

DEVELOPMENT AND SENSORY EVALUATION OF KHAKHRA WITH COMPARATIVE FORTIFICATION OF ROASTED AND GERMINATED FLAXSEED FLOUR

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Abstract

The value of whole wheat flour, roasted flaxseed flour, and germinated flaxseed flour in the formulated snack was used in samples K₀-100g:0g:0g (WF: RFF: GFF), K₁-100g:05g (WF: RFF), K₂-100g:10g(WF: RFF), K₃-100g:05g(WF: GFF), K₄-100g:10g (WF: GFF) respectively. The products were subjected to standard sensory analysis and accordingly, variant K₃ was found to be the most preferred concerning Appearance and color, flavor and aroma, taste, texture, and overall acceptability.

Keywords: wheat flour, roasted flaxseed flour, germinated flaxseed flour, and khakhra.

1. INTRODUCTION

Ready-to-serve snacks are popular among every child, young people, and old persons because of their good taste and flavor. In recent years, there has been a growing interest in using nutritional products as dietary adjuncts in the Food Industry. People are now more health conscious and they want all the good benefits in one food. The demand for healthy snacks always has an increasing trend and there is a great scope for the development of value-added products by utilizing nutritious food with functional properties. Flaxseed is rich in crude fiber and total fibers (cellulose, lignine, and hemicellulose) which helps in digestion. Flaxseed contains soluble and insoluble

dietary fibers. Flaxseeds also contain unsaturated fatty acids, soluble fiber, at the outer flaxseed outer layer of mucilage gums, and insoluble fiber cellulose and lignin which help avoid many diabetes, cancer, and many others. (Qian, K. Y., 2012).

Roasting of flaxseed results in the formation of desired flavor, and the quality depends on roasting conditions (Ozdemir & Devres, 2000).

Germination is an important method through which to increase the nutritional and functional contents of seeds. During the process of germination, several enzymes are activated, which results in the improvement of protein digestibility and mineral bioavailability (D'Ambrosio, T., et al., 2017).

Khakhra is a thin cracker that is commonly consumed in the Gujarati and Rajasthan cuisines of western India, especially among the Jain community. There are huge variations in the preparation of khakhra methods. The most commonly used method is wheat flour (and/or refined flour), salt, and masala mixed with oil, water, or milk added and kneaded to make a soft dough. This dough is then rolled into small balls which are flattened and roasted up to the texture to obtain crispiness with a

light brown in color (Dr. Anupama N. Devkotte, *et. al.*, 2019).

2. METHODOLOGY OF KHAKHRA

2.1 Optimization for Preparation of Khakhra:

K₀: Control- (100g:0g:0g) viz., WF: RFF: GFF

K₁: WF: RFF (100g:0.5g) viz., (100g Wheat flour:0.5g Roasted flaxseed flour)

K₂: WF: RFF (100g:10g) viz., (100g Wheat flour: 10g Roasted flaxseed flour)

K₃:WF:GFF(100g:0.5g) viz.,(100g Wheat flour:0.5gGerminated flaxseed flour)

K₄: WF:GFF(100g:10g) viz.,(100g Wheat flour:10g Germinated flaxseed flour)



Fig. no. 2.1 Roasted and Germinated flaxseed flour added to khakhra

2.2 Method of Preparation of Khakhra

Wheat flour, salt, water, and oil were used in below mentioned proportion and mixed properly to make dough. This dough was then divided into small balls and rolled evenly to make very thin khakhra in diameter. The khakhra was then roasted on a medium flame for 2 min and allowed for further analysis **Yugal Dasriya, 2020.**

KHAKHRA FLOWCHART
 SELECTION OF INGREDIENT

MIXED WHEAT FLOUR AND FLAXSEED FLOUR

(K₀= WF: RFF: GFF, 100g:0g:0g;
 K₁=WF: RFF, 100g:0.5g;

K₂=WF: RFF, 100g:0.5g; K₃=WF: GFF,100g:0.5g; K₄=WF: GFF, 100g:10g)

SALT AND OIL WERE ADDED AND KNEADED WITH A SUFFICIENT AMOUNT OF WATER TO MAKE HARD DOUGH

↓
 THE DOUGH WAS MADE TO REST FOR 10 MINUTES AT ROOM TEMPERATURE

↓
 DOUGH WAS DIVIDED INTO SMALL BALLS AND ROLLED THINLY TO MAKE KHAKHRA OF 8-12 CM DIAMETER

↓
 ROASTING (ON MEDIUM FLAME FOR 2 MIN)

↓
 SENSORY EVALUATION

↓
 KHAKHRA

Fig. No. 2.2 Preparation of Khakhra

3. SENSORY EVALUATIONS OF KHAKHRA

The control Khakhra and roasted and germinated flaxseed flour added Khakhra were evaluated for sensory quality by a semi-trained panel of ten members using nine points Hedonic scale and the Sensory score card method as given by **Amerine, et. al. (1965)**. Finally, the most acceptable Khakhra was selected based on mean sensory scores for attributes- appearance and color, flavor and aroma, taste, texture, and overall acceptability.

4. RESULT AND DISCUSSION

4.1 Sensory Evaluation of Khakhra

4.1.1 Appearance and Colour

Table 4.1 observed that the mean sensory score of khakhra about appearance and colors indicates that K₃ had the highest score **8.1** followed by K₀ (8.0), K₄ (8.0), K₁ (7.8), and K₂ (7.3). It is quite obvious from the table that the treatment K₃ (wheat flour and 5g germinated flaxseed flour) was liked very much whereas treatment control sample K₀ (only wheat flour), K₄ (10g germinated flaxseed flour) was liked slightly regarding the color and appearance of khakhra, K₁ with 5g (roasted flaxseed flour) and K₂ (10g flaxseed flour added) and. It was reported that the replacement of wheat flour with amaranth flour lowered the loaf volume and resulted in darker-colored bread **Lorensen, E. et. al., (1981)**.

