The Pharma Innovation Journal 2022; SP-11(1): 352-355

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(1): 352-355
© 2022 TPI
www.thepharmajournal.com
Received: 10-11-2021
Accepted: 12-12-2021

Sonia Gulia
Ph.D. Scholar, Department of Foods and Nutrition, I.C. College of Home Science, CCS Haryana Agricultural University, Hisar, Haryana, India

Asha Kawatra
Ex. Professor, Department of Foods and Nutrition, I.C. College of Home Science, CCS Haryana Agricultural University, Hisar, Haryana, India

Corresponding Author
Sonia Gulia
Ph.D. Scholar, Department of Foods and Nutrition, I.C. College of Home Science, CCS Haryana Agricultural University, Hisar, Haryana, India

Evaluation of pizza base prepared with pearl millet and Chia seeds: A healthy alternative

Sonia Gulia and Asha Kawatra

Abstract
In this modern era due to lack of time for cooking, bakery products became very popular due to their easy accessibility, long shelf-life and compatibility with multi type recipes. The present study was conducted to evaluate the nutrient composition of Pizza base prepared from HHB-67 Improved variety of pearl millet flour with incorporating *chia* seeds powder (10 to 30%). The protein and fibre content of Pizza base were observed in the range of 12.25 to14.42g/100g and 10.62 to 15.13 g/100g, respectively. The concentration of minerals content like calcium and iron in different types of Pizza base were ranged 99.19 to 197.39 mg/100g and 5.32 to 5.51mg/100g, respectively. This combination of pearl millet-based bakery products with *chia* seeds is a healthy boom to bakery industry because these are not only gluten free, nutritionally superior but also provides a therapeutic option to refined flour based bakery products.

Keywords: pearl millet, pizza base, *chia* seeds, proximate composition, bakery

Introduction
Pearl millet (*Pennisitum glaucum*) is one of the most widely grown among all type of millet and extensively distributed across the semiarid tropics of Africa and India. It has since become Pearl millet has traditionally been an important grain, forage, and stover crop primarily in the arid and subtropical regions of many developing countries. Pearl millet is a rich source of macronutrients i.e., calories, proteins and micronutrients i.e. vitamins and minerals. Nutritionally, pearl millet makes an important contribution to human diet due to high levels of calcium, iron, zinc, lipids and high-quality protein; hence they are termed as "nutri-cereals" (Arora *et al.*, 2003) [3]. It contains about 10.96 g protein, 61.78 g carbohydrates, 11.49 g fibre, 27.35 mg calcium and 6.42 mg iron per 100g because of its high oil content, pearl millet is a good source of fat – soluble vitamin E (2mg/100g) (Longvah *et al*. 2017) [12] when compared to the major cultivated cereal crops such as wheat, rice and sorghum. It is an important source of minerals particularly iron and zinc. The energy content of pearl millet is greater than sorghum and equivalent to brown rice due to its rich unsaturated fatty acids (75%) and linoleic acid (46.30%) content (Jaybhaye *et al.* 2014) [8] In addition, minerals such as magnesium, manganese, and phosphorus are present in significantly higher amounts than in other cereals. It has high levels of lipids, high quality and well-balanced proteins (Elyas *et al.*2002) [7] and diverse health promoting phenolic compounds. Pearl millet has heath promoting properties, particularly its antioxidant activity and its use as nutraceutical's and in functional foods (Dykes and Rooney, 2006) [6]. Pearl millet can be substituted for other major cereals for developing valued food products such as *chapati*, *sev*, *ladoo*, bread (fermented or unfermented), baked products (biscuits, donuts, *pizza base* etc.), porridge, snack and fast foods, baby foods, extruded products, millet wine, millet nutrition powder etc. are made up of pearl millet, which is particularly rich in iron and zinc and antioxidants which altogether may prove beneficial for treating deficiency diseases like anaemia. In addition to good nutritive value, several potential health benefits of pearl millet have been reported such as lowering the risk of cancer and cardiovascular disease like lowering blood pressure, risk of heart disease, lowering cholesterol and rate of fat absorption, and delaying gastric emptying by supplying gastrointestinal bulk. Pearl millet is gluten-free, therefore an excellent option for people suffering from celiac disease which often irritated by the gluten content of wheat and other more common cereal grains.

