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Studies on the development of high protein biscuits from composite flour

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Abstract

The present investigation was done on studies on development of high protein biscuits from composite flour in which quinoa, garden cress seeds were used as main ingredients and Bengal gram and Green gram used as composite flour. The different trials and proportions were made for development of high protein biscuits viz; (20:1:2:2) for the trial 1, similarly (25:2:4:4) for trial 2 and (30:1:3:3) respectively. Further biscuits were subjected to organoleptic evaluation in which trial 1 i.e., (20:1:2:2) sample got highest scores. Trial 1 taken for proximate analysis in which Moisture content, Fat content, Protein content, Carbohydrates, Fiber and Ash content were measured viz; 3.2%, 21%, 17.9%, 60%, 1.6% and 1.8% per 100 g of sample. Overall trial 1 has good nutritional as well as medicinal benefits on human health and acceptance.

Keywords: Quinoa, garden cress seeds, Bengal gram, green gram, biscuit

Introduction

The globalization scenario in new millennium year has increased the demand for bakery products along with ready to eat (RTE) foods due to change in economic consideration, Westernization, Urbanization, busy life and increased women employment. Today consumers have requested convenient, Ready-to-eat foods that fulfill their dietary needs and accommodate their busy schedules. Many people who are on special diet, either as result of a medical condition, or because they have elected to live a healthier lifestyle, spend a lot of time in meal planning and trying to locate foods they can eat. Multinational food industries, especially baking industries have responded well to the increased interest in nutrition and so they are developing products that meet the nutritional requirement and recommendation of the consumer. Consumption of bakery products per capita per annum in our country is has seen demand rise during the pandemic. (Simona, *et al.*, 2014) ^[1].

Biscuits are made from a number of ingredients. Flour is the most basic and important. Different types give a range of textures and crispness. Whole meal wheat flour is used in the "digestive," "sweet meal," or "wheat-meal" type of biscuits. Oatmeal forms the basis of oatmeal biscuits. Rice flour and corn flour add flavor. Fats give the biscuits their "shortness." Butter and lard are the main fats, though these are augmented by vegetable and other refined fats. For fancy biscuits, sugar is an important ingredient, and introduces a range of tastes. It is added in several forms: processed as caster and Demerara sugars, syrups, honey, and malt extract. Long shelf-life of biscuits makes large scale production and distribution possible. Good eating quality makes biscuits attractive for protein fortification and other nutritional improvements. Development of fortified biscuits or other composite flour bakery products is the latest trend in bakery industry. The growing interest in these types of bakery products is due to their better nutritional properties and possibility of their use in feeding programs and in catastrophic situations such as starvation or earthquakes. Biscuits have a high energy content, ranging from 420 to 510 kcal per 100 g. The present work deals with Protein Enriched Biscuits here we introduce quinoa and pulses which make biscuits more nutritious and impart health benefits (Baljeet, *et al.*, 2016) ^[2].

Quinoa belongs to the class *Dicotyledoneae*, family *Chenopodiaceae*, genus *Chenopodium*, and species the quinoa. *Chenopodium quinoa* Wild is a native to Andean region of South America. It belongs to the group of crops known as pseudo-cereals. The quinoa grains are considered as potentially gluten-free, has high protein content with abundance of essential amino acids such as lysine, threonine and methionine. This is a valuable source of protein for vegans, as its protein levels are similar to those found in milk and higher than those present in wheat, rice and maize (Nisar, *et al.*, 2017) ^[6].

It does not contain gluten, so it can be eaten by people suffering from celiac disease. Furthermore, it is a good source of dietary fibre. The Incas credited quinoa with medicinal properties including lowering of blood cholesterol, improving glucose tolerance and reducing insulin requirements. Due to its excellent nutritional profile, it is considered as one of the most nutritious and super food. It is also rich in unsaturated fatty acids (linoleic and linolenic acids), in vitamins (folate and tocopherol), minerals (iron, copper, manganese, potassium) and other phytochemicals, phenolic acids, flavonoids with possible nutraceutical benefits (isoflavons and lipids). Besides nutrient compounds, it also contain anti nutrients (phytic acid, saponin and tannin) which mainly concentrated in the outer layer of the grain. (Kavali, *et al.*, 2020) [12].

