

Development of Chickpea (*Cicer arietinum* L.) Food Products and Its Benefits to Human Nutrition

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Abstract--- Chickpea locally known as garbanzos is a good source of protein, minerals, and trace elements. Based on the results of the nutrient analysis of chickpea flour, it showed that it is high in dietary fiber, protein, potassium, calcium and iron. Chickpea flour is three times higher in dietary fiber than wheat flour and rice. Chickpea flour has low glycemic index, much lower than wheat flour and milled rice. Various products were developed with the supplementation of wheat flour with chickpea flour. Thirty percent (30%) substitution showed acceptable processed chickpea based food products.

Keywords---chickpea, dietary fiber, protein

I. INTRODUCTION

Chickpea is a good source of protein, macro minerals, and trace elements. Legumes contain almost two times more protein and minerals and three times more in dietary fiber than wheat flour. Legume proteins are rich in lysine which is an important essential amino acid limited in cereal grains [1]. Its anti-nutritional factor is the lowest of all legumes.

In a technological feasibility of incorporating legume flours (35 %) for pasta making, nutritional analysis showed that the dough contains high levels of fiber, vitamin B₁, magnesium, phosphorous, protein, and good balance of essential amino acids. Its glycemic index is also lower than that of durum wheat dough. Lower glycemic index as a result of adding legume flour is a positive characteristic of a wheat- legume food product [3,4].

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Chickpea in brine, in syrup, as salad, as humus or paste were also acceptable. These chickpea-based food products are rich sources of nutrients particularly, energy, protein, fat, carbohydrates, calcium and vitamin A.. Chickpea is a good alternative high value crop for the farmers, improve nutritional problems and provide alternative health promoting food products in the market and alternative livelihood opportunities for entrepreneurs.

Utilization of the crop is limited. Product development aims to explore alternative utilization techniques for the crop thereby increasing its product line in the market. Product development can promote production, utilization, and marketing of the crop.

Objectives

General:

To enhance production and pilot test processing of chickpea by developing acceptable chickpea based food products.

Specific

- a. Determine protocol formulation/ technique for bottled chickpea and chickpea based food products;
- b. Determine nutritional content of chickpea substituted food products;

II. METHODOLOGY

1. Development of Chickpea Based Food Products

Chickpea grits/flour was processed before different products were developed. Nutritional content of chickpea flour was analyzed at the Food and Nutrition Research Institute, Department of Science and Technology (FNRI-DOST & PIPAC). Chickpea flour was compared with wheat flour and rice flour. Several products were developed and formulated such as egg drop cookies, linguas, butter cookies, buns, tart, crackers, butter cake, humus, finger food, salad, chickpea in syrup/brine, waffle, leche flan, pulvoron and noodles. Chickpea seeds were also tested as a beverage just like a hot coffee drink.

2. Determine Nutritional Content of Chickpea Substituted Food Products

The nutrient content of the different chickpea-based food products were computed using the 1997 Philippine Food Composition Table published by the Food and Nutrition Research Institute of the Department of Science and Technology [5].

III. RESULTS AND DISCUSSIONS

1. Product Development of Chickpea Based Food Products

A. Process in making chickpea flour

Fully dried chickpea seeds of desi type variety ICCV 92955 were used. It has a milling recovery of 800gm per one

kilogram of seeds [2]. Dried seeds were sprinkled with water and oil, mix gently then it was sun dried for 3 to 5 days. Dried seeds were passed through a dhal machine in order to crush the dhal from the seed coat. The seed coat and dhal were separated with the use of a winnower or blower. The dhal was milled in a flour miller/ pulverizer. Sieve to separate

the dhal and grits. The grits were re-pulverized in order to produce a finer product. Chickpea flour is then packed and sealed in a container for future use (Figure 1). From the developed chickpea flour, different products were formulated.



