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RESEARCH ARTICLE

ORGANOLE PTICAPPRAISAL AND STANDARDIZATION OF RECIPE FOR NUTRACEUTICAL DARK CHOCOLATE BAR WITH ADDED MORING A AND QUINOA

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ABSTRACT

The purpose of this research project is to develop a nutraceutical chocolate based confectionary product which will provide benefits other than that of traditional chocolate. We felt like there is a need to produce some innovative confection other than traditional chocolates. The nutraceutical chocolate bar which we have manufactured is more nutritious and healthy due to its rare ingredients which also makes it a unique nutraceutical chocolate bar. The raw materials required for the preparation of this bar like moringa and quinoa along with fruits like kiwi, pineapple, apricots and nuts like almonds, cashew nuts, peanuts and desiccated coconut are procured from Jalgaon district. For the standardization of formulation, 4 test samples were prepared of different proportions of raw materials, among which the T4 was selected by sensory panelist based on organoleptic evaluation. The bar is further packed into the aluminum foil wrappers. The approximate nutritional values obtained by analysis are particularly as, Protein 5.19 gm, Fat 29.15 gm, Carbohydrate 37.28 gm Fiber 22.8 gm. The storage conditions are studied at variable temperature conditions and recommended to be as below 20^0C in cool, dark and dry place. The well packed bars were studies for the duration of 3 month to determine its shelf life.

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INTRODUCTION

Chocolates are typically sweet, usually brown, food preparation of Theobrama cacao seeds roasted and ground often flavored as with vanilla. Dark chocolate is also called as black chocolate is produced by adding fat and sugar to cocoa (*K. Haritha 2014*). Developing a nutraceutical or functional food is becoming mandatory as looking at the current nutritional status of population over world. The nutraceutical foods are proven to cause several health benefits to the people. Hence the basic aim behind developing the nutraceutical chocolate bar was to fulfill the nutritional demands and provide some additional benefits to people. This chocolate bar is a confectionary product which has nutraceutical benefits. This product mainly contains two unique ingredients that are, Drumstick (*Morings oleifera*) which has most qualities to call it as a Superfood" and Quinoa (*Chenopodium quinoa*) which is referred to as "Mother of all grains" This product also contains some fruits and nuts to make it taste delicious as well as nutritionally sound. The formulation of such chocolate bar containing bioactive components was relatively easy as it contains some miracle causing ingredients like moringa which has plenty of health benefits along with a grain like quinoa consisting of a wide amino acid profile and some fruits, nuts. Blending these ingredients caused a major change in overall nutritional profile of traditional chocolate and made it functional in several aspects. Hence such chocolate provides consumers something more than just the chocolate gives. Usually products and food preparation of scientifically proven beneficial effects on the human body are referred to as functional foods. Their action is to improve the health and well-being, as well as reducing the risk of disease, especially the civilization once. (*Wanda Rogavaska 2015*) Throughout history, chocolate has been used to trail a wide variety of ailments and in recent years, multiple studies have found that chocolate can have positive health effects providing evidence to a centuries- long established use (*Donatella Lippi*).

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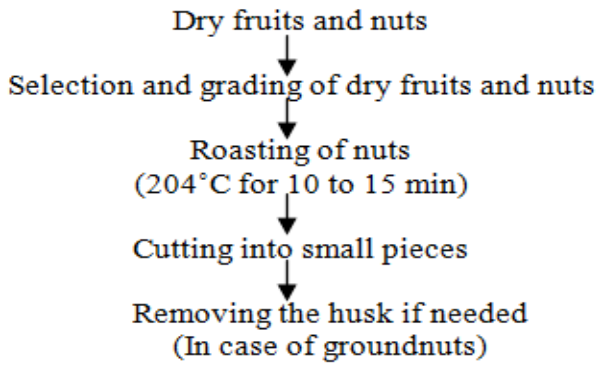
MATERIALS AND METHODS

