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DEVELOPMENT AND ANALYSIS OF NUTRI-DIP FROM BAMBOOSA VULGARIS & SESAMUM INDICUM

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Abstract: The study of Nutri-dip development was carried out at the Parul Institute of Applied Sciences, Parul University, Vadodara. Bamboos are the fast-growing evergreen species belonging to the Kingdom - Plantae, Family - Poaceae and Subfamily - Bambusoideae. There are about 100 species of bamboo which are edible and consumed most probably in North-Eastern states of India and in other Asian countries like Nepal, Japan, etc. This research highlights on the Bamboosa vulgaris species as a food resource. The main objective of study was to develop lactose free nutri-dip which will furnish body with ample number of proteins and energy. Flavoured nutri-dip was prepared using tender bamboo shoots, tahini (sesame seed paste), corn, virgin coconut oil, onion and garlic powder, black pepper powder, and turmeric. Pre-treatment of roasting and grinding was given to sesame seeds; the shoots were dried in tray dryer to make fine powder prior to prepare the nutri-dip. The physicochemical parameters, microbiological and sensory properties of the Nutri-dip formulation were evaluated. The formulated Nutri-dip was observed to have 77.6% Moisture, 3.4g Protein, 9.2g Carbohydrate, 7.9g Fat, 1.90% Ash, and provides up to 121.5K/Cal of energy. The results show that Nutri-dip is very well received and nutritionally superior because it is a good source of calories and protein.

Keywords: **Poaceae, Bambusoideae, nutri-dip, tahini, virgin coconut oil**

I. INTRODUCTION

A dip is a creamy, chunky, or sauce mixture of complementary ingredients into which we can dip finger foods like chips and crackers. Dips have various consistencies, from fresh, chunky options like salsa to creamy textures like guacamole. A dip or dipping sauce is a typical condiment for many different kinds of food. Dips add taste to a variety of foods, including pita bread, dumplings, crackers, diced fresh fruits and vegetables, fish, meat and cheese cubes, potato chips, tortilla chips, falafel, and occasionally even entire sandwiches. Typically, a dip is served with the main dish as a supplementary dish. It frequently serves as an adornment, mostly adding extra flavor and texture to the food we eat. The dips are sufficiently thick to cover food. However, the way they're created can always affect their textures. They can occasionally be runny, frequently be thick, or even have a consistency that falls between the two.

The use of young bamboo shoots as food, which can be eaten fresh, fermented, or canned, is a lesser-known characteristic of bamboos. The young shoots are not only tasty but also packed with nutrients, particularly proteins, carbs, minerals, and fibre, while being low in fat and sugar. They also have a lot of phytosterols and fibre, which make them nutraceuticals or natural medicines that are catching the interest of both scientists and health advocates. According to recent studies, bamboo shoots can improve appetite and digestion, help people lose weight, and even treat cancer and cardiovascular illnesses. According to reports, the shoots have antiviral, antibacterial, and anticancer properties. Shoots have antioxidant capacity due to the presence of phenolic compounds (Nirmala

Chongtham, Madho Singh Bisht, Sheena Haorongbam) Bamboo shoot forms a traditional delicacy in many countries. Bamboo shoots are consumed in raw, canned, cooked, marinated, fermented, frozen, liquid, and medicinal forms because they are low in fat and high in potassium, carbohydrate, dietary fibre, vitamins, and active ingredients. The young shoots of species like *Dendraocalamus giganteus* can be processed into a variety of food products with longer shelf lives and superior organoleptic properties, making them more palatable even if the fresh bamboo shoots are healthier and nutritionally dense. However, the consumption pattern of bamboo shoots in most of the countries is traditional, non-standardized, seasonal and region-specific with little value addition (Debangana Choudhury, Jatindra K. Sahu).

