *thalipeeth* including sensory, proximate composition, mineral texture profile analysis carried out to achieve final objective.

Materials and Methodology

The present research study was carried out in Department of Food Microbiology and Safety with collaboration of Department of Food Chemistry and Nutrition in College of Food

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Materials
The raw material required during the research work such as Jowar flour, Soybean, Green gram, Horse gram, Moth beans, Bengal gram flour, Sesame, Turmeric, Salt, Ajowan, and Soybean Oil were procured from the Aakar super shop, Parbhani, Maharashtra. Fresh Moringa leaves, onion, garlic, green chillies and coriander made available from the local market, Parbhani, Maharashtra. The chemicals and reagents used for analysis were of analytical grade. All chemicals and glass wares required during research work were obtained from the department of Food Chemistry and Nutrition College of Food Technology, VNMKV, Parbhani and used at the time of research work.

Methods
Formulation and preparation of Thalipeeth
Talipeeth were prepared as pert the formulation given in Table no. 01. Ingredient were selected based on their nutritional profile and quality. Cleaning, washing and weighing of selected ingredients were done as per the recipe. Soybean, green gram, horse gram and moth beans were soaked in lukewarm water for 6hrs and 30min. Washing of *moringa* leaves and soaking it for 2hrs in 2% salt concentration solution was carried out. Soaked soybean, green gram, horse gram and moth beans were grinded with the help of mixer. Jowar flour, Bengal gram flour and *moringa* leaves were added into the grinded material. Water was added if required. Sesame seeds, turmeric powder, salt, chopped green chilli, onion, garlic, ajowan and coriander was added in the prepared mass. Mixing was carried and dough was formed having the consistency like *thalipeeth* and kept it for 10min. Prepared dough was divided into balls having the weight 70g. Rolling of dough balls on wet muslin cloth in round shape having the diameter of 14cm and oiling on that side was carried out. The prepared dough sheet was transfer on hot pan having the temperature of 140˚C. Baking of one side for 45sec then turned to other side with application of oil and baked it for 45sec with keeping vessel on it for uniform baking.

Different Analysis
Sensory evaluation of *thalipeeth*
Sensory analysis of all 4 samples (T1-T4) were carried out for the acceptability based on 9 points Hedonic scale. Samples were evaluated on the basis of appearance, color, taste, flavour, texture and overall acceptability. Scores were given on Hedonic scale represent 9 for like extremely while 1 for dislike extremely. Evaluation was carried out with the help of trained and semi trained panellists by providing respective evaluation sheet to individual member. Average score was selected for the selection of final *thalipeeth* formulation.

Proximate composition of *thalipeeth*
The selected sample based on sensory evaluation was crushed and moisture was calculated. Then the moisture free sample was analyzed for protein, fat, total ash and crude fiber content according to their respective standard methods as described in (AOAC, 2000) [1].
Total carbohydrate content of the thalipeeth was calculated by the difference method (Wandhekar *et al*., 2021) [9].

Mineral Analysis of *thalipeeth*
Five gram of moisture free sample was weighed in crucible and burn it on heating plate till the sample becomes fumeless. The obtained sample was placed in muffle furnace at 550°C for 5-6 hrs. The obtained ash samples were digested with concentrated Hydrochloric acid (HCL) on hot plate. The digested material was then filtered using whatman No. 42 filter paper and the final volume made to 100ml with distilled water the obtained mineral solution was further used for analysis with respect to minerals Calcium, Magnesium, Phosphorus, Zinc, Iron and Copper content by using methods given by Ranganna (1986) [7].

Texture profile analysis of *thalipeeth*
Instrumental TPA test was carried out by a compression test that generates plot of force (N) versus time (s) using a texture analyser (TA-XT2 plus Texture Analyzer) equipped with a 5 kg load cell. The analyser was linked to a computer that recorded data via a software programme. The conditions employed were: pretest speed= 5.0 mm s-1, test speed=2.0 mm s- 1, posttest speed=10.0 mm s-1, distance= 60.0 mm and trigger type= auto. *Thalipeeth* was held at the centre of the two clamps. One clamp was attached to the platform while the other was attached to the moving arm of the texture analyzer. The clamps were allowed to pull until the talipeeth ruptured (Cheng and Bhat, 2015).