The search for novel foods is a relevant practice worldwide. *Chia* also known as *Salvia hispanica* L. is a species of flowering plant in the mint family native plant of Central and Southern Mexico and North of Guatemala that belongs to Lamiaceae family (Ayerza, 2010) [4]. The *chia* was classified by the Swedish botanist Carl Von Linneo in 1753, who named it

it Salvia means cure and *hispanica* (Spanish word) that in Latin means Spanish plant used to cure or save (Urbina, 1887) [14]. In Mayan, chia word is used for "strength" and their warriors consumed these seed to last on long hunts, due to its high nutritional value.

The plant of *chia* is an annual herb growing to 1.5 m tall; it produces purple and white flowers with seeds growing in clusters in a spike at end of each stem. These seeds are small and oval in shape and have mild nutty flavour of approximately 1 mm in diameter. The seeds are speckled with brown, grey, black and white colours. Today, *chia* consumed by consumers all over the world as a primary source of food, *chia* sprouts are used in salads, seeds are used in beverages and cereals-based foods and it can be consumed in raw form, concentrated pill and in powder form (Ali et al. 2012) [1]. Due to the gelatinous properties of the seeds, it can be added to foods products such as puddings and smoothies (Dorsey Kockler, 2011) [5]. It can be used for commercial food applications including bread and baked goods, breakfast cereals and bars, beverages, pasta, and dairy, without altering flavour.

Bakery products are usually made with wheat flour, due to its unique functional characteristics to develop a gluten network when it is mixed with water. This gluten formation is essential in producing good baked products and the quality of the bakery products depends largely on the wheat quality. It is possible to replace the wheat flour in bakery products to a certain degree by using other cereal grains, even though the presence of gluten forming proteins is a unique property of wheat flour. The use of millets in bakery products will not only give products superior in terms of fibre content and micronutrients but also create a good potential for millets to enter in the bakery world for series of value added products (Verma & Patel, 2013) [15]. Pearl millet flour can be incorporated in bakery items like biscuits, cakes, muffins, buns etc. Incorporation of *chia* seeds with pearl millet in bakery products is like “made for each other” combination because these seeds fulfilled all the requirements needed during baking. *Chia* seeds can be used as starting material in the food industry because of its dietary fiber content. Gum can be extracted from dietary fiber fraction of *chia* by treatment of seeds with water for use as an additive to control viscosity, stability, texture, and consistency in food systems. Addition of *chia* seeds with pearl- millet may help in baking process due to its unique physio-chemical properties.

Procurement of materials

The seed samples of pearl millet (HHB-67 improved) were procured from Bajra Section, Department of Genetics and Plant Breeding, College of Agriculture, Chaudhary Charan Singh Haryana Agricultural University, Hisar. The *chia* seeds (white variety) and other ingredients used in the preparation of products were purchased from the local market in a single lot.

Processing of pearl millet

To improve the nutritive value and shelf life of pearl millet flour, the grains were subjected to blanching.

Blanching

The grain samples of pearl millet were cleaned. Blanching was done by the process of Johari (2017) [9]. Distilled water was brought to boiling to 98 ºC in an aluminium container. The grains were subjected to boiling water (1:5 ratio of seeds to boiling water) for 30 seconds and dried in oven and ground to flour. The dried flour was stored in plastic container till further usage for product development.

Preparation of *chia* seeds powder

Chia seeds were cleaned of dirt and dust. The cleaned *chia* seeds ground into fine powder. The powder was stored in plastic container till further usage for product development.

