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Research Article

IMPACT OF INCORPORATION OF ANTIOXIDANT RICH DIETARY FIBRE POWDER IN PIZZA BASE

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ABSTRACT

In this study impact of incorporation of antioxidant rich Dietary Fibre Powder (DFP) in pizza base was studied. DFP was obtained from white cabbage outer leaves (*Brassica oleracea* var. capitata). DFP was incorporated at the level of 5% and 10% in pizza base. Pizza bases were analyzed for proximate composition, crude fibre content and antioxidant activity. Shelf-life of pizza base was also assessed. The results were analyzed using ANOVA and DMRT tests. The results showed that incorporation of DFP in pizza base at 10% has significantly increased the vitamin C content, total phenol content and antioxidant activity of the base however its sensory acceptance was low as compared to pizza base with 5% DFP however Vitamin C content was not stable hence degraded rapidly. The shelf-life of pizza base was found to be 6 days.

INTRODUCTION

Food is a major determinant of health and nutritional status of people. Now-a-days consumption of convenience and processed food is on rise. Research has shown many of these food products lacks in health promoting nutrients thus gives rise to many chronic degenerative diseases. Therefore, now attempts are continuously made to improve their nutrient content by supplementing them with health promoting compounds. Dietary fibre is one such component and is increasingly used to improve the nutritional content of processed foods.

Dietary fibre generally consisting of polysaccharides, oligosaccharides and lignin and is defined by Codex Alimentarius Commission (2008/2009) as a carbohydrate polymers with ten or more monomeric units, which are not hydrolysed by the endogenous enzymes in the small intestine of humans. However it can be fermented in the colon by the microflora to short-chain fatty acids (SCFA) which have been proved to have beneficial effects on colon health and metabolism (Salminen *et al*., 1998). Other health beneficial effects of dietary fibre are well documented in literature. For example, research has shown that people consuming diets rich in fruits and vegetables exhibit higher plasma antioxidant status thus lower risk of cancer and cardiovascular disease. A significant inverse correlation has also been reported between total fruits and vegetables intake and cerebrovascular disease mortality (Williams & Acheson, 1983). Dietary fibre also provides bulk to the stools thus relieving constipation. This has led to increased consumption of fibre rich products such as fruits, vegetables, legumes, whole grains etc. Alternatively, by-products from the fruit and vegetable industry are now increasingly being used to fortify food products with dietary fibre as it an inexpensive and radily available rich source of dietary fibre. Some of the agricultural by-products such as apples, citrus fruits and Brassica vegetables have already been used in the production of dietary fibre (Figuerola, Hurtado, Estevez, Chiffelle, & Asenjo, 2005;Grigelmo-Miguel *et al*., 1999). These have been incorporated in many food products such as ready to eat snacks, drinks, baked goods and extruded products etc. Such a product is apple pomace, which is the residue of apple juice extraction. Similarly, orange pomace has been used as a dietary fibre source for the preparation of cookies, and was found to contain 74% total

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alimentary fibre (Larrea, Chang, & Martinez-Bustos, 2005). Mango peel powder from mango pulp was used in a soft dough biscuit formulation and was found to contain 51.2% dietary fibre (approximately 19% soluble and 32% insoluble) (Ajila, Leelavathi, & Prasada Rao, 2008). However addition of dietary fibre to some foods may be challenging as it may adversely affect the functional, physico-chemical and organoleptic characteristics of that food product such as in case of baked goods. The effect of these fibres on end-product quality was mainly dependent on the type and components of fibre, on the level of substitution and also on the particle size of the fibre. The most common source of dietary fibre generally used in baking includes bran from various cereals such as wheat, oat, barley and rice, or dietary fibre obtained from various fruit and vegetables. Wheat grain or particularly wheat bran are most commonly used for the production of whole meal products, including cookies, breads, muffins and extruded snacks (Westenbrink, Brunt, & van der Kamp, 2013). Other fibre sources for bakery products include nuts, pea, orange, sugar beet, peach, mango, potato, apple and fruits and vegetables.

