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Nutritional Composition of Chickpea (*Cicer arietinum*) Milk

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Abstract
Chick pea (*Cicer aretinum*) is an important pulse crop grow and consumed all over the world. Chick pea is a good source of protein and carbohydrate and its protein quality is better than other cereal. Lactose free milk based on chick pea was developed and specially compared with "isomil" (soy protein formula) in its nutritive value. Chick pea milk versus isomil provided high percentage of protein, carbohydrate, fat, mineral's and vitamin. Chick pea milk was improvement in children nutritive status and their blood parameters. After administering chick pea milk children recovered from diarrhea in less than five day. No case of lactose intolererane was found. Chick pea is nutritionally rich having important unsaturated fatty acids likes linoleic and oleic acid. It can be utilized to developed nutritious value added products. Different levels of Chick pea milk was used in cottage cheese prepration it improved the nutritive property of the product like proteins, carbohydrate and fat.

Keywords: chick pea milk, nutritional, infant formula

Introduction

Chickpea is a good source of carbohydrates and proteins, which together constitute about 80% of the total dry seed mass. The starch content of chickpea cultivars have been reported to vary from 41% to 50%. The Kabuli type contains more soluble sugars. The unavailable carbohydrate content is higher in chickpea than other legumes and chickpea carbohydrate has a lower digestibility than that of other pulses. The designed chickpea based infant follow-on formula meets the WHO/FAO requirements on complementary foods and also the EU regulations on follow-on formula with minimal addition of oils, minerals and vitamins. It uses chickpea as a common source of carbohydrate and protein hence making it more economical and affordable for the developing countries without compromising the nutrition quality (Malunga 2014) [4].

In Chick pea (*Cicer arietinum* L.) Different carbohydrates are classified into (i) available (mono and disaccharides), which are enzymatically digested in the small intestine and (ii) unavailable (oligosaccharides, resistant starch, non-cellulosic polysaccharides, pectins, hemicelluloses and cellulose), which are not digested in the small intestine (16). The total carbohydrate content in chickpea is higher than pulses. Chickpea has: (i) monosaccharides-ribose, glucose, galactose and fructose (ii) disaccharides-sucrose, maltose and (iii) oligosaccharides- stachyose, ciceritol, raffinose and verbascose (Gaur, 2012) [6].

The nutritive value of chick-pea and soy infant formulas were evaluated. Nitrogen balance was performed in 17 malnourished babies, seven of which were fed with the chick-pea formula, and 10 with the soy commercial formula (Sotelo. *et al.*, 1987) [7].

Lactose free milk based on chick pea milk was developed and specially compared with "ISOMIL" (soy protein formula) in its nutritive value. Chickpea milk was fed to thirty infants of different nutritional status and blood parameters. The children recovered from diarrhea in less than five days case of lactose intolerance was found. Chickpea milk proved to be highly effective in the management of persistent diarrhea.

Lactose free milk was developed from chickpea. To study its effect on the control of persistent diarrhea and its acceptability and suitability for infants and children. Thirty children aged (0-12) suffering from diarrhea for >14 days were selected. A thorough clinical examination was performed in addition to historical data collected routinely on standard diarrhea, case record form. The results of the study indicated that diarrhea was controlled in 3-4 days among all children. There was marked improvement TP, RBC, Hb and Hct values in all children.

The stool of twenty-six children were acidic, one was alkaline and three were neutral. No case of lactose intolerance was found. The milk was also found palatable and adequate in nutritional rehabilitation as it helped to improve nutritional status of all children. Chickpea milk was found highly effective in the management of persistent diarrhea (Mahmood NA, 2003) [5].

Chickpea is a good source of important vitamins such as riboflavin, niacin, thiamine, folate and the vitamin A precursor β-carotene. As with other pulses, chickpea seeds also contain anti-nutritional factors which can be reduced or eliminated by different cooking techniques. Chickpea has several potential health benefits, and, in combination with other pulses and cereals, it could have beneficial effects on some of the important human diseases such as CVD, Type 2 diabetes, digestive diseases and some cancers (Harsha Hirdyani, 2014) [2].

Chickpea milk was highly effective in the management of persistent diarrhea and contains natural protein. Sensory acceptability of the cottage cheese added with seasoning was higher and more suitable for fortification with chick pea milk and different level of turmeric powder as seasoning like black pepper masked the chick pea flavor as these carrying antioxidant properties (Kishor, K *et al*., 2016) [3].

