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Nutritional trait of oilseed based nutritious bar

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Abstract
Nutritive potential of the oilseed crops is known for improvising the human diet, because these crops provide food security and assurance of employment generation in the society. The present experimentation was under taken at Department of Food Science, Nutrition and Technology, CSKHPKV, Palampur, Himachal Pradesh with objective to standardize the processing techniques and to analyze the nutritive aspects of the developed bars. The flaxseeds (Surbhi) and sesame seed (Brajeshwari) were given treatments *viz*. roasting and soaking followed by roasting were incorporated at 10, 15 and 20 percent in the development of nutritious bars. Flaxseeds and sesame seeds were soaked in water for six hours and roasted at 95-120 °C for 6-10 minutes. The nutrients *viz*. carbohydrate, crude protein, total ash content and total fiber increased significantly ($p \leq 0.05$) in the developed nutritious bars by using roasted flaxseeds and sesame seed increased.

Keywords: Flaxseed, sesame seed, roasting and soaked roasting

Introduction
Oilseed crops are one of the utmost imperative crops in the world. Their role in the human diet and industrial application cannot be under-estimated. The major oilseed crops include safflower, coconut, sesame, flax, soybean, sunflower, olive, etc. Flaxseed is an annual herb, carrying rich quantity of omega-3, omega-6 rich oil, lignans, having high eminence of biologically accessible proteins and fibers; mean while biologically active components were utilized in the preclusion of certain chronic diseases and also good for the brain development of infants [5]. Moetazza [8] mentioned that there was 57 percent α-linolenic acid, 16 percent linoleic acid, while the nutritionally undesirable saturated fatty acids were only 9 percent of total fatty acids of flaxseed. There was a total 2.4 percent mineral which contained potassium-750 mg, calcium-170 mg, phosphorous-370 mg, and iron-2.7 mg [5]. Phytic acid which is an antinutrient was 1369.56 mg for 100 g [13] and antioxidant activity of flaxseeds oil extracted by petroleum ether was 26 ± 0.05 percent (DPPH inhibition activity) [4]. Sesame seed is also an excellent source of phytonutrients like vitamins, omega-6 fatty acids, flavonoid, phenolic compounds, anti-oxidants, dietary fiber and also known for containing potential anti-cancer, as well as health-promoting properties. It has properties such as anti-cancer, diuretic, lactogogue, hepato-protective and laxative. There is the availability of high biological value of the amino acids in sesame seed that could be useful in enhancing the nutritional status of human and livestock nutrition as well. It contains a little low amount of lysine, besides this, it contains a fair amount of other sulphur-containing amino acids such as arginine, methionine, cysteine and leucine considerably more often the limiting amino acid in legume-based diet [13]. Sene [12] also studied 32-15 variety of sesame seed and the outcomes revealed that the seed contained dry matter (95.15 percent), crude protein (20.75 percent), ash (5.39 percent), crude fiber (3.04 percent), fat (51.92 percent), and carbohydrate (14.05 percent). Nzikou [10] showed that sesame seeds were found to be a good source of minerals. potassium (851.35 ± 3.44 mg), phosphorus (647.25 mg), magnesium (579.53 mg), calcium (415.38 mg) and sodium (122.50 mg) for 100g of sesame seed. Sesame is rich in sulfur-containing amino acids and limited in lysine and contains significant amounts of oxalic (2.5 percent) and phytic (5 percent) acids [6]. Kaur [7] also studied the total phenol content (TPC) and DPPH activity in raw, soaked, dehulled and oven-dried sesame seed where TPC was found to be 60.31, 74.92, 63.61, and 60.23 mg GAE/100g respectively. While DPPH activity was 16.70 percent, 20.66 percent, 17.02 percent, and 14.48 percent respectively. Other author [2] reported about the oil content of sesame which was grown in Morocco. The major unsaturated fatty acid was linoleic acid (46.9 percent), oleic acid (37.4 percent) and the palmitic acid (9.1 percent) was foremost saturated fatty acid found in the sesame seeds. The seeds were found to be rich in tocopherol content comprises high proportion of y-tocopherol up to 90.5 percent.

While, the sesame seed oil contains about 59.9 percent of phytosterol maker ß-sitosterol of total sterols. Flaxseed and sesame seed has been used for traditional purposes in Hindu culture these crops are known as a "symbol of immortality" and its oil is used widely in prayers, medicine in human diets over a very long period of time. More recently it has been utilized as a source of nutraceutical and identified as a functional food.