In baked products, addition of fibre has been shown to reduce loaf volume (Gómez, Moraleja, Oliete, Ruiz, & Caballero, 2010) produce denser less aerated structure, and generate harder and darker crumb (Ajila *et al*., 2008). It also decreases the dough extensibility (Barros, Alviola, & Rooney, 2010) ,produces stiffer dough (Martínez-Cervera, Salvador, Muguerza, Moulay, & Fiszman, 2011).

These adverse effects could be because of dilution of the gluten forming proteins; restriction of the available water for gluten development (Autio, 2006), physical disruption of the gluten matrix and piercing of the gas cells (Gan, Ellis, Vaughan, & Galliard, 1989; Gan, Galliard, Ellis, Angold, & Vaughan, 1992).

Thus, this study was aimed to investigate the effect of addition of dietary fibre powder obtained from white cabbage outer leaves (*Brassica oleracea* var. capitata golden acre) on the acceptability and antioxidant potential of pizza base.

MATERIALS AND METHODS

Dietary Fibre Powder production

Dietary fibre powder (DFP) was produced from outer leaves of white cabbage (*Brassica oleracea* var. capitata golden acre) by tray drying blanched outer leaves of white cabbage at 80°C.

Preparation of Pizza Base

All the ingredients used for preparation of pizza base were procured from local market of Delhi, India. The pizza base was prepared by incorporating the DFP at two different levels i.e., 5% and 10%. A formulation of control pizza base and those with DFP is shown in Table 1. All the ingredients were mixed using high speed mixer. The dough formed was divided, sheeted into round shape, pricked and fermented for 60 minutes at 30°C and 85% RH. After fermentation the base was baked at 220°C for 25 minutes, cooled, packed in Low Density Poly-ethylene packs and stored at room temperature (~25°C) in dark and dry place until the completion of shelf life studies.

Table 1 Formulation of pizza base with different levels of DFP

Ingredients	Control (gms)	Base with 5% DFP (gms)	Base with 10% DFP (gms)
Refined wheat flour	100	95	90
DFP	0	5	10
Yeast	2	2	2
Salt	1	1	1
Sugar	2.5	2.5	2.5
Fat	1	1	1
Water	variable (66ml approx.)	variable (66ml approx.)	variable (66ml approx.)
Acetic acid	0.1	0.1	0.1
Calcium propionate	0.3	0.3	0.3
Potassium bromated	30ppm	30ppm	30ppm
Ascorbic acid	60ppm	60ppm	60ppm
GMS (glycerol mono-stearate)	0.3	0.3	0.3
SSL (sodium steroyl lactylate)	0.15	0.15	0.15

Analysis of the Product

Sensory Analysis

The consumer acceptance of pizza base was determined organoleptically via panel of trained panelists for sensory attributes such as crust color, crust shape, crust symmetry, crumb color, crumb texture, flavor, mouth feel, overall acceptability using nine point hedonic scale (with 9 being like extremely, 8 being like very much, 7 being like moderately, 6 being like slightly, 5 being neither like nor dislike, 4 being dislike slightly, 3 being dislike moderately, 2 being dislike very much and 1 being dislike extremely)

Proximate Analysis

Moisture, protein, crude fat, crude fibre and ash content were measured following (AOAC, 1999) protocol. Carbohydrate content was estimated by subtracting protein, lipid, crude fibre and ash content from 100.

Antioxidant Analysis

Vitamin C analysis: Vitamin C was estimated by titrating with Indophenol dye (AOAC, 1999). The results were expressed as mg ascorbic acid/100g of the sample (dry matter).

Total Phenolic Content: Total phenolic content was measured using Folin-Ciocalteu reagent and reading the absorbance at 65nm (Yu *et al*., 2005). The results were expressed as Gallic Acid Equivalent (GAE) per 100g of the sample (dry matter).

Total antioxidant activity: Total antioxidant activity was measured using DPPH assay (Akowuah, Ismail, Norhayati, & Sadikun, 2005) and measuring the absorbance at 517nm.

$$\text{Antioxidant activity (\%)} = \frac{A_c - A_s}{A_c} \times 100$$

where,
A_c is the absorbance of the control after 60 min; and
A_s is the absorbance of the tested sample after 60 min.