Many attempts have been made to use chickpeas in non-dairy infant formulas and in weaning food blends. The protein efficiency ratio (PER), net protein retention (NPR) and net protein utilization (NPU) of chickpea based infant formula were not different to soy or milk based formula. Similarly, when fed to malnourished children, there were no significant difference found between chickpea based formula and commercial soy formula in the samples tested. The mean percentage of absorption, retention and biological value of the chickpea formula were 72.4, 26.4 and 35.1 compared to that of soy 69.6, 24.3 and 34.0, respectively (Malunga, 2014) [4].

Chickpeas are well-known for their delicious nut like taste and are high in protein content. Also known as garbanzo, chickpeas are highly nutritious. Their nutritional quality makes chickpea famous Indian and Middle Eastern dish. Chickpeas are one of the healthiest food sources of dietary fiber. They provide carbohydrates for people sensitive to insulin and those suffering from diabetes. Chickpeas are low in fat content and contain both the soluble and insoluble fiber, which helps in reducing both total and LDL cholesterol. Chickpeas are rich in folate and protein content. Folate is a soluble B vitamin, which is present naturally in food items and reduces the risk of colorectal cancer in people.

Among the food legumes, chickpea is the most hypocholesteremic agent; germinated chickpea was reported to be effective in controlling cholesterol level in rats (Geervani, 19991) [1].

Materials and Methods

The experimental work was carried out in the research laboratory of department of Dairy, Technology, Warner college of Dairy Technology, Sam Higginbottom university of Agriculture, Technology and Sciences, Allahabad. Chick pea was obtained from the local market of Allahabad city Chick pea milk was prepared by chick pea through different steps of processing.

Chick pea milk processing

People used to buy soy milk when they needed a non dairy alternative to milk, but it was quite expensive. Therefore, soymilk was prepared at home. Out there are many health issues related to soy, and now try to avoid it as much as possible. While there are other non dairy alternatives to soy milk out there, they're usually expensive to buy or even make. The chickpea milk is an alternate to soy milk. The taste is quite good, and remarkably similar to soy milk.

Processing

1. Soaked the chickpea in water overnight. Made sure to put in lots of water because the chickpeas expand and absorb a lot. When they finished soaking, they were soft enough to bite.

Fig 1: Soaked chickpea

2. Blended the chickpeas until they form as smooth a paste as possible. Using some water and also stopped the machine periodically to push down the sides so that no unblended parts remained.
3. Filled a large pot halfway with water and bring to a boil on the stove.
4. When the water is boiling, added the chickpea paste to the water, mixed, and was cooked on a medium heat for 20 minutes or so. Mixed it periodically and stand on guard because the chickpea milk will probably boil over. The boiled over chickpea milk on the stove dries, it flakes off very easy and is quite a breeze to clean.

Fig 2: Grinded chick pea

5. Strained the milk. Chickpea milk is a bit thicker than soy milk, so the straining process needs to be a drop different. strained through a mesh strainer into a large container, or

line a collander with a cheese cloth. Usually when straining through a cheese cloth, simply let it drip, but chickpea milk is too thick to simply drip through- it must be pressed through. Tied the cheese cloth and put a weight on it, like a bowl filled with water, or simply wait till the chickpea milk cools down enough to handle and squeeze out the milk by hand.

Fig 3: Filtered by muslin cloth

Fig 4: Straining of chick pea milk

6. Fixed it up. Water down the chickpea milk and added salt and sweetener to taste. usually put less than a tablespoon of each and watered down the chickpea milk quite a bit.

Fig 5: Prepared chick pea milk

Fig 6: Residue of chick pea milk

Chickpea Grain Composition

Different carbohydrates are classified into (i) available (mono and disaccharides), which are enzymatically digested in the small intestine and (ii) unavailable (oligosaccharides, resistant starch, non-cellulosic polysaccharides, pectins, hemicelluloses and cellulose), which are not digested in the small intestine.

Dietary Fibre

Dietary fibre (DF) is the indigestible part of plant food in the human small intestine. DF is composed of poly/oligosaccharides, lignin and other plant-based substances. The dietary fibres can be classified into soluble and insoluble. Soluble fiber is digested slowly in the colon whereas the insoluble fibre is metabolically inert and aid in bowel movement. The insoluble fibre undergoes fermentation aiding in the growth of the colonic bacteria. Total dietary fibre content (DFC) in chickpea is 18-22 g 100-g of raw chickpea seed and it has higher amount of DF among pulses. Soluble and insoluble DFC is about 4-8 and 10-18 g 100-g of raw chickpea seed respectively. The fiber content of chickpea hulls on a dry weight basis is lower [75%] compared to lentils [87%] and peas [89%]. The lower DFC in chickpea hulls can be attributed to difficulty in separating the hull from cotyledon during milling

Protein Content

Protein malnutrition is observed in infants and young children in developing countries and includes a range of pathological conditions arising due to lack of protein and calories in the diet. Malnutrition affects about 170 million people especially preschool children and nursing mothers of developing countries in Asia and Africa. Pulses provide a major share of protein and calories in Afro-Asian diet. Among the different pulses, chickpea is reported to have higher protein bioavailability.