4.1.2 Flavor and aroma: Table 4.1 revealed that the mean sensory score of khakhra with flavor and aroma indicates that K₃ had the highest score **8.0** followed by K₀ (7.9), K₄ (7.9), K₁ (7.5), and K₂ (7.2). It is quite obvious from the table that the treatment K₃ (wheat flour and 5g germinated flaxseed flour) was liked very much whereas treatment control samples K₀ (only wheat flour), K₄ (10g germinated flaxseed flour), K₁ with 5g (roasted flaxseed flour) and K₂ (10g flaxseed flour added) was liked slightly regarding the flavor and flavor of khakhra **Srivastava, et. al., 1994**, reported that a similar study of the soybean grain khakhra that made of Bengal gram.

4.1.3 Taste: Table 4.1 revealed that the mean sensory score of khakhra about taste indicates that K₃ had the highest score **8.1** followed by K₄ (8.0), K₀ (7.5), K₂ (7.5), and K₁ (7.4). It is quite obvious from the table that the treatment K₃ (wheat flour and 5g germinated flaxseed flour) was liked very

much whereas treatment control sample K₀ (only wheat flour) K₁ with 5g (roasted flaxseed flour), K₂ (10g flaxseed flour added) and K₄ (10g germinated flaxseed flour) was liked slightly regarding the taste of khakhra. A Study conducted by **Sharma (2010)** showed that the incorporation of AVLP (aloe vera leaf powder) at 12% in snack items like khakhra, maintained their moderately liked status.

4.1.4 texture: Table 4.1 revealed that the mean sensory score of khakhra with texture indicates that K₃ had the highest score **8.2** followed by K₀ (7.7), K₁ (7.5), K₂ (7.5), and K₄ (7.5). It is quite obvious from the table that the treatment K₃ (wheat flour and 5g germinated flaxseed flour) was liked very much whereas treatment control sample K₀ (only wheat flour) K₁ with 5g (roasted flaxseed flour), K₂ (10g flaxseed flour added) and K₄ (10g germinated flaxseed flour) was liked slightly regarding the texture of khakhra. **Srivastava et al., 1994**, reported that a similar study of the reason for the increase of hardness at 200 and 220⁰C for 75 sec, temperature and time combination may be due to a drastic reduction in moisture content of the soybean grain khakhra that made the grain harder as also observed in case of Bengal gram.

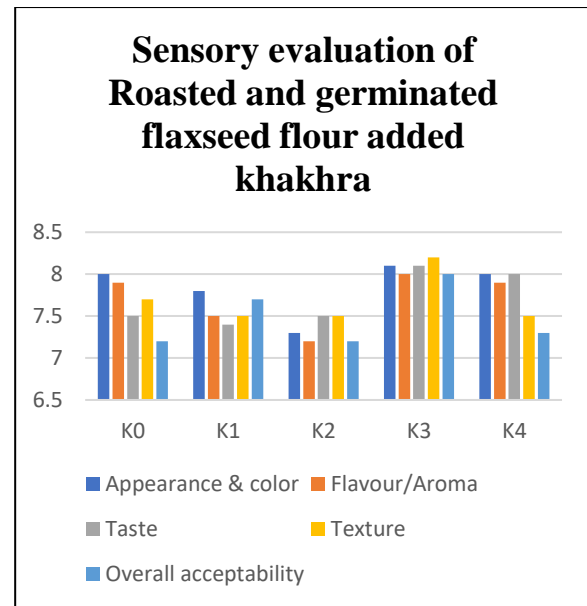
4.1.5 Overall acceptability: Table 4.1 revealed that the mean sensory score of khakhra about over-acceptability indicates that K₃ had the highest score **8.0** followed by K₁ (7.7), K₄ (7.3), K₀ (7.2), and K₂ (7.2). It is quite obvious from the table that the treatment K₃ (wheat flour and 5g germinated flaxseed flour) was liked very much whereas treatment control sample K₀ (only wheat flour) K₁ with 5g (roasted flaxseed flour), K₂ (10g flaxseed flour

added) and K₄ (10g germinated flaxseed flour) was liked slightly regarding the body and texture of khakhra. **Saeed, et. al., (2012)** reported that a proportion of 90:10 of plain wheat flour and sweet potato flour produced good results without any adverse effect on the physical and sensory characteristics of cookies.

Table No. 4.1 Sensory evaluation of Roasted and germinated flaxseed flour added khakhra.

Tr eat m en ts	Ap pea ran ce & colo r	Fla vor /Ar oma	Taste	Tex ture	Ove rall acce ptab ility
K ₀	8.0	7.9	7.5	7.7	7.2
K ₁	7.8	7.5	7.4	7.5	7.7
K ₂	7.3	7.2	7.5	7.5	7.2
K₃	8.1	8.0	8.1	8.2	8.0
K ₄	8.0	7.9	8.0	7.5	7.3
S E ±	0.56	0.52	0.52	0.45	0.46
C D at 5 %	1.74	1.61	1.61	1.39	1.41

*Each value is an average of three determinations.



5. CONCLUSION: Sensory evaluation showed that khakhra prepared by incorporating the germinated flaxseed flour 5g/100g had the maximum overall acceptability than Khakhra prepared by the addition of roasted flaxseed flour 5g/100g, 10g/100g, and germinated flaxseed flour 10g/100g respectively.

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