

Development and standardisation of purple yam waffles

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ABSTRACT

Purple yam (*Dioscorea alata* L) is a food that has the potential as a source of natural antioxidants, because of the anthocyanin component. Among the many therapeutic uses of purple yam include enhancing blood circulation and reduces asthmatic symptoms. In addition to these benefits, they are also used in the manufacturing a wide range of food items, including ice cream, waffles, jam, and buns. This study aims to develop a Purple yam waffles. The main ingredients that go into making these waffles are purple yam, sugar, Maida, baking powder, ordinary yam, and strawberry flavor. The levels of anthocyanins, total phenol, antioxidant activity, and darker color increased with the addition of purple yam flour. However, the addition of purple yam flour did not affect the level of preference for the waffle produced. Three different versions of the waffles were developed and to study the organoleptic acceptability. The organoleptic study yielded good results for variation 1. The nutritional value of the one waffle (75g) is 446.38 kcal, 1.78 g fiber, 11.4 g protein, 10.7g fat and 36.4 mg calcium, 93.3mg phosphorous , 31.82 mg anthocyanin, 36 mg total phenols

Keywords : Purple yam, Anthocyanin , Health benefits, Waffles, Organoleptic evaluation, Nutrient composition.

INTRODUCTION

Purple yam are one of the varieties of tubers that have the potential as a source of local food ingredients that contain carbohydrates, proteins, fats, fiber, vitamins, minerals, and contain antioxidants [Indrastuti 2012]. Purple yam plants grow in the Soppeng area, but the people do not use these plants, even though purples can be processed into flour to extend shelf life and can be used as an alternative to reduce wheat flour in meeting consumer needs. The advantages of this processed flour can be seen from its form, among

others, easily stored ingredients, small volume, easy to transport, and can be used for various processed food products [Tejasari et.al 2001]. Another interesting thing from the *Dioscorea* plant is that it contains anthocyanin compounds and antioxidant activity.

According to [Fang et.al 2011], the purple color found in local varieties of tuber indicates that there is an anthocyanin which is an antioxidant and can counteract free radicals in the body. Anthocyanin content has colored compounds which are mostly red, blue and purple. Strong purple color shows

anthocyanin levels and has high antioxidant activity [Krisnawati 2009]. Antioxidants are compounds that serve as a neutralizing increase in free radicals, protecting cells from the toxic effects produced and contributing to disease prevention. Anthocyanin acts as an antioxidant that can counteract free radicals so as to prevent aging, cancer and other degenerative diseases. Anthocyanin content also functions as antimutagenic, antocarcinogenic and can reduce blood sugar levels and antihypertension [Jusuf et.al 2008]

Purple yam contains high energy content, various vitamins, minerals, and anthocyanins. Anthocyanins have been associated to a lower risk of premature ageing, cognitive decline, polyps, gout, stomach acid, coronary heart disease, and cancer. In addition, it also acts as an anti-inflammatory, anti-diabetic, and anti-obesity. It shows that purple yam is good for daily consumption and could be part of the local crop that can benefit human health. Waffles are popular snack foods among people. Manufacturers use many plant sources to produce waffles. Despite this, there has been minimal attempt to employ purple yam as the principal component in waffle manufacture. As a result, the main focus of this study was purple yam waffles. Therefore, it is important to analyze the waffles nutritional contents and sensory evaluation, shelf life (microbial analysis) of the product.

MATERIALS AND METHODS

RAW MATERIALS

The ingredient used for the development of waffles was Purple yam which was purchased online. The purple yams were first scrubbed before being peeled and boiled till

tender. The fleshs were mashed with the masher and their weight was calculated using the conventional procedure. The remaining ingredients like straw berry, maida, butter and sugar were purchased from local markets of Tirupati.



