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Development and Evaluation of Value-Added Cheese Spread using Red Cabbage Microgreens and Flaxseeds

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Abstract: ***Microgreens, the young seedlings of vegetables and herbs, are gaining popularity for their distinct flavors , superior nutritional content and positive impact on gut health. Red cabbage microgreens (RCMG) stand out with remarkable vitamin C (147mg/100g) and other antioxidant rich phytochemicals content. Flax seeds (FS), known for their versatility in food offer cardiovascular benefits with high levels of alpha-linolenic acid and dietary fiber. This study aimed to develop value-added cheese spread using RCMG and FS, employing pre-preparation treatments like blanching and roasting. Three variations (V1, V2, V3) with varying RCMG and FS compositions were developed and evaluated. Commercially available cheese spread was used as the control (basic). Sensory evaluation, conducted by 46 semi-trained panelists using a 9-point Hedonic rating scale, revealed V1 (RCMG-30%, FS-6%) as the most accepted variation with good spreadability compared to the basic cheese spread. Value-added cheese spread showed no signs of spoilage in 30 days shelf life check under refrigeration. This study indicates the successful incorporation of Red Cabbage microgreens and Flaxseeds into the cheese spread with good sensory acceptability.***
Keywords: Red Cabbage microgreens, Flaxseeds, value addition, cheese spread, sensory evaluation.

I. INTRODUCTION

Diet plays a crucial role in human health and disease prevention. With rapid urbanization, there is a change in dietary habits across the globe, with an increase in the proportion of energy intake from restaurant food, processed food, and fast food over time[1]. Poor dietary choices, coupled with an unhealthy lifestyle, have led to an increase in the incidence of non-communicable diseases (NCDs). NCDs are responsible for 41 million annual fatalities, constituting 74% of the total global death toll, as reported by the World Health Organization[2]. Currently, with growing awareness about the importance of diet on health, there has been an increase in the demand for nutri-dense foods among the ever-increasing health-conscious population.

Cheese spread is a versatile and universally enjoyed accompaniment, appealing to all age groups, making it an ideal product for value addition due to its wide-ranging culinary applications and broad consumer appeal. The aim of this research project is to develop, standardize and evaluate the value-added cheese spread by incorporating Red Cabbage micro greens (Brassica oleracea var. capitata f. rubra) and Flaxseeds (Linum usitatissimum). The following objectives guides the research

1) Market survey of commercially available cheese spread with their list of ingredients and nutritional information.
2) To develop and standardize value-added cheese spread incorporating Red Cabbage microgreens and Flax seeds (variations -V1, V2, V3).
3) Sensory evaluation of cheese spreads (Basic and variations - V1, V2, V3) using 9- point hedonic rating scale to identify the best accepted, value-added cheese spread variation.
4) To study the shelf life of the best accepted value-added cheese spread variation under refrigeration (0-5°C) condition.

II. LITERATURE REVIEW

Microgreens are immature plants harvested after the first true leaves have emerged (~ 7-21 days later) and can be easily grown indoors. They are packed with major bioactive compounds, such as ascorbic acid, phylloquinones, phenolic antioxidants, α-tocopherol, anthocyanins, β-carotene, carotenoids, and glucosinolates which offers various health benefits[3]. Microgreens are gaining domestic and commercial attention due to its ability to provide high nutritional value at relatively small quantities compared to its mature stage[4,5,6]. Microgreens have found to contribute various health benefits such as reducing blood glucose levels, inflammation, blood pressure, and increasing the hemoglobin concentration, and tumor suppression[3,7].

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Red cabbage microgreens (RCMG) stand out with remarkable vitamin C (147mg – 89.5mg /100g) and other antioxidant rich phytochemicals content[8,9]. Along with the other cardiometabolic protective effects, studies conducted in mice have reported that it alters the gut microbiota, and attenuate the diet-induced obesity and altered cholesterol metabolism[10]. Another study indicated that RCMG can lower circulating low-density lipoprotein (LDL), liver cholesterol, and inflammatory cytokines[11].