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Garden cress seeds (*Lepidium sativum* L.) are loaded with nutrition. It is an important source of iron, folic acid, calcium, vitamins C, E and A. It is a rich source of iron 'containing 100 mg iron/100g. They are high in calories. It has about 454 kcal and 33 gram of carbohydrate per 100 gram with a protein content of 25.3grams. It is often given postpartum to lactating mothers. It has low fat of 24.5 g, when compared with other nuts and oilseeds. It contain minerals like calcium, phosphorus (Talpade, *et al.*, 2018) [13].

Bengal gram which is also known as chickpea (*Cicer arietinum*) is an annual legume of the family *Fabaceae*, subfamily *Aboideau*. Bengal gram is a protein-rich supplement, it is considered a popular alternative for animal or meat protein. Regular consumption of bengal gram helps in reducing protein malnutrition. It also helps in lowering the cholesterol level in the bloodstream. Bengal gram is good for diabetic patients as it has a low glycemic index. The mung bean (*Vigna radiata*), alternatively known as the green gram is a plant species in the legume family. It is rich in high-quality proteins and other essential nutrients. A 100 g serving of cooked moong dal can provide you with about 6 g protein. It also contains some amounts of vitamin E, C, and K. An integral part of the Indian diet; it is incredibly light and easy to digest. (Bhosale, *et al.*, 2021) [3].

Materials and Methods

The present study was carried out in the department of Food Chemistry and nutrition, K. K. Wagh College of Food Technology, Mahtma Phule Krishi Vidyapeeth, Nashik, Maharashtra. The study was arrived to develop product

prepared from combination composite flour such as Quinoa, Garden cress seed, Bengal gram and Green gram. The raw materials used like quinoa, garden cress seeds, bengal gram, green gram, refined wheat flour, sugar, butter, baking powder, and baking soda were procured from the confectionary and local stores of Nashik market.

Organoleptic evaluation of Biscuits

Ten semi-trained panelists carried out a sensory evaluation of high protein biscuits and compared with the control samples. At the start the subjects described two very different biscuits (control and High protein biscuit) and mainly focused on the texture change. Then, the most frequently cited attributes were selected, and their definitions and the protocols scoring them were developed. Next, the panelists were given a score sheet to evaluate sensory attributes, namely, color, taste, texture, flavor, and overall acceptability, and asked to score samples on 9 point hedonic scale to rate the quality of High Protein biscuits respectively (Talpade, *et al.*, 2018) [13].

Methods

Standardization of formula for preparation of High Protein Biscuits

For standardization of formula, various combination were used and acceptable product were selected for further utilization. Composite flour (Quinoa, Garden cress seeds, Bengal gram, Green gram & refined flour) were added with sugar, butter, salt, baking soda and baking powder and dough was prepared. The other ingredients were kept constant throughout the treatments.

Table 1: Standardization of formula for preparation of High Protein biscuits.

S. No.	Ingredients	Quantity (g/100g)			
		T0	T1	T2	T3
1.	Quinoa	00	20	25	30
2.	Refined Wheat flour	70	55	45	45
3.	Bengal gram	00	2	4	3
4.	Green gram	00	2	4	3
5.	Garden cress seeds	00	1	2	1
6.	Sugar + salt	30	30	30	30
7.	Butter	20	20	20	20
8	Baking soda & Baking powder	2	2	2	2

