Original Research Article

COMPLACENCY OF NUTRIENTS WITH RESPECT TO NUTRITION LABELLING IN PACKAGED BAKERY PRODUCTS CARRYING NUTRITION RELATED CLAIMS

ABSTRACT

Aim: Nutrition claim means any representation which states, suggests or implies that a food has particular nutritional properties including but not limited to the energy value and to the content of protein, fat and carbohydrates, as well as the content of vitamins and minerals. Consumers may perceive foods carrying nutrition-related claims more positively because of the presence of a claim. However, sometimes the products may not compliant to their nutrient claims.
Place and Duration of Study: The study was carried out in Ludhiana, between 2021-2022
Methodology: In the present study, the packaged bakery products with nutrient claim (8 products) were selected from Ludhiana market and their complacency was evaluated in three phases- 1) Nutrient profiling through nutrition label on packaging 2) Nutrient content claims 3) Nutrient comparative claims.
Results: The findings of the study revealed that the selected products such as Cornflake digestive Biscuit, Max. Protein cookies, Brownie, Sugar free cookies, Marie light Biscuit, Marie whole wheat Biscuit and Brown bread were found with nutrient claims such as “rich in fibre”, “trans-fat free”, “cholesterol free”, “rich in protein”, “10g protein”, “4g fibre”, “contains calcium”, “no trans-fat”, “21g protein”, “rich in iron”, and “contains 6 vitamins”. In cornflake digestive biscuits,data regarding nutrient comparativeclaims showed that the product without nutrition claim contained protein content (2.5g/100g) at par withthe product with nutrition claim (2.3g/100g) while, dietary fiber content was significantly($p<0.05$) lower in the former (0.98g/100g) as compared to later product (3.98g/100g). The laboratory analysis of max protein cookiesshowedthat protein was present in cookies with nutrition claim which showed the complacency ofthis product. But, the value (5.21g/100g) did not meet claim criteria value (10g/100g).Further, the product was compliant in term of claims related to fibre and calcium but theanalyzed values such as 2.98g and 280mg per 100 g were found significantly lower ($p<0.05$)than the claim criterion. Most of thenutrient content claims related to protein and fibre did not meet information with respect to nutrition labelling, otherwise the selected products were compliant in terms of nutrition claims.
Conclusion: In terms ofnutrient content claims, the values of the nutrients obtained through laboratory analysis did not meet the claimed values on nutrition label. Therefore, further studies should be focused on evaluating the prevalence and complacency ofclaims on foods with health or nutrition claim as consumers may perceive them as healthy.

Key Words: *Complacency, Nutrient claim, Nutrient content claim, Nutrient comparative claim, Packaged baked foods*

1. INTRODUCTION

In modern days, baked food products have become the indispensable ingredient of human nutrition. The expediency, easy availability, and nutrition profile associated with these products have comprised of the major reason behind their sustainability in the current market. In India, most of the bakery products are consumed as evening snacks [12]. Sweet products such as biscuits, crackers, rusks sweet buns and cream rolls are preferred with milk and tea [19]. The trend of buying cakes to celebrate birthdays, anniversaries, and other occasions is gradually replacing traditional Indian sweets. Thereby, the Indian bakery industry is expected to expand at a CAGR of 9.3 percent during coming years. Similarly, the cake market of India has been expected to rise with a CAGR of 12.5 percent in near future [17]. Reason being, the urbanization and rising working inhabitants, the outdoor food consumption choices and preference for ready-to eat but healthy products have increased. Thus, changing food choices and busy regime of the end users are shaping the bakery industry in India as well [8]. Now a days, aware and health-conscious consumers prefer to look for 'guilt-free' baked products or goods prepared using healthier ingredients such as whole wheat, multigrain and good quality oils etc. Besides large market players, even traditional and local bakeries are also moving ahead with a variety of baked products so as to cater to the emerging demand for healthier foods. Moreover, the rise of non-communicable diseases in the country has also led to a rise in the demand for sugar free and healthy bakery products [9].

