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Formulation and Sensory Evaluation of Flax Seed Spice mix

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Abstract: This study explores flax seed-based spice mixes' formulation and sensory evaluation, emphasizing their nutritional and functional benefits. Flax seeds, rich in alpha-linolenic acid(ALA), lignans and omega-3 fatty acids(OM3FAs), offer significant benefits, including anti-inflammatory and antioxidant properties. However, their unpalatable nature necessitates incorporation into more acceptable forms like spice mixes.

Two formulations were developed: Sample T1, containing 50% flax seeds and 20% curry leaves, and Sample T2, with 50% flax seeds and 20% black gram. Sensory evaluation by 32 semi-trained panellists (aged 20-55) showed Sample T1 had higher overall acceptability, especially in flavour and texture. Sample T2, while nutritionally promising, was less preferred due to its taste and texture.

The study concludes that flax seed-based spice mixes, especially Sample T1, offer a nutritious and palatable alternative to traditional spice blends, with potential for widespread dietary adoption to enhance both health and flavour.

Keywords: Alpha – linolenic acid, Lignans, Palatable, phytoestrogen, Health benefits.

Introduction :

Flax(*Linum usitatissimum*) belongs to the family Linaceae and has been small flat seed with blue flowers. Flax seeds possess a crispy texture and nutty taste. They are also known as linseed[1]. The Mediterranean coast of Asia is noted to be the earliest region for flax seed cultivation. The major flax seed cultivating countries include India, the USA, and Canada, with Australia and Canada exhibiting the highest productivity. India accounts for about 1.9million hectares with seed production of 4.98lakh tonnes, ranking third globally. In India, Madhya Pradesh and Uttar Pradesh account for 70% of flax seed production.[2]

Flax seeds have a high concentration of ALA, OM3FAs, vitamins, minerals, and fiber. Secoisolariciresinol diglucoside (SDG), an essential dietary lignan phytonutrient found in high levels in flax seeds, makes flax seeds[3] an important functional food. ALA, a polyunsaturated fatty acid, exhibits anti-inflammatory properties[4]. OM3FAs were reported to possess chemo-preventative effects[5]. The amount of SDG in flax seeds ranges from 77 to 209 mg per tablespoon[6].

SDG scavenges hydroxyl free radicals. Free radicals produced during fat's oxidation, proteins, as well as carbohydrates damage tissues and nucleic acids, potentially causing cancer, neurological diseases, and premature aging. The anti-cancer activity of lignans is attributed to their scavenging ability[7].

Flax seeds offer numerous health benefits including bowel regularity, stabilization of blood glucose levels, and lower blood cholesterol levels. They are a rich source of fiber (24/100 g),

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preventing constipation. Additionally, the omega-3 fatty acid content significantly benefits heart health. Flax seed protein, rich in arginine, aspartic acid, cysteine, and methionine, as well as tocopherol (40 mg per 100 g), improves antioxidant levels and reduces cancer risk[8].

While flax seeds deliver significant health benefits, raw flax seeds may not be palatable. Grinding flax seeds enhances nutrient accessibility and absorption[9]. Incorporating ground flax seeds into spice mixes makes them more suitable for daily diets across all age groups. Traditional spice mixes, pickles, and chutney powders, commonly consumed in India, can include flax seeds to improve appetite, palatability, cravings[10] and nutritional value.

Considering the nutritional value of flax seeds, they can serve as an excellent replacement for traditional spice mixes. Adding black gram and curry leaves enhances palatability due to their familiar taste profiles. This study aims to formulate and estimate sensory characteristics of flax seed spice mixes.

Materials and methods Raw materials:

The raw materials—flax seeds, curry leaves, black gram, chilies, salt, and tamarind—were procured from local markets in Tirupati, Andhra Pradesh.

Composition of Spice Mix for 100 gm:

Table 1

Sample	Flaxseed	Curry Leaf	Black Gram	Tamarind	Garlic	Salt	Dry Chili
T1	50	20	5	5	5	5	10
T2	50	5	20	5	5	5	10
C	85	-	-	-	-	5	10

Sample preparation

Flax seeds and other spices were cleaned by hand picking to remove any extraneous substances. Curry leaves were washed and air dried in room temperature. The flax seeds are dry roasted for 3 min on low flame. Research shows that roasted flax seed's antiradical capacity decreased , as compared with untreated seeds after roasting at 200°C[11].Curry leaves, black gram and dry chillies are roasted separately. spices and salt are added to the sample and blended into fine powder. The powder is stored in air tight container. T1 and T2 spice mix samples were prepared with different proportion of curry leaf and black gram.

