



# DEVELOPMENT AND FORMULATION OF TURMERIC TUBER PICKLE

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*Abstract:* The objective of the study was to prepare ready to serve healthy pickle using turmeric which could be used by all age group of people. Turmeric tuber, ginger and lemon were used for the production and masala items were processed for the preparation of the turmeric tuber pickle. Sensory properties, pigment analysis, nutritional composition, physio-chemical properties, cost calculation ,packaging and labeling of the turmeric tuber pickle of the selected variation sample was discussed. From the curcumin pigment analysis conclusion among three selected variation sample of turmeric tuber pickle best sample was boiled turmeric tuber pickle and thus taken for packaging and labeling processes. Sensory score showed that appearance ranges from 4 to 4.7 ,colour ranges from 3.7 to 4.7, taste ranges from 3.6 to 4.8, texture ranges from 3.5 to 4.6, overall acceptance ranges from 3.6 to 4.8 respectively. However, all the sample were accepted but the preferred was variation 3 by the panellist members. Finding shows that pigment analysis done was safe for human consumption and acceptable pickle can be produced using boiled sample of variation 3. Thus result obtained shows the feasibility of producing quality and nutritive rich turmeric tuber pickle from boiled sample of variation 3.

**Index Terms** –Turmeric, Curcumin pigment analysis, Boiled sample, Sensory score, Packaging, Labeling

## I. INTRODUCTION

Food is a global business and the globalization of eating habit does not imply a narrowing of consumer tastes but a broadening of the range of preference and an increased diversity in consumption pattern within individual countries. The process of developing new products combines creative application of technology and idea. The advantage of plant based dietary invention in combating certain diseases and health conscious public at large. Through ginger and turmeric are aromatic spices pickle are available in the market. Enough thought was not given in the development of suitable food products with raw turmeric rhizome which also belongs to *Zingiberacea* family. Such work is of immense importance as it facilitates direct market ability of the raw rhizome which intern bring potential earning to the farmers.

Pickles are products prepared from clean, sound ingredients that may or may not have been previously subjected to fermentation and curing in a salt brine. The product is prepared and preserved through natural or controlled fermentation or by direct addition of vinegar to an equilibrated pH of 4.6 or below. Pickling can preserve perishable food for months. Antimicrobial herbs and spices such as mustard seed, garlic, cinnamon or cloves are often added. If the food contains sufficient moisture, a pickling brine may be produced simply by adding dry salt. (Jaggi Lal., June 2012)

## II. METHODOLOGY

The methodology pertaining to study entitled on “Development and formulation of turmeric tuber pickle” is presented.

The formulation of the product was done by using turmeric rhizome which was collected from the local market of Dharmapuri district. Ginger and lemon was purchased from the local market in Coimbatore district. Masala items and sesame oil were collected from the local grocery shops in Coimbatore district. The selected items were based on the nutritional acceptance and taste for the consumption.

### METHODS:

#### PRE PREPARATION:

The collected turmeric rhizome was cleaned, washed and vinegar treated. The rhizome was separate based on the variation of the unprocessed sample and processed sample. For processing, the rhizome was boiled and steamed separately and grated in to thin slices. The ginger was peeled and grated using vegetable grater and add along with vinegar treated turmeric tuber. The masala was fried in dry pan and roasted until the aroma raises. The masala product roasted was cooled and added to the mixer and grind into fine powder.

#### PREPARATION OF PICKLE:

To process turmeric tuber pickle, first to a hot pan add sesame oil. Add mustard and fenugreek seeds to the pan and allow them to pop up slightly, add the unprocessed turmeric tuber that was grated and added with ginger to the oil. Let the rhizome boil in oil for 2 minute. Add seasoning items that was pre-prepared was added to the rhizome and allow them to cook. Finally add lemon juice and turn off the flame and make a good mix. Add a pinch of asafoetida to the pickle and allow them to set and let it cool. The same processes is repeated for the boiled and steamed sample. Once the process is completed the sample is transferred to the packaging material and closed with vacuum lid and stored in dark and room temperature.