Microbiological Analysis

The pizza base formed were analyzed for total plate count (IS 5402: 2002) and yeast and mould count (IS 5403: 1999).

Statistical Analysis

All experiments were performed in duplicate. Results were expressed as mean ± standard deviations. Results were analyzed using one-way analysis of variance (ANOVA) and Duncan's multiple range test (DMRT) in SPSS. Values were considered at a significance level of 95% ($p < 0.05$).

RESULTS AND DISCUSSION

Analysis of fresh pizza base

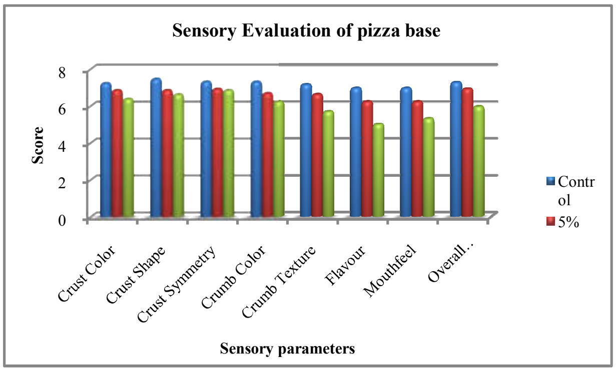
Moisture content of Pizza Base

The moisture content of pizza bases was estimated on the day they were made. The results showed that moisture content of pizza base has decreased with the increase in concentration of DFP incorporated. The moisture content of control base was found to be 47.46±2.43g/100 g dry matter which has decreased to 45.60±1.58g/100 g dry matter in case of pizza base with 5% DFP and to 41.70±1.65% in pizza base with 10% DFP. However the decrease in the moisture content was not significant. This decrease in moisture content could be because of increased absorption of water by the dough due to increased concentration of DFP. Similar results were observed by (Ajila *et al*., 2008) who have reported that incorporation of mango peel powder into wheat flour has increased the water absorption of soft dough biscuits.

Sensory Evaluation of Pizza Base

Influence of DFP on sensory acceptability of pizza base is shown in Table 2. Sensory evaluation studies showed that there was a significant difference in the crust color and crust shape of control pizza base as compared to base with 10% DFP but was not significantly different from base with 5% DFP. According to the responses of the panelists there was not a significant difference among the crust symmetry of all variations of the pizza base.

became relatively harder compared to the control with increase in the concentration of DFP.



Graph 1 Overall comparison of sensory quality of pizza base with different variations.

Similar results were observed by the (Ajila *et al*., 2008) by incorporating different levels of mango peel powder in soft dough biscuits.

Proximate Composition of Pizza Base

Proximate composition of the pizza bases with 5% and 10% DFP was analyzed and compared with control pizza base. The result shows that protein content of the base has increased with the increasing percentage of DFP. The protein content of control has been estimated to be 13.85±0.29g/100 g dry matter which has increased by 6.57% in pizza base with 5%DFP and by 11.12% in base with 10% DFP. However, the fat content of all the three bases did not differ greatly.

Incorporation of DFP has resulted in significant increase in the crude fibre content. The crude fibre content of control base was estimated to be 1.40±0.16g/100 g dry matter which has been increased significantly to 2.23±0.17g/100 g dry matter and 2.91±0.03 g/100 g dry matter in base with 5% DFP and 10% DFP respectively.

Table 2 Influence of Dietary Fibre Powder on sensory acceptability of pizza base

DFP (%)	Crust Color	Crust Shape	Crust Symmetry	Crumb Color	Crumb Texture	Flavor	Mouth feel	Overall acceptability
0 (control)	7.23± 0.83[a]	7.46± 0.66[a]	7.31± 0.85[a]	7.31± 0.95[a]	7.15± 0.90[a]	6.96± 1.13[a]	6.96± 1.13[a]	7.27± 0.60[a]
5	6.84± 0.69[ab]	6.85± 0.80[ab]	6.92± 0.76[a]	6.69± 0.95[ab]	6.62± 1.12[a]	6.23± 1.09[a]	6.23± 0.83[a]	6.92± 0.64[a]
10	6.38± 0.77[b]	6.62± 0.96[b]	6.85± 0.69[a]	6.23± 1.01[b]	5.69± 1.03[b]	5.00± 0.91[b]	5.31± 1.03[b]	5.96± 0.97[b]

All data are the mean ± SD of duplicate readings. Mean ± SD followed by same letters in the same column are not significantly different ($p \leq 0.05$).

