



PRODUCTION OF CALCIUM FORTIFIED BISCUIT EXTRACTED FROM EGGSHELL AND THEIR APPLICATION IN OSTEOPOROSIS.

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ABSTRACT

The main aim of the currently study was to enrich the fortification of biscuit with eggshell powder to improve calcium content. Eggshell is a waste, hard, inner membrane covering of egg. Although they contain a significant amount of calcium. A study was conducted to extract calcium chloride from eggshell For nutritional benefits for osteoporosis patients. A study was aimed to extract and quantify calcium was done using calcium chloride with HCL solution at different ratio 1: 5, 1: 10, 1:15, 1:20. Considering the importance of calcium fortification, the current research has been carried for the extraction and characterization of calcium from eggshell waste . The objective of these research was to fortify biscuit with eggshell powder and to assess its effect on some biscuits quality parameter, including physicochemical, physical, microbiological and nutritional quality. As far as we know, there are no studies previously conducting related to the development of fortified biscuits with eggshell powder and its effects on osteoporosis.

Keywords : eggshell, calcium, osteoporosis, extraction, fortified biscuits.

The present study was designed to overcome the deficiency of calcium by preparation of biscuit with egg shell powder. By dietary invention such as food fortification calcium deficiency can be reduced. The calcium deficiency cause osteoporosis in elder, and rickets in children.

This report explores the prospect of viewing accumulation of waste matter such as egg shell a potential calcium reservoir to relief the issue of calcium deficiency in the population.

Calcium is one of the most fundamentally critical and essential micronutrient that is the nessesary for the normal functioning eg. the human body as the human skeletal system. and incrsing bone mineral density. Low calcium intake result in higher occurrence of disease like osteoporosis , beriberi, rickets .Food waste such as chicken eggshell have been reported to high content of calcium, which is important to prevent osteoporosis. The shell membrane and eggshell are fall in category of non- edible by product and also source or biodegradable compound.

The aim to provide brief insight on unlike of calcium from there some of eggshell are which fulfill normal physiology foundation of individual. To absorb calcium your body also need vitamin D a few naturally contain smell amount of vitamin D. The RDA for vitamin D IS 600 international unit (15 μ g) a day for most adult . for instance , some calcium is may also contain vitamin D or mg for better absorption of calcium.

There for this research aim to explore the functional food for elderly to reduce the risk of osteoporosis . particularly with calcium from chicken egg shell.

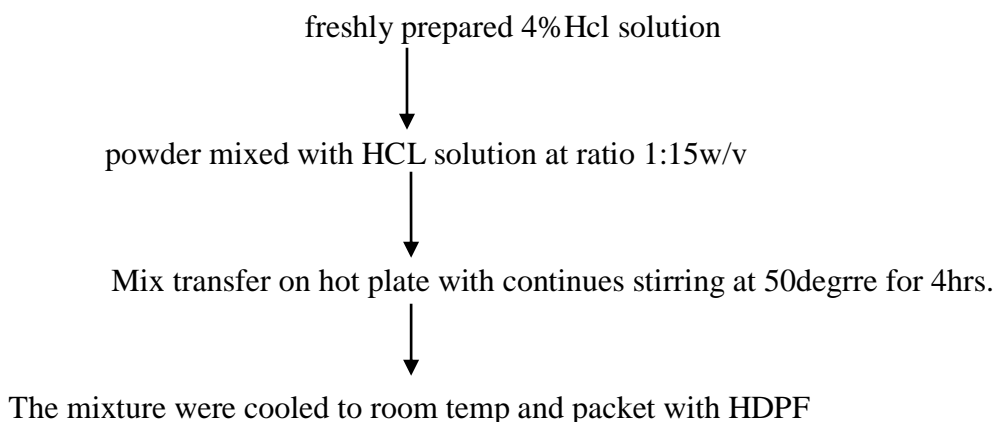
MATERIAL AND METHOD :

1) MATERIAL USED-

Chicken eggshell collected from a local store or a poetry farm for experiment. The commercially available ingredient such as sugar ,milk powder ,baking powder, wheat flour ,salt, ghee collected from local market while reagent and chemical also be first grade.

2) EXTRACTION PROCSS OF CALCIUM CHLORIDE FROM CHICKEN EGGSHELL :

A) PREPARATION OF MEMBRANE – free egg shell powder collected chicken eggshell were rinsed thoroughly with distilled water to eliminate foreign particle .shell membrane were separated from egg shell manually. Membrane free eggshell sterilization in hot water at 100degree Celsius for 25 min to pathogenic bacteria that are chicken egg shell crush the shell to small pieces the dried in hot air oven 60degree Celsius for 6 hrs powder was sieve through a 60 mm mesh and then than packed in high density polyethylene bag and store at air tight container .

