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The Evaluation of Some Gluten-Free and Casein-Free Products Fortified With Flaxseed

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Abstract

Autism is a neurological disorder of behavior and the ability to socialize with its influence clearly increasing over the past decades. Autism disorders (ASD) affect more the percent of children who are not apparent in the behavior before the age of three years. Genetics have a major role in the etiology of autism, in conjunction with the early environmental factors of growth. Epidemiological studies indicated that the environmental factors they are exposed to. This study was amid to assessment the effect of adding flaxseed to the biscuits and enabling a group of 35 children to work 50% female methodology and 50% mals. The study found Chemical composition of flax seeds, chemical composition of biscuit, Antinutritional materials content of flaxseeds and sensory evaluation of the biscuits. The obtained results indicated that the moisture, protein, fat, fiber, ash, carbohydrates and energy value contents of flax seeds as dry weight (DW) were 6.50, 24.40, 35.12, 3.15, 2.63, 28.20 % and 526.48, respectively. The obtained results indicated that the water, protein, fat, ash, fiber, and carbohydrates contents of the product were 5.60, 22.\, 18.35, 6.00, 38.00% and 10.05 Kcal/100g, respectively antinutritional materials content of flax seeds, obvious that IT contain tannins, phytates and oxalate. The mean values were 118.24, 225.16 and 16.20 mg/100g, respectively The values of Appearance were 10%, 40%, 30% and 20% for moderetly attractive, attractive matches photo, unappetizing and unattractive and the values for taste and flavor were flavorful 20%, acceptable 30%, off flavor 20% and flavor did not appeal to me 20% , texture/rating was 100% for off texture, Aroma/smell were 20% for acceptable aroma, 60% for aroma is not appealing and 20% for unappetizing aroma. And overall acceptability were 80% for moderately unacceptable and 20% for unacceptably.

Key words: Autism, Flaxseed, biscuit, children, anti-nutritional, sensory evaluation

Introduction

Autism spectrum disorders represent a group of neurodevelopmental disorders typified by impairments in verbal and non-verbal communication, social and stereotypical behaviors, which may or may not be associated with cognitive deficits, self-injurious behaviors and other neurological comorbidities (**Majewska et al., 2010**). Autism spectrum disorders affect more the percent of children and is usually evident in behaviour before the age of three years (**Oono et al., 2013**). The incidence and prevalence of autism have dramatically increased over the last 20 years. It is more prevalent in males, with a male : female sex ratio in the range 2:1 to 3:1 (**Lai et al., 2013**). Genetics has a key role in the aetiology of autism, in conjunction with developmentally early environmental factors (**Lai et al., 2013**). Epidemiologic studies indicated that environmental factors such as toxic exposures, teratogens, perinatal insults, and prenatal infections such as rubella and cytomegalovirus account for few cases (**Muhle et al., 2004**).

There is growing interest in possible dietary involvement in the aetiology and treatment of Autistic Spectrum Disorders (ASD) (**Cornish, 2002**). The most popular dietary intervention is the Gluten free -Casein free (GFCF) diet. Most parental and teacher reports of autism children who, after being placed on the restricted diet, have been cured of their autism, having acquired language and showing a marked improvement in social relatedness (**Elder et al., 2006**). It has been suggested that peptides from gluten and casein may have a role in the origins of autism and that the physiology and psychology of autism might be explained by excessive opioid activity linked to these peptides. Researchers have reported abnormal levels of peptides in the urine and cerebrospinal fluid of people with autism (**Millward et al., 2009**).

Over the past few years, the consumption of flaxseed has been noted to increase. This is due to a greater awareness on its benefits to the prevention of chronic noncommunicable diseases (NCDs), along with results from studies on the constituents of this grain. Of such constituents, we can highlight essential fatty acids, with α -linolenic acid (omega 3) found in the greatest amount, besides having fiber and protein. This grain is rich in lignans, phenolic acids, flavonoids, vitamins and minerals (**Morris., 2001**).