In case of crumb parameters, crumb color and crumb texture were analyzed and the results showed that in both the cases the difference between control and pizza base with 10%DFP was significant, however, control base and pizza base with 5% DFP were not significantly different. Similarly, there was not a significant difference in the crumb color of the pizza base with 5% DFP and with 10% DFP however, there was a significant difference in their crumb texture. For parameters like flavor, mouth feel and overall acceptability there was not a significant difference between control base and base containing 5% DFP. However, control and pizza base with 10% DFP varied significantly also pizza base with 5% DFP and pizza base with 10% DFP were significantly different from each other on these parameters. Graph 1 shows the overall comparison of sensory quality of pizza base with different variations. The base also

A similar increase was observed in case of ash content as well (Table 3).

Table 3 Proximate composition of Pizza Base with different concentrations of DFP

PB with DFP (%)	Composition (g/100g dry matter)				
	Protein	Crude fat	Crude fibre	Ash	Carbohydrate
0 (control)	13.85±0.29[a]	2.59±0.14[a]	1.40±0.16[a]	1.33±0.25[a]	80.83±0.34[a]
5	14.76±0.28[ab]	2.91±0.09[a]	2.23±0.17[b]	2.01±0.11[b]	78.08±0.31[ab]
10	15.39±0.38[b]	3.68±1.55[a]	2.91±0.03[c]	2.48±0.06[b]	75.53±2.01[b]

All data are the mean ± SD of duplicate readings. Mean ± SD followed by same letters in the same column are not significantly different ($p \leq 0.05$).

The carbohydrate content of the pizza bases, however, has shown a decrease with the increase in the concentration of DFP incorporated which might be due to a considerable increase in the protein, crude fat, crude fibre and ash content as a result of incorporation of DFP.

Antioxidant Activity of Pizza Base

The results have shown that Vitamin C content, TP content and Antioxidant content has increased with the increasing concentration of DFP. Vitamin C content of the pizza base with 5% DFP was found to be 1.16±1.42mg/100 g dry matter which has increased to 2.18±1.31mg/100 g dry matter in pizza base with 10% DFP. Even though Vitamin C is a heat labile vitamin, pizza bases with 5% and 10% of DFP has retained very small amount of vitamin C which could be attributed to the fact that the DFP incorporated in the pizza base has initially high content of the vitamin.

The total phenolic content of control base has been found to be 0.02±0.01mg/100 g dry matter where as the base with 5% DFP and with 10% DFP has been estimated to contain 0.16±0.01mg/100 g dry matter and 0.18±0.03mg/100 g dry matter respectively (Table 3). This shows that there was a significant increase in the total phenolic content of the base with DFP as compared to control.

Table 3 Vitamin C, TP content and TAA of Pizza bases

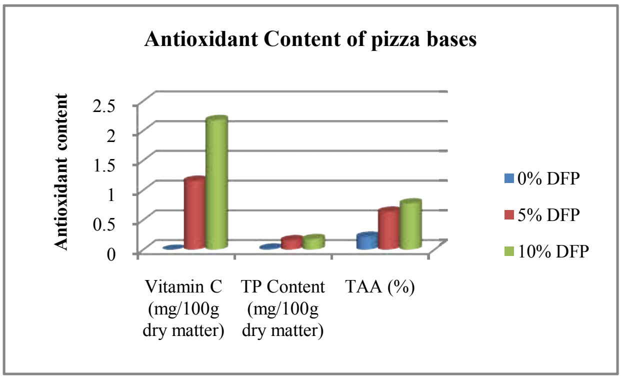
DFP (%)	Vitamin C (mg/100g dry matter)	TP Content (mg GAE/100g dry matter)	TAA (%)
0 (control)	0.00±0.00[a]	0.02±0.01[a]	0.22±0.02[a]
5	1.16±1.42[a]	0.16±0.01[b]	0.64±0.03[b]
10	2.18±1.31[a]	0.18±0.03[b]	0.78±0.01[c]

All data are the mean ± SD of duplicate readings. Mean ± SD followed by same letters in the same column are not significantly different ($p \leq 0.05$).