Material and Method

Flaxseed (variety-*Surbhi*) and sesame seed (variety–*Brajeshwari)* the commonly grown oilseeds in Himachal Pradesh were procured from the Department of Crop Improvement, College of Agriculture and Krishi Vigyan Kendra, Kangra, CSKHPKV. The other raw materials required for the preparation of nutritious bars were purchased from the local market. Rolled-oats, wheat, soybean, bengal gram flour, flaxseed, sesame seed and puffed rice were roasted separately and mixed properly (mixture1). Added honey and grated jaggery to work at low flame and stirred it in a clockwise direction. Peanut butter, gum arabic and glycerol were added to it and mixed properly to form semi-thick consistency (mixture2). Added above mentioned mixture 1 and 2. The batter was mixed in a clock or anticlockwise direction. Poured the mixture in a mould. Baked at 140ºC for 5 minutes and cooled at room temperature for 15-20 min. Demolding and packaging was done in butter paper and cling film. The nutritious bars were formulated for twelve different combinations of treated seeds at different level which were named as A1, A2, A3, A4, A5, A6, A7, A8, A9, A10, A11, and A12 also studied at four stages of storage i.e B1(fresh), B2(one month), B3(two month) and B4(three month). Physico-chemical analysis moisture, crude fat, crude protein (using the factor 6.5× N), total ash content and crude fibre in different nutritious bar samples were determined as per the standard methods of [1]. Total carbohydrates value was obtained [3]. Total calories were calculated [11].

Formulation of nutritious bar

Code of bars
A1 (10 percent-roasted flaxseed, 20 percent-roasted sesame)
A2 (10 percent- soaked + roasted flaxseed, 20 percent-soaked + roasted sesame)
A3 (10 percent-roasted flaxseed, 20 percent- soaked + roasted sesame)
A4 (10 percent-soaked + roasted flaxseed, 20 percent-roasted sesame)
A5 (20 percent-roasted flaxseed, 10 percent-roasted sesame)
A6 (20 percent-soaked + roasted flaxseed, 10 percent-soaked + roasted sesame)
A7 (20 percent- roasted flaxseed, 10 percent- soaked + roasted sesame)
A8 (20 percent- soaked + roasted flaxseed, 10 percent- roasted sesame)
A9 (15 percent- soaked + roasted flaxseed, 15 percent- roasted sesame)
A10 (15 percent-soaked + roasted flaxseed, 15 percent- soaked + roasted sesame)
A11 (15 percent- roasted flaxseed, 15 percent- soaked roasted sesame)
A12(control bar) (15 percent- roasted flaxseed, 15 percent- roasted sesame)

Result and Discussion

1. Moisture content

In Table no.1 according to composition of bar, bar A5 (5.89 percent) and A12 (5.87 percent), did not differ significantly from each other. However, these two bars showed significantly higher moisture then rest of the bars. Similarly bar A1, A8, A9, A4, A7, A11 and A3 as set 1, and bar A1, A8, A9, A4, A7, A11, A3, A6, A10 and A2 as set 2 were statistically non-significant but the composition was statistically significant when the bars were compared as above mentioned two sets. Bar A10 (4.51 percent) and A2 (4.48 percent) contained lowest moisture then rest of bars. The moisture content in bars varies from 4.48-5.89 percent. The present findings can be confirmed with the results of other researcher [14] who reported 4.5 per cent moisture content in her developed beet root bars.