## III. FIGURES AND TABLES

**TABLE 1: STANDARDIZATION OF TURMERIC TUBER PICKLE**

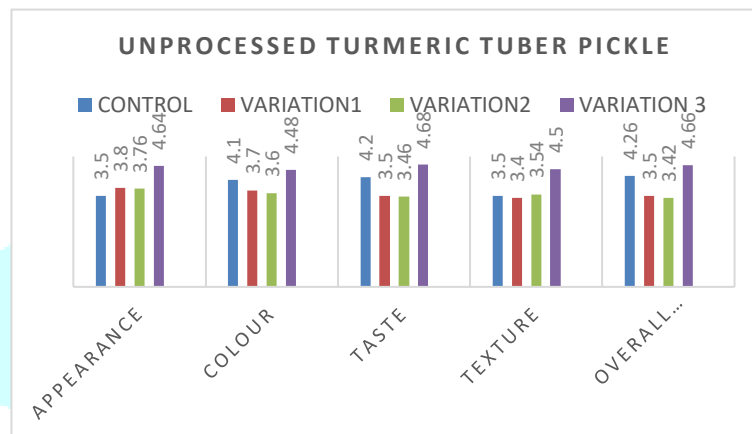
Ingredients	Variation I	Variation II	Variation III
<b>Turmeric tuber</b>	50	40	30
<b>Ginger</b>	15	25	35
<b>Lemon</b>	5	5	5
<b>Mustard</b>	15	10	5
<b>Fenugreek</b>	5	10	15
<b>Chilly powder</b>	5	5	5
<b>Rock salt</b>	5	15	25
<b>Sesame oil</b>	100	90	80

**TABLE 1:** The standardized products were standardized in terms of amount of ingredients, procedure and serving size. For the purpose of standardized products, a number of preliminary trials were conducted. It was formulated into four different variations. Different variations of turmeric tuber pickle were prepared by altering the proportion of all the ingredients for standardization.

TABLE 2: ORGANOLEPTIC EVALUATION OF UNPROCESSED TURMERIC TUBER PICKLE

Criteria	Control	Variation1	Variation2	Variation3
Appearance	3.5±0.52	3.8±0.78	3.76±0.72	<b>4.64±0.88</b>
Colour	4.1±0.63	3.7±0.68	3.6±0.78	<b>4.48± 0.78</b>
Taste	4.2±0.23	3.5±0.82	3.46±0.79	<b>4.68±0.85</b>
Texture	3.5±0.78	3.4±0.80	3.54±0.79	<b>4.5±0.82</b>
Overall acceptance	4.26±0.89	3.5±0.74	3.42±0.82	<b>4.66±0.89</b>

FIGURE 1: FIGURE OF ORGANOLEPTIC EVALUATION OF UNPROCESSED TURMERIC TUBER PICKLE

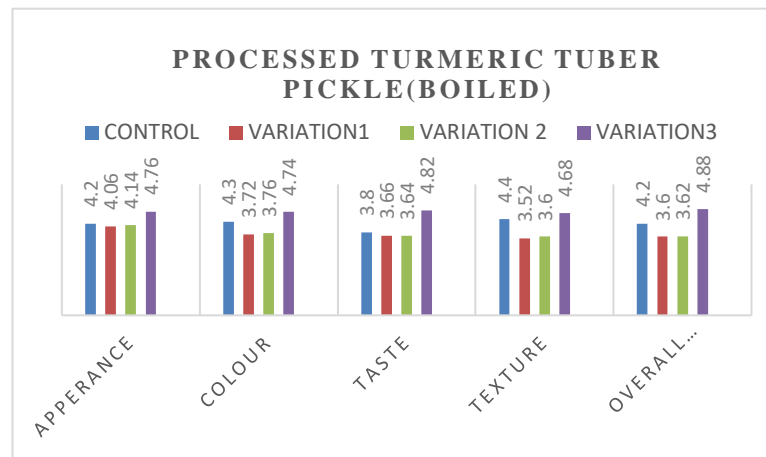


Organoleptic evaluation of has given to 50 semi trained panel members using the score card with a five hedonic scale. In evaluation, the qualities of the product were asked to judge by 50 semi trained panel members with respect to appearance, colour, consistency, texture, taste and overall acceptability. The individual mean sensory scores for control, variation I, variation II, variation III are noted.