Total antioxidant activity of pizza base has also shown similar results. Results show that TAA (%) has increased with the concentration of DFP incorporated. The TAA of control has been estimated to be 0.22±0.02% which has increased to 0.64±0.03% in base with 5% DFP and to 0.78±0.01% in base with 10% DFP. This shows that there was a significant increase in the TAA of the pizza base with DFP against DPPH radicals. Thus, the increase of all the three components i.e., vitamin C, TP content and TAA in pizza bases with 5% and 10% DFP has resulted in overall increase of antioxidant activity of the pizza base since both vitamin C and total phenolic compounds influence the antioxidant activity of the product.

Microbiological analysis

Microbiological analysis of pizza base was conducted to analyze the microbiological safety of the bases, for this purpose they were analyzed for total plate count and for the presence or absence of yeasts and moulds.



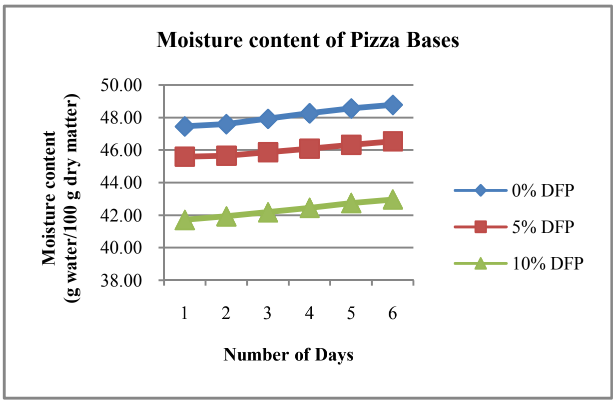
Graph 2 Graphical representation of Vitamin C, TP content and TAA of Pizza bases.

The results showed that both TPC and yeast and mould count of all the three types of base i.e., base with 0% DFP (control), and base with 5% and 10% DFP on the day of their preparation was not detectable indicating that the utensils used during the preparation of pizza base were washed properly and proper hygiene was maintained during the preparation of the base. In addition, the high temperature (220°C) used during baking might have resulted in considerable reduction of initial microbial load if there was any.

Shelf-life study of the pizza bases

Moisture Content

The moisture content of all three pizza bases were analyzed daily since moisture content of the pizza base is an important parameter in governing their shelf-life. The results show that the moisture content of all the bases has increased significantly over the period of 6 days (Graph 3).



Graph 3 Graphical representation of moisture content of pizza bases during shelf-life study.

The moisture content of control base has increased to 47.60±0.95g/100 g dry matter on day 2 as compared to 47.46±2.43g/100 g dry matter on day 1, this has increased further to 47.92±2.14g/100 g dry matter, 48.26±1.41g/100 g dry matter, 48.56±1.11g/100 g dry matter and 48.78±1.75g/100 g dry matter on day 3, 4, 5, and 6 respectively. Similar increase in moisture content was observed for the base with 5% DFP and with 10% DFP which has increased to 46.54±1.02g/100 g dry matter and 42.96±2.86g/100 g dry matter respectively on day 6 (Table 4). The study of moisture content of the bases was carried for 6 days because on 7th day there was a yeast and mould growth on their surface indicating end of their shelf-life.