Table 1: Moisture content

Factor AB	B1 (fresh stage)	B2 (30 days)	B3 (60 days)	B4 (90 days)	Mean CD(0.748)
A 1	5.6_a^b	5.67_a^b	5.67_a^b	5.68_a^b	5.67^{ab}
A 2	4.48_a^g	4.48_a^i	4.48_a^h	4.49_a^h	4.48^b
A 3	4.63_a^f	4.63_a^g	4.64_a^f	4.65_a^f	4.64^{ab}
A 4	5.45_a^d	5.45_a^e	5.46_a^d	5.46_a^d	5.46^{ab}
A 5	5.88_a^a	5.89_a^a	5.90_a^a	5.90_a^a	5.89^a
A 6	4.51_a^g	4.51_a^h	4.52_a^g	4.52_a^g	4.52^b
A 7	4.71_a^e	4.71_a^f	4.71_a^e	4.72_a^e	4.71^{ab}
A 8	5.50_a^c	5.50_a^c	5.51_a^c	5.51_a^c	5.51^{ab}
A 9	5.48_a^c	5.49_a^c	5.49_a^c	5.50_a^c	5.49^{ab}
A10	4.50_a^g	4.51_a^h	4.51_a^g	4.52_a^g	4.51^b
A11	4.68_a^e	4.69_a^f	4.70_a^{ef}	4.70_a^e	4.69^{ab}
A12	5.86_a^a	5.87_a^a	5.87_a^a	5.88_a^a	5.87^a
Mean CD(0.748)	5.11_a	5.12_a	5.12_a	5.13_a	

*Means having different superscripts and subscripts within the column and row are significantly different at $p \leq 0.05$
Superscript represents different composition bars throughout the column (A1-A12)
Subscript represents different composition bars throughout the row (B1-B4)

During storage interval (B1-B4) moisture content in the bar increased with increase in the storage interval. But statistically all the values are non-significant which showed that there was no such increase of moisture content. However, the difference in moisture content was not significant statistically. The moisture content within bars varied from 4.48-5.89 percent. The moisture content in bars at four different stages of storage varied from 5.11-5.13 percent. At every stage of storage bar A5

and A12, bar 8 and A9, bar A7 and A11 and bar A6, A10 and A2 did not differ significantly from each other but the composition was statistically different when the bars were compared in four sets i.e. A5 and A12 as set 1, bar 8 and A9 as set 2, bar A7 and A11 as set 3 and bar A6, A10 and A2 as set 4. However, bar A5 and A12 showed significantly higher moisture then rest of the bars at every storage interval whereas bar A10 and A2 showed minimum moisture content at every stage of storage.

2. Crude protein

According to composition of bar, as shown in Table no.2 bar A1 (10.86 percent), A12 (10.85 percent), A5 (10.76 percent), A3 (10.75 percent), A11 (10.67 percent) and A7 (10.56 percent) were found significantly highest in crude protein from rest of bars. However, bar A2 (9.20 percent), A10 (9.18percent) and A6 (9.15percent) were found significantly lowest. Bar A4 and A6 and bar A4, A6, A9, A8, A2 and A10 was found non-significant from each other but the composition was statistically different when the bars were compared in two sets i.e., bar A4 and A6 as set 1, bar A4, A6, A9, A8, A2 and A10 as set 2. As the period of storage increased there was decrease in crude protein (9.97-10.06 percent) but non-statistically which means there is no major change of crude protein over the storage period.

Table 2: Crude protein

Factor AB	B1 (fresh stage)	B2 (30 days)	B3 (60 days)	B4 (90 days)	Mean CD(0.30)
A 1	10.86_a^a	10.86_a^a	10.86_a^a	10.86_a^a	10.86^a
A 2	9.20_a^b	9.20_a^b	9.20_a^b	9.19_a^c	9.20^c
A 3	10.75_a^a	10.75_a^a	10.75_a^a	10.75_a^a	10.75^a
A 4	9.54_a^b	9.54_a^b	9.53_a^b	9.53_a^b	9.53^b
A 5	10.80_a^a	10.79_a^a	10.79_a^a	10.79_a^a	10.79^a
A 6	9.16_a^b	9.16_a^b	9.15_a^b	9.15_a^c	9.15^c
A 7	10.56_a^a	10.56_a^a	10.55_a^a	10.55_a^{ab}	10.56^a
A 8	9.21_a^b	9.21_a^b	9.21_a^b	9.21_a^c	9.21^c
A 9	9.99_a^b	9.01_a^b	9.0_a^b	9.0_a^b	9.25^{bc}
A10	9.18_a^b	9.18_a^b	9.18_a^b	9.17_a^c	9.18^c
A11	10.67_a^a	10.67_a^a	10.67_a^a	10.67_a^a	10.67^a
A12	10.85_a^a	10.85_a^a	10.85_a^a	10.85_a^a	10.85^a
Mean CD(0.175)	10.06_a	9.98_a	9.97_a	9.97_a	

*Means having different superscripts and subscripts within the column and row are significantly different at $p \leq 0.05$
Superscript represents different composition bars throughout the column (A1-A12)
Subscript represents different composition bars throughout the row (B1-B4)

