IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

STUDIES ON THE DEVELOPMENT OF RTE THEPLA AND IT'S PREMIX

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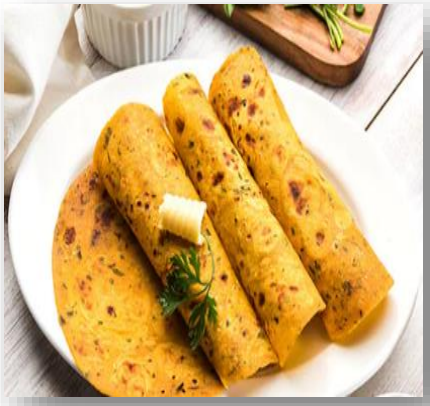
Abstract: Thepla is flat pan bread, consumption of thepla has increased and it has become more popular in many regions, standardization of the ingredients was based on the sensory acceptance of the product, thepla prepared by using multigrain flour (150) along with spices and leafy vegetables, addition of dehydrated methi (4.0g) and curry leaves (3.0g) increases the flavor, inclusion of dehydrated chili flakes (1.5g), punget flavor the, salt (7.0g) improves the quality and delays the microbial growth in thepla, sorbitol (1.1g), sugar (1.8g), cooked mashed potato(75g), curd(50g) enhances the appearance and soft texture in prepared thepla change of modern life style, eating patterns and health conscious has increased the demand for the healthy food with low carbohydrates with high proteins, the adding of bengal gram dhal along with multi grain flour increase bioavailability of protein and decrease the glycemic index, addition of citric acid(0.5g) and pasteurization at90^{o}C about 2hours with suitable packaging (MP,PP,PFP) material avoid spoilage and increase the shelf life in thepla.

***Index Terms*- RTE thepla, pasteurization, bioavailability of protein, packaging material, microbial growth.**

1. INTRODUCTION

Thepla is nutritious, traditional unleavened Indian flat pan bread similar to chapathi, popular in Gujarat, Maharashtra and Rajasthan, various types of thepla can be prepared by varying its ingredients like fenugreek leaves, palak, potato and mixed vegetables, fenugreek leaves thepla is the most popular amongst all theplas, inclusion of pulse, vegetables and leafy vegetables along with wheat flour in making of flat breads which increases the photochemical and nutritional values, thepla can be eaten as a breakfast, also be served as side dish along with meals, Thepla had a creamy appearance, soft, pliable, soft texture when it was baked fresh, thepla comprising mostly crust with little or no crumb, the short keeping quality of thepla possess serious problems where they have to be served to a large number of consumers at one time, as in canteens or in restaurants, changing lifestyle and food habits has resulted into the need of convenience food, thepla is a cheap and primary source of protein, energy **[10; 14; 7].**



Potato Thepla

Mixed vegetable Thepla

Fig No. 1: **Types of Thepla**

Thepla traditionally prepared at home by hand mixing, kneading and sheeting of dough followed by baking on a hot pan or in iron griddle, the consumption of traditional thepla is increased and has become more popular even in areas where the traditionally rice has been the staple diet, comparing with chapathi thepa has better shelf life and nutritional value, dough strength, gas retention, water absorption, flavors and colors are regulates by wheat gluten **[8].** The preparation of thepla is time consuming, the problem associate with thepla is, it becomes hard and stale immediately after 6 to 7 hrs of its preparation, the shelf life of thepla is one or two days, The changes during storage is due to retrogradation of the starch components, some additives are added during dough making to overcome with this problem and also to enhance the quality of thepla, the major factors associate with short shelf-life of thepla are microbial spoilage and staling during storage **[4].** With the changing global scenario, a demand has been generated for the provision of ready to eat theplas with longer shelf life on the market shelf **[13].** Oil has been used for the preparation of thepla and it may lead to oxidative rancidity during storage, however, fenugreek overcomes with this problem to some extent with the presences of antioxidants, which inhibits lipid per oxidation in prepared thepla, also methi leaves rich source of calcium, iron and β-carotene dietary fiber therefore it helps in improving the homeostasis of glucose and it also lowers cholesterol level **[17; 15].** An urban lifestyle, formation of nuclear families has been made RTE foods more popular **[16].**

Wheat is one of the most commonly cultivated cereals in the world, *Triticum aestivum vulgare* and *Triticum turgidum durum* are mostly used verities, In India among whole wheat production, almost 90% of the wheat is consumed in the form of chapathi, roti, etc. remaing 10% is used in making of biscuits, cake and other bakery products **[9].**

Staling is a process of chemical and physical changes including moisture redistribution, starch retrogradation, increased firmness and Fragility, as loss of freshness, aroma, crumb softness, and development of crumbliness during storage, which makes food products less acceptable by the consumers, **[11; 12; 6; 20].** During staling starch changes from the amorphous state to the crystalline state, as water is incorporated into crystalline structure, water molecules become immobilized, the diffusion of water also leads to the development of soft and leathery crust **[18].**