Standardization of Pizza base recipe

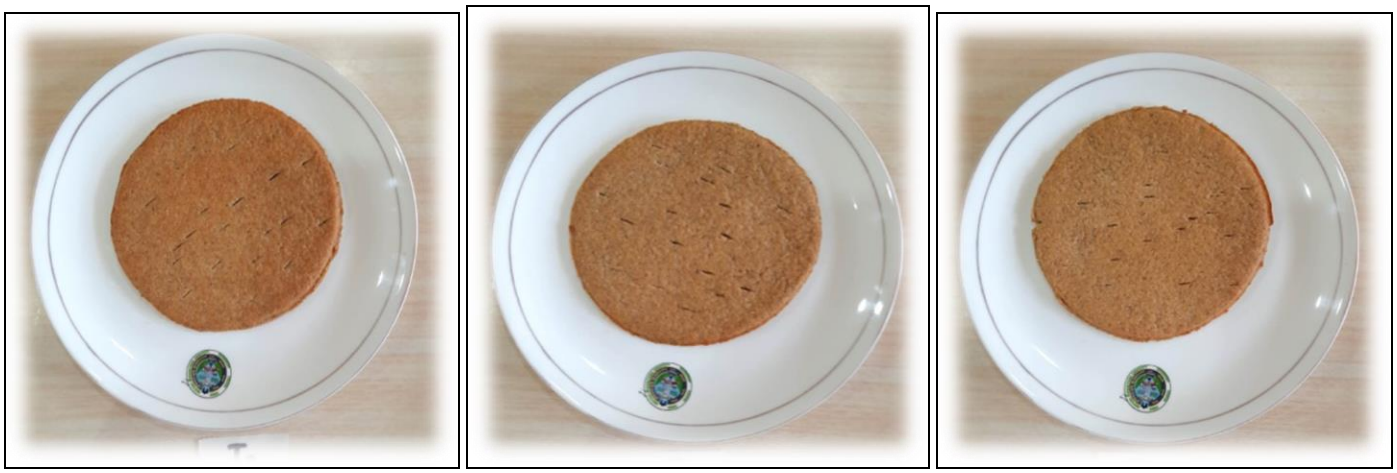
HHB-67 Improved variety of pearl millet was utilized for development of Pizza base. Along with pearl millet, *chia* seeds powder used for product development at 10%, 20% and 30% levels. Various other ingredients were used in different proportions as per requirement of recipe.

Standardization of Pizza base recipe

Ingredients	Type-I	Type-II	Type-III
Pearl millet flour (g)	90	80	70
Chia seeds powder (g)	10	20	30
Yeast (g)	7	7	7
Butter (g)	5	5	5
Sugar (g)	5	5	5
Milk powder (g)	5	5	5
Salt (g)	2	2	2
Bread improver (g)	3	3	3
Psyllium husk (g)	10	10	10
Apple cider vinegar (ml)	5	5	5
Water (ml)	50	50	50

Method

- Dispersed yeast (lukewarm water + a pinch of flour + sugar) Incubate 10 minutes.
- Gluten powder, bread improver, sugar powder, milk powder, salt and psyllium husk were added then add yeast + apple cider vinegar to flour and mixed well and make a dough.
- Fat was added then, knead the dough and kept in incubator for first proofing (30 minutes).
- Dough was knocked back, intermediate proofing (15 minutes).
- Then dough was scaled and rolled then kept for final proofing (30 minutes).Baked at 200-220 °C temperature (5-7 minutes).



Type-1 Type-2 Type-3

Fig 1: Three types of developed Pizza base

Nutritional evaluation of developed Pizza base

- Moisture, crude protein, crude fat, crude fibre and ash was estimated by employing the standard methods of analysis (AOAC 2010) +c.
- Iron and zinc in acid digested samples was determined by Atomic Absorption Spectrophotometer according to the method (Lindsay & Norwell 1969) [11].
- Available calcium and zinc were determined by the method of (Kim & Zemel 1986) [10]. Available Iron was determined by (Rao & Parbhavati 1978) [13] method.

Results

Proximate composition

Data in respect to proximate composition of Pizza base (%) is presented in Table 1.