Fig:1 PURPLE YAM

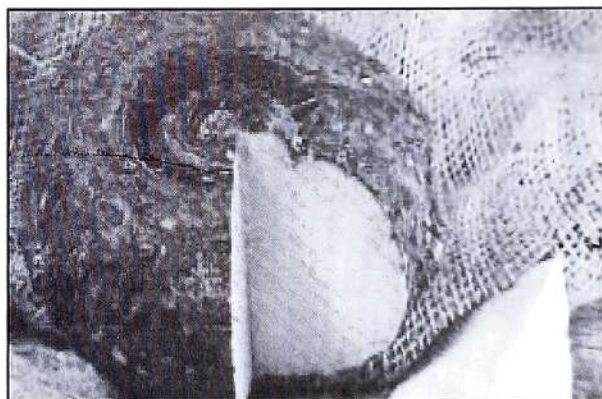


Fig:2 NORMAL YAM



Fig:3 STRAW BERRY



Fig:4 SUGAR POWDER

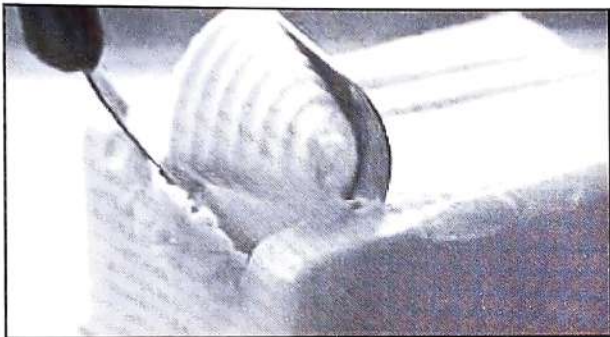


Fig:5 BUTTER



Fig:6 MAIDA

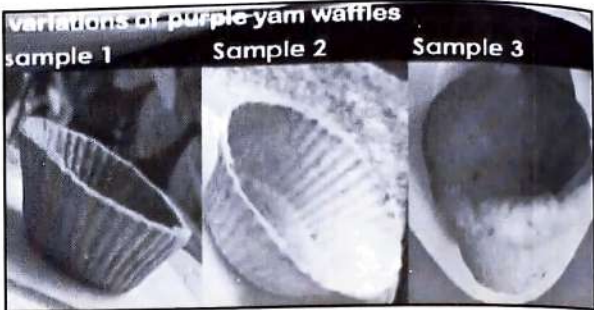


Fig:7 VARIATIONS OF EDIBLE WAFFLES
METHODS

Purple yam edible yam waffles processing and preparation:

The three main waffle recipes are listed in Table 1. The total mass of each formula is 100 g. Fine ingredients were selected for the development of product. The purple yam was peeled to separate the tuber meat and skin to lessen contamination. After being peeled and boiled for ten minutes, the purple yam was mashed into a paste. Then add maida, sugar, butter, baking soda, and yam flour in various ratios and prepare dough, shaping them into round soft balls and then into cups, transferring them into silicon moulds, adding weight to help them maintain their shape, and baking them for fifteen minutes at 150 degrees Fahrenheit produced perfect waffles.

Table 1: Purple yam waffles formulation with three distinct versions

INGREDIENTS	TRIAL-1	TRIAL-2	TRIAL-3
PURPLE YAM	30 grams	50 grams	0
NORMAL YAM	0	0	50 grams
STRAWBERRY FLOUR	20 grams	0	0
SUGAR POWDER	25 grams	25 grams	25 grams
MAIDA	20 grams	20 grams	20 grams
BAKING POWDER	5 grams	5 grams	5 grams
TOTAL	100 grams	100 grams	100 grams

Panel Judges' Sensory Evaluation of the Product:

Five-point hedonic measures were employed to assess acceptance. It is one of the tests that judges use to provide evaluation scores based on the ratings for the sensory attributes listed on the designated score card. They were given separate sheets with their feedback on the product's upgrades. The panelists used the given instructions to do a sensory evaluation of the product before to each session. Score cards were provided for each trial individually.

PACKAGING

The role of packing helps grab the audience's attention, its significance has increased. Packaging is one of those that marketers can use to make a customer more likely to buy a

product. Overuse of packaging is done for information transfer and convenience. Instructions on how to use, recycle, transport, or dispose of a package or product is provided on labels and packages. Careful packing was used to keep the product fresh for a while.

MARKETING

The waffles are distinctive as is and accessible even in local markets. They also have a lengthy shelf life and are simple to transport. These waffles are cheap and a hit with most kids. Because purple yam, which has antioxidants and other nutrients, is used to make them, they are also very nutrient-dense. Consequently, there would be a significant market demand for these waffles.

