VALUE ADDED BREAD OF PUMPKIN SEED FLOUR; FUNCTIONAL CONSTITUENTS & MEDICINAL PROPERTIES OF PUMPKIN SEED.

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Abstract

Pumpkin belongs to cucurbitaceae family. Pumpkin have high nutritional value, good bioavailability and low cultivation cost, can store for a long time. Pumpkin seed may considered as nutritional powerhouse, having neutraceutical properties and health benefits. Pumpkin seed rich source of functional components like vitamin-A, minerals (Mg,Zn,Fe),unsaturated fatty acids, PUFA, which prevent heart diseases and promote health. The study on "Development of value-added bread by using pumpkin seed flour and soyabean flour enriched with dates and cranberry" is to aware the people that pumpkin seed is not a agro-industrial waste. Pumpkin seed may use in bakery as noval value –added bakery products by using seed flour & oil. Pumpkin seed contains some functional components and medicinal properties. Some countries like America, Southeastern Europe, Germany and China have been used pumpkin as folk medicine. Pumpkin seed contains some phytoestrogen components which may helps in preventing hyperlipidemia ,osteoporosis for menopausal women, improve bladder and prostate problems, prevents infertility, having antioxidant, anti-diabetic, antibacterial, anticancer property.

Key words: value-addition, functional constituents, phytoestrogen, infertility, anticancer

Introduction:

Pumpkin belongs to cucurbitaceae family. *Cucurbita pepo* is most commonly used for cultivation. *Cucurbita arggyrosperma*, *cucurbita moschata* also looks like pumpkin.Pumpkin is one of the oldest domesticated plant having been used since 7,500-5,000 Bc. The name of pumpkin is derived from a greek word 'pepon' means "large melon" French adopted the word pepon as 'pompon' British named it 'pumpion'and later Americans named it 'pumpkin'. C. *Pepo* generally weigh between 3 and 8 kiligrams. The vegetables belongs to cucurbitaceae family is rich in protein,pepton,fibre,trace elements such as magnesium,zinc,iron etc.,phytochemicals, teriterpenes, saponins. C.maxima species weights of over 32 kgs. The colour of pumpkin is due to presence of carotenoid pigments,including β-cryptoxanthin,α &β carotene, which are provitamin. Provitamin is a compound converted to vitamin-A in the body. Pumpkin have high nutritional value and low cultivation cost. Flower and leaves of pumpkin is also used for cooking.pumpkin contains some functional components like β-carotene, polysachharides, sterol, para-amino benzoic acid. Pumpkin seed is edible kernel of fruit pumpkin which is generally considered as agro-industrial waste. Pumpkin seed having high nutritional value and medicinal properties which is beneficial for health. Pumpkin seed oil may use as salad dressings and in bakery, secreted from roasted seed of pumpkin. Pumpkin seed is contains fatty acids, such as oleic acid and alpha-linolenic acid. Study has been found that canned pumpkin is often recommended by veterinarians as a dietary supplement for dogs and cats in the treatment of constipation, diarrhoea or hairballs. High fibre in pumpkin seed is good for digestion. In winter the egg production of poultry decreases, reaserches explained that raw pumpkin can be feed to poultry as a supplement to regular feed in winter helps in maintain egg production. Studies on pumpkin seeds has found that the presence of zinc and antioxidant property could improve fertility, helps in synthesis of DNA and RNA, prevents atherosclerosis, high blood pressure and heart diseases as well as stimulate the metabolism of accumulated fats. Pumpkin seed is generally discarded as waste in India, beside of having high yield and high nutritional value and medicinal properties.. Roasted Pumpkin seed may consume as cooking oil, snacks, in baking cake, cookies, bread, and pie. Pumpkin seeds are a common ingredient in Mexican cuisine and are also roasted

and served as a snack. Marinated and roasted, they are an autumn seasonal snack in the United States, as well as a commercially produced and distributed packaged snack, like sunflower seeds, available year-round. Pepitas are known by their Spanish name (usually shortened), and typically salted and sometimes spiced after roasting (and today also available as a packaged product), in Mexico and other Latin American countries, in the American Southwest, and in specialty and Mexican food stores. Pumpkin seed may use as noval-value added food or as therapeutic food due to its neutraceutical properties. Pumpkin seed is a rich source of phytosterols, protein, unsaturated fatty acids, antioxidant vitamins such as carotenoid and tocopherol, all are functional constituents which are beneficial for health.