B) CALCIUM CHLORIDE EXTRACTED FROM CHICKEN EGGSHELL -**C) PHYSICO-CHEMICAL ANALYSIS**

The physicochemical analysis of wheat flour powder and fortified biscuits were determined according the procedure as describe by associating of analytical chemist for moisture protein ,fat crude fiber, and ash content were determine by using gravimeter method . protein by kjeldahil method, fat by soxhlet extraction method, ash by dry using method and fiber by enzymatic gravimeter method.

D) DETERMINATION OF MINERAL COMPOSITION-

The chemical analysis of mineral such as sodium potassium, calcium, magnesium, argaon, pb and zinc content were analyzed using atomic absorption spectrophotometer and standard flame emission photometer.

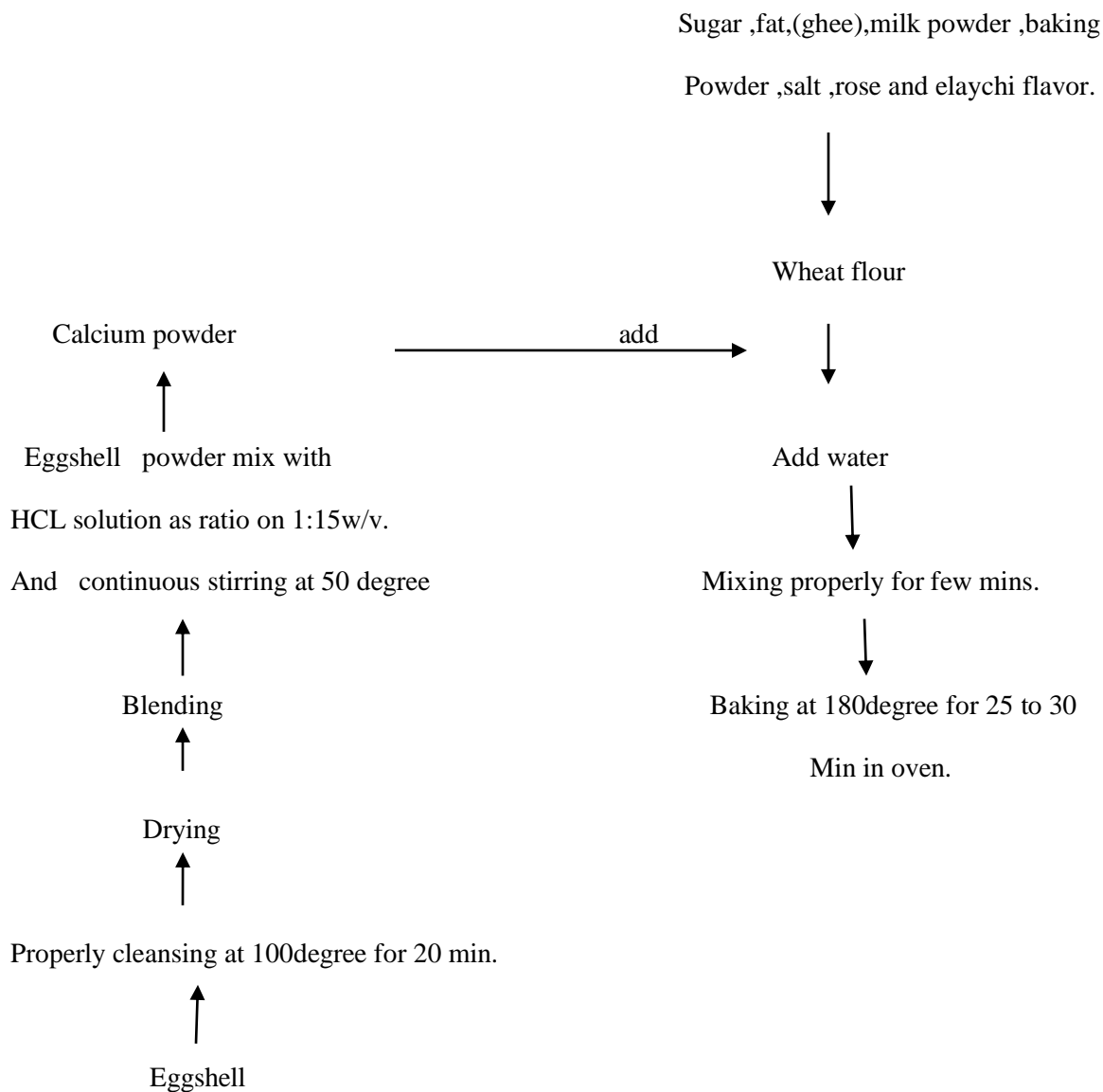
INGREDIENTS	QUANTITY(gm)
Wheat flour	200gm
Fat	53.33gm
Sugar	66.6gm
Calcium chloride	9. 8gm
Baking powder	5gm
Salt	1.66gm
Milk powder	7.5gm
Rose essence(flavour)	5/6 drops