Because it is rich in α -linolenic acid, evidence suggests that flaxseed has hypocholesterolemic effects, acting on the reduction of LDL (low density lipoprotein), and thereby it prevents cardiovascular diseases. Studies show that the consumption of flaxseed promotes increased HDL (high density lipoprotein) and its antioxidant properties work in the prevention of cancer and atherosclerosis (**Yuan *et al.*, 1999**).

Nutritional therapy and modifications in diet could be one of the alternate therapies of management. Seventy – eighty percent of people with autism have elevated levels of opioid peptides in the urine which aggravate autistic features (**Reichelt *et al.*, 1994**) . These peptides originate from improperly digested proteins mainly from casein and gluten. So a diet which excludes casein and gluten can help in reducing the autistic symptoms (**Uma Maheshwari and Susan Joseph., 2006**). Gluten in grains such as wheat, oats, rye and barley and casein in milk and milk products are one of the most significant launchers of the destructive reaction. In recent years, many studies have reported that fatty-acids deficiencies or imbalances are linked with childhood neurological disorders. Various studies have also proven that autistic children do have lesser content of omega- 3 in the body. Children with autism suffer from various feeding problems which decrease their dietary intake and lead to deficiency conditions. Supplementation of the snack rich in omega – 3 can bring about tremendous changes. Thus, in addition to a gluten-free casein-free diet, omega-3 supplementation is important. Therefore, this study attempts to find efficacy of flax seeds supplementation on children with Autism and how to improve their health.

Chickpea (*Cicerarietinum L.*) is an important pulse crop grown and consumed all over the world, especially in the Afro-Asian countries. It is a good source of carbohydrates and protein, and the protein quality is considered to be better than other pulses. Chickpea has a significant amounts of all the essential amino acids. Starch is the major storage carbohydrate followed by dietary fibre, lipids are present in low amounts but chickpea is rich in nutritionally important unsaturated fatty acids like linoleic and oleic acid. It can be utilized to develop nutritious value added products and hence products can also be used as nutritious food for low income group in developing countries and for patients suffering with life style diseases. Chickpea (*Cicerarietinum L.*), also called garbanzo bean or Bengal gram, is an

Old World pulse and one of the seven Neolithic founder crops in the Fertile Crescent of the Near East(**Lev-Yadun *et al.*, 2000**) .

In the Indian subcontinent, chickpea is split (cotyledons) as dhal and ground to make flour (besan) that is used to prepare different snacks. In other parts of the world, especially in Asia and Africa chickpea is used in stews, soups/salads and consumed in roasted,boiled, salted and fermented forms. These different forms of consumption provide consumers with valuable nutrition and potential health benefits (**Hulse JH. 1991**) .

There are two major types of chickpea distinguished by seed-size, shape and color. One, desi-type is characterized by relatively smaller seeds of angular shape with dark seed coat, whereas other kabuli- type is characterized by large owl/ram-head-shaped seeds with beige-colored seed coat. Kabuli-type chickpea is considered more economically important as it receives higher market price than desi-type (**Agarwal and Jhanwar,2012**) .

Nutrient Composition

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 (**Jambunathan, and Singh, 1980**). The unavailable carbohydrates content is higher in chickpea than other legumes, and chickpea carbohydrates has a lower digestibility than that of other pulses. The crude protein content of chickpea varies from 12.4 to 31.5%. Chickpeas contain about 6% fat that is important in the vegetarian diets of resource-poor consumers. The fiber components of kabuli and desi varieties differ quantitatively and qualitatively.

The protein quality is considered to be better than other pulses. Chickpea has significant amounts of all the essential amino acids except sulphur-containing amino acids, which can be complemented by adding cereals to the daily diet. Starch is the major storage carbohydrates followed by dietary fibre, oligosaccharides and simple sugars such as glucose and sucrose. Although lipids are present in low amounts, chickpea is rich in nutritionally important unsaturated fatty acids such as linoleic and oleic acids. β -Sitosterol, campesterol and stigmasterolare important sterols present in chickpea oil. Ca, Mg, P and, especially, K are also present in chickpea seeds (**Jukanti, 2012**).