Results and Discussion
Sensory evaluation of *thalipeeth*
Sensory evaluation of prepared thalipeeth was carried out with the help of trained and semi trained panel members using the 9 point headonic scale. The parameters like appearance, color, taste, flavour, texture and OAA was considered. Average score of sensory parameters of the preaped thalipeeth samples for the formulations (T1-T4) were summerised in the Table no.02 and the same data also presented by spider plot graphical representation (figure 01) (Wandhekar *et al*., 2021) [9].
The sensory evaluation was based on 9 point headonic scale ranges form 9 for like extremely to 1 for dislike extremely. The obtained results revealed that there was highest overall acceptability score (8.1) for the T3 sample with compare to other. For the parameters like color, flavour and texture sample T3 showed the highest score. While sample T4 showed the lowest score for all the parameters with overall acceptability score (6.7).
Increasing the concentration of moringa leaves above 5% was found to be unacceptable by the consumers due to the bitterness. Acceptable limit of the moringa leaves was found to be 5%. The study also revealed that utilization of cerals, pulses and legumes with moringa leaves had a very good textural properties. Seasoning with green chillies, coriander, seasame helped to enhance the colour attributes. By considering the above parameters it was found that sample T3 was having the highest score and superior than other samples hence it was selected for the further analysis.

Proximate composition of *thalipeeth*
Proximate comosition helps to analyse the nutritional content of the sample. Proximate composition selected sample T3 was carried out and parameters like moisture, protein, fat, carbohydrate, crude fiberand ash content were evaluated. The obtained results are presented in the Table no.03 As below.

The data obtained from the table no. 03 revealed that the moisture content of T3 sample was 25.5 ± 0.14%. Protein content of prepared thalipeeth was 16.94 ± 0.07%. With the incorporation of pulses, legumes and moringa leaves it was observed that the prepared product was rich source of protein. Soaking treatment given to the pulses and legumes helped to increase the protein digestibility and removal of antinutritional factors (Sathe and Mandal, 2016) [8]. Peapared thalipeeth was found to be the good source of carbohydrate as the combination of cereals, pulses and legumes with the value 49.29 ± 0.46%. Fat content of the prepared thalipeeth was 4.53 ± 0.68%. Prepared thalipeeth also found to be the good source of crude fibercontent 2.3 ± 0.01% as grains having the good quantity of fibercontent. Ash content of the prepared product was 1% and found to be the good source of nutrrients. The obtained data narrated that the sample T3 was the good source nutrition with good amount of protein, carbohydrate and crude fibre.

Mineral composition of thalipeeth
Minerals like calcium (Ca), magnesim (Mg), phosphorus (P), zinc (Zn), iron (Fe) and copper (Cu) were analysed for the prepared thalipeeth and obtained results are summerised in the Table no. 04.
The mineral content of prepared thalipeeth was evaluated and it was found that the selcted sample (T3) contains high amount of minerals. Obtained data revealed that calcium, magnesium and phosphorus content of selected sample was 80.81±0.53, 25.31±0.14 and 116.2±0.73 mg/100g respectively. The significantt increse in the mineral composition in the prepared thalipeeth was obsrved due to incorpoation pulses, legumes and moringa leaves. Mineral composition with respect to copper, iron and was found to be 81.75±0.12, 9.18 1± 0.54 and 1.83 1± 0.74 mg/100g respectively. With the obtained study it was narrated that the utilization plant based food sources will helps to achieve the required amount of minerals to fullfill the daily requirement.

Texture profile analysis of thalipeeth
Texture profile analysis was carried out to determine the textural behaviour of the prepared thalipeeth. The parameters such as hardness, cohesiveness and extensibility were determined and the results are summarised in the Table no. 05.
Obtained results revealed that the prepared thalipeeth was with good textural properties. Hardness, cohesiveness and extensibility of the thalipeeth (T3) was 0.14±0.039 N, 0.65±0.011 mm and 10.74±0.302 mm respectively. With the balance proportion of ingredients the prepared thalipeeth achieved a soft and desirable texture.

