

A formulation and evaluation of flaxseeds

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RESEARCH

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ABSTRACT

India is known for traditional medicines. Herbs are the traditional forms of medicines. Which were developed by ancient sages whose astute observation leads to development of conservational medicines. The aim of present research was to formulate and evaluate the nutraceutical tablets of flax seeds for the purpose of hyperlipidemia, three different formulations were formulated and evaluated and were found within the acceptable limits. The in vitro drug release of F2 formulation was found to be 84.88 per cent and we conclude it as the optimum formulation.

Key Words

Herb, Hyperlipidemia, Nutraceuticals, Flax seeds

Introduction

"Any product generated from food sources having additional health advantages in addition to the basic nutritional content present in foods" is how nutraceuticals are described. Nutraceutical products are non-specific biological medicines that are used to improve overall health, reduce symptoms, and prevent cancer.

The phrase "nutraceutical" is made up of two words: "nutrient," which refers to a nutrient in food, and "pharmaceutical," which refers to a medicinal drug. Stephen DE Felice, the founder and chairman of the Foundation for Innovation in Medicine, an American

organisation based in Cranford, New Jersey, invented the word in 1989.

According to the Greek physician Hippocrates (known as the "Father of Medicine"), "let food be your medicine," the principle underlying nutraceuticals is to focus on prevention. One of the most important areas of research is their involvement in human nutrition, which has far-reaching ramifications for consumers, healthcare practitioners, regulators, food producers, and distributors.

Global Demand for Nutraceuticals

Although the nutraceuticals sector began in the early 1990s, it exploded in popularity throughout the first decade of the twenty-first century. The nutraceuticals business grew at an annual average growth rate of 7.3 per cent from 1999 to 2002, but that rate has since doubled to 14.7 per cent during the last few years. The global nutraceutical market is currently valued at \$117 billion USD. The nutraceutical industry's creation of increasingly personalized and customizable products is gaining traction, particularly in the world's more developed countries. Increasing investment in research and development initiatives to uncover creative techniques, confirming health claims of goods, and marketing are some of the primary strategies used by the modern nutraceutical sector.

Consumer demand is a major driver of the nutraceutical industry's rapid expansion. To this purpose, customers want to live healthy lifestyles and get the best nutrition possible to avoid ailments like diabetes, high blood pressure, and obesity. Although the United States, the European Union, and India presently have the largest nutraceutical markets, China is expected to overtake them all by 2030.

Benefits of Nutraceuticals

Nutraceuticals have numerous advantages, and new applications for them are being discovered on a daily basis. Nutraceuticals have the ability to treat a wide range of illnesses and maladies, from physiological to psychological wellness. Nutraceuticals have been used to improve general health, extend life expectancy, increase energy, relieve anxiety, improve mental clarity, improve sleep quality and

quantity, avoid chronic diseases, lessen drug cravings, and postpone the ageing process. Flaxseeds are one such nutraceutical with a wide range of health advantages, and when combined with neem seed, they help to lower cholesterol and obesity^{1,2}.

Flaxseeds

Flax, usually known as common flax or linseed, is a flowering plant in the Linaceae family, *Linum Usitatissimum*. It is grown as a food and fibre crop in temperate climate zones around the world. Linen is the name given to flax-based textiles in Western countries, and it is typically used for bed sheets, underclothes, and table linen. Linseed oil is the name given to its oil. The term "flax" can also refer to the flax plant's unspun fibres, in addition to the plant itself. The plant is only known as a cultivated plant, and it appears to have been domesticated just once from the wild *Linum Bienne*, also known as pale flax. In New Zealand, however, the plants known as "flax" belong to the genus *Phormium*^{3,4}.

History

Flaxseeds, the oldest evidence of people utilizing wild flax as a textile comes from Dzudzuana Cave in the Republic of Georgia, where spun, coloured, and knotted wild flax fibres dating to the Upper Paleolithic, 30 thousand years ago, were discovered. Flax was first domesticated by humans in the Fertile Crescent. Domesticated oilseed flax with larger seeds has been found in Tell Ramad, Syria, while flax fabric fragments have been found at atalhöyük, Turkey, dating back to around 9,000 years ago. The crop's use gradually spread, and by 5,000 years ago, it had reached Switzerland and Germany.

Domesticated flax has been cultivated in China and India for at least 5,000 years. Flax was widely grown in ancient Egypt, where blossoming flax was painted on temple walls and mummies were embalmed with linen. Priests in Egypt wore only linen because flax was seen as a symbol of purity. Egyptian linen was traded throughout the Mediterranean by the Phoenicians, and it was utilised by the Romans for their sails. Flax production fell as the Roman Empire fell apart. In the seventh century CE, however, Charlemagne restored the crop with legislation aimed to popularise the sanitation of linen fabrics and the health of linseed oil. In the middle Ages, Flanders became the principal centre of the European linen industry.

Flax was introduced to North America by colonists, and it thrived there, but by the early twentieth century, cheap cotton and rising agricultural costs had concentrated flax production in northern Russia, which provided 90% of the world's supply.

Due to the simple availability of more durable fibres, flax has lost its commercial value since then⁵.

Health Benefits of Flaxseed

1. Flax is grown for its seeds, which can be ground into a meal or turned into linseed oil, a product used as a nutritional supplement and as an ingredient in many wood-finishing products.
2. Flax is often used as a decorative plant in gardens. Moreover, flax fibres are used to make linen. The specific epithet, *Usitatissimum*, means "most useful" Flax fibres taken from the stem of the plant are two to three times as strong as cotton fibres.
3. Additionally, flax fibres are naturally smooth and straight. Flax was the most prevalent plant for creating rag-based paper in Europe and North America until the 19th century, when cotton surpassed flax as the most common plant.
4. Flax is grown on the Canadian prairies to produce linseed oil, which is used as a drying oil in paints and varnishes, as well as in linoleum and printing inks.
5. Linseed meal, a by-product of linseed oil production from flax seeds, is utilised as cattle fodder⁶.