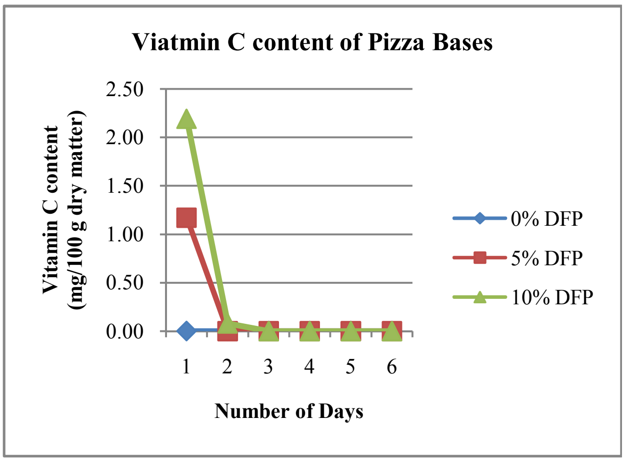
Table 4 Moisture content of Pizza bases over the period of 6 days

Days	Moisture Content of Pizza Base (g/100 g dry matter)		
	0% (control)	5%	10%
1	47.46±2.43	45.60±1.58	41.70±1.65
2	47.60±0.95	45.64±3.77	41.92±3.17
3	47.92±2.14	45.88±4.18	42.18±3.63
4	48.26±1.41	46.09±1.74	42.45±1.68
5	48.56±1.11	46.32±4.09	42.74±0.18
6	48.78±1.75	46.54±1.02	42.96±2.86

All data are the mean ± SD of duplicate readings.

Vitamin C

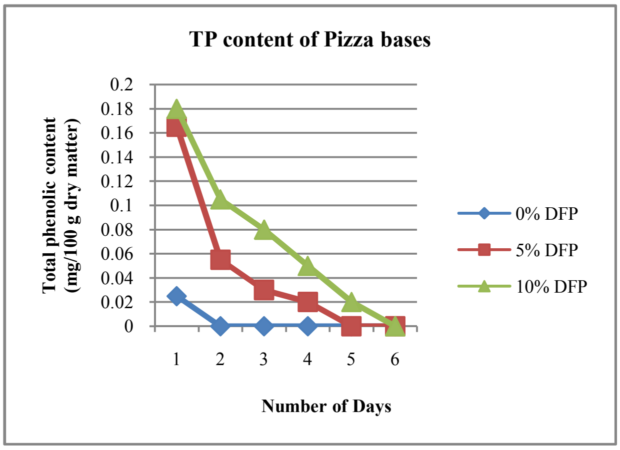
Shelf-life studies shows that the vitamin C content of pizza base with 5% and 10% DFP has also decreased to 0mg after day 1 and day 2 of storage. This could be because vitamin C would have been oxidized to DHA acid since it is highly sensitive to light and is also heat labile (Graph 4).



Graph 4 Graphical representation of vitamin C content of pizza bases during shelf-life study

Total Phenolic Content

Results showed that in control base the TP content has reduced to 0.00±0.00mg/100 g dry matter on the second day of storage indicating that it is a poor source of TP content. The base with 5% DFP, on the other hand, has TP content of 0.16±0.01mg/100 g dry matter on day 1 with has decreased to 0.06±0.01mg/100 g dry matter on day 2 to 0.03±0.01mg/100 g dry matter,0.02±0.01mg/100 g dry matter and 0.00±0.00 mg/100 g dry matter respectively on day 3, 4, and 5 (Graph 5).

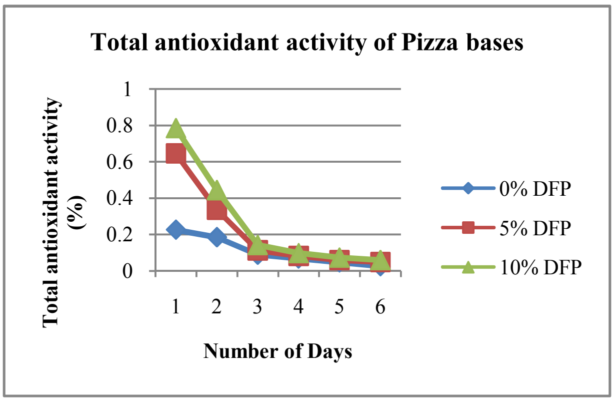


Graph 5 Graphical representation of Total phenolic content of pizza bases during shelf-life study

Similar results were observed for base with 10% DFP whose TP content has decreased to 0.02±0.01mg/100 g dry matter on day 5 of storage from 0.18±0.03mg/100 g dry matter present on first day and has finally reduced to zero on day 6. Such a reduction in TP content of samples over a period of 6 days could be because of degradation of phenols. Thus, the base with 10% of DFP can be considered better over other two with respect to their TP content since it has the maximum retention of total phenolics.