Figure 1. Process of Making Chickpea Flour

B. Preparation and formulation of different chickpea-based food products

About 32 chickpea-based food products were developed. These include baked products such as Chickpea Brownies, Chickpea Muffins, Chickpea-Camote Hopia, Chickpea Oatmeal Bar, Chickpea Lenguas, Chickpea Choco-Crinkles, Chickpea Tart, Chickpea Choco-Chip Cookies, Chickpea Raisin Cookies, Chickpea Corn Flakes, Chickpea Egg Drop Cookies, Chickpea Butter Cookies, Chickpea-Camote Butter Cake, Chickpea Sweet Potato Cake, and Hot Cross Buns. Other products include Chickpea Soup, Chickpea in Brine, Chickpea in Syrup, Chickpea Salad, *Buridibud*, Salted Chickpea, Sugar-Coated Chickpea, Chickpea Pancit Canton, Chickpea Pulvoron, Humus, Chickpea Flan, Chickpea Waffles, Chickpea Crackers and Chickpea Yoghurt.

C. Sensory evaluation of chickpea based food products developed

Chickpea based food products which includes chickpea oatmeal bar, tart, cracker and buns were evaluated for its sensory characteristics.

Chickpea oatmeal bars showed the best rating of like very much. Oatmeal bars with chickpea was rated like moderately based on color, crunchiness, texture, and sweetness. Chickpea buns showed that the lower the amounts of chickpea flour the

higher the acceptability rating. This could be due to the rough texture of the chickpea flour.

Lower rating was observed with the addition of chickpea flour, however found to be significantly acceptable by the panel members.

Chickpea buns and crackers showed to have slight differences on the acceptability rating with the increase formulation of chickpea flour. This could be due to the fact that panel members are not used to the taste of a chickpea, since chickpea is a new food in the community.

2 . Nutrient Content of Different Chickpea Flour and Chickpea Based Food Products

Chickpea flour is high in dietary fiber, protein, potassium, calcium, iron and has low glycemic index (GI) compared to rice and wheat flour (Table I). Low glycemic index foods reduce blood sugar level thus preventing diabetes mellitus.

The following tables show the nutrient content of the different substituted chickpea based-food-products developed.

The chickpea-based baked food products are good sources of nutrients particularly energy, fat, protein, carbohydrates, calcium and vitamin A. On a per serving basis, Chickpea Butter Cookies provides the most energy with 526 kcal. followed by Chickpea Oatmeal Raisin Cookies, 393 kcal., Chickpea Lengua, 376 kcal., and Chickpea Egg Drop Cookies with 371 kcal. Chickpea Oatmeal Bar has the least

energy content with 105 kcal although the serving size differs from one product to another. Chickpea Butter Cookies contains the most fat (28.3g), protein (9.5g), carbohydrates (58.5g) and vitamin A (163.8 ug) content while Chickpea Egg Drop Cookies has the most calcium (168.8 mg) (Table II).

Chickpea in brine and the chickpea in syrup are also developed and are additional sources of nutrients. The chickpea in syrup and sugar coated chickpea have the most energy and carbohydrates (315 kcal., 73.5 g and 223 kcal., 35.64 g respectively) per serving because of the added sugar. All the chickpea-based products provide comparable amount of protein ranging from 2.3 grams to 2.9 grams per serving. Chickpea in brine provides the most calcium with 43.2 mg per

185 grams followed by salted chickpea with 31.2 mg/50 g and chickpea in syrup with 24.5 mg/185grams (Table III.)

Desserts made from chickpea flour and chickpea served as salad with vegetables were also developed. Chickpea Flan provides the most nutrients including energy (654 kcal./serving), fat (21.6 g), protein (33.3 g), carbohydrates (81.2 g), calcium (611.4 mg), and vitamin A (378.2 ug). These nutrients are provided by chickpea as well as the other ingredients used particularly the evaporated milk, eggs and sugar. The other chickpea-based desserts such as Chickpea Waffles, Chickpea Pulvoron, and Chickpea Crackers as well as the chickpea-based vegetable salads such as the Chickpea Salad, Chickpea Pancit and *Buridibud* are also substantial sources of these major nutrients (Table IV).

TABLE I
NUTRITIONAL CONTENT OF CHICKPEA FLOUR COMPARED TO WHEAT FLOUR (ALL PURPOSE FLOUR) AND RICE FLOUR

Nutrients Analyzed per 100 gm	Rice flour**	Chickpea flour *	Wheat flour ** (All purpose flour, enriched)
Energy, kcal	358	358(356)	377
Total fat, g	0.3	10.4(0.6)	3.6
Total Carbohydrate, g	81.3	69.4(53.2)	75.2
Dietary Fiber, g	2.1	13.7(9.9)	0.4
Protein, g	7.6	19.2(20.6)	11.0
Iron (Fe) mg	0.0	12.0(4.5)	4.1
Calcium, mg	15.0	129.0	122.0
Potassium, mg	65	1,100	137.0
Glycemic index	60 (med) [6]	6 (low)[6]	60 (med)[6]

*Analyzed by FNRI/ITDI-DOST.

