African Journal of Food Science and Technology (ISSN: 2141-5455) Vol. 12(8) pp. 01-05, July, 2021
DOI: http:/dx.doi.org/10.14303//ajfst.2021.043
Available online @https://www.interesjournals.org/food-science-technology.html

Full Length Research Paper

Physio–chemical and technology evaluatation of carrot and Amla powder for thyroid patients

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Abstract

The main purpose of this research for treating the thyroid patients by the help of the combination of the carrot and amla. I choose this two combination because both are good in antioxidant it is also called they are rich in the antioxidant properties that can help to treating the thyroid patients. We also check the pH of the both carrot and amla that discrible that the carrot and amla are good for the health. We also used XRD for our food product to see there crystalliation sample. In this research about the presences of the micro-organisms that present in the food and that spoil the food. The purpose of this research is to see the present of the antioxidant in the carrot and amla is treating the thyroid disease by there present of the nutritive. The carrot and amla are using in the treating the thyroid patients. We also do the TSS of both carrot and amla.

Keywords: TSS, Ph, XRD, Thyroid, Carrot, Amla, Physiochemical properties.

INTRODUCTION

The thyroid is a butterfly-shaped endocrine gland located in the lower front of the neck below the larynx (voice box). The thyroid is make thyroid hormones, which secreted into the blood and carried the every tissues in the their body. Thyroid hormones help the body use energy, stay warm and keep the brain, heart, muscles and other organ is working as well as they should be doing. The main hormones made by the help of the thyroxine and they also called T4 because it contain 4 iodine atoms. Small amount of another and more potent thyroid hormones containing 3 iodine atoms, triiodothyronine also called T3 are also made by thyroid gland. However, most of the T3 in the blood made from T4, via the removal of an iodine atoms, in other body tissues. Thyroid hormones control the way every tissues in their body should uses the energy. They are essential help for each cell in the body tissues, and there organs work as a proper way. For example thyroid horomones control the body's temperature, heart rate, blood pressure and the rate at which food is turned into the energy i.e. metabolism.

Carrot(*Daucus carota)* is an important vegetable, which is having high nutritional value and utility, Carrot belong to the family Umbelli ferae, genus *Daucus* , species *carota*, and it is one of the important root crops cultivated throughout the world for its fleshy edible roots that in the winter season root vegetable grown extensively in various countries particularly durning winter season in the tropical regions. It finds a wide application in the day to day using for making carrot juice, powder, terminated carrot sweetmeat, soup etc (Gupta and Shukla). Carrot is known for the nutrient content viz., carotene and carotenoids, besides appreciable amount of vitamins B1, B2, B6 and B12 vitamins and minerals. Hence, carrot occupy an important place in root vegetables for their multifaceted application, which turn, results in the development of various processing operations for making different products and/or extend their shelf life.

Amla(*Emblica officinals)* and also known as Indian gooseberry. Amla is highly acidic and astringent in taste due to which they are unpalatable and unsuitable for direct consumption. The excellent nutritive value and therapeutic value of the amla fruit offers an untapped potential for processing into several quality products. Hence, they are consumed mainly in the processed forms (Gudapatey et al, 2010). Amla fruit is processed into murabbas, candy, dried chips, jelly, squash and syrups (Barwal et al., 2010).

MATERIALS AND METHODS

Tools: Dehydrator, solar dryer, hot air oven, Laminar air flow, incubator, centrifuge machine, fridge, oven, weighing machine, measuring cups, knife, whisker etc.

Technology: XRD.

Methods

The carrot and amla were selected for the absence of defects, washed with running water, and sanitized with sodium hydrochlorite solution for 15 minutes, and it drained. Then, peeled with manually with a knife were packed in low density polythene bags and subjected to drying and physiocochemical characterization.

Oven drying was a simplest method to dry food using moderate temperature, below 60℃, with no change in the functional properties and nutritional content of carrot and amla. After drying, the residue was ground in a food processor machine and sieve, resulting in carrot powder and amla powder.

Functional and physio- chemical analysis of both powder–Water activity

The water activity of powder was determined at the temperature of 30℃ using by resistive electrolytic hydrometers. The amount of the water was determined by subtracting the dry weight from the initial weight, and the moisture content was calculated as the amount of the water divided by the dry weight or the total weight.

Hydrogen ionic potential (ph):

The pH were measured by the using of an instrument that is called digital potentiometer calibrated with pH 4.0 and 7.0 buffer solution, by the direct immersion of the electrode into the beaker containing the sample with distilled water.

Total soluble solid (TSS)

The total soluble solid content were determined at 20℃ by reading of the degree Brix is a digital refractometer.

Water absorption index (WAI)

The WAI of the powder was determined according to adaptation. A suspension with 10mL of the water and 1 g powder was stirred by vortexing for 1 minute and then centrifuged at (1500 rpm\g for 30 minutes) in a centrifuge. The supernatant was drained and the remaining material was weighed. The difference between the sample weight before and after absorption represented the amount of absorbed water. The water absorption index was calculated according to

$$\text{Water absorption index} = \text{absorbed water (g)} \div s$$

Equation 1

XRD (X- Ray diffraction)

XRD was used to study the structure composition and physical properties of materials. The XRD analysis of the powder sample was done in the PAN alytical Xpert Pro XRD instrument.