Hence, rising concerns for health drove the bakery market to come up with innovative products such as fortified bakery products. It may be possible to encourage the general people to include necessary fatty acids and other essential nutrients in their diet by fortifying biscuits with omega fatty acids [2]. In order to have a positive impact on consumer health, the active ingredients should be viable enough in the finished products. Thereby, production of functional bakery goods of high quality and enough health-promoting qualities raises interesting research questions and the possibility of further studies [21]. Also, several Indian manufacturers have established an innovative approach towards consumer safety by adopting accurate labelling practices, thereby informing the Indian consumer regarding nutrition, ingredients, allergens, and claims. So, the nutrition-related claims may help parents, desk job doers and other consumers to make healthier choices. The irony of the fact is that researches pertaining to health and nutrition related claims have documented an insignificant impact of these claims on consumer's decision-making about purchasing packaged snack foods [6]. However, some health-conscious food lovers may consider foods having nutrition-related claims more nutritious due to claims printed on the label. However, sometimes the products may not compliant to their nutrient claims. A study conducted in 2016 in Sydney, Australia claimed that 34 percent of the products with nutrient claims did not meet to their nutrient profiling criteria. Therefore, it is imperative to evaluate the actual nutrient content of foods bearing nutrition-related claims to find out its complacency. (where the references)

2. MATERIALS AND METHODS

Seven packaged baked foods with nutrition claim and analogous food without any claim were sampled. All sampled foods were purchased and the packaging was retained**.**For nutrient profiling through nutrition label on packaging, the nutrients given on food label of packaged baked foods carrying nutrition-related claims were recorded. For nutrient content claims, the selected samples were analysed for the nutrients present in packaged baked foods as per the guidelines given by Food Safety Standard Authority of India (FSSAI) [15] for nutrition claim and specifically claimed nutrient on food label was analysed using standard methods(references). For nutrient comparative claims, the same packaged baked food but without nutrition claim was analysed for thenutrients as recommended by FSSAI and nutrient profiles of packaged baked foods of both with and without nutrition claim were compared.

Nutrient analysis of the selected samples

The selected samples were dried. About 100–200 g of the food samples was grinded in mortar pestle. Further, the homogenized samples were stored in air tight polyethene pouches at 4°C till further analysis.

Proximate composition: The nutrients such as protein (AOAC 960.52), fat (AOAC 920.39), fibre [5] and total ash [4] were analyzed using standard method. On the basis of analysis, the values of moisture, crude fat, crude protein, crude fibre and ash added and subtracted from 100. The difference

was taken as available carbohydrates(references and equation). This approach was based on the measurement of the sample's total protein, fat, and carbohydrate content. The protein, carbohydrate, and fat contents were then multiplied by four, four and nine, respectively, to produce energy in Kcal. This approach provided us with the metabolizable energy rather than the sample's total or gross energy [14].

Cholesterol content: Cholesterol content was determined by using Liebermann-Burchard reagent[11]. After adding one ml of oil sample, two ml of Liebermann-Burchard reagent, and seven ml of chloroform to three ml of sample solutions, the SP65 UV/Vis Spectrophotometer was used to measure the absorbances of the solutions. By graphically plotting the absorbance against mg/l cholesterol, a standard curve was created to calculate the cholesterol concentration of sample solutions.

Total sugars: Total Sugars were extracted using method given by [3]and estimated by Phenol-sulphuric acid Method [13].For analysis, 0.2 ml of test extract was taken in each of the test tubes and the volume was made upto one ml. Both the blank and the glucose standards (10–60 g) were measured at once. Each test tube was first filled with 1 ml of 5 percent phenol, then 5 ml of 95.5percent sulphuric acid was quickly added. In order to ensure proper mixing, the acid stream was directed against the liquid surface rather than the side of the test tube. The ingredients were combined and brought to room temperature. At 490 nm, the absorbance of the generated pink colour was measured. The standard glucose curve was then used to calculate the number of total sugars present in the test extracts.