Pumpkin seeds, fruits and leaves have been used as folk medicine by Americans to treat intestinal worms and urinary infections, in Germany and South-eastern Europe seeds of c.*pepo* also used as folk medicine for the treatment of bladder infection and prostatic hyperplasia. In china seeds were used for the treatment of parasitic diseases.

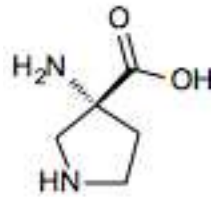
Fig-1: Figure of pumpkin seeds

Pumpkin seeds with shell

Pumpkin seeds without shell

Fig-2: Some Functional constituents of pumpkin seeds.

(A)



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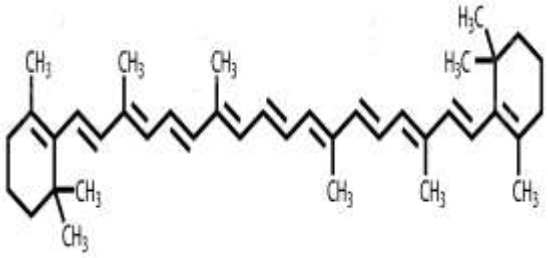

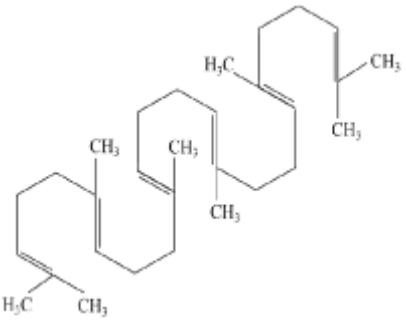

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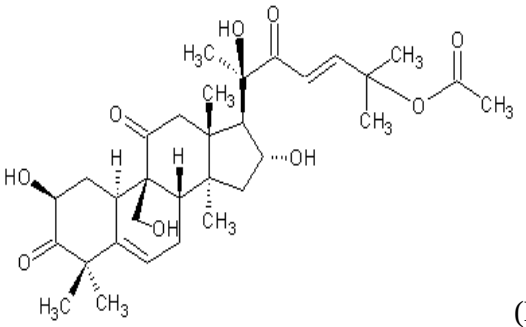

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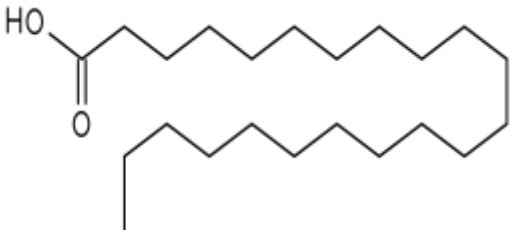
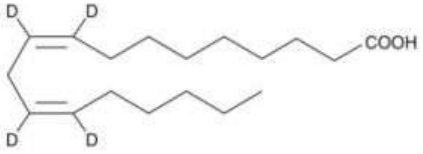


(E)



(F)

Chemical Structure of some functional constituents(A) cucurbitin,(B) beta-carotene,(C)beta-cryotoxanthin,(D) cucurbitocidin-A,(E) linolic acid, (F)Behnic acid.