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 (**Jukanti, 2012**).

Chickpea contains nutritionally important minerals, notably calcium and iron, and the availability of iron is reported to be good. Immature green chickpea seeds are reported to contain 2.2mg thiamine (100 g)⁻¹ and .7 mg riboflavin (100 g)⁻¹.

Fermentation improves the protein quality of chickpea in such products as dhokla, by increasing the levels of limiting amino acids, and thiamine and riboflavin, the important B-vitamins which usually are not consumed in adequate amounts to meet daily requirements in India. The antioxidant capacity, and antimutagenic (**Jukanti, 2012**). Apoptosis-related and antiproliferative effects of chickpea are associated with the presence of phenolic compounds in the seeds (**Murty, 2010**).

Overall, chickpea is an important pulse crop with a diverse array of potential nutritional and health benefits (**Segev, 2010**).

Flaxseed is the seed from flax plant (*Linum usitatissimum*) which is a member of the linaceae family. The plant is not a new crop being native to west Asia, and cultivated since at the least 5000 Bc; today it is mainly grown for its oil (**Oomah, 2001**).

Humans have consumed flaxseed since the beginnings of the earliest civilizations. It was used for medical purposes in ancient Egypt and Greece, mainly to relieve abdominal pains and also as energy source (**Oplinger et al., 1989**).

Flaxseed is the seed with the highest Omega 3 fatty acid (alpha-linolenic acid) content. Around 48% of all the lipids correspond to this essential fatty acid that should be consumed in a normal diet (**Coskuner and Karababa., 2007**).

Flax is considered a functional food or source of functional ingredients, because it contains alpha-linolenic acid, lignans and polysaccharides (other than starch), all of which have positive effects in

disease prevention. Although scientific evidence supports flaxseed consumption, many people are still unaware of the benefits provided by this product and its possible applications in the production of food stuffs (Udeniqwe , *et al.*, 2009)

Subject And Methods

The present study was conducted during the period from On autistic children. It include 35 autistic ages 5 to 10 years .All candidates mothers were subject to questionnaire to obtain data about possible risk factor of (ASD) it involves quotations on socio-demographic, birth family and medical history, anthropometric measurements, food record method, 24-hour recall, nutrients intake.

Materials:

- 1.Corn flour was obtained from Egyptian Italian corn products
- 2: Chickpea flour was obtained from Zamzam Co, cairo ,Egypt
- 3: Cocoa powder ,baking powder, vanilia , eggs were obtained from local market
- 4: Flaxseed from local market

Methods :

Preparation of flaxseeds

- 1-The seeds were dry cleaned to remove dust and undesirable materials.
- 2-After cleaning, the seeds were heated at (roasted) 150°C for 15 min in an electric oven.
- 3-Then the seeds were grounded and kept stored at 4°C until used.

Preparation of biscuits:

Biscuits were prepared according to the methods described by **Smith., (1972)**. Briefly, corn oil (45g), corn flour (150g)were mixed in a Hobaret mixer for 15 min. Fresh eggs (120 g) were added and mixed for 3min. Flaxseed(75g) mixed for 2 min and(113 g) grams of chickpeafLOUR(or its blends) were sieved twice with leaving agent (8 g) and mixed for 4 min . Water (8ml) was added and mixed for 12min .Dough were sheeted 4mm .Biscuits formed manually and baked at 180°C for 20 min in laboratory oven . The biscuits cooled at room temperature for 75 min.

Analytical Methods

Moisture, Protein (N x 6.25 Keldahl method), fat (hexane solvent, Soxhielt apparatus), fiber and ash were determined according to the method recommended by **A. O. A. C.(2000)**.

Carbohydrates and energy value

Carbohydrate calculated by differences as follows:

% Carbohydrates = 100 - (% moisture + % protein + % fat + % ash + % fiber).