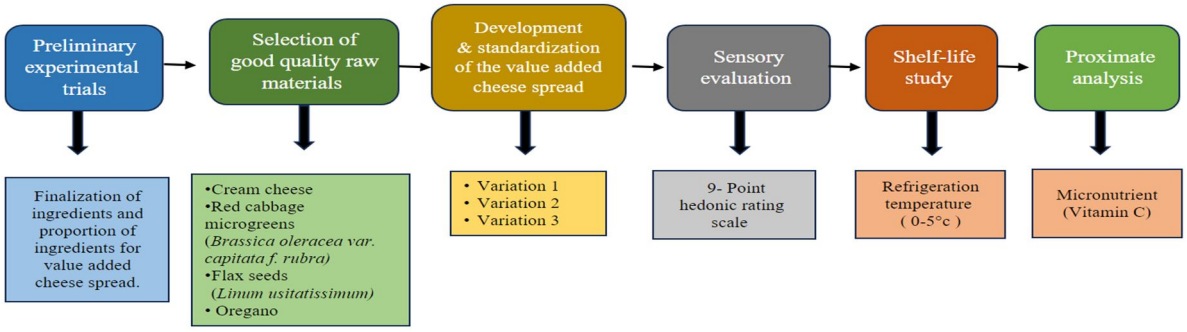
Flaxseeds is a functional food with bioactive compounds such as alpha-linolenic acid, lignans and fiber[12], offering a wide range of health benefits such as reducing plasma total cholesterol, LDL, and very LDL cholesterol[13]. Flaxseed lignans inhibit the development of malignant tumor characteristics and slow down cancer progression [14]. Flaxseeds contain anti-nutrients such as cyanogenic glycosides, phytic acid which may have adverse health effects. Thermal treatment such as roasting has been successful in reducing the anti-nutritional factors[15].

Oregano (Origanum vulgare) is a plant utilized as a spice in numerous regions of the world due to its characteristic sensory attributes of flavor, color, and aroma. Both fresh and dried leaves serve as a flavorful source, demonstrating high antioxidant activity[16].

III. MATERIALS AND METHODS

Market survey on commercially available cheese spread was conducted at local markets and from established online grocery purchase platforms - Big Basket, JioMart, and Nature's Basket. Products were specifically searched using the term ' cream cheese spread.'

Figure 1: Research design



Place of study

The experiment was carried out at the Department of Food and Nutrition, Smt. VHD Central Institute of Home Science and Research Centre, Bangalore. Sensory evaluations were performed in the laboratories.

Table 1: Trials during standardization of value-added cheese spread using microgreens and flax seeds.

Ingredients	Composition	Description of organoleptic properties
RS: CC	30:70	Very strong flavor of radish microgreens. Liquidity consistency
RCMG: RS: CC	15:15:70	Mild flavor of radish microgreens. Creamy to liquid consistency
RCMG: RS: CC	30:20:50	Very strong flavor of radish microgreens. Liquidity consistency
RCMG: FS: CC	30:10:60	Very thick consistency
RCMG: FS: CC	30:5:65	Very liquid consistency
RCMG: FS: CC	30:6:64*	Creamy consistency

RM – Radish microgreens, CC – cream cheese, RCMG- Red Cabbage microgreens, FS- flaxseeds

*****Selected

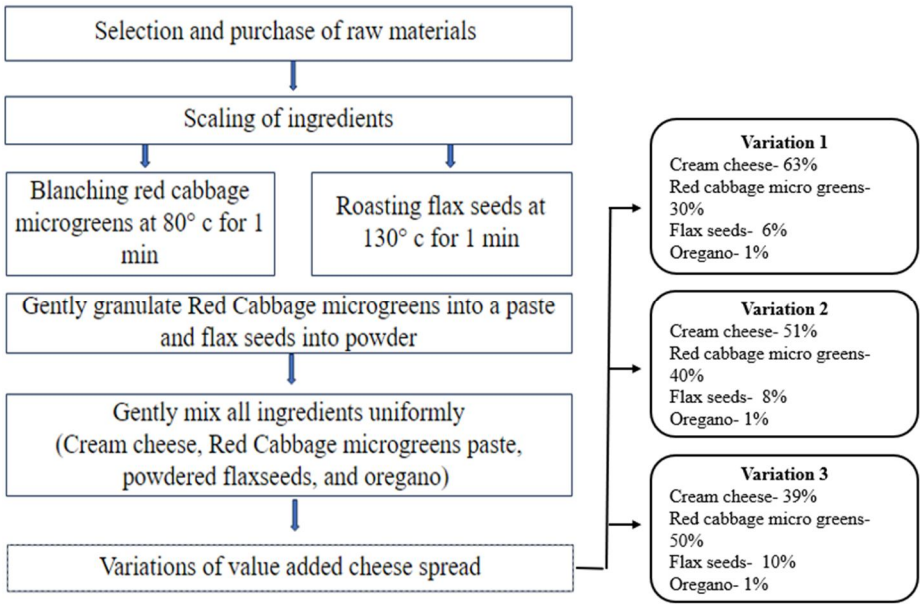
Raw materials and equipment required for developing value-added cheese spread