Aim and Objective

Formulation of nutraceutical tablets with less cost effective and optimize release for hyperlipidemic disease using flax seeds.

Materials Required

Flaxseed, Neem fruit, Corn starch, Soya poly saccharide, Dehydrated banana powder, Isopropyl alcohol, Talc.

Formulation Development

Table 1 lists the ingredients for Formulation 1 (F1), Formulation 2 (F2), and Formulation 3 (F3).

Process of Formulation

- All the ingredients of respective formulation are weighed according to their order except Talc.
- They are added to the blender and by slowly addition of isopropyl alcohol blend is made into a damp mass.
- Now the damp mass is passed through sieve no: 10.
- Resultant granules are dried in a hot air oven until it is completely dried.
- Dried granules are again passed through sieve no: 20
- To the resultant material, talc is added.
- This material is now compressed using compression machine using round punches.

Results and Discussion

Evaluation of Tablets

Pre compression studies of nutraceutical tablet (Table 2). Table 3, Table 4 and Figure 2 indicates the *In Vitro* Dissolution Profile of prepared formulations.

Summary and Conclusion

Above graph indicates that per cent Drug release of F2 formulation shows better drug release when compared with F1 and F3 Formulation.

Table 6 shows Post Compression Studies. From the above studies we conclude that nutraceutical tablets prepared by using flax seeds have given satisfactory and acceptable results. As conventional tablets, it is showing an immediate drug release.

The research work also states that herbal nutraceutical preparations of flax seeds are cost effective and as it is edible substance, we can have a high amount of patient acceptability. F2 formulation has 84.88 per cent of drug release as we conclude it has optimized nutraceutical formulation.

Tables and Figures

Table 1: Ingredients of Formulation 1(F1), Formulation 2(F2), Formulation 3(F3).

Ingredients	F1 (mg/ml)	F2 (mg/ml)	F3 (mg/ml)
Flax Seed Powder	200	200	200
Neem Fruit Powder	50	60	55
Corn Starch	25	27	28
Soya Polysaccharide	3	3	3
Dehydrated Banana Powder	6	6	6
Lactose	25	38	42
Isopropyl Alcohol	110	110	110
Talc	6	6	6
Total	450	450	450

Table 2: Standard Calibration Curve of flax seeds powder.

S. No.	Concentration (Conc.)	Absorbance(Abs)
1	10 ppm	0.17
2	20 ppm	0.349
3	30 ppm	0.51
4	40 ppm	0.669
5	50 ppm	0.85

Table 3: *In Vitro*-Dissolution profile in pH 6.8 Phosphate buffer.

Dissolution media	pH 6.8 Phosphate buffer
Volume	900 ml
Apparatus	Paddle
Speed	50 rpm
Time	10,20,30,40,50,60min

F1, F2, F3 formulations have been formulated and further combinations can be prepared and there is a further scope of carrying out animal studies and stability studies.

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Table 4: Pre compression studies.

Pre-Compression Parameters	F1	F2	F3
Angle of repose (θ)	21.12±0.11	24.32±0.12	23.46±0.12
Bulk Density (g/ml)	0.4649±0.12	0.4741±0.32	0.4541±0.21
Tapped Density (g/ml)	0.4262±0.08	0.4132±0.17	0.4587±0.023
Carr's Index	12.19±0.14	13.04±0.16	11.00±0.12
Hausner's Ratio	1.14±0.16	1.16±0.021	1.11±0.012

Table 5: Dissolution profile of prepared formulations.

Time (min)	F1 (%)	F2 (%)	F3 (%)
0	0	0	0
10	12.96	17.96	16.21
20	22.12	32.12	31.82
30	35.19	41.25	40.76
40	49.32	55.28	54.09
50	64.37	68.12	66.74
60	82.28	84.88	82.64

Table 6: Post Compression studies of nutraceutical tablets.

Post-Compression Parameters	F1	F2	F3
Thickness (mm)	1.2±0.1	1.2±0.21	1.2±0.21
Hardness (kg/cm ²)	5.5±0.2	4.8±0.11	4.31±0.21
% Weight Variation	0.399±0.021	0.399±0.034	0.397±0.012
% Friability	0.23±0.023	0.31±0.012	0.14±0.045
% In- vitro drug release	82.28	84.88	82.64

Figure 1: Standard Calibration Curve of flax seeds.

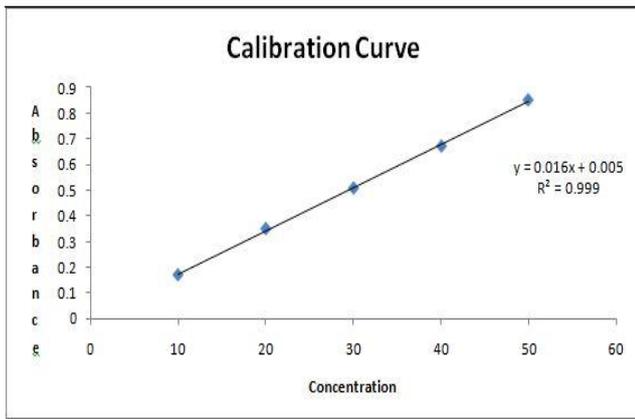


Figure 2: Line Graph of F1, F2, F3 Formulation (time vs percent drug release)