Bamboo shoots include a variety of macronutrients, such as protein, carbohydrates, fat, and fibre, and the amount of each varies depending on how they are processed. All the species have been reported to contain huge amount of moisture ranging from 54% in *Bambusa arundiancea* to 94.7% in *B. nutans* in the raw state. The canned shoots of *D. giganteus* species were found to contain as high as 95.16% moisture (Nirmala et al., 2008) while the dried shoot powder contained as low as 11.6% moisture (Rajyalakshmi and Geervani, 1994). Each 100 g of bamboo stalk contains 14 to 27 Kcal depending on the species. The protein content of bamboo shoots of various species from different origin, ranging from 1.8% to 25.8% (dry weight basis). Investigation by Kumbhare and Bhargava (2007) on *B. nutans, B. vulgaris, D. strictus, and D. asper* species of shoots reported values that ranged from 19.2% to 25.8% (dry weight basis). The carbohydrate content ranges from 2.0% to 9.94% in the raw form of bamboo shoots. Kumbhare and Bhargava (2007) state that the amount of carbohydrates in *B. nutans, B. vulgaris, D. strictus, and D. asper* was 3.3%, 3.4%, 2.6%, and 2.9%, respectively. Bamboo shoots are renowned for having little fat. The fat content ranged from 0.3% to 3.97% in the fresh shoots, highest being in *B. tulda*. Canned shoots were reported to contain the lowest content of crude fat, i.e., 0.25%, as compared to the raw shoots of different species. The study revealed higher crude fiber content ranging from 23.1% to 35.5% in different species of shoots. According to studies conducted by a number of academics, bamboo shoots are filled with some of the vitamins and minerals that the human body needs in trace amounts in addition to macronutrients. (Poonam Singhal, Lalit M. Bal, Santosh Satya, P. Sudhakar, February 2013)

Besides fruits and cereals, vegetables are important part of the diet and also serve as one of the main sources of Dietary Fibres. Bamboo shoots are one of them that are frequently utilised in China and many other Asian nations, including India (North East areas) (Thakur et al., 2016), and are regarded as a highly tasty delicacy as well as a healthy and nutritious diet (Thomas et al., 2016).

Due to their high protein, amino acid, carbohydrate, and vitamin content, bamboo shoots have a tremendous potential for usage as a vital health food. A significant amount of thiamine, niacin, vitamin A, vitamin B6, and vitamin E are present in newly harvested bamboo shoots. Furthermore, bamboo shoot-based diets are a popular pick among natural health foods due to their being a good source of dietary fibre, phytosterols, and cholesterol-lowering compounds. Dietary fibre has a multitude of health gains, including lowering blood pressure, protect health and hypertension, limiting cardiovascular disorders, and shielding the body from harmful carcinogens.

II. MATERIALS AND METHODS

The present study entitled "Development and analysis of Flavoured Nutri-dip from *Bamboosa vulgaris* and *Sesamum indicum*" was carried out in the Department of Food Technology, Parul Institute of Applied Sciences, Parul University, Vadodara. The materials utilised are listed in this part, along with a description of the processing methods, organoleptic testing, and analytical procedures employed in the study.

2.1 Materials

2.1.1. Raw materials used in study

The components utilized to make nutri-dip include bamboo shoot powder, sesame seed powder, corn paste, virgin coconut oil, onion and ginger powder, black pepper powder, turmeric and salt.

2.1.2 Chemicals and Glassware's

The Food Analysis and Food Processing Lab, Department of Food Technology, Parul Institute of Applied Sciences, Parul University, Vadodara, has enough glassware and chemicals for analytical grade.

2.1.3 Processing Equipment

Equipment required for the preparation of nutri-dip are: Weighing balance, heating medium, grinder, measuring cups and other utensils were obtained from Food Processing Lab, Department of Food Technology, Parul Institute of Applied Sciences, Parul University, Vadodara.

2.2 Methods

2.2.1 Physio-chemical Analysis

Bamboo shoot powder, roasted sesame powder, corn, virgin coconut oil, onion and garlic powder, black pepper powder, turmeric powder and salt were used to prepare nutri-dip and were analysed for proximate composition including moisture, ash, protein, fat, carbohydrate, and calories content as per the standard procedure given by (AOAC 2005).