Estimation of Minerals:

Elements namely iron, calcium, zinc, selenium and sodium were estimated using inductively coupled plasma-optical emission spectrometry (ICP-AAS), after wet digestion (AOAC 2000). For wet digestion, 0.5 g sample was weighed and added in 250 ml conical flask. To this 25 ml of the triacid mixture was added. The contents were heated at a low temperature on a hot plate the following day until there was only around one ml of clear, colourless liquid left after being stored overnight on a stand for slow digestion. The leftover contents were then put into a 50 ml volumetric flask, repeatedly washed with deionized water, and the volume was adjusted to the required level. The digests were stored in dried, decontaminated, and labelled sealed polythene bottles for ICP-AAS mineral detection after being filtered with Whatman No. 42 filter paper. To create the blank, 25 ml of the triacid combination were digested in the same manner as the samples, and the volume was then increased to 50 ml using deionized water.Standard solution of each element was used to make the standard graph. The prepared solutions included 100 ppm of each mineral. These were mixed with distilled water to varying degrees of concentration, 1 ml of concentrated sulfuric acid was added, and the volume was increased to 50 ml. The automated recorder in the ICP-OES captured the absorbance as a standard curve. Additionally, an automatic record of the samples' concentration was made.Mineral content= (Sample conc (ppm)-Blank conc (ppm))/ (Weight of sample (g or ml)) *total dilution

B-complex vitamins

Sample preparation was done in two steps**(** reference of method). First step involved weighing and dividing each sample into three equal portions of 6 g, placing each portion in glass test tube of 10 ml volume containing 5 ml of methanol, and centrifuging the mixture for 25 min at 5 103 rpm after 25 min of sonication in an ultrasonic bath. In order to evaporate the methanol, the supernatant solution from the three glass test tubes was mixed rapidly for 2 hours in a 25 ml beaker at 35 °C in the dark. To dissolve the residue, add 0.1 ml sodium hydroxide (0.1723 M). In second step, 2 ml of HPLC water was added to the solid precipitate in each of the three test tubes made of glass. Shake for 10 minutes in a vibrating bath. Add phosphoric acid (0.05 M) of 0.1 ml to each tube. Shake for 20 minutes in an ultrasonic bath. Centrifuge for 25 minutes at 5 103 rpm. Transferred the supernatant solutions to the residue that had been dissolved in the 25 ml Becker. Transferred to volumetric flasks of 5 ml were 2.5 ml of the final sample and 0.25 ml of the methyl paraben solution (1 g/l), which were then diluted to the appropriate mark with the diluted solution and filtered through a 0.22 m Millipore filter.

Further, at 40 °C, the column was in operation. Starting with solvent A 100%, the flow rate was 1.6 ml/min, and the injectionvolume was 20 L. For five minutes, a gradient elution was carried out until the

mobile composition was 50-50% for A and B.B1 were detected at 246 nm, vitamin B2 at 267 nm, vitamin B3 at 260 nm, vitamin B6at 290 nm, vitamin B9 at 361 nm, and vitamin B12 at 361 nm. For the first three minutes, the FLD Detector was configured at λ_{ex} = 296 nm, vitamin B6 λ_{em} = 390nm, and from minutes three to six, at λ_{ex} = 450 nm, λ_{em} = 530 nm for vitamin B2.

Trans fatty acids

O'Fallon et al. [18] synthesised trans fatty acid methyl esters using their approach. After samples' fat had been extracted, the lipid phase underwent esterification. For this, a 0.2 g sample of fat was given a 1 ml injection of internal standard. The fat sample was then given 2 ml of 14% BF3 in methanol. The sample was then vortexed for 30 seconds and incubated for 1.5 hours at 55° C in a shaking incubator. Every 15 minutes after cooling, the sample was vigorouslyshaken to ensure homogeneity. After that, the sample was put to a centrifuge for 15 minutes at 3000 rpm with 2 ml of saturated $NaHCO_3$ and 3 ml of heptanes. The auto sampler vial was then filled with 5 µl of supernatant, which was then injected into a gas chromatograph.

GC condition

Gas chromatography (Agilent Technologies, Palo Alto, California, USA) fitted with a flame ionisation detector (FID) was used to determine the composition of TFA. To separate and measure each FAME's component, the column was a capillary column HP88 (100.0 m x 0.25 mm x 0.2 m of film thickness) covered with cyanopropyl-polysiloxane (Agilent J & W Scientific GC Column, USA). As the carrier gas, helium gas was kept at a constant flow rate of 30 ml/min, hydrogen gas was kept at 40 ml/min, and air used for flame ionisation detection (FID) was kept at 450 ml/min [10]. The oven's temperature was gradually raised from 120 to 175 °C and finally to 230° C for five minutes. Injector and flame ionisation detector temperatures were set at 250°C and 280°C, respectively.