At former four stages bar A1, A12, A5, A3, A11 and A7, did not differ significantly from each other and exhibits higher crude protein content than rest of bars. Bar A4, A9, A8, A2, A10 and A6 did not differ significantly at former three stages whereas at fourth stage bar A7 and A4 and bar A9, bar A2, A8, A6 and A10 did not differ significantly. At every stage of storage bar A1 and A6 showed highest and lowest crude protein. Crude protein during different storage interval did not vary significantly but there was decrease of crude protein in bar A2, A4, A5, A6, A7, A10 and A9. But statistically all the values are non-significant which showed that there was no such increase of crude protein during storage period. The present findings can be confirmed with the results of Mridula[9] reported 10.8 per cent in omega-3 rich flaxseeds bar, other author[14] 9.81 per cent in developed beet root bar, 9.07 per cent in nutrient dense bar [7], 10.35-13.59 per cent crude protein in flaxseeds energy bar [13].

3. Crude fat

According to composition of bar, as shown in Table no.3 bar A1 (17.39 percent) showed significantly highest crude fat from rest of bars whereas bar A10 (13.97 percent) and A6 (13.74 percent) showed significantly lowest value. Bar A12, A5 and A3, bar A3, A11 and A7, bar A4, A9 and A8, bar A9, A8, and A2, bar A2 and A10and bar A10 and A6 did not differ significantly from each other but the composition was statistically different when the bars were compared in six sets i.e., bar A12, A5 and A3as set 1, bar A3, A11 and A7 as set 2, bar A4, A9 and A8 as set 3, bar A9, A8, and A2 as set 4, bar A2 and A10 as set 5and bar A10 and A6 as set 6.

Table 3: Crude fat

Factor AB	B1 (fresh stage)	B2 (30 days)	B3 (60 days)	B4 (90 days)	Mean CD (0.27)
A 1	17.39_a^a	17.39_a^a	17.40_a^a	17.40_a^a	17.39^a
A 2	14.09_a^{de}	14.09_a^d	14.10_a^d	14.11_a^d	14.10^{ef}
A 3	16.81_a^b	16.82_a^b	16.82_a^b	16.83_a^b	16.82^{bc}
A 4	14.75_a^c	14.75_a^c	14.76_a^c	14.76_a^c	14.76^d
A 5	16.94_a^a	16.94_a^{ab}	16.94_a^{ab}	16.95_a^b	16.94^b
A 6	13.74_a^b	13.74_a^d	13.75_a^d	13.75_a^d	13.74^g
A 7	16.62_a^b	16.62_a^b	16.63_a^b	16.63_a^b	16.63^c
A 8	14.47_a^{cd}	14.48_a^c	14.48_a^{cd}	14.49_a^{cd}	14.48^{de}
A 9	14.63_a^c	14.63_a^c	14.64_a^{cd}	14.64_a^c	14.64^{de}
A10	13.96_a^e	13.96_a^d	13.97_a^d	13.97_a^d	13.97^{fg}
A11	16.62_a^b	16.63_a^b	16.63_a^b	16.64_a^b	16.63^c
A12	16.98_a^a	16.99_a^{ab}	16.99_a^{ab}	16.99_a^{ab}	16.99^b
Mean CD(0.01)	15.58_b	15.59_a	15.59_a	15.60_a	

*Means having different superscripts and subscripts within the column and row are significantly different at $p \leq 0.05$
Superscript represents different composition bars throughout the column (A1-A12)
Subscript represents different composition bars throughout the row (B1-B4)

During storage interval of bar, the crude fat increased with increase of the storage period (15.58-15.60 percent). However, the difference in fat content from B1-B4 storage did not vary significantly.