Preparation of Biscuits

The process for preparation of High Protein biscuits was followed by (Simona, *et al.*, 2014) [11]. For preparation of High Protein biscuits, Quinoa, Bengal gram and green gram were grinded into a fine powder. (Bhosale, *et al.*, 2021) [3]. (Neelam, *et al.*, 2020) [7] Garden cress were roasted at 120 °C for 5 mins and then then grinded into fine powder (Talpade, *et al.*, 2018) [13]. All these ingredients were then added with refined wheat flour, butter, sugar, salt, baking powder and baking soda and dough was prepared. These dough was then sheeted to desired height and biscuits were given shapes with the help of moulder which were then baked in an air circulation oven at 180 °C for 10 mins. The biscuits were cooled for 10 mins at room temperature and stored in low density polyethylene bags before further analysis (Simona, *et al.*, 2014) [11] (Romani, *et al.*, 2014) [9].

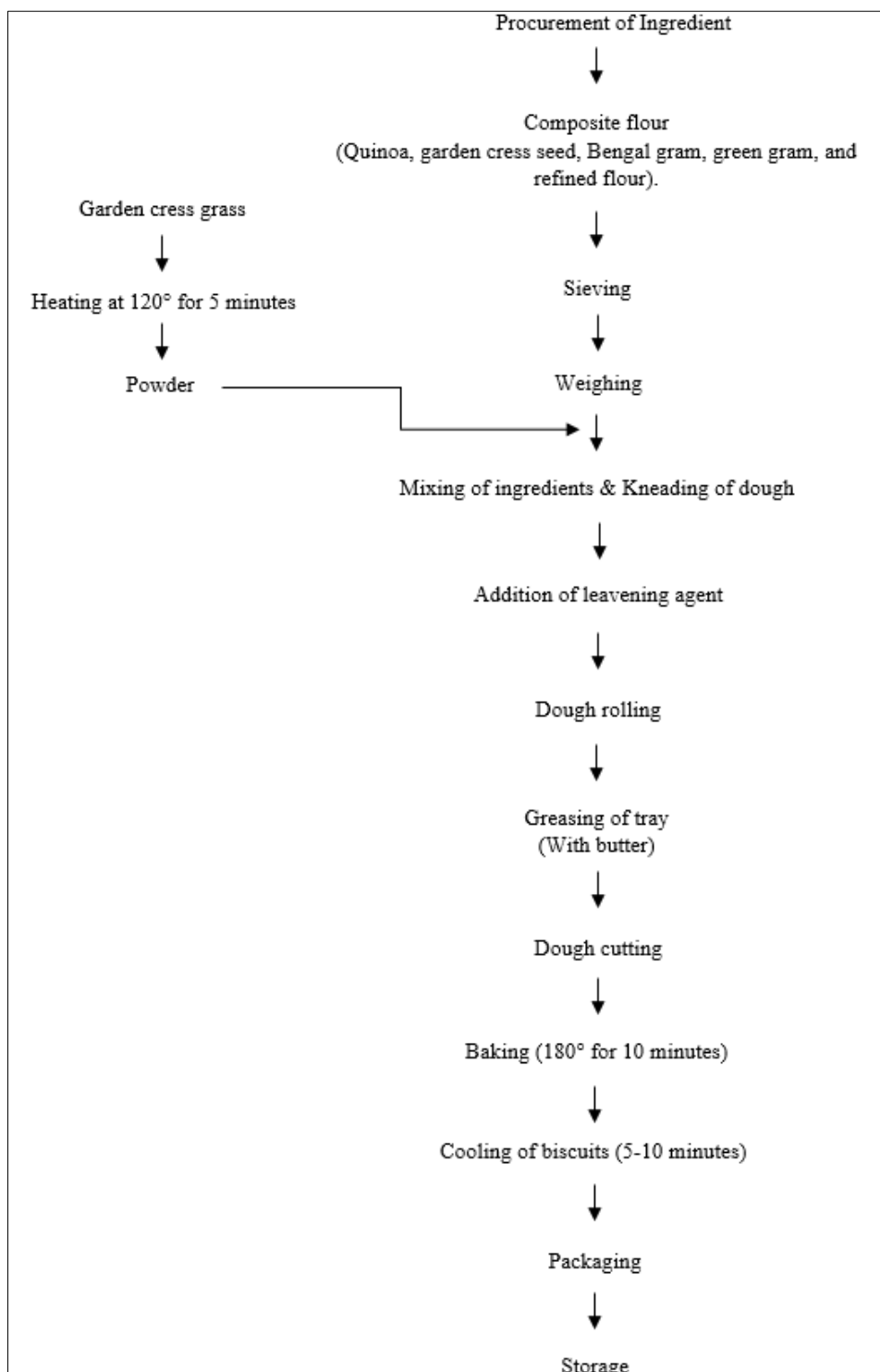


Fig 1: Flowsheet for Preparation of High Protein biscuits.

Results and Discussion