2.2.1.1 Moisture content.

After thoroughly drying the empty dish, 5g of the sample was weighed and ground in the dish to determine its moisture content. The dish was then placed in an oven to dry for 4 hours at 105^0C. It was again weighed after cooling in desiccator until constant weight. Moisture content was estimated from the weight loss that resulted.

Moisture % = Initial weight (W1)-final weight(W2) / Initial weight (W1) × 100

2.2.1.2 Ash content

Ash content was determined using (AOAC 2005) procedure. 5g of sample was weighed into pre-weighed crucible and it was heated at low flame till all the material was completely charred (smokeless) and cooled. The sample was then kept in the muffle furnace for about 4hrs, at 550^0C. It was again cooled in desiccator and weighed. The procedure was repeated until two consecutive weights were constant. The percent ash was calculated by knowing the difference between the initial and final weight.

Ash %=Weight before heating – Weight after heating/ weight of sample × 100

2.2.1.3 Determination of Protein content:

Protein content was determined by Micro-Kjeldhal method.

- **Digestion:** 200mg of defatted ground sample was accurately weighed and a pinch of catalyst mixture K2So4:CuSo4:HgO red (91:8.2:0.8g) was added and then it was transferred to the digestion flask, digestion was carried out with 5ml of concentrated H2So4 for 2-3hrs at 45^0C till the content becomes colourless.

- **Neutralization and Distillation:** Digested sample was diluted to the 50ml in volumetric flask and made final volume to 50ml with distilled water. Then the 5ml of aliquot was neutralized with 30% HCL and 40% of NaOH containing 5g of sodium thiosulphate. Distillation was carried and liberated ammonia was absorbed in 2% boric acid solution containing methyl red as indicator.

- **Titration: The ammonia that had been collected was tested against 0.01N H2SO4**. Titer reading was noted, Nitrogen was calculated by using following formula and % protein was calculated by multiplying 6.25. Simultaneously a blank sample was also run.

Crude Protein % = (Sample titre – Blank titre) × 0.0014 × 6.25 / Sample weight × 100

2.2.1.4 Crude Fat:

The fat analysis of nutri-dip was done using Soxhlet. A sample of 5g was measured and taken in a thimble. The extraction cups were weighed after being dried in an oven at 130^0C for 15 minutes. The extraction cups were cooled and 70ml of petroleum ether was added. The apparatus was preheated, and once the desired temperature was reached, the extraction cups were fastened to the apparatus and set to boil for 30 minutes, rise for 20 minutes, and then recover solvent for 10 minutes. The recovered ether was collected and fat contained in extraction cups were estimated.

Fat = (W2 – W1) / W × 100

2.2.1.5. Determination of Carbohydrates:

The carbohydrate content was calculated by deducting the sum of the value of moisture, fat, protein, total ash, and crude fiber. The NFE was calculated by the following formula

NFE % = 100 – (CP% + CF% + CF% + TOTAL ASH%)

CP = crude protein, CF= crude fat, CF= crude fiber

2.3 Microbial Parameter

In food products quality analysis, microbial examination is the perfect quality assessment protocol performed. The microbial quality of prepared cereal bar was determined. In the present study different microbial parameters such as Total Plate Count, Yeast and Mould were examined also the samples were examined during the storage at ambient temperature. Microbial tests were performed using the APHA's recommended procedures (1992).

A. Determination of total plate count.

- Preparation of nutrient agar medium: 28g of nutrient agar was added in 1000ml of distilled water and it was heated till it dissolved properly. Its mouth was plugged with cotton and it was sterilized in an autoclave for 20min at 120^0C and 15lbs pressure.
- Preparation of sample solution (serial dilution): Nine sterilized test tubes were taken and numbered. In each tube 9ml of distilled water was poured. The test tubes were plugged with cotton plugs and were sterilized in an autoclave at 121^0C for 15min with 15lbs pressure. A sterile test tube containing 9ml of distilled water received 1ml of material serially.
- Preparation of plates: Petri plates and pipettes were sterilized by hot air oven (dry heat treatment) or by autoclave (moist heat treatment). Sterilized petri dishes were taken to the laminar airflow cabinet and ultraviolet light was switched on for 30min. After 30min UV light was switched off and then blower was switched on, and the working surface was cleaned by 70% alcohol. Plates were properly marked then 1ml of samples were poured into the plates. Each plate received 15–20 ml of molten medium. This was done near a flame to prevent contamination of the plate by microbes. The plates were firmly swirled and kept for solidification. The plates were then placed into the incubator for 48hrs at 37^0C and then observed for the colonies on the plates.