At former four stages bar A1, A12 and A5 did not differ significantly from each other and exhibited highest crude fat content than rest of bars whereas bars A10 and A6 showed

lowest crude fat at every stage of storage. At fresh stage bar A3, A11 and A7, bar A4 and A9, bar A8 and A2 and barA2, A10 and A6 did not differ significantly from each other but the composition was statistically different when the bars were compared in four sets i.e., bar A3, A11 and A7 as set 1, bar A4 and A9 as set 2, bar A8 and A2 as set 3, and barA2, A10 and A6 set 4. At 30 and 60 days of storage bar A12, A5, A3, A11 and A7 as set 1, bar A4 and A9 as set 2, and bar A2, A10 and A6 as set 3 were statistically same but the composition was statistically different when the bars were compared in above mentioned three sets. At 90 days of storage bar A12, A5, A3, A11 and A7 as set 1, bar A4, A9 and A8 as set 2, bar A8, A2 and A10 as set 3 did not differ significantly but the composition was statistically different when the bars were compared in above mentioned three sets. Crude fat content in the bar increased with increase in the storage period from B1-B4. But all values were non-significant statistically which indicates that there was no change of crude fat during storage interval. The present findings can be confirmed with the results of with researcher [14] who reported 14.33 per cent crude fat in developed beet root bar and 17.41 per cent in controlled bar; 17.75 per cent crude fat in developed nutrient dense bar were also reported [7].

4. Crude fiber

According to composition of bar, as shown in Table no.4 bar A1 (2.86 percent), A12 (2.84 percent) and A5 (2.87 percent) were found significantly highest in crude fiber from rest of bars. However, bar A12, A5, and A3 as set 1, bar A9 and A4 as set 2 and bar A2, A10 and A6 as set 3 were found non-significant but the composition was statistically different when the bars were compared in above mentioned three sets. Bar A2 (0.51 percent), A10 (0.50 percent) and A6 (0.49 percent) were found non-significantly lowest from rest of bars.

With increase of storage period from B1-B4 there was an increase of crude but non-significantly (1.67 percent at every stage) which indicated that there was no change of crude fiber during storage. However, it was found that crude fiber was lowest B1 and B2 days and highest at B3 and B4 storage interval.

Table 4: Crude fiber

Factor AB	B1 (fresh stage)	B2 (30 days)	B3 (60 days)	B4 (90 days)	Mean CD (0.04)
A 1	2.86_a^a	2.86_a^a	2.86_a^a	2.87_a^a	2.86^a
A 2	0.51_a^{de}	0.51_a^e	0.51_a^e	0.52_a^e	0.51^f
A 3	1.80_a^b	1.80_a^b	1.80_a^b	1.80_a^b	1.80^b
A 4	1.60_a^{cd}	1.61_a^{cd}	1.61_a^{cd}	1.61_a^{cd}	1.61^d
A 5	2.82_a^b	2.82_a^a	2.82_a^a	2.83_a^a	2.82^{ab}
A 6	0.49_a^e	0.49_a^e	0.49_a^e	0.49_a^e	0.49^f
A 7	1.68_a^c	1.69_a^c	1.69_a^c	1.69_a^c	1.69^c
A 8	1.54_a^d	1.54_a^d	1.54_a^d	1.54_a^d	1.54^e
A 9	1.58_a^d	1.59_a^d	1.59_a^d	1.59_a^d	1.59^d
A10	0.50_a^{de}	0.50_a^e	0.50_a^e	0.51_a^e	0.50^f
A11	1.79_a^b	1.80_a^b	1.80_a^b	1.80_a^b	1.80^b
A12	2.83_a^a	2.83_a^a	2.84_a^a	2.84_a^a	2.84^{ab}
Mean CD(0.024)	1.67_a	1.67_a	1.67_a	1.67_a	

*Means having different superscripts and subscripts within the column and row are significantly different at $p \leq 0.05$

Superscript represents different composition bars throughout the column (A1-A12)

Subscript represents different composition bars throughout the row (B1-B4)

At every stage bar A1and A12 did not differ significantly from each other and exhibited highest crude fiber content while bar A10 and A6 contained lowest crude fiber. However, bar A3, and A11 as set 1, bar A7 and A4 as set 2, bar A4, A9 and A 2 as set 3 and bar A10 and A6 as set 4 was found to be non-significant from each other at B1, B3 and B4 storage but the composition was statistically different when the bars were compared in above mentioned four sets. Bar A3 and A11as set 1, bar A7 and A4 as set 2, bar A4, A9, A8, A2 and A10 as set 3 and bar A2, A10 and A6 as set 4 were statistically same at 30 days of storage but these are also statistically different when the bars were compared in above mentioned three sets. In general crude fiber in the bar increased with increase in the storage period from B1-B4. But all values were non-significant statistically which indicated that there was no change of crude fiber during storage period. The present findings can be confirmed with the results of Mridula [4] 0.9-2.1 per cent in developed omega-3 rich energy bar, other [14] reported 6.43 per cent in developed beet root bar, Kaur [7] reported 1.92 per cent in developed nutrient dense bar, Sharma [13] reported 1.36-1.74 per cent crude fiber in 0-120 days stored developed flaxseed energy bar.