FIG 8: FLOW CHART OF DEVELOPMENT AND STANDARDISATION OF PURPLE

YAM EDIBLE YAM WAFFLES

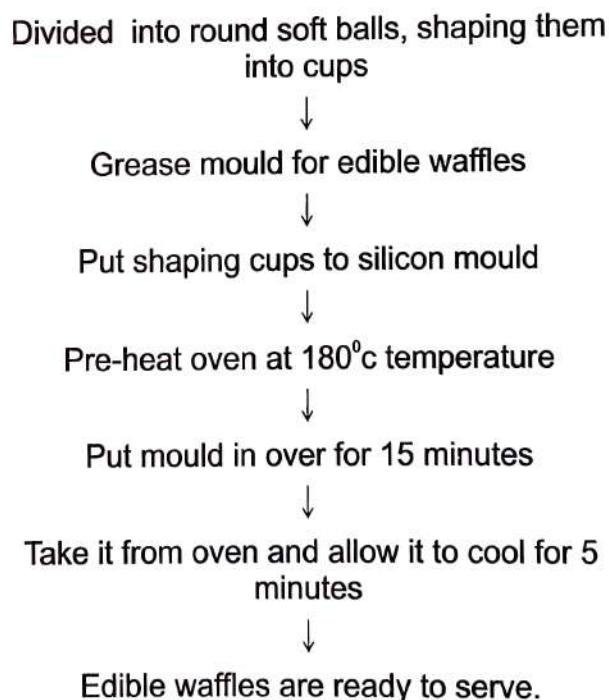
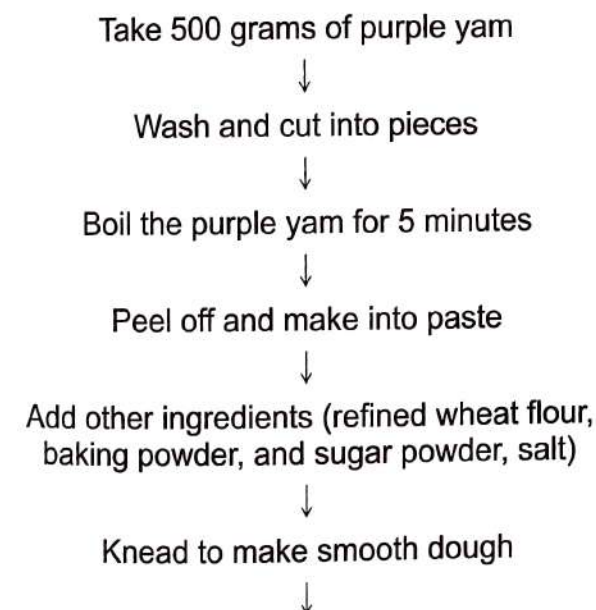


FIG 9: LABELLING OF PURPLE YAM EDIBLE WAFFLES



LABELLING : Following the packaging procedure, the product's specs were listed on the label. The cost estimation process often covers how the resources are used. There are three levels of costing studies, for example,

COST EVALUATION:

Obtaining assets for usage within a single agency. Distinguishing the costs of distinct

arbitrations between two or more activities. More comprehensive analysis of the full social cost implications of various arbitrations.

Cost aspects of purple yam edible waffle:

Weight of 1 purple yam edible waffle = 10 grams

1 kg of purple yam dough produces 100 edible waffles

Table 2 : Cost of making purple yam edible waffle

	INGREDIENT	Quantity in grams	Cost
A	Raw material		
	Purple yam	300	Rs.60/-
	Strawberry powder	200	Rs.275/-
	Sugar powder	250	Rs. 10/-
	Maida	200	Rs. 15/-
	Baking powder	50	Rs.15/-
	Total	1000	Rs. 375/-
B	Equipment		Rs. 100/-
C	Labour charges		Rs. 100/-
D	Miscellaneous		Rs. 10/-
	A+B+C+D		Rs. 585/-

The data in Table 2 shows the cost of 100 purple yam edible waffles which included

cost of raw ingredients, equipment, labor and miscellaneous. Thus, the cost of 1 edible waffle is Rs.5.8 per waffle.