Statistical analysis

All samples were analysed in triplicate and the results were expressed as mean ± standard deviation. Statistical t-test was used to compare mean between products with claims and without claims. The statistical significance was expressed at $p < 0.05$ and $p \leq 0.01$.(reference)

3. RESULTS AND DISCUSSION

The results revealed that cornflake digestive biscuits were found with four claims “rich in fibre”, “trans-fat free”, “cholesterol free” and “rich protein”(Table 1).

Table 1. Composition of Bakery products

Bakery product	Number of claims	Type of claims
Cornflake biscuit	4	Rich in fibre 0% trans fat cholestrol free rich in protein
Nutri choice biscuit	1	High fibre
Light biscuit	2	Rich in iron contains 6 vitamins
Whole wheat biscuit	2	Trans fat free Calcium rich
Protein cookies	3	10g protein 4g fibre calcium
Sugar free cookies	1	Sugar free
Brownie	2	No trans fat 21g protein

The laboratory analysis showed that the values of protein and fibre were 2.30 and 3.98 g per 100 g, respectively, which did not meet the claimed values on nutrition label (Table 2). Further, the product was also not compliant in term of claims related to trans- fatty acids (TFA) as the analysed value such as 0.45 g per 100 g was higher than the criterion given by Food Safety and Standards

Authority of India (FSSAI). According to FSSAI, all the food products in which edible oils and fats are used as an ingredient should not contain industrial TFA more than 2 percent by mass of total oils/fats present in the product. In term of nutrient comparative claims, the product without nutrition claim contained protein content (2.5g/100g) at par with the product with nutrition claim (2.3g/100g) while, dietary fiber content was significantly ($p<0.05$) lower in the former (0.98g/100g) as compared to later product (3.98g/100g) (Table 2). Lappi *et al* (2020) also found that the own brands of supermarkets had comparatively lower content of fibre, higher content of protein, lower sugar and total fat content than in regular brands.

Table 2. Complacency of nutrients with respect to nutrition labelling in packaged bakery products carrying nutrition related claims (Biscuits)

Products	Nutrients	Packaged Bakery product with nutrient related claim		Nutrient profiling of bakery product without claims through laboratory analysis	t-value (p-value)
		Nutrient profiling through nutrition label on packaging	Nutrient profiling through laboratory analysis		
Cornflake Biscuit	Energy (Kcal)	492.6	479.84±1.21	456.54±0.82	7.81*
	Carbohydrates (g)	66.8	71.91± 0.15	81.71±0.09	22.93**
	Dietary fibre (g)	4.6	3.98 ±0.08	0.98±0.03	60.09***
	Protein (g)	7.5	2.30 ±0.28	2.5±0.10	NS
	Fat (g)	21.7	20.33 ±0.07	13.3±0.23	7.30*
	Saturated fat (g)	10.8	11.03±0.01	7.2±0.31	17.64***
	Trans fat (g)	0	0.45 ±0.00	0.45±1.25	NS
	Cholesterol (mg)	-	0.01±1.44	0.20±0.01	42.57***
Nutrichoice Biscuit	Energy (Kcal)	485	476.02±0.93	496.58±0.18	7.43*
	Total fat (g)	21	20.57± 0.01	21.02±0.19	3.68*
	Saturated fat (g)	10.2	10.8±0.05	12.35±0.06	11.48***
	MUFA (g)	8	7.88±0.07	5.65±0.03	54.44***
	PUFA (g)	2.4	2.31±0.01	1.47±1.84	177.59***
	Trans fat (g)	0	0.70± 0.01	0.75±0.03	18.14**
	Carbohydrates (g)	68.4	68.79±0.90	74.87±0.52	4.61*
	Total sugar (g)	14.4	15.28 ±0.15	21.05±0.12	10.07**
	Protein (g)	8.6	3.94 ±0.25	1.98±0.07	22.18***
	Dietary fibre (g)	6	5.52± 0.10	0.62±0.02	39.36**
	Sodium (mg)	463	458.03 ±0.09	154±1.36	83.11***
	Cholesterol (mg)	0	0.5±0.01	1.2±0.21	41.02***
Light Biscuit	Energy (Kcal)	445	447.45±0.17	462.87±0.10	29.68**
	Total fat (g)	11	10.78± 0.05	14.56±0.08	17.34**
	Saturated fat (g)	5.6	5.56±0.02	6.20±0.03	3.61*
	Trans fat (g)	0.07	0.5±0.12	0.62±0.03	8.45**
	Cholesterol (mg)	0.1	0.1± 0.00	0.56±0.06	190.87***
	Protein (g)	9.1	2.45±0.37	2.89±0.09	6.60**
	Carbohydrates (g)	77.4	85.15±0.45	80.07±0.36	6.57*
	Total sugars (g)	21.3	22.15 ±0.02	27.23±1.20	7.25*
	Sodium (mg)	292.4	291± 0.12	320.19±0.92	25.03***
	Iron (mg)	2.9	2.67 ±0.11	0.89±1.23	58.84***
	Vit B1(mg)	0.3	0.26± 0.01	-	NA
	Vit B2 (mg)	0.3	0.25 ±0.04	-	NA
	B3(mg)	4.3	4.28 ±0.06	-	NA
	B6 (mg)	0.5	0.51± 0.03	-	NA
	B9 (µg)	45	44.98 ±0.07	-	NA