Fat Content and Fatty Acid

Profile Total fat content in raw chickpea seeds varies from 2.70-6.48 %. Reported lower values (~ 2.05 g 100-g) for crude fat content in desi chickpea varieties. Fat content of 3.40-8.83% and 2.90-7.42% in Kabuli and desi type chickpea seeds respectively was reported by Wood and Grusak.

Minerals

Chickpea, like other pulses, not only brings variety to the cereal-based daily diet of millions of people in Asia and

Africa, but also provides essential vitamins and minerals. Raw chickpea seed (100 g) on an average provides about 5.0 mg 100-g of iron, 4.1 mg 100-g of zinc, 138 mg 100-g of magnesium and 160 mg 100-g of calcium. About 100g of chickpea seed can meet daily dietary requirements of iron (1.05 mg/day in males and 1.46 mg/day in females) and zinc (4.2mg/day and 3.0 mg/day) and 200g can meet that of magnesium (260 mg/day and 220 mg/day).

Vitamins

Vitamins are required in tiny quantities; this requirement is met through a well-balanced daily diet of cereals, pulses, vegetable, fruits, meat and dairy products. Pulses are a good source of vitamins. chickpea can complement the vitamin requirement of an individual when consumed with other foods. Chickpea is a relatively inexpensive and good source of folic acid and tocopherols [both γ and α;. It is a relatively good source of folic acid coupled with more modest amounts of water soluble vitamins like riboflavin (B2), panthothenic acid (B5) and pyridoxine (B6).

Health Benefits

Although pulses have been consumed for thousands of years for their nutritional qualities. it is only during the past two to three decades that the interest in pulses as food and their potential impact on human health been revived. Chickpea consumption is reported to have some physiologic benefits that may reduce the risk of chronic diseases and optimize health (discussed in detail in the following paragraphs). Therefore, chickpeas could potentially be considered as a 'functional food' in addition to their accepted role of providing proteins and fibre. Different definitions are proposed describing the functional foods: (i) "one encompassing healthful products including, modified food or ingredient that may provide health benefits beyond traditional ingredients (ii) "foods that, by virtue of the presence of physiologically-active components, provide a health benefit beyond basic nutrition". As discussed above, chickpea is a relatively inexpensive source of different vitamins, minerals(9,99,100) and several bioactive compounds (phytates, phenolic compounds, oligosaccharides, enzyme inhibitors etc.) that could aid in potentially lowering the risk of chronic diseases.

Other Health Benefits

Chickpea seed oil contains different sterols, tocopherols and tocotrienols. These phytosterols are reported to exhibit anti-ulcerative, anti-bacterial, anti-fungal, anti- tumoric and anti-inflammatory properties coupled with a lowering effect on cholesterol levels phytosterols present in chickpea oil have antioxidant properties even at frying temperatures. Carotenoids like lutein and zeaxanthin, the major carotenoids in chickpea seeds, are speculated to play a role in senile or age-related macular degeneration (AMD). Though there are some epidemiological and association studies suggesting a beneficial effect of lutein and zeaxanthin on AMD, evidence from RCTs on the effect of carotenoids on AMD is not found. Carotenoids are reported to increase natural killer cell activity. Vitamin A, a derivative of β-carotene is important in several developmental processes in humans like bone growth, cell division/differentiation and most importantly vision. It is reported that at least three million children develop xerophthalmia (damage to cornea) and about 250,000-500,000 children become blind due to Vitamin A deficiency. Chickpea is reported to have higher levels of carotenoids (explained above) than "golden rice" and it could be potentially be used as a source of dietary carotenoids.

Conclusion

The information presented here shows the potential nutritional importance of chickpea and its role in improved nutrition and health. It is an affordable source of protein, carbohydrates, minerals and vitamins, dietary fibre, folate, β-carotene and health promoting fatty acids. Scientific studies provide some evidence to support the potential beneficial effects of chickpea components in lowering the risk for various chronic diseases, although information pertaining to the role of individual chickpea components in disease prevention and the mechanisms of action are limited to date. This is due to the complex nature of disease etiology and various factors impacting their occurrence. It is imperative the scientific community continues to unravel the mechanisms involved in disease prevention and determine how food bio-actives from such foods as chickpea can influence human health. Further research, especially well conducted RCTs, and needs to be performed to provide compelling evidence for the direct health benefits of chickpea consumption.

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