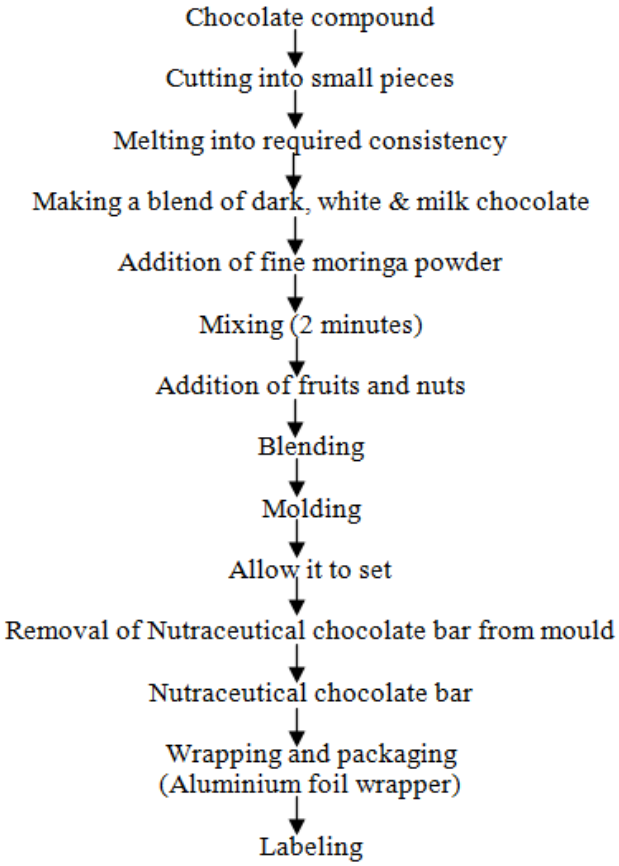
Procedure and flowchart

Select the clean, dry, dust free dry fruits and nuts. Sort and grade them on the basis of size, shape and other quality parameters.

Part 1- Preparation of Raw Material



Part 2. Preparation of Quimo bar



Flowchart: Procedure for preparing the nutraceutical chocolate bar

Selected nuts are roasted at around 204 ˚C. Cut the fruits and nuts into small pieces. For peanuts, the husk is removed after roasting. Take and measure specific quantity of chocolate compound. Chocolate compound is chopped into uniform pieces to ensure even melting. Melt the chocolate to obtain required consistency. The chocolate is melted using double boiler method. Stir the chocolate with spatula and blend white, dark and milk chocolate properly.

Now add moringa powder in previously prepared chocolate mixture. Add the chopped dry fruits and nuts into the blend. Mix all ingredients properly into the blend. The mixture is poured into the mould in specific quantity. Allow it to set for some time by keeping it in freezer. Remove the bar from mould after it gets solidified. The nutraceutical chocolate bar is ready for wrapping and packing.

Wrap the bar in aluminium foil chocolate wrapper. The prepared test samples were evaluated for their organoleptic characters by the sensory panel. On the organoleptic analysis the best test sample was selected as per the rating on hedonic scale for color, texture, flavor, and overall acceptability.

RESULT AND DISCUSSION

Standardization of Recipe: As per the sensory evaluation scores based on nine point hedonic scale, the T4 sample (77.25% major components for example- Dark, white and milk compound) and then 22.5% minor components.

The T1 got minimum score due to the bitter and unacceptable taste of moringa. The T2 and T3 were not liked by sensory panelist because it was over sweet and the color was less attractive as compared to T4 sample. Hence, due to the higher overall acceptability of the T4 sample it was further used for storage and shelf life study.