5. Total ash content

According to composition of bar, as shown in Table no.5 bar A1, A12, A5, A3, A11, A7 and A4, and bar A5, A3, A11, A7, A4, A9, A8, A2, A10 and A6 did not differ significantly from each other but the composition was statistically different when the bars were compared in two sets i.e., bar A1, A12, A5, A3, A11, A7 and A4 as set 1 and bar A5, A3, A11, A7, A4, A9, A8, A2, A10 and A6 as set 2. However, seven bars showed significantly higher total ash content (A1, A12, A5, A3, A11, A7, and A4) than rest of the five bars (A9, A8, A2, A10 and A6) and bar A1 (1.99 percent) and A6 (1.83 percent) showed maximum and minimum total ash content. During storage of bars the total ash content decreased with increase in the storage period from B1-B4. However, the difference in total ash content was not statistically significant which indicated that there was no such effect of storage on ash content of the bars.

Table 5: Total ash content

Factor AB	B1 (fresh stage)	B2 (30 days)	B3 (60 days)	B4 (90 days)	Mean CD (0.10)
A 1	1.99_a^a	1.99_a^a	2.0_a^a	2.0_a^a	1.99^a
A 2	1.86_a^a	1.86_a^a	1.87_a^a	1.87_a^a	1.86^b
A 3	1.96_a^a	1.96_a^a	1.96_a^a	1.96_a^a	1.96^{ab}
A 4	1.90_a^a	1.90_a^a	1.90_a^a	1.90_a^a	1.90^{ab}
A 5	1.96_a^a	1.96_a^a	1.97_a^a	1.97_a^a	1.97^{ab}
A 6	1.83_a^a	1.83_a^a	1.84_a^a	1.84_a^a	1.83_b
A 7	1.98_a^a	1.98_a^a	1.91_a^a	1.91_a^a	1.95^{ab}
A 8	1.88_a^a	1.88_a^a	1.88_a^a	1.88_a^a	1.88^b
A 9	1.89_a^a	1.89_a^a	1.89_a^a	1.89_a^a	1.89^b
A10	1.85_a^a	1.85_a^a	1.85_a^a	1.85_a^a	1.85^b
A11	1.95_a^a	1.95_a^a	1.96_a^a	1.96_a^a	1.95^{ab}
A12	1.99_a^a	1.99_a^a	1.99_a^a	1.99_a^a	1.99^a
Mean CD(0.06)	1.92_a	1.92_a	1.92_a	1.92_a	

*Means having different superscripts and subscripts within the column and row are significantly different at $p \leq 0.05$

Superscript represents different composition bars throughout the column (A1-A12)

Subscript represents different composition bars throughout the row (B1-B4)

The total ash in the bars varied with different composition of the bars and the lowest value was found in bar A6 followed by

A10, A2, A8, A9, A4, A7, A11, A3, A5 and A12 but there was no significant difference within bars which indicated that there was no such change in total ash content when incorporated with different treated seeds. The total ash content in the bars increased at B3 storage interval for bar A1, A2, A5, A6, A7 and A11 but the values were non-significant at every stage of storage which indicated that there was no such effect of storage on total ash content of the bars during different storage interval. The present findings can be confirmed with the results of the mean value was1.65 per cent of omega-3 rich energy bar with flaxseed [9], 1.94 per cent total ash content in nutrient dense bar developed [7].

6. Carbohydrate content

According to composition of bars, as shown in Table no.6 bar A5 (70.15 percent) and A2 (61.20 percent) was found significantly highest and lowest in carbohydrate from rest of bars. However, all the values of bars were significant from each other as followed by A12, A1, A8, A9, A4, A7, A11, A3, A6 and A10. As the period of storage increased there was decrease in carbohydrate content significantly in bars where the highest value was observed at fresh and lowest at B4 of storage interval.