Total antioxidant activity

TAA of pizza bases were analyzed for first six days of storage and the results obtained were shown in Graph 6. The TAA of the samples has decreased considerably over the period of 6 days. There was a decrease of 90.90% in TAA during 6 days in case of control base where the TAA of the sample has decreased from 0.22±0.02% on day 1 to 0.02±0.03% on day 6 while base with 5% DFP has resulted in 92.19% loss of TAA. The maximum loss was observed on 2nd day which was 46.88% and thereafter it resulted in reduction of only small percentage i.e., the TAA of the base with 5% DFP was 0.34±0.07% on day 2 which has decreased to 0.11±0.01%, 0.08±0.07%, 0.06±0.03%, and finally to 0.05±0.02% on day 3, 4, 5, and 6 respectively.



Graph 6 Graphical representation of Total antioxidant activity of pizza bases during shelf-life study.

Similarly in case of base with 10% DFP, 92.31% reduction in TAA was observed on 6th day. In this case also the maximum reduction was observed on 2nd day i.e., 43.59% (Graph 6). Thus, the results showed that the TAA of the samples have decreased during their shelf-life of 6 days and this reduction could have occurred because of degradation or oxidation of antioxidants present.

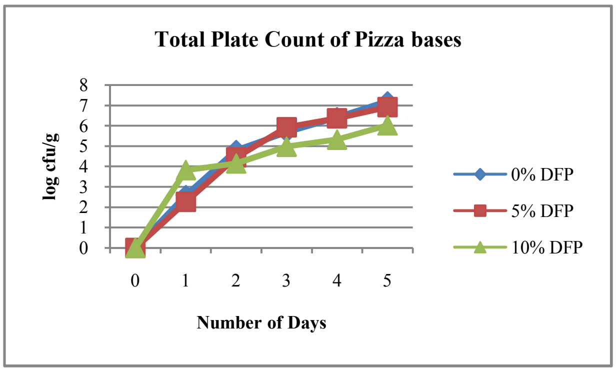
The reduction in TAA of the samples during the shelf-life of the samples was quite obvious since several researchers have reported that a significant and linear relationship existed between the antioxidant activity and phenolic content of spices and herbs and reduction of one component leads to the equal reduction of the other component since phenolic compounds in spices and herbs have been reported to contributed significantly to their antioxidant properties (Gómez *et al*., 2010; Grigelmo-Miguel *et al*., 1999; Shan, Cai, Sun, & Corke, 2005; Wong, Li, Cheng, & Chen, 2006; Wu *et al*., 2006)

Microbiological parameters

Total Plate Count. The total plate count (TPC) of the samples over the period of 6 days is shown in Table 5. On the first day, TPC content was found to be so less that it was non-detectable since during their preparation they were baked at high temperature which could have resulted in decreasing the total plate count of the base. However, TPC of all the bases has increased with storage.

Results show that the TPC content of control base has increased from not detectable levels to 2.592 log cfu/g on 2nd day, 4.799 log cfu/g on 3rd day, 5.678 log cfu/g on 4th day, 6.415 log cfu/g on 5th day and finally 7.195 log cfu/g on 6th day. Similar results were observed for pizza base with 5% and 10% DFP i.e., the TPC content has increased with storage. Overall total plate count of base with 5% DFP was lesser that that of control base (0% DFP). The TPC of base with 5% DFP has increased to final count of 6.915 log cfu/g on 6th day as compared to not detectable on 1st day. It was also observed that the TPC of base with 10% DFP was even lower than that of base with 5% DFP with 6.017 log cfu/g on 6th day.