Nutritional value of pumpkin seeds

Nutrient	Value per 100gm	Nutrient	Value per 100gm
Water	4.5(g)	Vitamin B-6	0.037(g)
Calcium	55(mg)	Folate,total	9(mcg)
Energy	446(k.cal)	Vtamin –A, RAE	3(µg)
Iron	3.31(mg)	Vitamin-A, IU	62(IU)
Protein	18.55(g0	Magnessium	262(mg)
Total lipid (fat)	19.4(g)	phosphorous	92(mg)
Ash	3.8(g)	potassium	919(mg)
CHO, by difference	53.75(g)	sodium	18(mg)
Fibre (total dietary)	18.4(g)	Zinc	10.3(mg)
Mangnese	0.496(mg)	Fatty acids,total saturaded	3.67(g)
Copper	0.69(mg)	12:0	0.019(g)
14:0	0.022(g)	Cholesterol	0(g)
16:0	2.374(g)	18.0	1.189(g)
Fatty acids,mono unsaturated	6.032(g)	16:1	0.042(g)
18:1	5.985(g)	Leucine	1.572(g)
Isoleucine	0.956(g)	Threonine	0.683(g)
Tryptophan	0.326(g)	Lysine	1.386(g)
Fatty acid, total poly unsaturated	6.032(g)	18:2	8.75(g)
18:3	0.077(g)	Cystine	0.228(g)
Methionine	0.417(g)	Phenylalanine	0.924(g)
Vitamin C, total ascorbic acid	0.3(mg)	Tyrosine	0.77(g)
Thiamin	0.034(mg)	Valine	1.491(g)
Riboflavin	0.052(g)	Arginine	3.049(g)
Niacin	0.28(g)	Histidine	0.515(g)
Pantothenic acid	0.056(g)	Alanine	0.875(g)
Asparatic acid	1.873(g)	folic acid	9(mcg)
Glutamic acid	3.262(g)	Glycine	1.358(g)
Proline	0.756(g)	Serine	0.868

Source :- USDA, National nutritional databasefpr standard per 100gm of Pumpkin seed kernel(2019).

Use of Pumpkin seeds in bakery industry

Reserches has been found that pumpkin seed having a functional constituents and neutraceutical properties. Bakery industry are using pumpkin seed flour or oil in bakery products like pestry,cake,bread,cookies etc in considered increasing the health benefits of functional food among consumenrs**.** Jun and others (2006) reported that pumpkin is processed into various food products as it is a good source of carotene, minerals, pectin, mineral salts, vitamins and other bioactive substances such as phenolic compounds and terpenoids (crozier 2003). It also contains pufa and mufa that helps to regulate the serum insulin levels, reduce blood glucose levels and improve glucose tolerance.antioxidants are found in many foods, especially green plants and highly colored fruit. The components of pumpkin seeds (oil and cake) can be valuable as additives in bread, because they provide a good source of protein, are rich in antioxidants, and are high in monounsaturated and polyunsaturated fatty acids. When pumpkin seed oil is expelled from the seed, a byproduct, pumpkin seed cake, is produced (peričin, krimer, trivić, &radulović, 2009; el-soukkary, 2001). Pumpkin seeds primarily consist of

protein and fat providing a concentrated energy source (caili, huan, &quanhong, 2006). Protein from food is one of the main components needed to be consumed each day for a healthy diet. Pumpkin seed proteins contain a high amount of tryptophan (zdunczyk, minakowski, frejnagel&flis, 1999). With the addition of pumpkin seed cake and oil to bread, the nutritional content of bread could be increased and the disposal of the cake (psc) minimized at the same time (el-soukkary, 2001).

A network of antioxidants, possessing different chemical properties, from food may provide proper protection against stress oxidation. Taking antioxidant supplements like ascorbic acid does not protect against oxidative stress-related diseases as well as antioxidants that come from food (halvorsen, carlsen, phillips, bøhn, holte, jacobs jr., &blomhoff, 2006). Research has shown that consuming foods rich in antioxidants can increase cognitive and behavioral abilities especially as people age (willis, shukitt-hale, & joseph, 2009). Therefore, consuming foods rich in antioxidants may provide an increased value to human nutrition than do supplements. Since pumpkin seed oil and cake are rich in antioxidants like tocopherols and carotenoids, they offer the opportunity to create a new kind of specialty bread that contains this ingredient. Due to the neutraceutical properties of the functional constituents(eg.antidiabetic,antihypertensic,antiinflammetry ,anticancer,immunomodulative,antitumor,antibacterial,antia llergic,intestinal antiparasital,anti-hypercholestremia) found in pumpkin seed researchesrs are focused to aware the consumers its health benefits and and to industries to utilize