Sensory Analysis: The overall acceptability of the T4 was decreased from the initial score of 9 to 8.8 at the end of storage period of product, which is wrapped in aluminium foil and stored at temperature below 20˚C for the period of three months. This change occurred might be due to the very slight moisture attained by the sample. So, on average overall acceptability of T4 at the end of 3 month is 8.875

Chemical Analysis

Effect of Storage Period on Chocolate bar: The T4 was stored at variable temperature such as refrigeration temperature i.e., 1˚C to 4˚C, 10˚C, 20˚C, 30˚C for the duration of three months. The sample stored at 30˚C was observed to have visibly notable changes and it was unacceptable. Whereas, sample stored at 10˚C to 20˚C did not show any notable changes in any parameter. The sample stored at refrigeration temperature made it relatively hardened and also affected its results.

Moisture Content: The moisture of the product is the major factor affecting its shelf life. The moisture content of sample was determined by AOAC 20th Ed 2016; Chapter no.4, Method no. 934.01.The T4 was properly wrapped in aluminum foil wrapper and initially detected to have the moisture content of 3.79 % at 0 day. The sample was observed to have no changes at one month and two month. There was a slight change in the moisture content at about 4.05% which can be considered negligible. Humidity was a major factor affecting the moisture at the time of storage. Thus on the completion of three months of storage the final moisture was observed to be as 4.05%but it is still acceptable as it doesn't cause any other changes in the product.

Ash: Ash content resembles the total inorganic material which gradually decreases as the storage period of the food sample increases. The ash content was determined by AOAC 20th ED 2016; Chapter no.4, Method no. 942.05. The ash content was noted to be 1.79% on 0 day analysis. Then sample was analyze at the end of one month and second month, it is noted that there has been no change in ash content and in third month the ash content has slightly decreased to 1.67 % on storage.

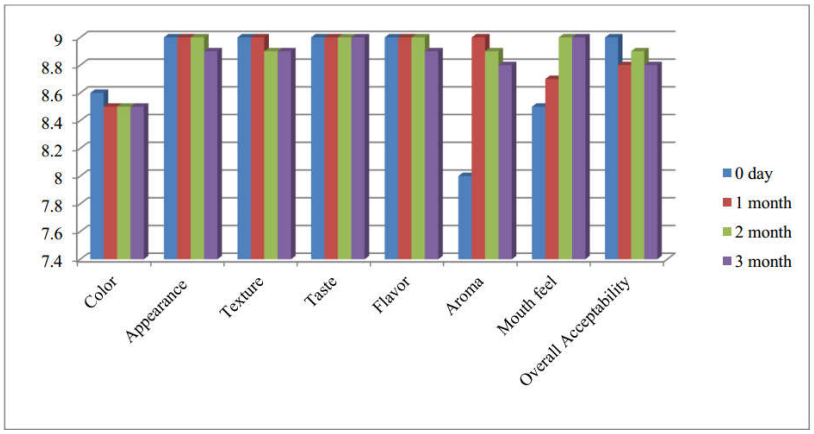


Table 1. Effect of Storage studies on Sensory Evaluation of Chocolate bar

Sr. No	Sensory attributes	0 day	1 month	2 month	3 month
1	Color	8.5	8.5	8.5	8
2	Appearance	9	9	9	9
3	Texture	9	9	8.9	8.9
4	Taste	9	9	9	9
5	Flavor	9	9	9	9
6	Aroma	8	9	8.9	8.8
7	Mouth feel	8.5	8.7	9	9
8	Overall acceptability	9	8.8	8.9	8.8