Energy value was estimated by the sum of multiplying protein and carbohydrates by 4.0 and fat by 9.0 according to **FAO (1982)**.

Statistical analysis

Data were recorded as means and descriptive by (SPSS) (Ver.10.1). (SPSS windows ., 2007)

RESULTS AND DISCUSSION

The relation between economic Status and anthropometric measurements

Table (1) data showed the anthropometric measurements of autistic children were lived in both the low and medium economic status had the nearly same values of head circumference were (49.85 ± 1.55 and 49.94 ± 2.38 cm, respectively), BMI was (15.64 ± 2.17 and 17.07 ± 3.22 , respectively), weight was (17.41 ± 4.27 and 15.22 ± 1.90 kg, respectively), height was (103.35 ± 9.29 and 95.39 ± 10.39 cm, respectively) and finally Current age was (5.24 ± 1.99 and 4.72 ± 1.52 year, respectively). There is no significant between low economic status and medium in head circumference while there were insignificant changes in the other parameters.

The relation between economic status and delivery feeding

The percentages of breastfeeding of autistic were 94.4% in low economic status and 70.6% in medium economic status and 5.6% were mix feeding in low economic status compared to 11.8% in medium economic status, with the difference was statistically nonsignificant ($X^2 = 4.17$, $p = 0.1243$, $p > 0.05$). as showed in table (2)

Chemical composition of flax seeds

Data given in Table (3) show the chemical composition of flaxseeds. The obtained results indicated that the moisture, protein, fat, fiber, ash, carbohydrates and energy value contents of flax seeds as dry weight (DW) were 6.50, 24.40, 35.12, 3.15, 2.63, 28.20 % and 526.48 Kcal/100g, respectively.

The chemical composition of biscuit

Data given in Table (4) show the chemical composition of the product.

The obtained results indicated that the water, protein, fat, ash, fiber, and carbohydrates contents of the product were 5.60, 22.1, 18.35, 6.00, 38.00% and 10.05 Kcal/100g, respectively.

Antinutritional materials content of flax

Data presented in Table (5) show the antinutritional materials content of flax seeds. It is obvious that IT contain tannins, phytates and oxalate. The mean values were 118.24, 225.16 and 16.20 mg/100g, respectively.

The sensory evaluation of the technological biscuits.

Data in table (6) showed that, the sensory properties (Appearance, Taste/Flavor, Texture/rating, overall acceptable, Aroma/smell/rating) of the cake.

The values of Appearance were 10%, 40%, 30% and 20% for moderately attractive, attractive matches photo, unappetizing and unattractive and the values for taste and flavor were flavorful 20%, acceptable 30%, off flavor 20% and flavor did not appeal to me 20%, texture/rating was 100% for off texture, Aroma/smell were 20% for acceptable aroma, 60% for aroma is not appealing and 20% for unappetizing aroma. And overall acceptability were 80% for moderately unacceptable and 20% for unacceptably.

Table (1): The relation between economic Status and anthropometric measurements

Mean \pm SD	Anthropometric	
	Low (N=18)	Medium (N=17)
Current age	5.24 \pm 1.99	4.72 \pm 1.52
High	103.35 \pm 9.29	95.39 \pm 10.39
Weigh	17.41 \pm 4.27	15.22 \pm 1.90
BMI	15.64 \pm 2.17	17.07 \pm 3.22
Head circumference	49.85 \pm 1.55	49.94 \pm 2.38

Table (2): The relation between economic status and delivery feeding

Variables	Economic status				X ²	P
	Low (N=18)		Medium (N=17)			
Delivery feeding	No	%	No	%	4.170	0.1243
Breast feeding	17	94.4%	12	70.6%		
Bottle feeding	0	0%	3	17.6%		
Mix feeding	1	5.6%	2	11.8%		