**Source : 1997 Philippine Food Composition Table [5]

TABLE II
NUTRI-FACTS OF CHICKPEA-BASED BAKED PRODUCTS PER SERVING

Nutrients	Chick pea- Butter Cookies (50g/ serving)	Chickpea Egg Drop Cookies (80g/ serving)	Chickpea Lenguas (75g/ serving)	Chickpea Oatmeal Bar (29g/ serving)	Chickpea Camote Hopia (47g/ serving)	Chickpea Oatmeal- Raisin Cookie (75g/ serving)
ENERGY (kcal)	526	371	376	105	231	393
FAT (g)	28.3	3.9	19.1	7.3	10.7	18.7
PROTEIN (g)	9.5	7.7	5.8	1.8	4.4	7.3
CHO (g)	58.5	77.2	45.3	13.7	29.2	49.0
FIBER (g)	(3.2)	(2.6)	(1.9)	(0.9)	1.3	(1.7)
CALCIUM (mg)	118.9	168.8	94.2	30.9	60.4	130.4
VITAMIN A (µg RE)	163.8	0.2	88.7	25.6	38.1	103.1

Nutrient content computed from the 1997 Philippine Food Composition Table [5]

TABLE III
NUTRI- FACTS OF CHICKPEA IN BRINE AND IN SYRUP PER SERVING

NUTRIENTS	Chickpea in Brine 185g/serving	Chickpea in Syrup 185g/serving	Salted chickpea 50g/serving	Sugar Coated Chickpea 50g/serving
ENERGY (kcal.)	99	315	102	223
FAT (g)	1	1	1	0.8
PROTEIN(g)	2.9	2.9	2.85	2.3
CHO (g)	21.8	73.5	20.4	35.64
FIBER (g)	(4.2)	(4.2)	(4.15)	(3.3)
CALCIUM (mg)	43.2	24.5	31.2	19.6
VITAMIN A (μ g RE)	0.5	0.5	0.5	0.4

Nutrient content computed from the 1997 Philippine Food Composition Table [5]

TABLE IV
NUTRI- FACTS OF CHICKPEA AS VEGETABLE SALAD AND AS DESSERT PER SERVING

Nutrient	Chickpea Waffles 80g	Chick pea Salad 75g/ Serving	Chickpea Pulvoron 29g/ serving	Chick pea Flan 200g/se rving	Chickpea Crackers 50g/ serving	Chickpea Pancit 150g/ serving	Buridibud 95g/serving
Energy (kcal.)	189	58	124	654	402	297	40
Fat (g)	6.3	0.6	3.9	21.6	14.8	4.3	0.4
Protein (g)	6.6	17.6	1.8	33.3	12.8	11	1.1
CHO (g)	26.6	11.5	11.3	81.2	54.6	53.7	9.4
Fiber (g)	2.0	(2.2)	(0.9)	(8.3)	(7)	(3.1)	(1.7)
Calcium (mg)	105.7	43.1	30.0	611.4	93.7	73.4	56.8
Vit. A (μ g RE)	60.0	215.6	43.2	378.2	1.3	43.4	43.3

Nutrient content computed from the 1997 Philippine Food Composition Table [5]

IV. SUMMARY

Chickpea is versatile and could be prepared in several ways, as salad, as snack, as humus/paste, as baked products. It could combine with vegetables such as *buridibud*, soup, as finger food and also as beverage like coffee.

Chickpea based food products showed to have slight differences on the acceptability rating with the increase amount of chickpea flour. This could be due to the fact that panel members are not used to the taste of chickpea, since chickpea is a new food in the community. Thirty percent (30%) chickpea substitution showed acceptable products.

V. RECOMMENDATIONS

Based on the results, it showed promising results on chickpea production, farmers are therefore encourage to plant chickpea as an alternative or rotation crop being a versatile, nutritious crop. Entrepreneurs in the foodservice industry may consider the commercialization of these developed food products.

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