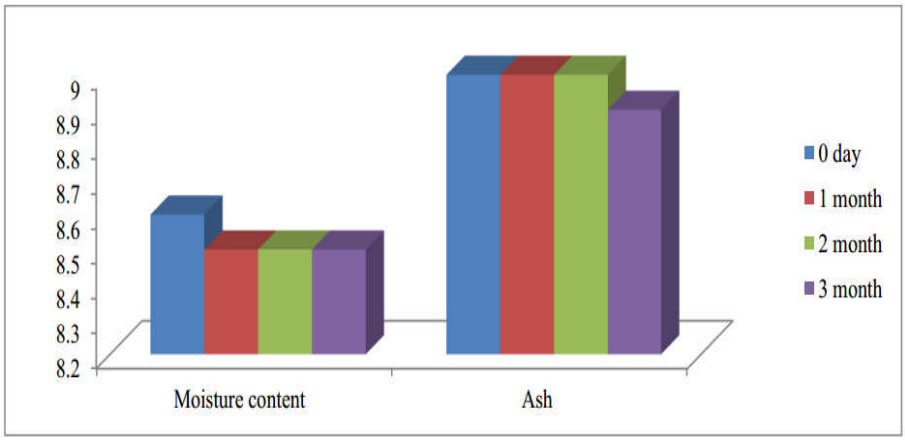


Fig. 2. Effect of Storage Period on Chocolate bar

Table 2. Effect of Storage Period on Chocolate bar

Sr. No.	Chemical Parameter	0 day	1 month	2 month	3 month
1	Moisture content	3.75%	No Change	No change	4.05%
2	Ash	1.79%	No Change	No Change	1.67%

*Each value was an average of four determinations

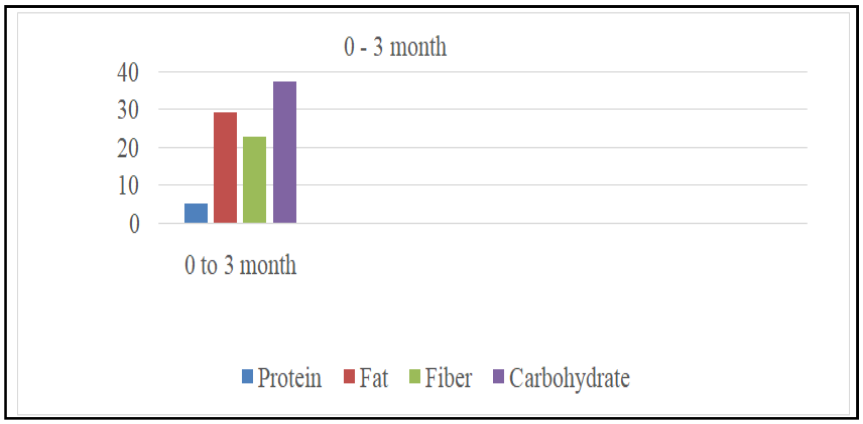


Fig. 3. Effect of storage studies on Chemical Analysis of Chocolate bar

Table 3. Effect of storage studies on Chemical Analysis of Chocolate bar

Sr.No	Chemical Parameter	0 to 3 month
1	Protein	5.1gm
2	Fat	29.15gm
3	Fiber	22.8gm
4	Carbohydrate	37.28gm

* Each value was an average of four determinations

Table 4. Effect of storage studies on Physical analysis of Chocolate bar

Sr. No	Physical Parameter	Result
1	Size	4×8cm
2	Shape	Rectangular shape
3	Hardness	27.6 $Kg.cm^{-2}$@20^0C
4	Texture	Cohesive ,Gummy, Chewy

* Each value was an average of four determinations.

Table 5. Effect of storage studies on Microbial analysis of Chocolate bar

Sr. No	Day/ month	Colonies	Colony count unit (CFU/mL)
1	0	07	0.7 x 10^2
2	1	12	1.2 x 10^2
3	2	14	1.4 x 10^2
4	3	18	1.8 x 10^2

* Each value was an average of four determinations.