1) Cream cheese: FSSAI approved commercially available.

2) Red cabbage microgreens: Sponsored by Earthly Farms Pvt. Ltd., an FSSAI-approved agricultural production in Bengaluru, Karnataka.
3) Flaxseeds: Purchased locally.
4) Oregano: Purchased locally.

- Equipment: Grinding mixer, glass jars, cutlery.
- Equipment's were sterilized, excluding the grinding mixer, washed in running water, dried, and used for value-added cheese spread preparation.
- Refrigerator to store the cheese spreads under (0-5°C).

Figure 2: Development and standardization of value-added cheese spread (variation 1, variation 2 and variation 3)



Sensory evaluation of cheese spreads (basic and variations) was performed by 46 semi trained panel members using 9 Point Hedonic scale [17]. Various characteristics like appearance, colour, texture, taste, flavour and overall acceptability were scored from a rating of 9 to 1. The basic product was considered as the control.
Shelf-life was studied under refrigeration (0-5°C) condition for 30 days.
The nutritional information for the best accepted value-added cheese spread was derived from published research articles on Red Cabbage Microgreens (RCMG), the cream cheese's nutrition label, and the Indian Food Composition Table (IFCT) 2017. Vitamin C analysis was conducted by Vsix Analytical Labs Pvt. Ltd., accredited by FSSAI and BIS, utilizing HPLC (method: GH0005).

IV. RESULTS AND DISCUSSION

Table 2: Market survey of commercially available cheese spreads

Brand	Commercial name	Flavour	Ingredients	Energy (kcal)	Protein (g)	Fat (g)	Carbohydrate (g)	Vitamin C (mg)	Sodium (mg)
Amul	Amul cheese spread	Plain	Cheese, milk solids, emulsified salt (452,339,331,471), iodized salts, preservatives (200,234)	247	11.5	21	3	0	900
Amul	Amul cheese spread	Spicy garlic	Cheese, milk solids, emulsified salt (452,339,331,471), common salts, garlic powder (0.5%) preservatives (200,234)	276	11.2	20	12.8		840
Britania	Cheese	-	Cheese, water, milk solids, emulsifiers	262	9	23.5	3.6	0	1338

	Spreadz		[452(i), 339(iii), 331 (iii)], iodised salt, stabilizer (412), preservatives (200, 235) and acidity regulator (260)						
D'lecta	Cheese spread	-	Cheese, milk solids, Iodized salts	250	10.2	22	3	0	NM
Milky mist	-	-	-	287	11.6	25	4	0	1426
Nandhini	Cheese spread	Jalapeno	Cheese, milk solids, emulsified salt (339,331), common salts, Jalapenos, preservatives (202,234)	220	11.2	17	5	0	840
Go	Cheese spread	Plain	Cheddar cheese, milk solids, emulsifiers [452(i), 339(iii), 331 (iii)], iodised salt	540	NM				
Average				297	10.8	21.4	5.2	0	1068

NM- not mentioned.

The market survey results of commercially available cheese spreads revealed that there were no products with microgreens and flaxseeds.