In powder mode with the source being Cu-Kα radiation at 1.54$\mathring{0}$ A. The spectra were scanned at a diffraction angle (2θ) range of 5- 80 at a step size of 0.05°/ step and 2 sec/ step.

Evaluation of microbiological stability

The microbial stability of carrot and amla powder soup and soup sticks were evaluated attending to the specification of the international standard CODEX Alimentarius. The microbiological stability of the powder soup and soup sticks were evaluated in 12 hours, 24 hours, 72 hours by analysing the total viable *Aerobic mesophilic bacteria, Escherichia coli, Bacillus cereus, Yeast* and mould counts and also the verification of the presence of *Salmonella sp., Coliform* at 30℃ and 40℃, the maximum accepted levels followed the regulation of the food micro-biological standards. This legislation establishes microbiological standards, based on the CODEX Alimentarius separated by the category; the categories considered were carrot and amla product, baking product.

RESULT AND DISCUSSION

XRD (X- Ray diffraction analysis)

The present study of XRD is a great importance for the stability of powdered and can be determined through X- ray diffraction containing amorphous material is because, in the amorphous state, the molecules are disorderly displayed producing disperse bands whereas crystalline materials yield sharp and defined peaks since they are the presented in the a highly ordered state. The X- ray diffraction patterns of carrot and amla powder are shown in Figure 1 and 2, respectively. The diffraction peaks observed in the graph are broad, which indicate that the crystalline size is small which was similar to the results obtained. The particle size of each residual powder has determined using Debye-Scherrer formula :

$$\tau = \kappa\lambda \div \beta \cos\theta$$

Equation 2

Where, K = shape factor

Lambda = X- ray wavelength

$^{\beta}$ = line broadening at half the maximum intensity in radians

θ = Bragg angle; is the means size of the ordered domains, which may be smaller than or equal to the powder size.

The XRD patterns of the powder give the stronger diffraction peaks at around 10, 12 and 23$\mathring{}$. In the soup powder, the powder gives 4 peaks values around (27.29, 24.76, 10.88,

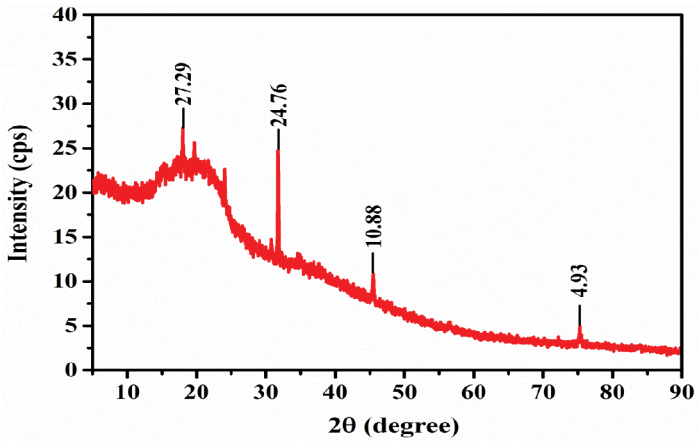

Figure 1: XRD Spectra of soup powder. Where X= 2θ and y = intensity (a.u.).

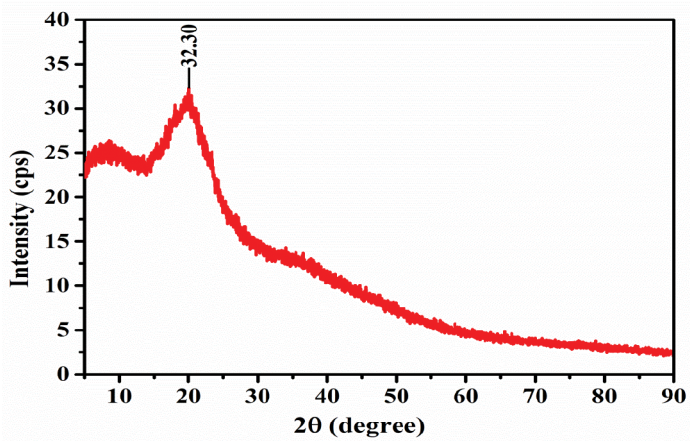

Figure 2: XRD Spectra of Soup stick powder. Where X= 2θ and y= intensity (a.u.).

4.93). In soup sticks, there are 1 peak value around (32.30) at 2θ angle indicating C – materials. The presence of C-group material indicates that the graphite and amorphous nature of carbon group like that are present in powder and not to destructed after dehydration process

Changes in the physio-chemical properties

The acidity determine that can provide important data to assess the conservation state of the product since it's a decomposition process by hydrolysis or oxidation, often changes the sensory and nutritional characteritics of the product.