RESULTS AND DISCUSSION

TABLE 3 : NUTRIENT COMPOSITION OF PURPLE YAM EDIBLE WAFFLES

Ingredients	QUANTITY gm	Protein gm.	CALCIUM mg	PHOSPHOROUS mg	β - CAROTENE mg	Total Phenols mg	Anthocy Anins mg
VARIATION1	75	11.46gm	36.44mg	93.3mg	0.2mg	36	31.82
VARIATION2	75	3.66gm	34.44mg	64.3mg	0.2mg	31	31.5
VARIATION3	70	2.85gm	12.54mg	35.93mg	09.3mg	13	6.8

The results presented in Table 3 showed that the protein content of variation-1 (11.46g) is higher than that of the variation 2 and 3. It was observed that calcium content was high in variation - 1 (332.44mg) followed by variation - 2 and 3 respectively. However, the β -carotene, and Anthocyanins content of the waffles are not producing a noticeable changes. Total Phenols content is also rich in variation -1 compared to other variations (2 and 3). The results of the phenol content in the formulated waffle showed that the baking temperature treatment had no effect on the phenol content, while the addition of purple yam had an effect on the phenol content. The total phenol content of plain bread further increased with the addition of yam. Studies of [Tamaroh *et.al* 2017] showed the total phenol content in purple yam flour (454.67 mg GAE/100g db). In a previous study, [Hong and Koh 2016] stated that the baking processing method has no effect on the total phenolic content of purple yam.

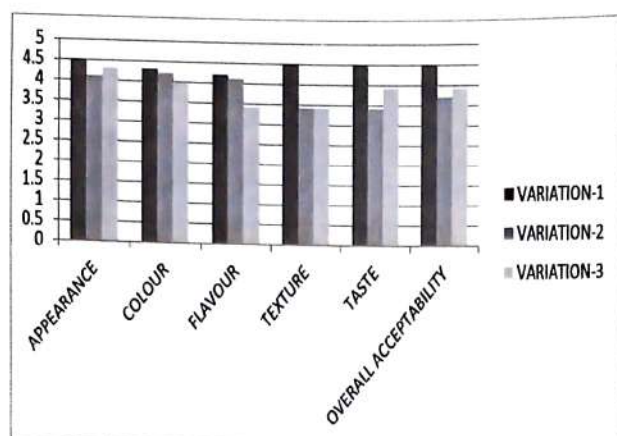
The formulation has been standardized by repeating lab trials and examining the organoleptic qualities with semi-trained panel members. Variation -1 is the final product recommended by the panel members.

Table 4 shows the acceptance values for the organoleptic evaluations and mean scores for the production of edible waffles and display the average score for each aspect of the product.

There are various stages involved in new product development, the most important of which is the tasting panel stage. Various product attributes including as appearance, color, taste, flavor, and texture are staged in the tasting panel. Variation 1 has a better appearance, taste, color, flavor, texture, and general acceptability than the other varieties. The edible waffles with strawberry flavoring and purple yam have the right taste. It was stated that the flavor of strawberry with purple yam might be increased or decreased.

TABLE : 4 Sensory Evaluation of Edible Waffles

ATTRIBUTES	VARIATION 1	VARIATION 2	VARIATION 3
APPEARANCE	4.5 $\pm$ 0.52	4.1 $\pm$ 0.56	4.3 $\pm$ 0.48
COLOUR	4.3 $\pm$ 0.48	4.2 $\pm$ 0.42	4.0 $\pm$ 0.66
FLAVOUR	4.2 $\pm$ 0.42	4.1 $\pm$ 0.56	3.4 $\pm$ 0.69
TEXTURE	4.5 $\pm$ 0.70	3.4 $\pm$ 0.69	3.4 $\pm$ 0.69
TASTE	4.5 $\pm$ 0.70	3.4 $\pm$ 0.96	3.9 $\pm$ 0.87
OVERALL ACCEPATABILITY	4.5 $\pm$ 0.52	3.9 $\pm$ 0.56	3.9 $\pm$ 0.56



Variation-1 offers the best colour, appearance, texture, taste, and general acceptance of the three versions. The panel members who sampled the three variations appreciated and rated variation 1 as the best of the three variations. Additionally, variant 1 had the highest nutrient composition, particularly in nutrients such as calcium, phosphorus, and protein.