Sensory evaluation of Biscuits The sensory evaluation were carried out of high protein biscuits data with respect to color,

appearance, taste, flavor, texture and overall acceptability are depicted in Table No. 2.

Table 2: Mean sensory values for the High Protein biscuits.

Samples	Taste	Color	Flavor	Texture	Overall acceptability
T0	9	9	9	9	9
T1	9	8.5	9	8	8.7
T2	7.2	7.2	7.2	7.2	7.3
T3	7.6	7.8	7.8	7.6	7.68
SE ±	0.06999	0.16288	0.13628	0.08729	0.07469
CD at 5%	0.21227	0.49403	0.41333	0.26474	0.22653

*Each value id average of three determinations

Where, T0- (Controlled sample), T1- (Trial 1), T2- (Trial 2), T3- (Trial 3).

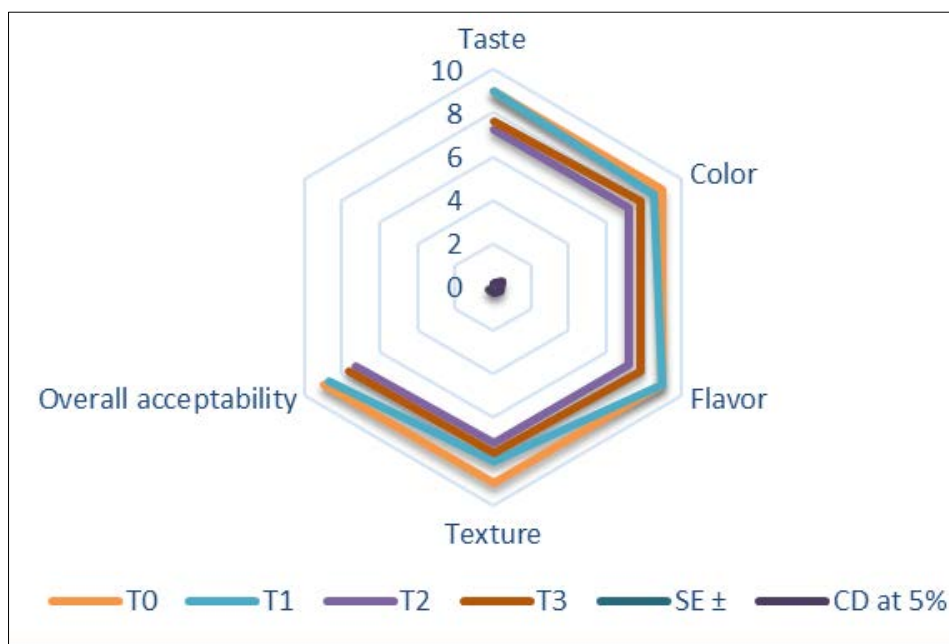


Fig 2: Sensory evaluation

The present data indicated in above table 2. Showed that High protein biscuits with 20:2:2:1 formulation received highest sensory score (7.8) in case of all sensory attributes followed by biscuits having (30:3:3:1) scored (7.6) compared to test of the samples. The sample T1 was varied significantly over of treatment whereas T0, T2 and T3 was spastically as per with each other.

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