B. Determination of Yeast and Mould count

- Preparation of potato dextrose agar medium: 39g of Potato dextrose agar medium was added in 1000ml of distilled water and it was heated to dissolve properly. Using cotton plug the mouth was plugged and it was sterilized in an autoclave at 121^0C for 15min with 15lbs pressure.
- Preparation of sample solution (serial dilution): 9 sterilized test tube were taken and numbered accordingly. 9ml distilled water was poured in each tube. The test tubes were closed with cotton plugs and were sterilized inn an autoclave at 121^0C for 15min with 15lbs pressure. 1ml of sample was added in 9ml distilled water of sterile test tube serially.
- Preparation of plates: Petri plates and pipettes were sterilized in hot air oven (dry heat treatment) or by autoclave (moist heat treatment). Sterilized petri dishes were taken to laminar air flow cabinet and ultraviolet light was switched on for 30min. After 30min UV light was switched off and then blower was switched on, and the working surface was cleaned by 70% alcohol. Plates were properly marked and then 1ml of samples were poured into the plates. Molten medium (15–20 ml) was poured into each plate. To avoid microbial contamination of the plate, this was done close to a flame. The plates were firmly swirled and kept for solidification. Then the plates were kept into the incubator for 48hrs at 37^0C and the colonies were observed on the plates. The former colonies were counted on the plate.

2.4. Preparation of Nutri-dip

Table 1: Formation of Nutri-dip

Constituents	**CS**	**S1**	**S2**
Bamboo shoot powder (g)	-	35	52.5
Roasted sesame seed powder (g)	25	35	17.5
Corn paste (g)	65	20	20

Virgin coconut oil (ml)	5	5	5
Onion and garlic powder (g)	2.5	2.5	2.5
Black pepper powder (g)	2.5	2.5	2.5
Turmeric	Accordingly,		
Salt	Accordingly,		

35g of bamboo shoot powder, 35g of toasted sesame seed powder, 20g of maize, 5ml of virgin coconut oil, 2.5g of onion and garlic powder, 2.5g of black pepper powder, salt, and turmeric make up the various ingredients used in the standardised formula for making the Nutri-dip. These ingredients were used to make a 100g sample. Bamboo shoots that were still raw were dried in a tray dryer at 85^0C for 3-5 hours before being ground into powder. On a pan, sesame seeds were roasted before being ground into a fine powder. The flawless, smooth texture of the dip is provided by the boiling corn paste. The corn paste was well combined including other raw ingredients in a mixer grinder for around 2-3 minutes after which it was given a boil for 3–4 minutes before cooling. The obtained dip was put into a glass jar and kept in the refrigerator for a longer shelf life.

III. RESULT AND DISCUSSION

The result obtained during investigation "Development and analysis of nutri-dip from *bamboosa vulgaris* and *sesamum indicum*" is discussed here. In all of the chosen formulas, boiled corn paste served as the foundation for the dip. The final product was analysed for Physico-chemical analysis, microbial analysis, sensory evaluation and stored in refrigerator. Research experiments undertaken to standardized the method for manufacturing of Nutri-dip have been discussed under heading follows

3.1 Proximate composition of Nutri-dip

Three distinct nutri-dip formulations — control sample, sample 1, and sample 2—were developed. Hero component, or powdered bamboo shoots, was eliminated from the control sample for reference purpose. Bamboo shoot powder and sesame seed powder were combined in sample 1 in a 1:1 ratio, whilst they were combined in sample 2 in a 4:1 ratio. Sample 1 was particularly appreciated based on proximal analysis and sensory analysis. The excellent formulation was achieved with a 1:1 ratio of sesame seed powder to bamboo shoot powder, whereas a 4:1 ratio resulted in a product with an objectionable colour and a powerful shoot scent.