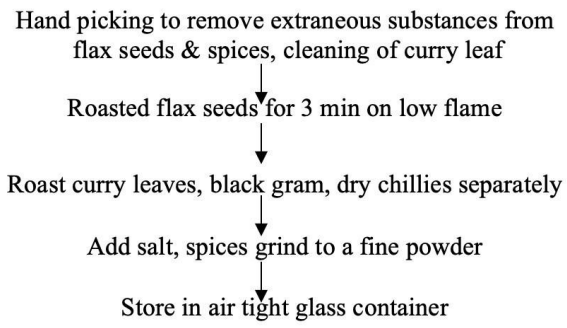

Fig 1: Preparation of flax seeds spice mix.

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Sensory evaluation

Two formulations of flax seed spice mix were prepared and analysed for sensory evaluation. Thirtytwo semi-trained panellists aged 20–55 years assessed the samples based on appearance, taste, texture, flavour, and overall acceptability using a 9 point hedonic scale (1 = poor, 9=excellent).

Statistical analysis

Appropriate statistical tests, including measures of central tendency, t-tests, and p-tests, were used to evaluate differences between variables.

Result and Discussion Table 2: Sensory evaluation of flax seed spice mix Developed

S.No	Sensory parameters	T1 Mean	T1 Standard deviation	T2 Mean	T2 Standard deviation	t-value	p-value
1.	Appearance	7.75	0.44	6.38	1.01	7.0720	< 0.0001
2.	Taste	7.50	0.51	5.88	0.94	8.590	< 0.0001
3.	Texture	7.38	0.71	6.38	0.87	5.0434	< 0.0001
4.	Flavour	7.88	0.34	6.50	0.51	12.7706	< 0.0001
5.	Overall acceptability	7.50	0.51	6.13	0.94	7.2685	< 0.0001

Note: ** significant at 1 percent level

The mean values of the sensory analysis given in table 2, shows Sample T1 Spice mix with 50% flax seeds and 20% curry leaf was more acceptable followed by sample T2 spice mix with 50% flax seeds and 20% black gram.

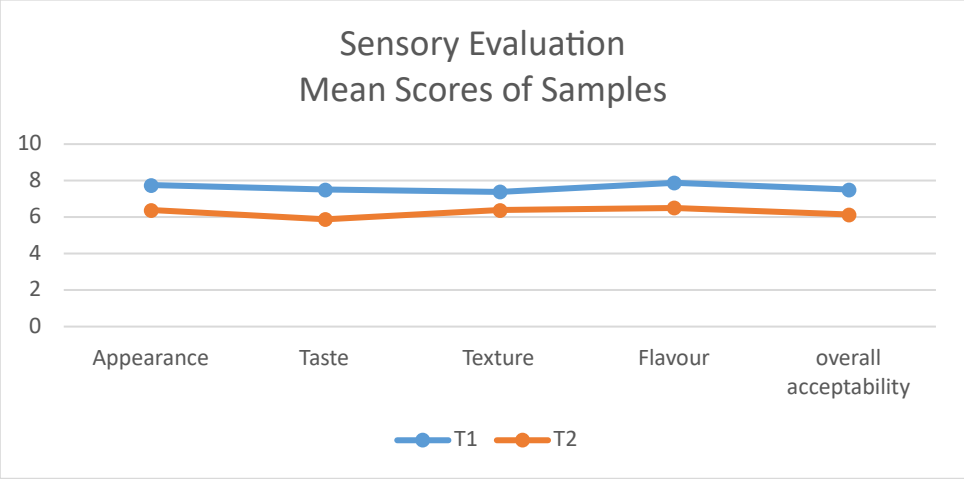

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Figure-2

Figure-2 represents the graph of mean sensory score of two samples for various attributes at each corner with a least value of 0 and maximum value of 9.

Considering positions of sample T1,T2 two samples were completely different to each other.T1 location indicates it has highest acceptability followed by T2. The vector of attributes showed that flavour is the highly scored attribute and Texture has least score in T1 sample. **Conclusion**

Sample T1, containing 50% flax seeds and 20% curry leaves, was found to be more acceptable regarding sensory qualities. Although there has been no statistically significant difference amongthe overall acceptability of T1 and T2, T1 scored higher in flavor and texture. Incorporating flax seeds and curry leaves into traditional spice mixes offers a palatable and nutritious alternative. **Acknowledgement**

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