	B12 (µg)	0.5	0.49 ±0.03	-	NA
Whole wheat Biscuit	Energy (Kcal)	438	438.18±0.15^{b}	451.77±0.29^{a}	55.51***
	Total fat (g)	12.5	11.67 ±0.04^{b}	12.34±0.43^{a}	NS
	Saturated fat (g)	6.3	6.42±0.02^{a}	5.62±0.00^{b}	6.75*
	MUFA (g)	5	4.85±0.00^{a}	4.23±1.26^{b}	89.83***
	PUFA (g)	1.2	1.15±0.03^{b}	1.45±0.08^{a}	112.14***
	Trans fat (g)	0	0.01±0.07^{b}	0.20±0.01^{a}	202.62***
	Carbohydrates (g)	75	80.41± 0.03^{b}	82.60±1.34^{a}	6.43**
	Protein (g)	7.8	2.89 ±0.37^{a}	2.58±0.03^{b}	14.67***
	Dietary fibre (g)	5	4.07 ± 0.08^{a}	2.01±1.27^{b}	159.99***
	Cholesterol (mg)	0	0.1 ± 0.00^{b}	0.34±0.01^{a}	99.46***
	Sugars (g)	21	21.05 ± 0.01^{b}	27.89±0.63^{a}	15.04***
	Calcium (g)	0.55	0.52 ± 0.01^{a}	0.21±0.56^{b}	82.55***
	Zinc (mg)	3.4	3.47 ± 0.07^{a}	1.87±0.04^{b}	45.18***
	Selenium(mg)	0.1	0.07 ± 0.00	-	NA
	Vit B1(mg)	0.27	0.19± 0.02	-	NA
	Vit B6 (mg)	0.58	0.50 ± 0.06	-	NA

*Values are mean ± SD (N=3); *** Significantly at 0.1% level of significance (p≤ 0.001), **Significantly at 1% level of significance (p ≤ 0.01), *Significantly at 5% level of significance (p ≤ 0.05), NS- Non-Significant.*

The data revealed that protein cookies was found with three nutrition claim i.e., “10g protein”, “4g fibre” and “contains calcium” (Table 1). The laboratory analysis showed that protein was present in cookies with nutrition claim which showed the complacency of this product. But, the value (5.21g/100g) did not meet claim criteria value (10g/100g). Further, the product was compliant in term of claims related to fibre and calcium but the analyzed values such as 2.98g and 280mg per 100 g were found significantly lower ($p<0.05$) than the claim criterion. In term of nutrient comparative claims, the product without nutrition claim contained protein content (2.23g/100g) which was significantly lower than the product with nutrition claim (5.21g/100g). Further, the product without nutrition claim contained fibre (1.89g/100g) and calcium (0.01 mg/100g) content lower than the product with nutrition claim (Table 3). TFAs in both type of products was present in higher amount than standard criterion.