Table (3): Chemical composition of flax seeds

Constitutes of flaxseed	(%, DW)
Moisture %	6.50 ± 0.89
Protein %	24.40 ± 3.12
Fat %	35.12 ± 4.11
Ash %	2.63 ± 0.56
Fiber %	3.15 ± 0.65
Carbohydrates %	28.20 ± 5.01
Energy value (Kcal/100g) %	526 ± 14.32

DW= Dry weight

Table (4) : The chemical composition of biscuits

Constitutes	Mean ± SD
Water %	5.60 ± .1000
Protein %	22 ± .1000
Fat%	18.35 ± .1076
Ash %	6.00 ± .16289
Fiber %	38.00 ± .1,0000
Carbohydrates %	10.05 ± .10017

Table (5): Antinutritional materials content (Mean±SD) of flax seeds

Anti-nutritional	Flax seeds
Tannins (mg/100g)	118.24±0.12 ^b
Phytates (mg/100g)	225.16±0.13 ^b
Oxalates	16.20±0.10 ^b
LSD : p≤ 0.05	4.50

Table (6): The sensory evaluation of the technological biscuits.

Overall acceptable		Aroma/smell/rating			Texture	tase/flavore				Appearance				
Unacceptably	moderately unacceptable	unappetizing aroma	aroma is not appealing	acceptable aroma	off texture	Flavor did not appeal to me	off Flavor	acceptable	Flavorful	unattractive	unappetizing	matches photo	attractive	moderately attractive
20	80	20	60	20	100	20	20	30	20	20	30	40	10	

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تقييم بعض المنتجات الخالية من الجولتين والخالية من الكازين المدعمة ببذور الكتان

حمدية أحمد هلال، دعاء مصطفى ضيف

المخلص العربي

يعد التوحد اضطراباً عصبياً في السلوك وقدرة التواصل الاجتماعي مع زيادة تأثيره بشكل واضح على مدار العقود الماضية. تؤثر اضطرابات التوحد (ASD) على نسبة مئوية أكبر من الأطفال الذين ليسوا واضحين في السلوك قبل سن ثلاث سنوات. للوراثة دور رئيسي في مسببات مرض التوحد ، بالاقتران مع العوامل البيئية المبكرة للنمو. تشير الدراسات الوبائية إلى أن العوامل البيئية التي يتعرضون لها. كانت هذه الدراسة في تقييم تأثير إضافة بذور الكتان إلى البسكويت وتمكين مجموعة من 35 طفلاً من العمل بنسبة 50٪ في منهجية الإناث و 50٪ ذكور. وجدت الدراسة أن التركيب الكيميائي لبذور الكتان والتركيب الكيميائي للبسكويت ومحتوى المواد المضادة للتغذية من بذور الكتان ، والتقييم الحسي للبسكويت. حيث أظهرت النتائج التي تم الحصول عليها أن الرطوبة والبروتين والدهون والألياف والرماد والكربوهيدرات ومحتويات قيمة الطاقة من بذور الكتان كوزن جاف (DW) كانت 6.50 ، 24.40 ، 35.12 ، 3.15 ، 2.63 ، 28.20 ٪ و 526.48 كيلو كالوري (K. Cal) علي التوالي. أوضحت النتائج التي تم الحصول عليها أن محتويات الماء والبروتين والدهون والرماد والألياف والكربوهيدرات للمنتج كانت 5.60 و 22 و 18.35 و 6.00 و 38.00 ٪ و 10.05 كيلو كالوري / 100 جم علي التوالي. محتوى المواد المضادة للتغذية من بذور الكتان. من الواضح أن تكنولوجيا المعلومات تحتوي على الفيتات ، والتاناتوالأكسالات. وكانت القيم المتوسطة هي 118.24 و 225.16 و 16.20 ملجم / 100 جرام ، علي التوالي. وبالنسبة للصفات الحسية لوحظ أن جميع الصفات الحسية (اللون والنكهة والطعم والملمس والمظهر والشعور في الفم، والقبول العام) سجلت أعلى درجة الجودة.