Table 6: Carbohydrate content

Factor AB	B1 (fresh stage)	B2 (30 days)	B3 (60 days)	B4 (90 days)	Mean CD(0.003)
A 1	69.20_{a}^{c}	69.19_{b}^{c}	69.19_{b}^{c}	69.19_{b}^{c}	69.19^{c}
A 2	61.20_{a}^{l}	61.20_{ab}^{l}	61.20_{b}^{l}	61.19_{b}^{l}	61.20^{l}
A 3	64.50_{a}^{i}	64.50_{ab}^{i}	64.49_{ab}^{i}	64.49_{b}^{i}	64.49^{i}
A 4	66.20_{a}^{f}	66.20_{ab}^{f}	66.19_{b}^{f}	66.19_{c}^{f}	66.19^{f}
A 5	70.41_{a}^{a}	70.40_{a}^{a}	70.40_{a}^{a}	69.40_{a}^{a}	70.15^{a}
A 6	61.87_{a}^{j}	61.87_{b}^{j}	61.86_{bc}^{j}	61.86_{c}^{j}	61.87^{j}
A 7	65.24_{a}^{g}	65.24_{a}^{g}	65.24_{b}^{g}	65.23_{b}^{g}	65.24^{g}
A 8	66.90_{a}^{d}	66.90_{b}^{d}	66.90_{b}^{d}	66.89_{c}^{d}	66.90^{d}
A 9	66.60_{a}^{e}	66.60_{ab}^{e}	66.59_{b}^{e}	66.59_{b}^{e}	66.59^{e}
A10	61.50_{a}^{k}	61.50_{a}^{k}	61.49_{b}^{k}	61.49_{b}^{k}	61.50^{k}
A11	64.99_{a}^{h}	64.99_{ab}^{h}	64.98_{b}^{h}	64.98_{b}^{h}	64.99^{h}
A12	69.87_{a}^{b}	69.87_{b}^{b}	69.87_{b}^{b}	69.87_{b}^{b}	69.87^{b}
Mean CD(0.01)	65.71_{a}	65.70_{a}	65.70_{a}	65.61_{a}	

*Means having different superscripts and subscripts within the column and row are significantly different at $p \leq 0.05$

Superscript represents different composition bars throughout the column (A1-A12)

Subscript represents different composition bars throughout the row (B1-B4)

At every stage of storage all the bars were significant from each other which indicated that each bar has its own carbohydrate content which differs from others due to different composition bars. At B1- B4 storage interval the highest carbohydrate content was found in bar A5 followed by A12, A1, A1, A8, A9, A4, A7, A11, A3, A6, A10 and A2. During different time of storage, for every bar the highest carbohydrate content was found at fresh stage and lowest at B4 storage. Bar A1 and A12 showed significant value at B1-B2 stage and it was non-significant from B2-B4 storage. Bar A2, A9 and A11 were found highest at B1-B2 storage but non-significantly and for B2-B4 storage these were again non-significant irrespective to B1-B2 days of storage. Bar A7 and A12 were found non-significant at B1-B2 and B3-B4 irrespectively. Bar A4 was found non-significant at B1-B2 as set 1, B2-B3 as set 2 and at B4 it was significantly lowest but it varied statistically when compared in above mentioned two sets. Bar A3 was found non-significant at first three stages (B1-B3, as set 1) and last three stages (B2-B4, as set 2) of storage but became significant statistically when compared as two above mentioned sets. Bar A5 was non-significant at former three stage of storage except for B4 storage interval. Bar A6 was found significant at B1 stages, B2-B3 and B3-B4 storage. Bar A8 was also found significant at every stage except for B2-B3 storage interval. Bar A7 and A10 was non-significant at B1-B2 and B3-B4 stage irrespectively. The present findings can be confirmed with the results of other researcher [9] 60.6-71.2 per cent in omega-3 rich energy bar with flaxseed, Tangariya [14] reported 65.13per cent in controlled bar and 68.26 per cent in beet root bar, 71.07 per cent in nutrient dense bar [7] while Sha 69.11-79.02 per cent carbohydrate content flaxseed energy bar.

7. Energy (Kcal)

According to composition of bars, as shown in Table no.7 bar A1 (468.21 Kcal), A12 (452.11 Kcal) and A5 (410.10 Kcal) were found significantly highest in energy from rest of bars whereas bar A2 (374.11 Kcal), A10 (371.13 Kcal) and A6 (368.12 Kcal) were found to be lowest in energy. However, bar A3 and A11 as set 1, bar A11, A7 and A4 as set 2, bar A4 and A8 as set 3, bar A9 and A2 as set 4 and bar A2, A10 and A6 as set 5 showed non-significant difference except for bar A1, A12 and A5 but when the above-mentioned sets were compared, they became significant in nature. As the period of storage increased the energy from B1-B4 storage interval energy neither was increased nor decreased. It also showed that there was no change of energy with increase of storage period from B2- B4.