Firming was greatly affected by the gluten protein content of flours **[6].** Firming caused by the formation of cross-links between partially solubilized starch and gluten proteins due to moisture loss **[19].** In fresh breads there is a high moisture gradient between crumb and crust, during storage, moisture migrates from crumb to crust and crumb starts to lose moisture, that increases crumb firmness and starch re-crystallization **[3; 5].**

2. MATERIAL AND METHOD

For the thepla preparation, whole wheat flour, Multigrain wheat flour, bengal gram dal, green gram dal, black gram dal, potato, curd, methi leaves, chili powder, turmeric powder, coriander powder, procured from the local market, Mysuru, India. Dehydrated chili flakes and dehydrated curry leaves are prepared in our institution, DFRL Mysore, India.

2.1. CONTROL THEPLA PROCEDURE

Wheat flour 150g.

↓

Mixed with1g of turmeric powder, 1g of red chili powder, 1g of coriander powder, 5g of salt, and dehydrated methi leaves 5g.

↓

80ml of water added and dough was prepared.

↓

Dough kneaded for 7-8min.

↓

Prepared dough rested for 20 min.

↓

Small dough balls prepared, and sheeted.

↓

Baked on previously heated tawa for about 23-25 sec on medium flame, oil was applied on both sides.

Fig No. 2: **Flow chart for Control thepla**

Thepla prepared manually by following traditional methods, 150g of whole wheat flour was taken, the spices were weighed, based on quantity of wheat flour, initially flour was mixed with 1g of turmeric powder, 1g of red chili powder, 1g of coriander powder, 5g of salt, and 5g of dehydrated methi leaves, after then by adding 80ml of water, dough was prepared, prepared dough was kept for of resting about 20 min. whole dough was divided into small dough bolls and rolled by rolling pin, sheeted thepla baked on the nonstick tawa, oil was applied on both the sides, baked medium flame for about 23-2 sec, hot theplas was cooled at room temperature about 6-7 min.

Fig No. 3: **Control thepla**

2.2. VARITIONS

Table No.1: Variations of pulse mixed thepla

Variations	Pulse (g)	Wheat flour (g)
Variation1 Bengal gram dal		
T0	0	150
T1	50	150
T2	75	150
T3	100	150
Variation2 Black gram dal		
T1	75	150
Variation3 Green gram dal		
T1	75	150

In variations, RTE thepla prepared by incorporating three different types of pulses, the selection of pulses based on their protein content which includes bengal gram dal, black gram dal, green gram dal, by using 150g of multigrain wheat flour as a standed. Variation 1 carried by using bengal gram dal at varies levels namely 0g, 50g, 75g and 100g, among this, (75g) T2 RTE thepla was accepted by the panelists, inT1(50g) prepared thepla had little hard in texture, and in T3 (100g) thepla flavor was dominated by bengal gram dal, among the trials, (75g) T2 RTE thepla was accepted by the panelists, by taking 75g of pulse weight as a standard, Variation 2 and variation 3 made by incorporating (75g) black gram dal, green gram dal, variation2 (black gram dal) prepared thepla was more sticky and in variation3 (green gram dal) prepared thepla was hard in texture hence among the 3 variations bengal gram dal incorporated thepla had highest scores.

2.3 STANDARDISATION OF INGREDIENTS FOR PULSE MIXED RTE THEPLA

Standardization of the ingredients based on the sensory acceptance of thepla.

Table No. 2: Standardization of Ingredients

Ingredients Name		Amount (g)	Name of brands
Multi grain wheat flour		150	Aashirvaad
Cooked channa dhal		75	Local market
Boiled and mashed potato		75	Local market
Curd		50	Nandini
Sesame oil		5	Ganeshs sesame oil
Dehydrated chili flakes		1.5	From the institution
Dehydrated curry leaves		3.0	From the institution
Dehydrates methi leaves		4.0	Everest
Spices mix	Red chilli powder	1.5	MTR
	Coriander powder	1.0	Everest
	Turmeric powder	1.5	Everest
Taste enhancer	Salt	7.0	Tata
	Sugar	1.8	Madhu
Preservatives and texture improver	Sorbic acid	1.1	SD Fine chemicals
	Citric acid	0.5	-
	Sorbitol (D extra pure)	0.5	SD Fine chemicals
Medium	Water	60 ml	-