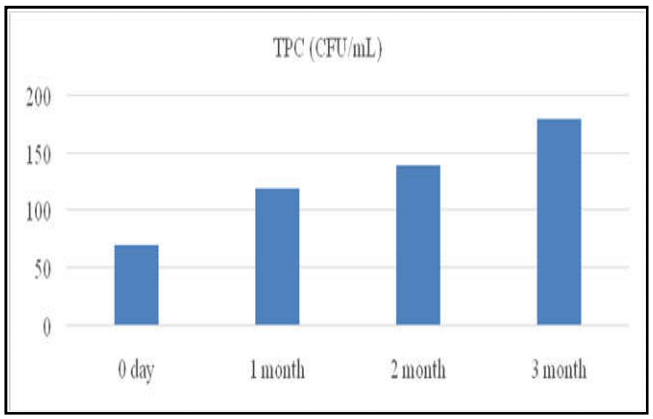


Fig. 4. Effect of storage studies on Microbial Analysis of Chocolate bar

Effect of Storage Studies on Nutritional Parameters: TheT4 was studied for proximate analysis at 0 day, 1 month, 2 month and 3 month.

Protein: The protein content in nutraceutical bar wrapped in aluminum foil is analyzed by AOAC 20th ED2016; Chapter no.4, Method no.954.01. The protein content was initially noted to be as 5.19 gm at 0 day. There were no specific changes observed in protein content at the end of second and third month. So it can be said that there is no effects on protein content at the end of third month and it's noted to be as 5.19 gm.

Fat: The monosaccharide fat is a major factor which can possibly contribute in saying that the product is either healthy or unhealthy. The T4 was analyzed by AOAC 20th ED 2016; Chapter no.4, Method no. 954.01 at 0 day and observed for the results which is 29.15 gm, whereas, there were no changes occurred in fat during the span of one month and second month. Finally at the end of third month the fat was observed to be 30.10 gm showing no changes.

Carbohydrate: The carbohydrate was determined by FAO, Chapter no. 2, and Method no. 2.3. As per 0 day analysis of T4, the carbohydrate was observed to be as 37.28 gm per 100 gm of sample. When the same sample was analyzed at one month, second month and third month, the observed value for carbohydrate was constant as before stating 37.28 gm.

Fiber: The fiber content was determined by AOAC 20th ED 2016; Chapter no.4, Method no. 978.10. The fiber content was initially observed to be as 22.8 grams. There were no several changes observed in fiber content of nutraceutical chocolate bar during the storage of second months in well packed condition. At the end of third month, the fiber content was constant as 22.8 gm. But there was no assurance that this would not change on extended storage than that of three months.

Physical analysis: The finalized sample which is T4 was tested for physical parameters like its size, shape, hardness and texture which are the major factors responsible for the acceptability of the product. Hence, the sample was studied at 0 day as considering the importance of physical factors. The size of bar is 4×8 cm and the bar is in rectangular shape. The texture shows gumminess, chewiness and cohesiveness.

Microbial analysis: Microbial safety of the food products is a major factor which may be responsible for causing some severe changes and effects in food products. Hence, the total plate count was studied by means of spread plate technique. The T4 sample was stored for three months and same sample was used throughout the microbial analysis.

As per the observations made on 0 day analysis, the colony count was 0.7×10^2 CFU/ mL while, looking towards the observations made on one month analysis the colony count was 1.2×10^2 CFU/ mL. Similarly, the observation for second and third month analysis are 1.4×10^2 CFU/ mL and 1.8×10^2 CFU/ mL respectively. Considering the microbial safety aspect of the chocolate bar, the results were under the recommended range and the product was microbially safe till the duration of three months.

Conclusion

From the research study that we have conducted on this nutraceutical dark chocolate bar infused with moringa and quinoa, we concluded that this product is a highly nutritious product containing some traces of higher bio active compounds which can potentially provide several health benefits and also maintains the overall health.

As per the storage study which was carried out for the duration of three months, the product did not show any objectionable changes and withstood at its best condition during overall shelf life study. This bar have gone through several analytical evaluations like sensory, chemical, physical and microbial in the duration of three months and on the basis of results, it is clear to say that, the product is absolutely safe for consumption till three months. The quality of the bar is not affected if it is well packed and stored under the recommended storage conditions as the result of this study.

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