Graph 7 depicts that the TPC of base with 10% DFP was even lower than that of base with 5% DFP with 6.017 log cfu/g on 6th day. Since the growth of micro-organisms is exponential therefore the total plate count has increased during storage. Thus, after 6 days all the samples have spoiled.



Graph 7 Graphical representation of TPC of pizza bases during shelf-life study

Yeast and Mould count. The yeast and mould count of the pizza bases during storage are shown in Table 6. Results shows that the yeast and mould count of all the three samples on day 1 were not detectable. The reason for this could be that the thermal treatment given during their preparation has reduced the yeast and mould count significantly.

Table 5 Total plate count of Pizza bases during shelf-life study

Days	Total Plate Count (log cfu/g)		
	0% DFP (control)	5% DFP	10% DFP
1	ND	ND	ND
2	2.592	2.267	3.824
3	4.799	4.447	4.146
4	5.678	5.932	4.976
5	6.415	6.362	5.322
6	7.195	6.915	6.017

Where, NDis <1 x10^{-1}cfu/g.

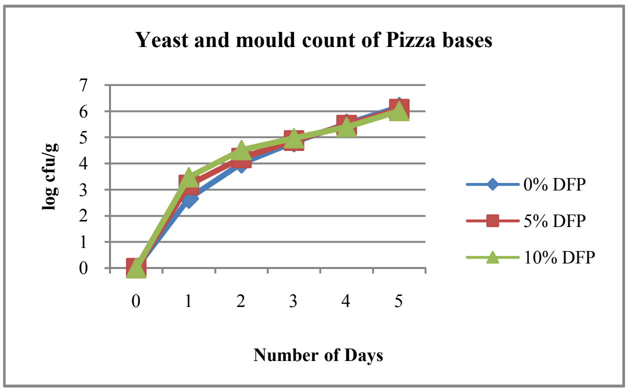
Table 6 Yeast and mould count of Pizza bases during shelf-life study

Days	Yeast and Mould Count (log cfu/g)		
	0% DFP (control)	5% DFP	10% DFP
1	ND	ND	ND
2	2.659	3.179	3.478
3	4.000	4.204	4.518
4	4.814	4.876	4.972
5	5.518	5.462	5.398
6	6.156	6.078	6.012

Where, NDis<10 yeasts and moulds per g.

The yeast and mould count has increased in all the samples during storage. The yeast and mould count of control base has increased to 2.659 log cfu/g on day 2, followed by 4.000 log cfu/g on day 3, 4.814 log cfu/g on day 4, 5.518 log cfu/g on day 5 and 6.156 log cfu/g on day 6. Similarly, the yeast and mould count of pizza base with 5% DFP has increased to 3.179 log cfu/g on day 2, and 4.204 log cfu/g, 4.876 log cfu/g, 5.462 log cfu/g and 6.078 log cfu/g on day 3, 4, 5, and 6 respectively. The pizza base with 10% DFP has also shown the similar increase in yeasts and mould count during 6 days with final count of 6.012 log cfu/g on day 6.

From the graph 8 it can be seen that there was not a much difference between different samples with respect to their yeast and mould count during storage and all of them have almost the same count. The increase in yeast and mould count for all samples during storage could be because of increase in moisture content which makes conditions suitable for their growth. On day 7 the yeast and mould colonies were visible on all the samples therefore the shelf life of the pizza base was found to be of 6 days.



Graph 8 Graphical representation of Yeast and mould count of pizza bases during shelf-life study.

CONCLUSION

The present study was undertaken to develop DFP rich pizza base. DFP was incorporated at two levels i.e., 5% and 10%. The results showed that base with 10% DFP had more retention of nutrients like antioxidant, total phenolic content and it has highest fibre content of 2.91g/100 g dry matter followed by base with 5% DFP containing 2.23 g of dietary fibre/ 100 g dry matter among all the samples. However, the overall acceptability of control pizza base was highest followed by base with 5% DFP and base with 10% DFP. But considering the health benefits of the base with DFP over base without DFP it can be said that pizza base with 5% DFP can be used as a medium to increase fibre content of pizza base which is otherwise low in fibre content.

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