Figure 3: Mean sensory evaluation scores of basic and value-added cheese spreads (V1,V2,V3)

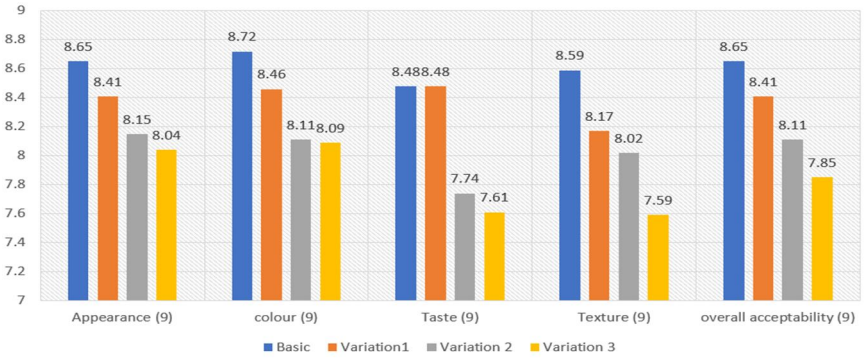


Figure 3 shows the mean scores of each sensory attribute of the basic, Variation I, Variation II and Variation III. Basic cheese spread has higher Mean scores with respect to most of the attributes, which includes appearance, color, and taste. Followed by variation I which has 63% cream cheese, 30% red cabbage microgreens, 6% flaxseeds and 1% oregano. Taste wise both basic and variation I are equal, indicating the acceptability of variation I equal to that of a basic.

Table 3: One way ANOVA and Post hoc test of the basic and value-added cheese spreads

Sensory Attribute	Basic	Variation 1	Variation 2	Variation 3	P value
Appearance	8.65 ± 0.53	8.41 ± 0.65	8.15 ± 0.73	8.04 ± 0.89 [b,c]	p < 0.001
Color	8.72 ±0.5	8.46 ± 0.59	8.11 ± 0.74	8.09 ± 0.89 [b,c]	p < 0.001
Texture	8.59 ± 0.54	8.17 ± 1.16	8.02 ± 0.77	7.59 ± 1.17 [b,c]	p < 0.001
Taste	8.48 ± 0.81	8.48 ± 0.66	7.74 ± 1.18	7.61 ± 0.95 [b,c]	p < 0.001
Overall acceptability	8.65 ± 0.53	8.41 ± 0.78	8.11 ± 0.82	7.85 ± 1.15 [b,c]	p < 0.001
Total score	43.09 ± 2.32	41.93 ± 2.86	40.13 ± 3.49	39.17 ± 4.02 [b,c]	p < 0.001

Note: [a] Basic Vs Variation 1, [b] Basic Vs Variation 2, [c] Basic Vs Variation 3

The ANOVA results indicate a significant difference ($p < 0.001$) among the basic and variations of value-added cheese spread for all sensory attributes. Post hoc tests show that significant differences exist between the basic and variation 2, as well as between the basic and variation 3. However, there is no significant difference observed between the basic and variation 1 for any of the sensory attributes.

Table 4: Shelf-life study of best accepted value-added cheese spread (V1) at refrigeration temperature (0-5°c)

ATTRIBUTES	DAY			
	1	10	20	30
Color	Light green	Light green	Light green	Light green
Texture (Spreadability)	Good	Good	Good	Good
Odor	No off odor	No off odor	No off odor	No off odor
Presence of mold growth	Absent	Absent	Absent	Absent

The value-added cheese spread was stored in refrigeration; temperature range of 0 - 5°C for a span of one month. Remarkably, no visible signs of spoilage were detected until the end of the first month. Indicating a good shelf life but may have to be subjected to taste and microbiological evaluation.

Table 5: Nutritional information* of best accepted value-added cheese spread (V1)

	Quantity (g)	Energy (kcal)	Carbohydrate (g)	Protein (g)	Fat (g)	Vitamin C (mg)	Carotenoid (µg)
Red cabbage microgreens[8]	30	6	0.7	0.56	0.11	27	3624
Cheese spread	63	155	1.89	7.24	13.23	0	-
Flax seeds[18]	6	26.6	0.65	1.13	2.1	0	5.4
Total		187.6	3.24	8.93	15.44	27	3629.4

***** Published research articles on Red Cabbage Microgreens (RCMG), the cream cheese's nutrition label, and the Indian Food Composition Table (IFCT) 2017.

However, the vitamin C content from the proximate analysis showed 1 mg/kg, indicating a significant deviation from the literature. Several factors may have contributed to the loss of vitamin C content in the value-added cheese spread, such as time of harvesting, exposure to light, air, pre-preparation blanching treatment, and temperature fluctuations during processing and storage. Also, there is a lack of information on the various nutrients in Red cabbage microgreens. A thorough investigation into these factors could be a future line of work.