Table 1: Proximate composition of pearl millet-based Pizza base developed incorporating *chia* seeds (%, on dry matter basis)

Type of Pizza base	Moisture*	Crude protein	Crude fat	Ash	Crude fibre
Type-I (P:C::90:10)	28.52±1.49	12.25±2.03	9.65±0.79	4.28±2.09	10.62±1.85
Type-II(P:C::80:20)	31.81±2.35	13.31±0.08	11.18±1.68	4.53±0.09	12.88±2.58
Type-III (P:C::70:30)	35.14±0.58	14.42±1.52	12.63±1.89	4.81±0.95	15.13±0.86
C.D(P≤0.05)	1.95	1.13	2.74	0.97	2.98

Values are mean ± SE of three independent determinations
P: Pearl millet flour C: *Chia* seeds powder
*Fresh weight basis

A significant increase in moisture, Crude protein, Crude fat, Crude fiber and ash content of Pizza base was observed with increase in percent incorporation of *chia*seeds powder. The moisture, crude fat, crude protein, crude fibre and ash content of all the three types of Pizza base Type-I, Type-II and Type-III were ranged 28.52 to 35.14, 9.65 to 12.63, 12.25 to 14.42, 10.62 to 15.13 and 4.28 to 4.81 percent, respectively. Highest content of crude fat, crude protein and crude fibre were observed in Type-III pizza base whereas content of crude fibre and ash were found in Type-I Pizza base (Table -1).

Total and available minerals

Data pertaining total and available calcium, iron and zinc content of pearl millet based *chia* seeds incorporated pizza base have been presented Table-2.

It was observed that Type-III pizza base had significantly (P=0.05) higher (197.39 mg/100g) content of total calcium followed by Type-II pizza base (149.23 mg/100g) and lowest was found in Type-I (99.19 mg/100g).Type-III pizza base prepared using pearl millet flour with 30 percent incorporation of *chia* seeds had significantly (P=0.05) higher content of total calcium.

Iron content of Pizza base was found to be increased significantly with the value addition of *chia* seeds powder. The iron content of Pizza base prepared from pearl millet flour and *chia* seeds powder was ranged 5.20 to 5.51 mg/100g. The iron content within three types of pizza base differed significantly (Table -2) being highest in Type-III Pizza base (5.51 mg/100g) followed by Type-II (5.40 mg/100g) and lowest in Type-I (5.32 mg/100g) Pizza base.

Zinc content was ranged from 3.54 to 3.55 mg/100g in the pizza base prepared from pearl millet flour and *chia* seeds powder. No significant difference was observed for zinc content in all three value added pizza base.

The availability of calcium, iron and zinc of value added Pizza base ranged 34.53 to 29.14, 15.36 to 12.34 and 36.59 to 41.73 percent, respectively. Type-I had significantly higher percent of available calcium and zinc as compared to otherPizza base (Table -2). A significant difference was also observed among available iron content of all three types of value added Pizza base.

Table 2: Total Mineral content and their availability of pearl millet-based Pizza base developed incorporating *chia* seeds (dry matter basis)

Type of Pizza base	Total minerals (mg/100g)			Mineral availability (%)		
	Calcium	Iron	Zinc	Calcium	Iron	Zinc
Type-I (P:C::90:10)	99.19±0.22	5.32±0.85	3.54±0.91	34.53±2.09	15.36±0.72	36.59±0.69
Type-II (P:C::80:20)	149.23±2.02	5.40±1.62	3.55±2.02	31.85±0.95	13.88±1.64	39.14±1.36
Type-III (P:C::70:30)	197.39±0.61	5.51±0.81	3.55±1.02	29.14±1.78	12.34±0.56	41.73±1.92
C.D(P≤0.05)	6.05	0.66	NS	1.69	2.09	2.91

Values are mean ± SE of three independent determinations
P: Pearl millet flour C: *Chia* seeds powder
NS- Non significant

Discussion

It was observed that protein content of all developed pizza base prepared with pearl millet flour (HHB-67 improved) incorporated *chia* seeds powder were found to be 12.25, 13.31and14.42 percent, respectively. The good amount of protein observed in all developed pizza base may be attributed to addition of *chia* seeds powder. The fat content of Type-I developed pizza base was 9.65 whereas Maximum amount of fat content was observed in Type-III pizza base prepared from 30 percent incorporation of *chia* seeds powder. The ash content of all types of pizza base were observed as 4.28, 4.53 and 4.81%, respectively (Table 1).

The crude fibre content in all three pizza base was ranged between 10.62 to 15.13 percent, respectively. The proximate composition of bakery products showed an increase in range for moisture, crude protein, crude fat, crude fibre and ash, respectively with progressive inclusion of *chia* seeds powder. The concentration of calcium content in all three type of pizza base were observed as 99.19, 149.32 and 197.39 mg/100g, respectively.