2.4 THEPLA MAKING

Dough was prepared by using dough making machine, (Berjaya, capacity 5kg), above mentioned ingredients was added into the dough making container, usage of curd and cooked an mashed potato minimizes need of water in dough making, also it supports soft dough development, and improves the thepla quality, salt enhances the gluten development, on the medium speed ingredients was mixed for 7-8 minutes on a circular motion, after making the dough, whole dough weight was taken by manually, then prepared dough was rested for 30 min for the gluten development, dough mix was divided into 40g each small dough balls, and then dough balls placed on previously heated chapathi pressing machine (AARBEE Engineering Industry, Coimabatore). Pressing temperature of the upper plate was 147°C and lower plate was 135°C and the pressing time is about 0.45seconds, once the pressing was done, the raw sheeted thepla immediately transfer into previously heated hot tawa, oil was applied, raw thepla baked at 180°C about 22±2sec on one side and at 18±2sec on the other side, it was again turned and baked for 7±2sec on both sides, baked thepla placed on steel tray for cooling, once the cooling was done, thepla packed in sterilized Metalized Polypropylene (MP), Polypropylene (PP), Paperal Foil-Polyethylene (PFP) pouches, sealed mechanically, sealed pouches were pasteurized at 90°C for about 2hours, after that pasteurization pouches allowed for cooling under the room temperature, stored in carton box.

Weighing all the ingridients.

↓

Adding all ingredients to the dough making machine.

↓

Mixing about 7-8 minutes.

↓

Whole dough weight was taken.

↓

Prepared dough was rested for 20 minutes for gluten development.

↓

Dough divided into small dough balls of 40g.

↓

Flattened and cooked preheated chapathi pressing machine. Temperture upper plate 147°C/ lower plate 135°C.

↓

Sheeted raw thepla transfer into hot tawa.

↓

Oil was applied

↓

Thepla baked for 20±2 sec at one side, 20±2sec on other side at 180° C. and turned.

↓

Cooled at room temperture.

↓

Thepla paked in MP, PP, PFP pouches, sealed mechanically.

↓

Pasturization at 90°C about 2h.

↓

Cooling

↓

Stored in carton box.

Fig No. 4: **Pulse mixed RTE thepla making flow chart**

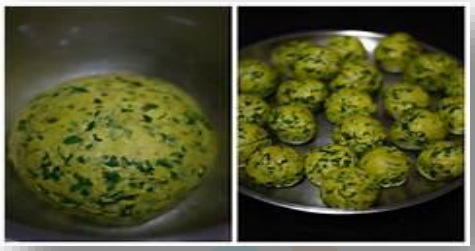


Fig No. 5: **RTE Thepla dough mix**

Fig No. 6: **RTE Thepla**

2.5 SENSORY EVALUATION

Sensory analysis was carried out according to the method of Lawless and Heymann. Sensory evaluation was carried out using 9- point hedonic rating scale in laboratory at ambient conditions. 10 Number of semi-trained panelists are selected, sensory panelists were asked to rate and given score for different parameters as appearance, color, texture, mouth feel, taste and overall acceptability, compare with control thepla optimized batch had highest acceptability by the panelist, in addition of cooked mashed potato and sorbitol in preparation improves soft texture, chili flakes increases the pungent flavor, dehydrated curry leaves, and methi leaves enhances flavor in prepared thepla which was experienced by the panelists.

Table No. 3: Sensory evaluation

Types	No. of month	No. of panels	Appearance	Color	Texture	Flavor	Taste	Overall acceptability
Control thepla	0	10	7.3±0.1	7.1±0.1	7.1±0.1	7.2±0.1	7.1±0.1	7.1±0.1
Pulse mixed RTE thepla	0	10	8.0±0.2	8.0±0.1	8.1±0.1	8.1±0.1	8.1±0.1	8.0±0.1

2.6 STORAGE STUDIES

For storage studies prepared thepla were packed in polypropylene(PP), paperal foil-polyethylene (PFP) and metalized polypropylene(MP) (two thepla in each pouch for the study at different time intervals) sealed and stored in an ambient temperature t, 7 month old theplas are subjected to sensory analysis, 3 panelists ask to given the score based on the acceptable of the product, among these sample paperal foil-polyethylene (PFP) packed thepla has more acceptability followed by metalized polypropylene (MP) packed thepla s and followed by PP (polypropylene)packed thepla sample.