FORMULATION AND PREPARATION OF FORTIFIED BISCUITS-

The biscuits were formulated as shown in table by following method.

Formula for preparation of biscuit

PROCEDURE:



EVALUATION PARAMETER-

1) Test For Calcium Biscuit



Fig : Test for calcium biscuit

Ammonium oxalate test-

Take 2ml of the aqueous solution of the biscuit in a test tube and add 1-2 ml of ammonium oxalate $[(NH_4)_2C_2O_4]$. then add little amount of NH_4OH to it.

Formation of white precipitate indicates the presence of calcium ions.

2) Sensory Analysis Of Formulated /Fortified Biscuits-

Sensory properties of the formulated biscuits as follows-

A) Color

B) Odor

C) Taste

D) Texture

E) Flavor

F) General Appearance

G) Mouth fill

H) overall acceptability are evaluated.

3) Physical properties-

- 1) Biscuits were weighted in grams after 2 hrs from baking.
- 2) Weight volume of specific volume-volume of biscuits was determine using the seed displacement method.

Specific volume was calculated by using following equation:

Specific volume =volume in(ml)/weight in(gm)

4) Micro-biological evaluation-

The microbiological evaluation for the biscuits to determining the total bacterial ,yeasts and moulds counts.

1) Sample Preparation

Weighing 10gm of each sample under aseptic condition and transfer into a sterile flask. A known volume of a sterile water90 ml. added and shake 2-3 min and several dilutions were made (1/10,1/100,1/1000).

- a) Determination of total bacteria counts (TBC)
- b) Determination of yeast and moulds.

5) Hardness test for biscuit –

The hardness test for biscuit is determined by using hardness tester instrument.

Hardness = 1.5 kg (1kg=9.8N)



Fig; hardness test for biscuit.

RESULT AND DISCUSSION:

The proximate analysis of commercially available wheat flour and eggshell powder is reported in following table :

Component	Wheat (%)	Eggshell powder (%)
Moisture	4.5	5
Protein	26.4	0.2
Fat	4.90	90.1
Ash	90	35.4
Ph	6.7	7.2

1) Sensory properties of calcium fortified biscuits:

Evaluated calcium fortified biscuit for color , flavor, texture , overall acceptability as shown in given :

Test	Observation / result
Color	Brown red
Odor	Choklate
Taste	sweet
Texture	Solid, roughed , crunchy
Flavor	Elaychi flavor
Mouth fill	Sweet
General appearance	Round ,flat ,dry.

2) Composition of calcium fortified biscuit product :

The composition of calcium fortified biscuit are given in table :



Fig: calcium fortified biscuit

Test	Result (%)
Moisture	4.6
Protein	10.20
Fat	17.25
Ash	1.53
Total carbohydrate content	66.26

3) Extraction rate of calcium chloride from eggshell :

The yield of calcium chloride from eggshell according to the different ratio of HCL present ;

Local chicken eggshell provided the highest amount of calcium chloride than layer eggshell , when same amount of HCL was used for extraction. Extraction amount with 20.5 ml HCL was the best option in the point of cost effectiveness. No significant changes were detected by applying 10ml and 15 ml HCL application.

4) Microbiological assay for eggshell powder :

Treatment	Observation
Boiling	Negative
Autoclaved	Negative
Hot air oven	Negative
Microwave	Negative

CONCLUSION :

- 1) The effort to reduced the risk of osteoporosis in the elderly using calcium source .
- 2) The information observed in these research could be useful for scientific knowledge, especially as one of the alternative way to solve eggshell waste problem by incorporating it into biscuit to decrease calcium deficiency and risk of osteoporosis, which are global health problem.
- 3) The study was highlighted that both eggshell powder and calcium chloride powder extracted from eggshell increase the calcium content in the biscuit. The current research revealed that the addition of eggshell powder in a excellent source of calcium.
- 4) Eggshell is a food waste which may causes environmental and health problems, if it is not manage properly. In these study the innovative functional food based on biscuits enriched with calcium content .
- 5) It can be concluded that eggshell powder is an appropriate and cheap source of calcium for human nutrition and is easily prepared at home.