Table 7: Energy (Kcal)

Factor AB	B1 (fresh stage)	B2 (30 days)	B3 (60 days)	B4 (90 days)	Mean CD(5.2)
A 1	468.20_{a}^{a}	468.21_{a}^{a}	468.21_{a}^{a}	468.21_{a}^{a}	468.21^{a}
A 2	374.11_{a}^{ef}	374.11_{a}^{ef}	374.11_{a}^{ef}	374.12_{a}^{ef}	374.11^{gh}
A 3	401.10_{a}^{cd}	401.10_{a}^{cd}	401.10_{a}^{cd}	401.11_{a}^{cd}	401.10^{de}
A 4	388.10_{a}^{de}	388.11_{a}^{de}	388.11_{a}^{de}	388.12_{a}^{de}	388.11^{f}
A 5	410.01_{a}^{c}	410.01_{a}^{c}	410.02_{a}^{c}	410.02_{a}^{c}	410.019^{c}
A 6	368.11_{a}^{g}	368.11_{a}^{g}	368.12_{a}^{g}	368.12_{a}^{g}	368.12^{h}
A 7	393.10_{a}^{d}	393.11_{a}^{d}	393.11_{a}^{d}	393.12_{a}^{d}	393.11^{ef}
A 8	379.10_{a}^{ef}	379.10_{a}^{ef}	379.11_{a}^{ef}	379.11_{a}^{ef}	379.11^{g}
A 9	384.10_{a}^{e}	384.11_{a}^{e}	384.11_{a}^{e}	384.12_{a}^{e}	384.11^{fg}
A10	371.11_{a}^{fg}	371.11_{a}^{fg}	371.19_{a}^{fg}	371.12_{a}^{fg}	371.13^{h}
A11	398.20_{a}^{d}	398.20_{a}^{d}	398.21_{a}^{d}	398.21_{a}^{d}	398.20^{e}
A12	452.10_{a}^{b}	452.11_{a}^{b}	452.11_{a}^{b}	452.12_{a}^{b}	452.11^{b}
Mean CD(3.05)	398.94_{a}	398.95_{a}	398.96_{a}	398.96_{a}	

*Means having different superscripts and subscripts within the column and row are significantly different at $p \leq 0.05$

Superscript represents different composition bars throughout the column (A1-A12)

Subscript represents different composition bars throughout the row (B1-B4)

At every stage of storage A1 and A6 differ significantly from rest of bars and exhibited highest and lowest energy in every stage of storage. Bar A5 and A3 as set 1, bar 3, A11, A7 and A4 as set 2 and bar A7, A4, A9 and A8 as set 3, bar exhibited lowest kilocalories and significant as above-mentioned sets. In fresh storage of bar A5 and A3 as set 1, barA3, A1, A7 and A4 as set 2, bar A4, A9, A8 and A2 as set 3, bar A2 and A10 as set 4 and bar A6 and A10 as set 5 differ non-significantly at every stage but became significant when compared as above mentioned five sets. At every stage of storage all the bars were

did not varied significantly which indicated that each all bars have same energy level at every stage of storage. The present findings can be confirmed with the results 360-390 Kcal in omega-3 rich flaxseed bar [9], other [14] reported 466 Kcal in controlled bar and 441Kcal in beet root developed bar, Sharma [13] reported 408-426 Kcal energy in flaxseed energy bar.

Conclusion

After treatment of flaxseeds and sesame seeds there were slightly changes nutrients like crude protein, crude fat, carbohydrate, antioxidants and minerals and also prevents from age-related degenerative diseases for successful ageing. So, it can be incorporated in the development of nutritious bars for different age group to provide adequate amount of nutrients in an easy and affordable form and which can be consumed as snack as well as meal also. One can get highly nutritive, cheap and convenience bars.

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Data Availability

The authors declare that the data supporting the findings of this study are available within the article.

Declarations

Ethics Declaration: This article does not contain any studies with human or animal subjects.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that influenced the work reported in this paper.

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