Further, the third product i.e., brownie was found with two claims “no trans-fat”, “21g protein” (Table 1). The laboratory analysis showed that the values of *trans*-fat and protein was 0.62 and 8.12 g per 100 g, respectively, which did not meet the claimed values on nutrition label. In term of nutrient comparative claims, the product without nutrition claim contained trans-fat content (0.48g/100g) at par with the product with nutrition claim (0.62g/100g) while, protein content was significantly ($p<0.05$) lower in the former (1.89g/100g) as compared to later (8.12g/100g) (Table 3). The data regarding fourth product revealed that Nutri choice Biscuit was found with one nutrition claim i.e., “high-fibre” (Table 1). The laboratory analysis showed that fibre was present in biscuit with nutrition claim which showed the complacency of this product. But, the value (5.52g/100g) was found significantly ($p<0.05$) lower than the claim criteria value (6g/100g). In term of nutrient comparative claims, the product without nutrition claim contained fibre content (0.62g/100g) that was significantly lower than the product with nutrition claim (5.52g/100g) (Table 3). Further, the data revealed that sugar free cookies was found with one nutrition claim i.e., “sugar free” (Table 1). The laboratory analysis showed that sugar content was present in cookies with nutrition claim which showed the non-complacency of this product. But, the value (0.11g/100g) was close to the claim criteria value (0g/100g) (Table 3). Almughthim and Jradi (2020) concluded that 29 percent of foods made nutritional or health claims. About 19.2 percent of foods with health claims and 28.9 percent of all items with nutritional claims complied with standard regulations.

Table 3. Complacency of nutrients with respect to nutrition labelling in packaged bakery products carrying nutrition related claims (Cookies and Brownie)

Products	Nutrients	Packaged Bakery product with nutrient related claim		Nutrient profiling of bakery product without	t-value (p-value)
		Nutrient	Nutrient		

		profiling through nutrition label on packaging	profiling through laboratory analysis	claims through laboratory analysis	
Protein cookies	Energy (Kcal)	259	424.94±0.21	514.35±1.21	11.97**
	Total fat (g)	14.5	28.15± 0.03	29.67±0.59	NS
	Saturated fat (g)	9.2	9.32±0.04	12.32±0.09	15.41**
	Total sugars (g)	11	10.53± 0.01	18.96±0.06	20.98**
	Cholesterol (mg)	1	1.2± 0.04	0.45±0.89	63.09***
	Trans fat (g)	0.1	0.39 ±0.01	0.58±0.01	14.10***
	Carbohydrates (g)	23.9	37.69 ±0.09	59.6±1.45	25.90**
	Protein (g)	10	5.21± 0.93	2.23±0.09	7.79*
	Dietary fibre (g)	4	2.98± 0.07	1.89±1.18	16.97***
	Sodium (mg)	124	174.61± 0.03	180.28±0.03	4.43*
	Calcium (mg)	300	280± 0.04	0.01±0.52	76.85***
Sugar free cookies	Energy (Kcal)	488	476.02±0.07	486.29±1.44	NS
	Total fat (g)	25.8	26.98 ±0.03	21.25±0.57	NS
	Saturated fat (g)	14.7	15.3±0.01	13.9±0.00	0.50**
	MUFA (g)	8.3	8.1±0.00	4.8±1.24	34.80***
	PUFA (g)	1.2	1.3±0.07	1.4±0.06	4.07*
	Trans fat (g)	0	0.15±0.00	0.65±0.01	43.74***
	Carbohydrates (g)	56	68.79± 0.90	71.53±1.35	NS
	Protein (g)	6.2	2.14± 0.06	2.23±0.06	NS
	Dietary fibre (g)	6.2	5.52± 0.10	1.57±0.56	71.57***
	Sugar (g)	0	0.11± 0.01	21.89±1.75	90.63***
	Cholesterol (mg)	0	0.02± 0.03	0.45±0.01	14.68**
Brownie	Energy (Kcal)	245.83	352.14±1.28	366.47±1.89	NS
	Total fat (g)	8.45	17.62 ±0.02	20.31±0.73	4.65*
	Saturated fat (g)	3.91	4.02±0.01	7.62±0.16	21.24*
	MUFA (g)	3.73	3.67±0.03	1.59±0.01	104.25***
	PUFA (g)	0.81	0.78±0.00	0.45±1.36	26.47***
	Trans fat (g)	0	0.62±0.03	0.48±0.00	16.00**
	Carbohydrates (g)	21.45	33.42± 0.04	44.03±0.56	16.30***
	Protein (g)	21	8.49± 0.87	1.89±0.02	38.21**
	Dietary fibre (g)	3.9	3.05± 0.04	2.76±0.04	12.91**
	Sugar (g)	7.5	8.12±0.07	13.8±0.34	28.33**