Development of Value-added bread of pumpkin seeds flour enriched with dates and cranberry

Bread can be define as a fermented bakery product produced with the help of basic ingredient wheat flour, water, yeast and salt, by undergoing processing procedures such as mixing, kneeding, proofing, shaping and baking. Bread products vary widely around the world, as do their production techniques. Basic ingredients are cereal flour, water, yeast or another leavening agent, and salt (Martin, 2004; Sluimer, 2005). Optional ingredients can be added to improve processing or to produce specialty and novelty breads which often have an increased nutritional value (Jackel, 1994; Sluimer, 2005). During breadmaking, the availabilities and levels of bioactive compounds in cereal grains can decrease or increase (Slavin et al., 2001). The interactions between bread and companion foods are also important and affect the nutritional value of bread (Jenkins et al., 1981). In the past, much effort has been made to divide breadmaking into, on one hand, the laborious dough making and processing, and, on the other hand, proofing and baking (Sluimer, 2005). Dough freezing was also introduced in bread production around 1960. Scientific knowledge can be applied to develop new dough making processes for commercial products (Cauvain, 2004).

The consumption of bread has declined by 13.8% during the period 1999 to 2003 (VLAM, 2005), due to factors such as changing eating patterns and increasing number of choices of substitutes such as breakfast cereals and fast foods (Pra¨tta¨la¨ et al., 2001; Siega-Riz et al., 2000). The market value is being maintained by the growing interest in premium-priced ethnic and specialty breads such as, for example, Italian ciabatta bread. Sliced and packaged bread is also becoming increasingly popular in some countries such as France (Casdagli, 2000; Hilliam, 2001; Hy, 1998). Jones (2006) reviewed the epidemiological evidence for the health-promoting effect of whole grain foods. ‘Eat plenty of cereal foods, preferably whole grain and without added fat, sugar or salt’ can be found in several sets of national dietary guidelines (Truswell, 2002). Fewer calories, more fibre, less salt and fewer additives are the consumer demands for a healthier diet (Meuser et al., 1994). Therefore, new varieties of baked goods are becoming increasingly popular worldwide. Ideal bread should have a lower glycaemic index, be an important source of proteins and contain tolerated dietary fibre, vitamins, magnesium, trace elements

and antioxidants (Lopez et al., 2001). Value added Bread developed by using refined flour mixed with pumpkin seed flour and enriched with dates and cranberry is nutritional rich and having low glycemic index, a good source of minerals and antioxidants, which is beneficial for health.

Composition of value added bread developed by using pumpkin seed flour,dates & cranberry

The Experiment was carried out in the laboratory of Food Science and Technology, Baba Saheb Bhimrao Ambedkar University (a central university), Lucknow.

Ingredients	Amount
Refined Wheat flour	300gm
Pumpkin seeds Flour	100gm
Dates	50gm
Cranberry	50gm

Nutritional value of value-added bread developed by using pumpkin seeds flour and enriched with dates and cranberry

The nutritional profile of sample is done in R-FRAC, Lucknow. There were the samples of bread developed (T1,T2 and T3). Where,T1 is standard bread, T2 is soyabean flour(100gm) added with refined flour(300gm), dates(50)gm, cranberry(50gm), T3 is pumpkin seed flour(100gm), refined flour(300gm), Dates (50gm), cranberry(50gm) and consequently their sensory motor, nutritional and the TPA(Texture Profile Analysis) were done. The TPA was conducted in the laboratory of Allahabad Univeristy, Centre for Food Science and Technology. The study found that value-added bread is nutritionally rich in comparison to standard white bread. The purpose of the study is to highlight the functional and nutritional benefits of the value-bread made of pumpkin seed flour.