TABLE 3: ORGANOLEPTIC EVALUATION OF PROCESSED (BOILED) TURMERIC TUBER PICKLE

CRITERIA	Control	Variation1	Variation2	Variation3
Appearance	3.5±0.52	4.06±0.79	4.14±0.62	4.76±0.88
Colour	4.1±0.63	3.72±0.69	3.76±0.57	4.74±0.86
Taste	4.2±0.23	3.66±0.62	3.64±0.69	4.82±0.91
Texture	3.5±0.78	3.52±0.69	3.6±0.67	4.68±0.83
Overall acceptance	4.26±0.89	3.6±0.67	3.62±0.67	4.88±0.95

FIGURE 2: FIGURE OF ORGANOLEPTIC EVALUATION OF PROCESSED (BOILED) TURMERIC TUBER PICKLE

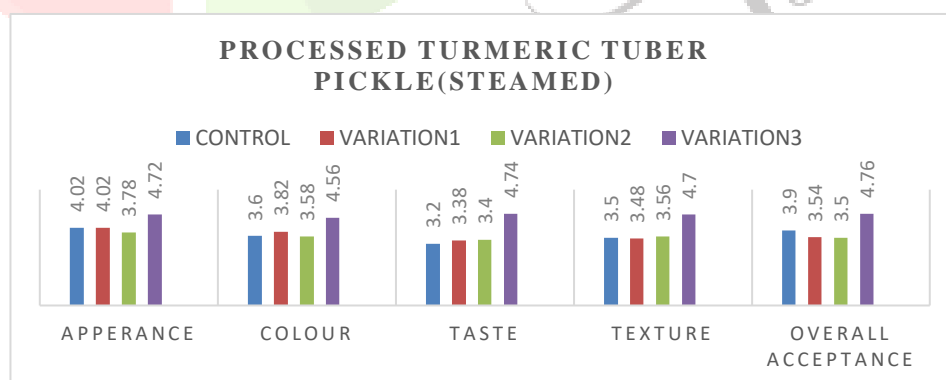


Organoleptic evaluation of has given to 50 semi trained panel members using the score card with a five hedonic scale. In evaluation, the qualities of the product were asked to judge by 50 semi trained panel members with respect to appearance, colour, consistency, texture, taste and overall acceptability. The individual mean sensory scores for control, variation I, variation II, variation III are noted.

TABLE 4: ORGANOLEPTIC EVALUATION OF PROCESSED (STEAMED) TURMERIC TUBER PICKLE

CRITERIA	Control	Variation1	Variation2	Variation3
Appearance	3.5±0.52	4.02±0.51	3.78±0.68	4.72±0.83
Colour	4.1±0.63	3.82±0.71	3.58±0.76	4.56±0.78
Taste	4.2±0.23	3.38±0.79	3.40±0.80	4.74±0.86
Texture	3.5±0.78	3.48±0.78	3.56±0.69	4.70±0.86
Overall acceptance	4.26±0.89	3.54±0.71	3.5±0.72	4.76±1.01

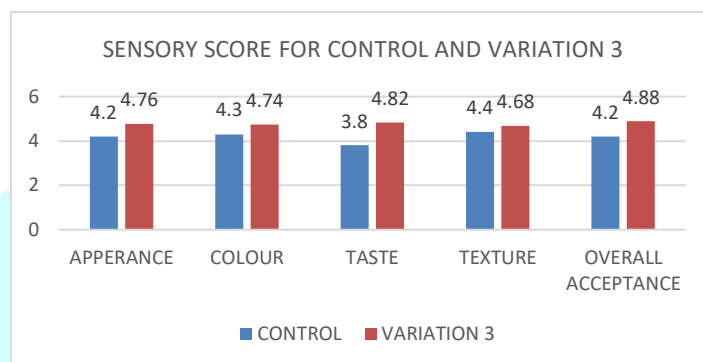
FIGURE 3: FIGURE OF ORGANOLEPTIC EVALUATION OF PROCESSED (STEAMED) TURMERIC TUBER PICKLE



Organoleptic evaluation of has given to 50 semi trained panel members using the score card with a five hedonic scale. In evaluation, the qualities of the product were asked to judge by 50 semi trained panel members with respect to appearance, colour, consistency, texture, taste and overall acceptability. The individual mean sensory scores for control, variation I, variation II, variation III are noted.