*Values are mean ± SD (N=3); *** Significantly at 0.1% level of significance (p≤ 0.001), **Significantly at 1% level of significance (p ≤ 0.01), *Significantly at 5% level of significance (p ≤ 0.05), NS- Non-Significant.*

The results showed that light biscuits were found with three claims “rich in iron”, “trans- fat free”, “contains 6 vitamins” (Table 1). The laboratory analysis showed that the values of iron and trans-fat were 2.67mg and 0.5g per 100 g, respectively, which did not meet the claimed values on nutrition label. Further, the product was compliant in terms of claim “contain 6 vitamins” i.e., vitamin B1, B2, B3, B6, B9 and B9 as the analysed values such as 0.26, 0.25, 4.28, 0.5 mg, 44.98 and 0.49 µg per 100 g, respectively, were significantly at par with the claim criterion. In term of nutrient comparative claims, the product without nutrition claim contained iron (0.89 mg) and *trans*-fat content (0.62g/100g) significantly lower than the product with nutrition claim (Table 2). But, TFAs in both type of products was present in higher amount than standard criterion given by FSSAI. Similarly, [20] concluded that there were unlabelled products which did not comply the government regulations for labeling TFA content.

Further, it was observed that whole wheat biscuit was found with two claims “trans-fat free”, “contains calcium” (Table 1). The laboratory analysis showed that the value of trans- fat and calcium was 0.01 and 0.52g per 100 g, respectively, which were at par to the claimed values on nutrition label. In term of nutrient comparative claims, the product without nutrition claim contained trans-fat content (0.20g/100g) at par with the product with nutrition claim (0.01g/100g) while, calcium content was

significantly ($p<0.05$) lower in the former (0.21g/100g) as compared to later product (0.52g/100g)(Table 2). Further, one out of five breads were found with one nutrition claim i.e., “fibre rich”. The laboratory analysis showed that fibre was present in bread with nutrition claim which showed the complacency of this product. But, the value (5.73g/100g) did not meet claim criteria value (7.8g/100g). Bedran *et al* (2022) also concluded thatthe claims made about the nutritional value of salt, fibre, and sugar on pita bread did not meet the expectations. Therefore, the product was not compliant to the nutrient claims. Similarly, another study showed that goods with health or nutritional claims had significantly lower levels of salt (371.36 mg/100 g), sugar (9.67 g/100 g), fat (9.2 g/100 g), and saturated fat (3.2 g/100 g) [1]. The UK nutritional profiling model found that 46.9 percent of the goods with claims were less healthful than those without claims.

4. CONCLUSION

In the present study, seven packaged bakery products with nutrient claim were compared with their analogous bakery products. Further, nutrient profiling through laboratory analysis of analogous packaged bakery product without any claim was compared with the laboratory analysis of product with claim. Most of the nutrient content claims related to protein and fibre did not meet information with respect to nutrition labelling, otherwise these products were compliant in terms of nutrition claims.(This a Recommendations) Therefore, further studies should be focused on evaluating the prevalence and complacency of claims on foods with health or nutrition claim as consumers may perceive them as healthy.