Table:1- Nutritional value of value-added bread using pumpkin seeds flour enriched with dates and cranberry,

S.No	Parameter	Unit	Result	Test method
1.	Fat	%	4.30	AOAC
2.	Protein	%	5.50	AOAC 978.04
3.	CHO	%	76.81	SP:7874-1975
4.	Total ash	%	1.33	IS:7874-1975
5.	Calcium	Mg/100gm	63.94	SP:18(P-1)1980
6.	Iron	Mg/100gm	11.80	SP:18(P-1)1980

Source :– R-FRAC, Lucknow

Table:-2 Nutritional value of refined flour bread

Nutritional Information of wheat bread per slice		
Nutritional Facts		
Serving size 1 slice Amount Per Serving		
Calories from fat 22 Calories 128		
Nutrients	Amount	% Daily Values
Total fat	2.48 gm	4%
Saturated Fat	0.366 gm	2%
Poly Unsaturated Fat	1.352 gm	
Mono Unsaturated Fat	0.533 gm	
Cholesterol	0 mg	0%
Sodium	159 mg	7%

Potassium	144 mg	
Total Carbohydrate	23.64 gm	8%
Dietary fiber	2.8 gm	11%
Sugar	1.77 gm	
Protein	3.86 mg	
Vitamin A	0	
Vitamin C	0	
Calcium	2%	
Iron	8%	

Source:- NIN, Hydrabad

Functional Constituents and Medicinal use of Pumpkin seeds

Pumpkin kernels are also an excellent source of B-complex group of vitamins such as thiamin, riboflavin, niacin, pantothenic acid, vitamin B-6 (pyridoxine) and folates. These vitamins work as co-factors for various enzymes during cellular substrate metabolism in the human body. In addition, niacin helps in the reduction of LDL-cholesterol levels in the blood. Along with glutamate, it enhances GABA activity inside the brain, which in turn reduces anxiety and nervous irritability. Pumpkin seeds are a very good source of anti-oxidant vitamin E. Vitamin E is a powerful lipid soluble antioxidant. It prevents tissue cells from the free radical mediated oxidant injury. Thus, it helps maintain the integrity of mucusa and skin by protecting from harmful oxygen-free radicals. The seed of pumpkin has pharmacological activities such as antidiabetic, antifungal, antibacterial and anti-inflammation activities, and antioxidant effects ***(Atuonwu and Akobundu, 2010; Abd El-Aziz and Abd Kalek, 2011).*** Pumpkin seeds are considered an alternative treatment for stage I and II benign prostatic hyperplasia and for irritable bladder*(Winkler et al., 2005)*.The seeds are mildly diuretic and vermifuge *(Pandya and Rao,2010)*.Pumpkin (cucurbita pepo) Seed and seed oil have macro- and micro-constituents composition. They are a rich natural source of proteins, phytosterols polyunsaturated fatty acids, antioxidant vitamins, such as carotenoids and tocopherol and trace elements, such as zinc. Pumpkin seed extract contain high levels of natural potent phytochemicals sterols with great promise for immunomodulation, reproductive health, and therapeutic advantage over a wide range of disease conditions**.** The intake of a whole extract of pumpkin seeds is correlated to reduced benign prostate hyperplasia-associated symptoms (glew et al., 2006, fruhwirth and hermetter, 2007 and stevenson et al., 2007).