Purple yam is gaining popularity as a nutritious and functional ingredient in food products. This promotes the creation of new branded healthy and functional foods. The anthocyanin content in this entices food technologists to fully investigate its capabilities in the commercial food processing sector. Today, a large section of the population suffers from blood circulation, digestion, cough, ulcers, and other ailments.

As a result, there is a necessity to cure the patients using natural methods. It has skin and hair advantages in addition to being a fantastic anthocyanin-containing meal.

Microbial analysis of developed edible waffles:

Microbial estimation of product may provide information concerning the quality of the food Material. The sanitary conditions under which the product was processed and effectiveness of the method of preservation. Estimation of the total number of organisms in ingredients involves basically the same procedure.

The waffles are packed and sealed in aluminum foil and packed in sealed plastic bag. The product was drawn for analysis at 15 days; 30 days and 90 days. The samples were analyzed for yeast and mould, total plate count. (Aneja, 2005).

The serial dilution is a common technique used in immunologic procedures. A small amount of serum or solute can be serially diluted by transferring aliquots to dilute. One of the most common serial doubles the dilution factor with each transfer (1:2, 1:4, 1:8,). These dilutions can be done in microtiter plates or test tubes depending on the volume of the sample and diluents used. (Booth 2006)...

Table 5 : Microbial analysis of edible waffle at different storage periods.

Test parameter	15 th day	30 th day	90 th day	Test method
Total plate count	Nil	Nil	1.3×10 ³ CFU/g	Is 5402:2012 (RA:2018)
Total yeast and mould count	Nil	Nil	<1 CFU/g	ISO 4883:2003 IS 5403:1999 (RA:2005)

As these waffles are made from purple yam, Maida, microbial analysis was done to know the Microbial count of purple yam edible waffles. In this Microbial analysis test was done according to parameters, the samples are kept in incubator for 24 hours. Data in table no.5 Shows the total plate count and the yeast and mould count were performed for edible waffle of regular interval of 15th day of period up to 90th day of storage period. The total plate count was nil at initial day to 30th day, Microbial count observed in 90th day. The results of shelf life studies showed that purple yam edible waffle doesn't have any microbial contamination & it is considered safe to use. The products are stored for 6 months without any microbial spoilage at room temperature if stored carefully without any contamination or rodent contamination. The present study results are on par with the study results of Gerald et.al (2018), who stated that the microbial action in biodegradable and non-biodegradable and concluded that the microbial range in biodegradable products were 63 to 110 cfu per gram. When compared to the above study, the developed edible waffles had an acceptable level of microbial count.

CONCLUSION

The study discovered that purple yam, yam, and strawberry flavours are employed to make palatable waffles. The edible waffles had an adequate amount of antioxidants, vitamins, and minerals and were appropriate for feeding children of all ages. The production process is cost-effective and simple to use on a small and big industrial scale. Sensory, packing, and storage tests show that the purple yam-based product has

a high overall acceptance. Because of the presence of many substances in it, edible waffles are beneficial to persons suffering from osteoporosis, skin and hair problems, and also to enhance gut health and digestion.

REFERENCES

- Fang Z, Wu D, Yu D, Ye X, Liu D and Chen J. (2011) Food Chemistry Vol. 128, P 943-948
- Gerald, Johnson, (2018), "The journal of Biodegradable products with shelf life study", 52-53.
- Hong K. H. and Koh E., (2016) "Effects of cooking methods on anthocyanins and total phenolics in purple-fleshed sweet potato," Journal of Food Processing and Preservation, vol. 40, no. 5, pp. 1054-1063. View at: Publisher Site | Google Scholar
- Indrastuti E, Harijono dan Susilo B (2012) journal Technology, pertain Vol. 13 P.169-176
- Krisnawati. (2009). Homemade Food : Olahan ubi untuk bayi dan Balita. Gramedia. Jakarta .
- Tamaroh . S, Raharjo .S, Murdiati .A, and Anggrahini .S , Pengaruh (2017) " Perlakuan blanching pada total antosianin, total fenolik dan aktivitas antioksidan pada pembuatan tepung uwi ungu (*Dioscorea alata* L) ", National Seminar Proceedings PATPI, Lampung, pp.26-38.
- Tejasari S, Hartanti, Herlina BH, Purnomo (2001). Laporan penelitian kajian tepung umbi-umbian local bahan pangan olahan Jember University p. 121