**TABLE 5: MEAN SENSORY SCORE OF CONTROL AND SELECTED VARIATION OF BOILED TURMERIC TUBER PICKLE**

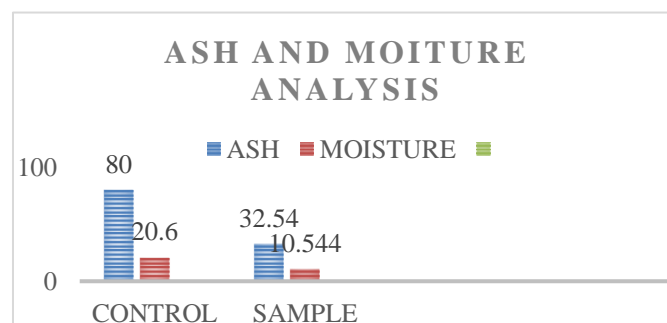
	Control	Variation III
APPEARANCE/COLOUR	4.2	4.76
FLAVOUR	4.3	4.74
TEXTURE	3.8	4.82
TASTE	4.4	4.68
OVERALL ACCEPTANCE	4.2	4.88

**FIGURE 4: FIGURE OF MEAN SENSORY SCORE OF CONTROL AND SELECTED VARIATION OF BOILED TURMERIC TUBER PICKLE**

From the above table, it was clear that the formulated boiled turmeric tuber pickle has better score than control and based on organoleptic evaluation the variation III has the highest score among the other variations. Hence the highest scored overall acceptability variation III has been used for the further analysis.

**TABLE 6: PHOTOCHEMICAL ANALYSIS OF BOILED TURMERIC TUBER PICKLE**

Criteria	Control	Sample
ASH	80	20.6
MOISTURE	32.54	10.059

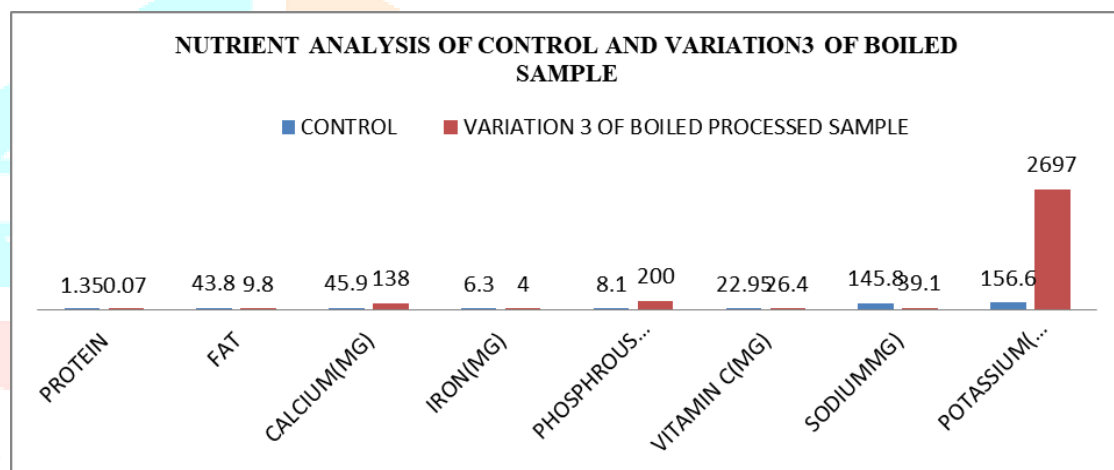
**FIGURE 5: FIGURE OF PHYSIO-CHEMICAL ANALYSIS OF BOILED TURMERIC TUBER PICKLE**

The experimental boiled turmeric tuber pickle (Variation III) has got the higher score of ash value when compared with control. The ash content of the control and sample was (80 & 20.6). The moisture content of sample was lesser than control, lower the moisture content helps to minimize the growth of microorganism and food spoilage. The moisture content of the control and sample was (32.54 & 10.059) respectively.