V. CONCLUSION

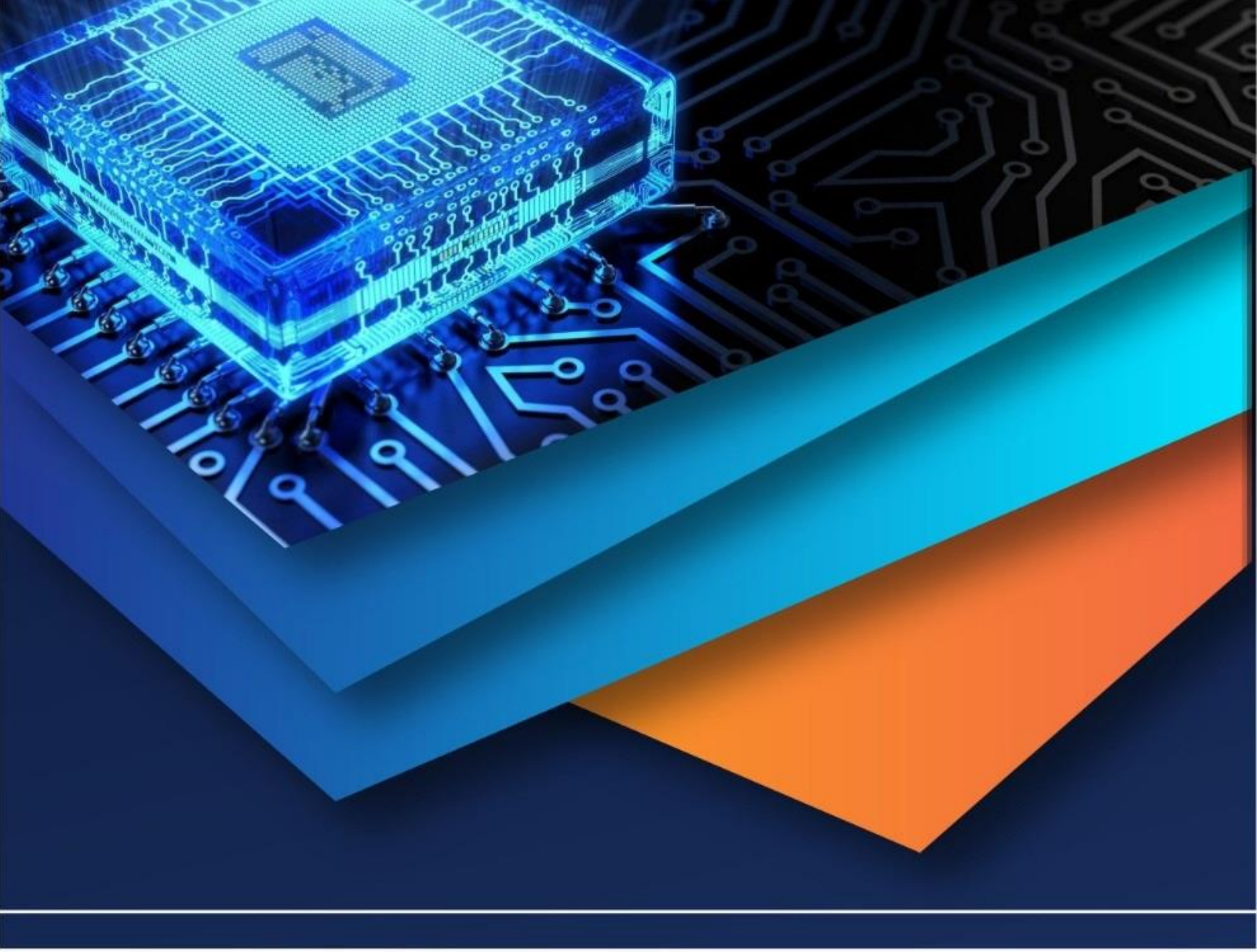
The study demonstrated successful integration of Red Cabbage microgreens and flaxseeds into a cheese spread with favorable organoleptic properties. The value-added cheese spread did not show any signs of spoilage for 30 days shelf life check under refrigeration, advocating for the inclusion of these ingredients in various food applications.