Reference :

- 1) Eggshells calcium extraction and the application in food fortification [Internet] journal of bio-based materials and bio-energy. Vol. 15,615- 620, 2021 [cited on October – 2021] available from : https://www.researchgate.net/publication/356137591_Eggshells_Calcium_Extraction_and_the_Application_in_Food_Fortifications
- 2) Production of calcium chloride from eggshell [1998] [internet] Alongcot chongpuak; kasetsart univ ; Bangkok (Thailand) graduate school. [corporate author]

available

from:[https://agris.fao.org/agris-](https://agris.fao.org/agris-search/search.do?recordID=TH2000002751#:~:text=Calcium%20in%20egg%20shell%20is,extraction%20period%20of%203%20hours)[search/search.do?recordID=TH2000002751#:~:text=Calcium%20in%20egg%20shell%20is,extraction%20period%20of%203%20hours](https://agris.fao.org/agris-search/search.do?recordID=TH2000002751#:~:text=Calcium%20in%20egg%20shell%20is,extraction%20period%20of%203%20hours)

- 3) Effect of calcium chloride extracted from eggshell in maintaining quality of selected fresh cut fruits [internet] research article, [2019] BY – Rohit J Thakur , Hamad Sheikh , Yogesh Gat , Roji B. Waggmare available from:<https://www.mdpi.com/2304-8158/10/3/656>
- 4) Indian pharmacopoeia – 2018, vol- I ,Monograph of conc.HCL and dil. HCL, Page no : 2217 and 2218.
- 5) Indian Pharmacopoeia- 1996 , Appendix 13.2 , preparation of 4% HCL solution (4% HCL solution = 1.3 M) page no : A- 169.
- 6) Functional food for elderly high in antioxidant and chicken eggshell calcium to reduced the risk of osteoporosis- a narrative review, [cited on 19 march 2021]Department of gastronomy science and functional foods . available from: <https://www.mdpi.com/2304-8158/10/3/656>
- 7) A pathway for sustainable utilization of waste chicken eggshell. A narrative Review article by - Omojola Awogbemi, Daramy Vandi Von Kallon And Victor Sunday Aigbodion . [cited on 4 nov 2021] available from: <https://www.techscience.com/jrm/v10n8/47608>
- 8) Effect of egg shell powder fortification on the physiochemical and organoleptic characteristics of muffins – research article By Faiqa Afzal , Ghulam Mueen-Ud-Din,Muhammad Nadeen[cited on 10 march 2020] available from :<https://www.thepab.org/files/2020/June-2020/PAB-MS-190120488.pdf>
- 9) Effect of fortification with egg shell powder on injera quality. by- Intigist Fekadu,Angela Cassano, Ignacin Angos .Department Of Agronomy ,Biotechnology And Food Sciences Eengineering, ISFOOD-31006,panplona,spain. [cited on 1 feb 2022] published by Elsevier Ltd.avilable from: [https://www.google.com/url?sa=t&source=web&rct=j&url=https://academic-](https://www.google.com/url?sa=t&source=web&rct=j&url=https://academic.elsevier.com/locate/S0925656321000000)
[e.unavarra.es/bitstream/handle/2454/42641/2022020202-](https://www.google.com/url?sa=t&source=web&rct=j&url=https://academic.elsevier.com/locate/S0925656321000000)
[Fekadu_EffectFortification.pdf%3Fsequence%3D1%26isAllowed%3Dy&ved=2ahUKEwiQ0era-9X-](https://www.google.com/url?sa=t&source=web&rct=j&url=https://academic.elsevier.com/locate/S0925656321000000)
[AhXHVMwGHX6RDUIQFnoECBAQAQ&usg=AOvVaw3ZyvO935w9pG](https://www.google.com/url?sa=t&source=web&rct=j&url=https://academic.elsevier.com/locate/S0925656321000000)
- 10) Chicken Egg Shell Powder As Dietary Calcium Source In Biscuit By Nahlam.M Hassan,Food Technology Research Institute Agiriculture Research Centre ,Egypt [cited on 2015] available from: [https://idosi.org/wjdfs/wjdfs10\(2\)15/14.pdf](https://idosi.org/wjdfs/wjdfs10(2)15/14.pdf)