Pumpkin fruit,seeds and its leaves has been used as folk medicine during ancient times. Pumpkin seeds, fruits and leaves have been used as folk medicine by Americans to treat intestinal worms and urinary infections, in Germany and South-eastern Europe seeds of c.*pepo* also used as folk medicine for the treatment of bladder infection and prostatic hyperplasia. In china seeds were used for the treatment of parasitic diseases. Pumpkin seeds have been used for many years to improve sexual stimulation and improvement of sexual performance in terms of intromissions and ejaculatory latency which also improved sexual sensation and coupulatory efficiency (gundidza et al., 2009). Zinc is an essential mineral, important in prostate gland function and the growth of the reproductive organs. Zinc is found more in male reproductive fluid than anywhere else in the body. It is required for protein synthesis and collagen formation, promotes a healthy immune system, the healing of wounds and synthesis of dna and rna. Zinc is an important fertility nutrient for both sexes. Zinc deficiency is also linked to men's infertility. Zinc will normalize deficient sperm counts and sperm motility. Even marginal zinc deficiency can cause sperm counts to drop below the point of technical sterility (feng et al.,2002).therefore, the present study was designed to investigate some chemical composition of pumpkin seeds and also determine the effect of pumpkin seeds and / or zinc on the nutritional and sexual healthy status. In addition, several triterpenes such as cucurbita-5, 24-dienol, α- and β-amyrin and sterols are present in the seeds and flowers of *cucurbita maxima.* The essential trace mineral zinc in pumpkin seeds acts as an antioxidant which acts as antioxidant reduce the free radical generation and helps in synthesis of DNA molecule. Pumpkin seed extracts have been used as the initial treatment of cancer, suppress secondary tumor formation, reproductive health and therapeutic purposes for wide ranges of disease conditions. In addition, omega 3 and 6 essential fatty acids in pumpkin seed oil are important for healthy brain and body functioning as well as preventing and improving bladder and prostate problems ,treatment of diabetes, anxiety and even cancer.

Several studies have explained that pumpkin seeds and daily rich diet of zinc can decrease the undesirable side effect of lead contaminants and improve the sexual health status. Pumpkin seeds improve sexual stimulation and intromission and ejaculatory latency. On the other hand,

pumpkin plant extract caused a significant reduction in sperm count with primary and secondary abnormalities by producing further zinc and protein. Therefore, pumpkin seed oil but not the plant extract has been used in preclinical studies to explore its role in both the prevention and treatment of infertility in male animal models (Ebd El Ghany et al.,2010). Along similar lines, studies by aghaei et al have demonstrated that pumpkin seed extract could recover the side effects of cyclophosphamide (cp) mediated changes in histology of epididymis and sperm parameters through preventing oxidative stress. The sperm characteristics in cp-treated rats were significantly decreased and biochemical analysis revealed that the administration of pumpkin seed extract significantly enhanced the total antioxidant capacity. In addition, pumpkin seed extract remarkably improved the histopathological parameters such as vacuolization, disorganization and separation of epididymal epithelium in cp-treated rats. These finding indicate that the pumpkin seed extract could be used to prevent cp-induced reproductive toxicity19. Similarly, mohammadi et al have shown that administration of ginger and pumpkin seed extract simultaneously increased the number of germ cells in seminiferous tubes and had positive effects on the recovery of spermatogenesis in adult rats after cyclophosphamide (cp) treatment. Studies by bourre et al have further brought the importance of oleic acid, a monounsaturated fatty acid also present in pumpkin in reducing the susceptibility of the testis and epididymis to lipid peroxidation.

Multiple studies have demonstrated that an antioxidative property of pumpkin seed extract could improve the fertility and help in preventing arteriosclerosis, high blood pressure and heart diseases as well as in stimulating the metabolism of accumulated fats. Studies by bharti et al have provided pharmacological evidence of tocopherol fraction of raw seeds of *cucurbita pepo l*. As possessing an anti-hyperglycemic property mediated via the interactions of its various components with multiple signaling targets that play crucial roles in diabetes mellitus (dm). In addition, el-mosallamy et al have demonstrated the effect of pumpkin seed extract on blood pressure induced by nitric oxide synthesis inhibitor n(ω)-nitro-l-arginine methyl ester hydrochloride (l-name). In this study, rats treated with 50 mg/kg/day l-name with or without calcium channel blocker, amlodipine and pumpkin seed oil and their effects on the pathological alterations in the heart and aorta induced by l-name were evaluated. Authors demonstrated that both pumpkin seed oil and amlodipine treatments protected the rats from l-name induced defects in the heart and aorta through the mechanism that could involve the generation of no suggesting that pumpkin seed oil exhibits an antihypertensive and cardioprotective effects.