REFERENCES

[1] Nielsen SJ, Siega-Riz AM, Popkin BM. Trends in food locations and sources among adolescents and young adults. Preventive medicine. 2002 Aug 1;35(2):107-13.
[2] World Health Organization, Fact sheet on non-communicable disease. Dated on 16 September 2023, https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases.
[3] Bhaswant M, Shanmugam DK, Miyazawa T, Abe C, Miyazawa T. Microgreens—A Comprehensive Review of Bioactive Molecules and Health Benefits. Molecules. 2023 Jan 15;28(2):867.
[4] Ebert A.W., Wu T.H., Yang R.Y. Amaranth sprouts and microgreens—A homestead vegetable production option to enhance food and nutrition security in the rural-urban continuum; Proceedings of the Symposium SEAVEG 2014: Families, Farms, Food—Sustaining Small-Scale Vegetable Production and Marketing Systems for Food and Nutrition Security; Bangkok, Thailand. 25–27 February 2014; pp. 233–244.
[5] Stoleru T., Ionita A.A., Zamfirachi M.M. Microgreens—A new food product with great expectations. Rom. J. Plant Biol. 2016;61:7–16.
[6] Ghoora M.D., Srividya N. Micro-farming of greens: A viable enterprise for enhancing economic, food and nutritional security of farmers. Int. J. Nutr. Agric. Res. 2018;5:10–16.
[7] Ma S, Tian S, Sun J, Pang X, Hu Q, Li X, Lu Y. Broccoli microgreens have hypoglycemic effect by improving blood lipid and inflammatory factors while modulating gut microbiota in mice with type 2 diabetes. Journal of Food Biochemistry. 2022 Jul;46(7):e14145.

[8] Kowitcharoen L, Phornvillay S, Lekkham P, Pongprasert N, Srilaong V. Bioactive composition and nutritional profile of microgreens cultivated in Thailand. Applied Sciences. 2021 Aug 28;11(17):7981.
[9] Partap M, Sharma D, Deekshith HN, Thakur M, Verma V, Bhargava B. Microgreen: A tiny plant with superfood potential. Journal of Functional Foods. 2023 Aug 1;107:105697.
[10] Wu Y, Pham Q, Wang Y, Huang H, Jiang X, Li RW, Yu L, Luo Y, Wang J, Wang TT. Red cabbage microgreen modulation of gut microbiota is associated with attenuation of diet-induced obesity risk factors in a mouse model. Food & Function. 2023;14(14):6654-64.
[11] Huang H, Jiang X, Xiao Z, Yu L, Pham Q, Sun J, Chen P, Yokoyama W, Yu LL, Luo YS, Wang TT. Red cabbage microgreens lower circulating low-density lipoprotein (LDL), liver cholesterol, and inflammatory cytokines in mice fed a high-fat diet. Journal of agricultural and food chemistry. 2016 Dec 7;64(48):9161-71.
[12] Parikh M, Netticadan T, Pierce GN. Flaxseed: Its bioactive components and their cardiovascular benefits. American Journal of Physiology-Heart and Circulatory Physiology. 2018 Feb 1.
[13] Ratnayake WM, Behrens WA, Fischer PW, L'Abbé MR, Mongeau R, Beare-Rogers JL. Chemical and nutritional studies of flaxseed (variety Linott) in rats. The journal of nutritional biochemistry. 1992 May 1;3(5):232-40.
[14] Nowak W, Jeziorek M. The Role of Flaxseed in Improving Human Health. InHealthcare 2023 Jan 30 (Vol. 11, No. 3, p. 395). MDPI.
[15] Shaikh RP, Gadhe KS, Syed SJ. Studies on physico-chemical and functional properties of flaxseed flour. Journal of Pharmacognosy and Phytochemistry. 2020;9(1):2309-12.
[16] Zheng W, Wang SY. Antioxidant activity and phenolic compounds in selected herbs. Journal of Agricultural and Food chemistry. 2001 Nov 19;49(11):5165-70.
[17] Swaminathan, M., 1987. Food Science, Chemistry and Experimental Foods, Bangalore Printing and Publishing Co. Ltd.,
[18] Indian food composition tables, 2017.

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