**TABLE 7 : NUTRITIONAL ANALYSIS OF BOILED TURMERIC TUBER PICKLE CONTROL AND SELECTED VARIATION**

PARAMTER	CONTROL	VARIATION 3 OF PROCESSED PICKLE-BOILED
Protein	1.35 g	0.07 g
Fat	43.8 g	9.80 g
Calcium	45.9mg	138 mg
Iron	6.3 mg	4 mg
Phosphorus	8.1 mg	200 mg
Vitamin –C	22.95 mg	26.4 mg
Sodium	145.8 mg	39.1 mg
Potassium	156.6 mg	2697 mg

**FIGURE 6: FIGURE OF NUTRIENT ANALYSIS OF CONTROL AND BOILED TURMERIC TUBER PICKLE**

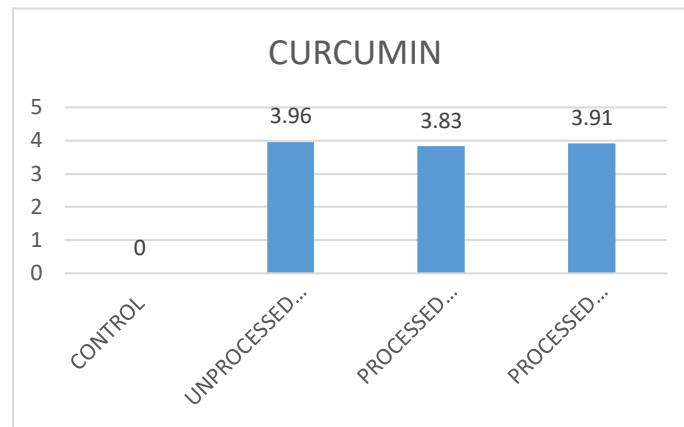


From the above table and figure, it was clear that the formulated turmeric tuber pickle(boiled) contains high nutritional values like **Protein (0.07g)**, **Fat (9.8g)**, **Calcium (138mg)**, **Iron(4 mg)**, **Phosphorus(200 mg)**, **vitamin C(26.4mg)**, **sodium (39.1 mg)**, **potassium(2697 mg)** when compared to control **protein (1.35g)** ,**fat (43.8g)**, **calcium (45.9 mg)**, **iron(6.3 mg)**, **phosphorus(8.1 mg)**, **vitamin C(22.95 mg)**, **sodium(145.8 mg)**, **potassium(156.6 mg)** ,the selected variation has more amounts of calcium and phosphorus and vitamin C than control. Hence it reduces the risk of energy malnutrition and nutritional deficiency disorders.

**TABLE 8: PIGMENT ANALYSIS FOR THE FORMULATED TURMERIC TUBER PICKLE:**

CRITERIA	CURCUMIN CONTENT(g/100g)
Unprocessed sample	3.96g
<b>Processed sample-boiled</b>	<b>3.83g</b>
Processed sample-steamed	3.91 g

FIGURE 7: PIGMENT ANALYSIS FOR THE FORMULATED BOILED TURMERIC TUBER PICKLE



The microbiological analysis was done as pigment analysis for the formulated turmeric tuber pickle. The unprocessed turmeric tuber pickle, boiled turmeric tuber pickle, steamed turmeric tuber pickle was done for pigment analysis - curcumin content in each selected variation 3 sample. Among them boiled sample had **low curcumin content of 3.83 gram /100 gram** of turmeric tuber pickle when compared to unprocessed pickle of 3.96 g/100 g and steamed sample 3.91 g /100 g. As per GRAS, daily intake of turmeric compared boiled sample was found to have low curcumin content and thus selected for packaging, cost calculation, labeling and healthy consumption of human.