The effects of pumpkin seed oil have also been investigated in influencing the growth of hairs. Interestingly, studies by cho et al.,2014 have evaluated the effects of pumpkin seed oil on hair growth in men with androgenetic alopecia. Studies by bourre et al have further brought the importance of oleic acid, a monounsaturated fatty acid also present in pumpkin in reducing the susceptibility of the testis and epididymis to lipid peroxidation.

Pumpkin oil inhibits acinetobacter baumanii, aeromonas veronii biogroup sobria, candida albicans, enterococcus faecalis, escherichia coli, klebsiella pneumoniae, pseudomonas aeruginosa, salmonella enterica subsp. Enterica serotype typhimurium (Hammer KA, et al.,1999). In a research study it was found that, high enrichment of pumpkin seed oil with unsaturated fatty acids,antioxidant properties of tocopherol and selenium is beneficial for healin arthiritis. Research has been found that pumpkin seeds or its constituents cucurbitin has shown some activity against intestinal parasites (Rybaltovski et.al.,1960). Pumpkin seed is rich in phytochemicals. Studies suggests that pumpkin seed have hypolipidemic effect. It improves the risk of arethroma development(Gossell-Williams et al.,2011).Presence of flavanoids, phenols or saponene are

found in the seed extracts of cucurbita maxima could have hypoglycemic and anti-diabetic agents(Sharma et al.,2013).

Table -3 Some Functional constituents.

Functional components	References
Essential amino acids	The wealth of India,2004
	India,2004
Vitamin	(Stevenson et al,2007)
Minerals	(Parry et al.,2006)
Carotenoids	(Glew et al.,2006)
Lignan	(Slavin et al.,1999)
Squalene	(Rayon et al.,2007)
Cucurbitin	(Chopra et al.,1956)

Sources- Sohni Roy et al.,2015

Table -4 Use of Pumpkin seeds as Folk Medicine

Place/Country	Part	Use as folk medicine	Reference
Nother Mexico	Seeds	diuretics, treatment of parasitic worm infections	(Mc Ginley 2011)
China	seeds	anti-parasitic, deworming medicine	(Ziang Z et al.,2011), (State Administration of Traditional Chine Medicine (1999) Zhong-hua-ben-cao)
Mexico	seeds	treat irritable bladder	(Kesseler OZ et al.,1998)
	Seeds	Micturition caused by the prostate and Treatment of urinary and prostate diseases	References (Wang XL et al.,2001), (Jayaprakasam B et al.,2003)
Europe			
China	Seeds	Anti-parasitic, Beneficial to the spleen and lungs	(Dhiman K. et al.,2012) , (Dabaghian FH, et al.,2012)
Central and North America	Seeds	America Taenicide, diuretic, Gastritis, burns, enteritis and Febrile diseases, Headaches and neuralgia	(Mc Ginley2011),(Wang XL et al.,2001)

Sources – Bahare Salehi et al.,2019

Conclusion

The purpose of the study was to enhance the nutritional property of refined flour bread and to utilize the nutritional benefits of pumpkin seed flour. The value-added bread is valuable in terms of nutritional quality . The study has shown that value added bread made of pumpkin seed flour along with dates and cranberry is nutritionally rich in protein, carbohydrate, ash ,calcium and iron and haing functional properties. And the literature study on the use of pumpkin seeds in bakery industry, functional constituents and medicinal properties is to aware the consumers to utitlise to pumpkin seed,t it is not a agro-industrial waste which is unknowingly discarded as waste beside of having high nutritional value and medicinal and functional properties. The study found that many food shops of united states based on pumpkin seeds like vegetable salads, granola, chunks,breads,cookies,oils etc. The above study shows that pumpkin seeds has nutritional,functional and medicinal properties,which significantly providing micronutrients and also used in the treatment and management of numerous dioseases such as diabeties, inflammation,dipression, hyperlipidemia, hypertension,and cancr.

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