Table 1: Formulation of *thalipeeth*

Ingredients	Quantity (g)			
	T1	T2	T3	T4
Jowar Flour	12.5	13	15	15.5
Soybean	15	14	15	14
Green gram	17	15	15	12.5
Horse gram	14	15.5	12.5	12.5
Moth beans	15	15	12.5	13
Bengal gram flour	12.5	12	12	12.5
Moringa leaves	1	2.5	5	7
Green Chilli	2.5	2.5	2.5	2.5
Sesame seeds	1.5	1.5	1.5	1.5
Turmeric	0.5	0.5	0.5	0.5
Salt	1	1	1	1
Chopped onion	2	2	2	2
Garlic	1	1	1	1
Ajowan	0.5	0.5	0.5	0.5
Chopped coriander	1.5	1.5	1.5	1.5
Soybean oil	2.5	2.5	2.5	2.5

Table 2: Sensory evaluation of *thalipeeth*

Sample	Sensory attributes					
	Appearance	Color	Taste	Flavour	Texture	OAA
T1	7	7.6	7.8	7.6	7.9	7.5
T2	7	8	8	7.8	8	7.8
T3	8	8.1	8.2	8.1	8.2	**8.1**
T4	6	6.3	6.5	6.8	7.8	6.7
SE ±	0.026	0.012	0.063	0.079	0.080	0.112
CD@5%	0.085	0.041	0.189	0.235	0.244	0.335

Table 3: Proximate composition of *thalipeeth*

Parameters	Value/100g (Approx.)
Energy (Kcal)	313.29 ± 1.23
Moisture (%)	25.5 ± 0.14
Carbohydrate (%)	49.29 ± 0.46
Protein (%)	16.94 ± 0.07
Fat (%)	4.53 ± 0.68
Crude fiber (%)	2.3 ± 0.01
Ash (%)	1 ± 0.02

Table 4: Mineral composition of thalipeeth

Parameters	values (mg/100g)
Calcium	80.81±0.53
Magnesium	25.31±0.14
Phosphorus	116.2±0.73
Copper	81.75±0.12
Iron	9.18 1± 0.54
Zinc	1.83 1± 0.74
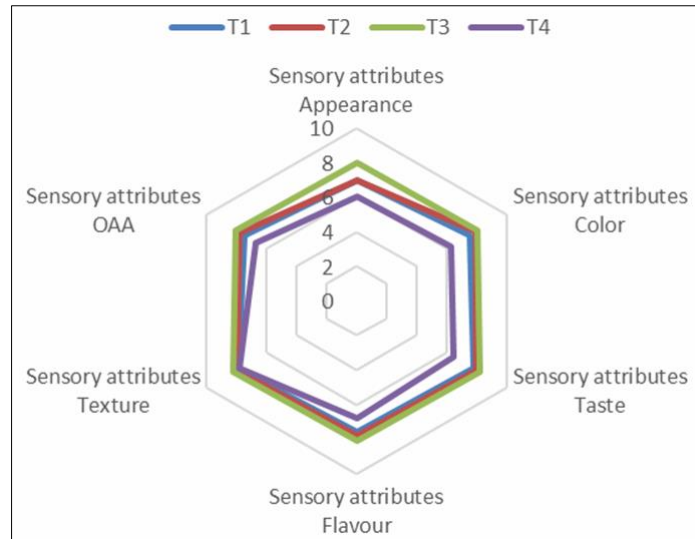
Fig 1: Sensory evaluation of *thalipeeth*

Conclusion
From the above observations, it can be concluded that standardized protein rich plant based thalipeeth is more nutritious. This shows statically significant in varying levels of ingredients and process parameters. On the basis of sensory parameters the sample T3 is found to be acceptable with highest overall acceptability score 8.1. Overall it can be concluded that the selected ingredients for the preparation of thalipeeth having the good nutritional profile. This study shows that utilization of plant based sources having the good impact and will achieve an great success with its nutrional and health importance for the all age group people.

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