TABLE 9: COST CALCULATION OF PROCESSED TURMERIC TUBER PICKLE

S.NO.	INGREDIENTS	QUANTITY	COST IN MARKET /PER KG	COST(RS) /200 GRAMS
1.	Turmeric tuber	30 grams	100 /kg	Rs. 3
2.	Ginger	35 grams	47/kg	Rs. 1.6
3.	Lemon	5 grams	175/kg	Rs .087
4.	Mustard seeds	5 grams	250/kg	Rs. 1.25
5.	Fenugreek seeds	15 grams	150/kg	Rs.0.01
6.	Chilly powder	5 grams	700 /kg	Rs. 3.5
7.	Rock salt	25 grams	110 /kg	Rs.2.75
8.	Sesame oil	80 ml	375 /1000ml	Rs.30
	<b>Total</b>	<b>200 grams</b>		<b>Rs. 42.98</b>

Raw material count =42.98

Overhead charges =42.98 \*20/100

Total cost =42.98+8.596

=51.576

Total yield =200 grams

Packaging cost (empty PET jar /piece with cap) = Rs. 10 of grade -1

Total cost+ packaging cost= 51.576+10

=61.57/200 grams

Taste and texture = Good

Thus, the table indicated the cost calculation of the formulated turmeric tuber pickle. The cost for the developed product is Rs..61.57 / 200 grams along with packaging cost.

#### IV. DISCUSSION

Pickling is the process of preserving edible products in an acid solution, usually vinegar, or in salt solution (brine). The process of pickling is also known as brining and the resulting foods as pickles. Pickling is one of the ancient technique of Indians in the preservation of fruits and vegetables.

The main aim of the study was formulation and quality evaluation of turmeric tuber pickle based on the consumption rate of curcumin intake per day by a healthy individual. For the 3 variation sensory evaluation were evaluated. The nutritional value, cost and quality of the formulated turmeric tuber pickle was calculated.

Boiled turmeric tuber pickle was selected for marketing, packaging and labelling. The turmeric tuber on boiling leaches the curcumin content. Thus the boiled turmeric tuber pickle has low curcumin content of 3.83 gram/100 gram.

The recommended dietary intake as per GRAS is 2 to 2.5 gram of turmeric can be consumed that contains 60 to 100 mg of curcumin. Thus, the boiled sample containing all other major ingredients and spices, 2 -2.5 gram turmeric of boiled sample contains 76.6 mg -95.754 mg of curcumin. Boiled sample of 2 -2.5 grams of turmeric pickle containing consumption of 76.6 mg-m95.75 mg of curcumin. Hence, 16 gram of boiled turmeric tuber pickle can e consumed without any illness effect. 16 gram pickle is equal to 1.6 tablespoon.

The boiled turmeric pickle contains protein -0.07 g, fat -9.80 g, calcium -138 mg, iron -4mg, phosphorus-200 mg, vitamin c- 26.4 mg , sodium- 39.1mg, potassium – 2697 mg for 100 gram of boiled turmeric tuber pickle.

Packaging material provide a means to preserve , protect, merchandise , market and distribute foods. The play a significant role in how these products reach the consumers in safe and whole some form without compromising quality. PET is a biologically inert material that does not react with food or beverages and it is resist to attack by micro organisms . poly ethylene terephthalae is a desirable packaging material that contains good impact on microbial resistance and acts as barrier

#### V. CONCLUSION

From the finding it was concluded that the boiled turmeric tuber pickle of variation 3 was selected as the best among the control and unprocessed sample, steamed sample. The boiled turmeric tuber pickle was good in terms of nutritional composition like protein, fat, calcium, iron, phosphorus, vitamin c, sodium, potassium. Therefore, the boiled turmeric tuber pickle was to be advantageous to the industry and increase the health status of all age group. Turmeric tuber pickle can be consumed by all age group and children above 6 years old. Thus ,Over eating of pickle is not advisable. The turmeric tuber pickle can be consumed by everyone and children above 6 and not below. The turmeric tuber pickle should be avoided by the person those who suffer from allergic conditions.



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