3.2. Microbial analysis of Nutri-dip

- **Total plate count (TPC) of Nutri-dip:**

The total plate count recorded in nutri-dip is 21,800 cfu/g i.e., 4.3385 Log_{10} cfu/g.

- **Total yeast and mould count of Nutri-dip:**

The total yeast and mould count observed in nutri-dip is 15 cfu/g i.e., 1.1761 Log_{10} cfu/g.

- ***Escherichia -coli* detection in Nutri-dip:**

The nutri-dip test results demonstrate 0% *E. coli*.

3.3 Sensory evaluation of Nutri-dip

Table 2: Sensory evaluation of produced Nutri-dip

Sr. No.	Sample code	Appearance	Colour	Texture	Taste	Overall acceptability

1	CS: Control sample	8	8	7	7	7.5
2	S1: Sample 1	9	9	8	9	9
3	S2: Sample 2	7	6	6	7	6.5

The flavour, texture, and taste of Nutri-dip all had a substantial impact on its quality. Because of a variance in the concentration of the raw components, Nutri-dip's flavor and colour underwent considerable fluctuations. The control sample formulation of nutri-dip received 8 hedonic ratings on the basis of appearance, 8 hedonic ratings on the basis of colour, 7 hedonic ratings on the basis of texture, 7 hedonic ratings on the basis of taste, and 7.5 hedonic ratings on the basis of overall acceptability, indicating that the control sample is liked very much. The sample 1 formulation of nutri-dip received 9 hedonic ratings on the basis of appearance, 9 hedonic ratings on the basis of colour, 8 hedonic ratings on the basis of texture, 9 hedonic ratings on the basis of taste, and 9 hedonic ratings on the basis of overall acceptability, implying that the sample 1 is liked extremely. The nutri-dip sample 2 composition received 7 hedonic ratings for appearance, 6 hedonic ratings for colour, 6 hedonic ratings for texture, 8 hedonic ratings for taste, and 7 hedonic ratings for overall acceptability, demonstrating that the sample 2 is liked slightly. Sample 1 was rated as liked extremely because of its acceptable appearance, consistent taste, stable texture, eye appealing colour and overall acceptability. Consequently, nutri-dip with S1 formulation was selected as the best nutri-dip.

IV. CONCLUSION

From the aforementioned findings, it can be postulated that S1 formulation contains 77.6% moisture, 1.90% total ash, 7.9g fat, 3.4g protein, 9g carbohydrates, and 121.5 kcal of energy out of all the formulations containing different concentrations of bamboo shoot powder, sesame seed powder, and corn paste. Prior to developing nutri-dip, the goal was to produce a sweetened nutri-spread, but due to the intense odour of bamboo shoots, the final product failed to pass approval in all sensory tests. Thereafter, while preparing dip and working on shoots, the powder made from dried bamboo shoots had no scent and made nutri-dip taste excellent. People who are lactose intolerant cannot ingest the market-available dips as they are prepared with sour cream, cheese, or mayonnaise as a core. The prepared dip is completely lactose-free and ideal for consumption by individuals who are lactose sensitive because it doesn't contain no milk or dairy ingredients. The prepared dip can be used to make salads and enjoyed with baked chips to add a nutritious touch to a person's diet. The market-available dips, such as Dr. Oetker Fun foods dips, Veeba cheese and jalapeno dips, and Doritos dipping sauce, have a protein level of 2 to 2.9g per 100g and a fat content of 18 to 46g/100g. In comparison with dips available in market, nutri-dip offers 3.4g of protein and 7.9g of fat per 100g, demonstrating that it is a healthier option than other dips on the market. The components for Nutri-dip preparation were deliberately selected with the goal of offering adequate protein and energy.

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