The pH of the samples was shown in the table and range is 4.0 – 5.0, which classify the samples as acidic or slightly acidic powder.

The acidity of the powder analysed in work show a result compatible with European legislation, which establishes a maximum limit 6% for powder acidity. Acidity is an important quality parameter, especially because it prevent microbial growth and enzymatic reaction, which is affect the stability and quality of the food products, as well as food flavour. During storage, the assessment of the acidity enables observation of the product's conservation, since the decomposition process by hydrolysis or oxidation often changes the sensory and nutritional characteristics of the product. In addition, it is an essential measurement for use of a given ingredient in pH- sensitive formulations. The low acidity and water activity of the powder of the present study contribute to the safety and stability during storage.

Concerning the total soluble solids content, flours presented values ranging from 3.57 to 7.81 Brix. In the food industry, the soluble solids content is used, mainly, in the correction of sugar levels of products, such as sweets, juices, nectar, pulps, ice cream, liquors, among others.

All flours had low water activity (Aw), with values ranging from 0.21 to 0.38. The free water, represented by the water activity, is directly related to the physio-chemical and microbiological changes in foods during storage, which interferes with their conservation, once water molecules weakly associated with other food constituents can effectively participate in degradation reaction when compared to the strongly associated water molecules.

Table 1: Physio-Chemical Properties of biscuit and nachos added with carrot and amla powder.

	Soup powder	Soup stick
Aw	0.28	0.33
pH	4.3	5.0
TSS	2.8	3.1

Table 2: Microbial gowth or tested in the soup powder.

Testing	12 hours	24 hours	48 hours	72 hours
TPC	10 power 3	10 power 6	10 power 8	10 power 9
Mac Conkey test	N/A	N/A	N/A	10 power 6
Vitro test	N/A	N/A	N/A	N/A
Salmonella test	N/A	N/A	N/A	N/A

Table3: Microbial testing in the soup stick.

Testing	12 hours	24 hours	48 hours	72 hours
TPC	10 power 5	10 power 7	10 power 10	10 power 12
Mac Conkey test	N/A	N/A	10 power 3	10 power 6
Vitro test	N/A	N/A	N/A	10 power 2
Salmonella test	N/A	N/A	N/A	N/A

Aw values lower than 0.60 prevent microbial spoilage, once they prevent the growth of micro-organisms. Thus, the samples of the present study are below the limit the microbial growth.

Microbiological tests

All food products designed with the fruit and vegetable flour were compiled with the CODEX Alimentarius standards and were negative for Salmonella sp., Coliforms(at 30°C to 45 °C) and Escherichia coli (o.5 MPN g-1). All samples met the standard set for specific counting of each category according to the Indian standard regulation.

The evolution of the microbiological profile of the samples during storage until 80 days was also analyzed, except for the soup stick, that after 30 days presented visible growth of moulds and yeasts being consequently discarded, all samples met the standard set for specific recommendations of Indian standard regulation for each category and did not present exceeding microbiological limits or degradation symptoms for, 30 and 80 days. The growth of moulds and yeast in the soup stick after 45 days of storage is related to the high moisture content found in these samples. For the conservation of these products additional studies, changing the packaging or the processing and adding preservatives should be carried out.

Because microorganisms play a significant role in the determination of shelf-lives of food products, we investigated the level of viable aerobic mesophilic bacteria. The results, expressed as log CFU-1, ranged from 7.13, 7.95 to 7.50 for the powder, respectively after 30, 60 days of storage. The counting for samples were in the same range but decreased during storage. In soup and soup stick there are different the storage time that should be high in the soup powder and lower in soup stick because soup stick is a baked product on which there is presences of the milk. Since there is no standard value specified for the presence of these microorganisms in food products. Therefore, these numbers have only an informative purpose.

CONCLUSION

This experiment was based on incorporating the food preparation with carrot and amla powder so that that help with these the making products could be consumed regularly as durning for thyroid patients.

The evaluation of the prepared powder showed water activity and pH favourable to the conservation of microbiological quality during storage. Powder and developed products showed higher water solubility than milk solubility, in addition to greater water and milk absorption compared to fat absorption. The results indicated the potential for use in food processing. Therefore, it is suggested that future work use the flours analyzed in this study.

Results showed that the high in antioxidant, protein and mineral contents of the carrot and amla powder are potentially suitable for use in food applications as a new-calorie and functional raw material. The designed products presented high in antioxidant content, and micro-biologically stable. This research promotes the reduction of food waste since whole plant tissues have been used leading to the maximum exploitation of food raw materials. XRD showed the Carbon related material such as; fructose, glucose, sucrose etc which is graphite in structure and amorphous in nature.

Conflict of Interest

The author declares that there is no conflict of interest regarding the publication of the paper.

Acknowledgement

I would like to thanks Prof. Sunita Mishra, Dean and Head, for School for home Science, Babasaheb Bhimrao Ambedkar University, Lucknow for her immense support and encouragement during the research planning and also for always showing the right path and enlightening students with her knowledge.

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