Table No. 4: Sensory evaluation pulse mixed RTE thepla with different packing material

Packaging material	No. of moths	No of panels	Appearance	Color	Texture	Flavor	Taste	Overall acceptability
PFP	7	1	8.5	8.1	8.2	8.3	8.3	8.6
		2	8.4	8.0	8.2	8.2	8.6	8.5
		3	8.5	8.3	8.1	8.1	8.7	8.5
Mean & SD			8.4±0.05	8.1±0.15	8.1±0.05	8.2±0.1	8.5±0.20	8.5±0.5
MP	7	1	7.2	7.5	7.1	7.5	7.0	7.0
		2	7.2	7.3	7.3	7.3	7.2	7.5
		3	7.1	7.2	7.0	7.2	7.0	7.4
Mean & SD			7.1±0.05	7.3±0.15	7.1±0.15	7.3±0.15	7.0±0.11	7.3±0.20
PP	7^{th} month	1	7.1	7.0	7.2	7.1	7.2	7.1
		2	7.1	7.0	7.0	7.0	7.3	7.2
		3	7.2	7.3	7.0	7.1	7.1	7.0
Mean & SD			7.1±0.05	7.1±0.17	7.0±0.11	7.0±0.05	7.2±0.10	7.1±0.10

Table No. 5: Moisture content of pasteurized pulse mixed RTE thepla with different packaging material

Name of the packaging material	Moisture content in%	
	0 month	7 month
MP	39.00	35.89
PP	40.36	36.12
PFP	39.36	37.53

Moisture content has obtain from the fresh and 7 month ld samples nearly similar, during pasteurization evaporation of water molecule takes place this decrease the rate of moisture lose, mobility of water during storage, thereby brittle and hardness, hence pasteurization increase the shelf life in thepla

2.7 PHYSICAL PARMETERS OF RTE THEPLA

Baked thepla contains 25±2 black spots, interaction of simple sugar molecules reacted with heat result in the formation of black spots on the surface of thepla, diameter of the thepla is about 15±1cm, vernier caliber used to measure the thickness in the thepla which is about 2mm±0.5mm, before baking the dough was weighed about 40g, after baking thepla weight had reduced because of evaporation of moisture during baking, hence the baked thepla weighed was 31±2g.

Table No.6: Physical parameters of thepla

Parameters	Results
Dough weight	40±2g
Thepla weight	32±2g
Thepla diameter	15±1cm
Thepla thickness	2±0.5mm
No. of black spots	25±2

2.8 NUTRITIONAL COMPOSITION OF RTE THEPLA

Moisture, protein, ash, and fat contents, were determined according to the methods described in (AOAC, 2016)

Table No. 7: Nutritional composition

Nutrients		Results in %
Moisture content	BP	40.54
	AP	36.75
Dough moisture content		58.86
Ash		3.65
Protein		19.25
Fat		6.30

NOTE- Before Pasteurization and After Pasteurizations

Nutritional value of flat breads depends on the chemical composition of the flour and other added ingredients in the preparations, mineral and phytochemicals value of flat breads get reduced due to lowering extraction rate of wheat flour.

2.8.1 Moisture content

Moisture determination is one of the most important and most widely used measurements in the processing and testing of foods. The amount of dry matter in a food is inversely related to the amount of moisture it contains. Thepla is intermediate moisture flat bread and the total moisture is about 25-35%, higher moisture content is more the chances of spoilage, mold growth also occurs after 3-4 days of Storage **[1].** Moisture content estimated in two stages, before pasteurization and after pasteurization by using digital moisture analyzer and also by oven drying method, before pasteurization thepla contains 40% and after pasteurization thepla contains 36% of moisture content, prepared dough had 58% of moisture content.

2.8.2 Protein

Prepared thepla contains 19g. Protein content of thepla was high due to the addition of channa dhal, pulse is good source of protein and amino acids such as leucine, lysine, and valine. Intake of pulse along with cereals helps in preventing the protein energy malnutrition; consumption of pulse positively affects cardiovascular disease risk and also other chronic diseases **[1].**

2.8.3 Fat

Thepla contains 6g of fat, sesame oil is good sources vitamin E, linoleic acid (omega 6), oleic acid (omega 9), and phytosterols, these antioxidant helps it reduces production free radicals and helps lowers the Low Density Lipoprotein (LDL) cholesterol level. Vit E content of sesame oil prevent the oxidative stress arises due to the oxidization of LDL, and also prevent the development of atherosclerosis.

2.8MICROBIAL ANALYSIS

Table No. 8: Microbial count

Name of packaging material	No. of month	Total plate count (TPC)
PFP	0	-
PFP	7	10^2

The number factors influence the moulds growth, includes moisture content, packaging material, type of raw materials was used, normally mold growth occurs after 3-4 days of storage. Hence there is no mould growth seen in 7-month-old pasteurized PFP packed thepla.

3. CONCLUSION

In this present study results that, the effects of pasteurization technology and the addition of spices, potato in dough development, pasteurization at 90ºC delays growth of moulds, during storage , adding cooked mashed potato(75g) and curd (50g) along with wheat flour improves the dough quality and softness and decrease the usage of water in the preparation, therefore mobility of water was control during storage, hence the firmness was can be avoid, hence this resulted these simple tools useful helps in extent the shelf life of thepla.

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