The highest amount of iron was found in Type- III pizza base (5.51mg/100g) followed by Type-II pizza base (5.40 mg/100g) and Type-I (5.32 mg/100g). Zinc content was similar (3.54-3.55mg/100g) in all types of pizza base and differed non significantly with each other.

The percent availability of calcium, iron and zinc within value added Pizza base ranged 29.14 to 37.24, 34.53 to 29.14 and 15.36 to 12.34 percent, respectively. Type-I had significantly (P=0.05) higher content of available calcium and iron as compared to Type- II and Type-III Pizza base (Table -2) whereas significant difference was also observed among percent available iron content of all three types of value added Pizza base. Zinc availability was higher significantly in type-III than another two types of pizza base.

Conclusion

Chia seeds improved quality of baking due to unique physio-chemical properties and high fibre content. All developed pizza base prepared of pearl millet with incorporating *chia* seeds powder contains very good amount of crude protein, crude fat and crude fibre content. The amount of minerals like calcium, iron and zinc found in adequate amount in all developed pizza base. Keeping in view the nutritional profile of pearl millet the development of these products will not only diversify the uses of pearl millet but also will be beneficial for human health. The use of pearl millet flour and *chia* seeds powder make bakery products therapeutic and super nutritious.

References

1. Ali NM, Yeap SK, Ho WY, Beh BK, Tan SW, Tan SG. The promising future of chia, *Salvia hispanica* L. Journal of Biomedicine and Biotechnology, 2012.
2. AOAC. Official Methods of Analysis. Association of Official Analytical Chemist. Washington, D.C, 2010.
3. Arora P, Seghal S, Kawatra A. Effect of dry heating on total minerals and their HCl extractability in pearl millet. Recent Trends in Millet Processing and Utilization, 2003, 28-31.
4. Ayerza R. Effects of seed color and growing locations on fatty acid content and composition of two chia (*Salvia hispanica* L.) genotypes. Journal of the American Oil Chemists' Society. 2010;87(10):1161-1165.
5. Dorsey, Kockler AA. Chia seed: the new omega- 3 powerhouse. Nutraceutical business and Technology. 2011;7:38-39.
6. Dykes L, Rooney LW. Sorghum and millet phenols and antioxidants. Journal of Cereal Science. 2006;44:236-251.
7. Elyas SH, El Tinay AH, Yousif NE, Elsheikh EA. Effect of natural fermentation on nutritive value and *in vitro* protein digestibility of pearl millet. Food chemistry. 2002;78(1):75-79.
8. Jaybhaye RV, Pardeshi IL, Vengaiah PC, Sivastav PP. Processing and technology for millet based food products: a review. Journal of ready to eat food. 2014;1(2):32-48.
9. Johary A. Utilization of processed pearl millet (*Pennisetum glaucum*) in development of gluten free convenience foods. Ph.D. thesis, CCS HAU, Hisar, India, 2017.
10. Kim H, Zemel MR. *In vitro* estimation of the potential bioavailability of calcium from sea mustard, milk and spinach under stimulated normal and reduced gastric acid conditions. J Food. Sci. 1986;**51**:957-963.
11. Lindsey WL, Norwell MA. A new DPTA-TEA Soil test for zinc and iron. Agron. Abst. 1969;61:84-89.
12. Longvah T, Ananthan R, Bhaskarachary K, Venkaiah K. Indian food composition tables. National Institute of Nutrition, Indian Council of Medical Research, India, 2017.
13. Rao NBS, Prabhavathi T. An *in vitro* method for predicting the bioavailability of iron from foods. *The* American Journal of Clinical Nutrition, 1978;**31**(1):169-175.
14. Urbina M. Lachíaysusaplicaciones. *La Naturaleza*. Sociedad Mexicana de Historia Natural Tomo. 1887;1:27-36.
15. Verma V, Patel S. Value added products from nutricereals: Finger millet (*Eleusine coracana*). Emiates. Journal of Food and Agriculture. 2013;25(3):169-176.