REFERENCES

Notes: (the references style is different because use alphabetical sortingwith numbers style, like reference no.1 in introduction is 12) and some references need to edit (by red font)

1. Almughthim A,Jradi H. Nutritional quality of prepackaged food that carry health or nutritional claims and their compliance with SFDA regulations in Saudi Arabia. Res Sq. 2020; 1-16.
2. Amrutha Kala AL. Studies on saturated and trans fatty acids composition of few commercial brands of biscuits sold in Indian market. J Food Sci Technol.2014;51: 3520–26.
3. AOAC (1965) Official Methods of Analysis. 12th Edition, Association of the Official Analytical Chemists, Washington DC.
4. AOAC (2000) Official Methods of Analysis. 17th Edition, Association of the Official Analytical Chemists, Washington DC.
5. AOAC (2005) Official Methods of Analysis. 18th Edition, Association of Official Analytical Chemists, Washington DC.
6. Aschemann-Witzel J, Varela P, PeschelAO.Consumers' categorization of food ingredients: Do consumers perceive them as 'clean label' producers expect? An exploration with projective mapping. Food Qual Prefer.2019;71: 117–28.
7. Bedran P, Bou-Mitri C, Merhi S, Doumit J, Fares J, Farhat AG. The compliance of nutrition claims on pita bread in Lebanon and risk on public health: a cross-sectional study. BMC Nutr. 2022;8(1): 32.
8. Bijlwan M, Naik BS, Sharma D, Singh AV and Kumar V. Recent developments in dough-based bakery products: A mini review. J Pharm Innov.2019;8(5): 654-58.
9. Colla K, Costanzo A,Gamlath S. Fat Replacers in Baked Food Products. Foods. 2018;7(12): 1-12.
10. David F, Sandra P, Vickers AK. Column selection for the analysis of fatty acid methyl esters. Food Anal. Appl. Palo Alto CA Agil.Technol. 2005;19:19.
11. Dimberu GA, Belete B. Estimation of total free fatty acid and cholesterol content in some commercial edible oils in Ethiopia, Bahir DAR. J Cereals Oilseeds. 2011;2(6): 71-76.
12. Doménech-Asensi G, Merola N, López-Fernández A, Ros-Berruezo G, Frontela-Saseta C. Influence of the reformulation of ingredients in bakery products on healthy characteristics and acceptability of consumers. Int J Food Sci Nutr.2016;67 (1):74–82.
13. Dubois M, Gilles KA, Hamilton JK, Rebers PT, Smith F. Colorimetric method for determination of sugars and related substances. Anal Chem. 1965;28(3): 350-56.
14. Food and Agriculture Organization (FAO) (2003) World Agriculture: Towards 2015/2030. An FAO Perspective.
15. FSSAI (2018) Food Safety and Standards (Advertising and Claims) Regulations, 2018. Pp. 26-27. Government of India Press, New Delhi.
16. Lappi V-M, Mottas A, Sundstrom J, Neal B, Löf M, dongRadholm K. A Comparison of the Nutritional Qualities of Supermarket's Own and Regular Brands of Bread in Sweden. Nutr.2020;12(4): 1162.
17. NPCS (2014) Bakery Industry in India (Bread, Biscuits and other products) Present and Future Prospects, Market size, Statistics, Trends, SWOT analysis and Forecasts (up to 2017). Pp 1-118. NIIR project Consultancy services, New Delhi.
18. O'Fallon, JV, Busboom, JR, Nelson, ML, Gaskins CT. A direct method for fatty acid methyl ester synthesis: Application to wet meat tissues, oils, and feedstuffs. J anisci. 2007;85(6), 1511-1521.
19. Omeroglu PY,Ozdal T. Fatty acid composition of sweet bakery goods and chocolate products and evaluation of overall nutritional quality in relation to the food label information. J Food Comp Anal.2020;88: 103438
20. Reshma MV, Ravi KC, Nisha P, Soban KDR, Sundaresan A,Jayamurthy P. Trans-fat content in labeled and unlabelled Indian bakery products including fried snacks. Int Food Res J.2012;19(4): 1609-14.

21. Zhang L, Boom R, Chen X and Schutyser M (2018) Recent developments in functional bakery products and the impact of baking on active ingredients. In IDS 2018. 21st International Drying Symposium Proceedings Pp. 667-74, Editorial Universitat, Politècnica de València.