NUTRITIONAL EFFICACY OF FLAXSEED IN THE REDUCTION OF BLOOD SUGAR AND CHOLESTEROL

THESIS SUBMITTED TO

BABASAHEB BHIMRAO AMBEDKAR UNIVERSITY

(A CENTRAL UNIVERSITY)

LUCKNOW

FOR THE AWARD OF

THE DEGREE OFDOCTOR OF PHILOSOPHY IN HOME SCIENCE

(FOOD AND NUTRITION)

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2016

ABSTRACT

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Title of the Thesis	Nutritional Efficacy of Flaxseed in the Reduction of Blood Sugar and Cholesterol
Degree to which it is submitted	Doctor Of Philosophy
Major Field	Nutrition
Faculty	School For Home Sciences
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University	BabasahebBhimraoAmbedkar University, Lucknow
Year of Submission	2016

Abstract: Good health is a challenge of modern-day living as the current civilization is plagued by several degenerative lifestyle diseases.WHO has recognized diabetes and cardiovascular disease as major non-communicable diseases (NCDs).These so-called lifestyle and or non-communicablediseases (NCDs), constitute a large group ofdiseases that are of long duration, and progresses slowly and are the major cause ofadult mortality and morbidity worldwide. According to WHO Report 2004, they account for almost 60% of deaths and 47% of global burden of disease. WHO have identifiedthat most NCDs are the result of four particularlifestyle related behavioral risk factors like tobaccouse, physical inactivity, unhealthy diet, and theharmful use of alcohol that lead to four key metabolic/physiological changes e.g., raised blood pressure (BP), overweight/obesity, raised blood glucose and raised cholesterol levels. Diabetes and CVD are major health threats which occur due to raised level of blood sugar and cholesterol and affecting people worldwide. Coronary heart disease (CHD) is currently the leading cause of death worldwide and together with diabetes, poses a serious health threat, particularly in the Indian Asian population.

The modern civilization, which due to technological advances, developed medicines which are quick acting, potent and capable to treat & provide symptomatic relief, has now started to feel the need for longer lasting & more fundamental cures for their problems of health. Given the high cost of medication, practitioners in India are now looking to control Diabetes & CVD with alternatives. Due to risk of toxicity or adverse effect of drug, consumers are turning massively to food supplements to improve health where pharmaceutical fails.

Alternative therapy or complementary therapy with plant-based medicinal foods is rapidly gaining attention, both within the scientific community and among consumers. They have several physiological and biochemical advantages, and are nowadays particularly being considered for their beneficial effects in the context of chronic ailments. Most of the bioactive constituents appear to modify the aetiopathological processes of atherosclerosis, inflammation, and other metabolic disorders. Flaxseeds (Linseed) due to its health beneficial compounds have generated interest. The components present in flaxseed attract the food technologists and nutritionists to explore its activities in health sector.Flaxseed and flaxseed oil have been valued asfoods and for medical purposes since ancient times**.** Flax typically has a small seed 3-6 mm in length and 2-3.5 mm in diameter. It is unique among cultivated seed plants. By far the most human nutritional interest in this seed has focused on the carbohydrates, in the form of fibers, and on the other components. Higher protein and dietary fiber content of flaxseed addup its functional characteristics in flaxseed based dietarypatterns. Flax meals, after oil extraction contains 35.5%protein, 3.5% fat, 6% ash and 70% total digestiblenutrients. Significant amount ofprotein, soluble fibers and lignan contents representsnutritional prospects of flax seed meal and positivelyassociated with health beneficial properties includingantioxidant, estrogenic and anti-estrogenic qualities.Flaxseed is richest source of alpha-linolenic acid, lignans and other nutritional components. The protein content of flaxseed was recorded about 20 per 100 grams of dried grain.

Owing to the nutritional profile and bioactive compounds of flaxseed the present study was taken up to study the nutritional profile of flaxseed and to check its efficacy of flaxseed in the reduction of blood sugar and cholesterol among the STZ and Hypercholesterolemia induced rats .

Objectives of the Study

1. To study the nutritional profile of flaxseed.
2. To develop the diabetic rat models by inducing Streptozotocin (Stz).
3. To develop the hypercholesterolemic rat models through administration of high fat diet.
4. To administer the flaxseed among the diabetic and hypercholesterolemic models of rats.
5. To assess the efficacy of the flaxseed in the reduction of blood sugar level.
6. To assess the efficacy of flaxseed in the reduction of blood cholesterol level.

Methodology: The present study was the experimental study and the study was carried out in two phases. In the first phase the nutritional evaluation of the flaxseed was done. The nutrients present in the flaxseed were analyzed. In the second phase blood sugar and blood lipid profile of the rats were studied. In the second phase 92 white albino rats weighing (180 gm-200gm) were taken and they were exposed to ambient condition. The rats were further divided into two groups (Group A and Group B). In group A 46 rats were taken and in group B 46 rats were taken.

Rats of Group A were induced with Streptozotocin (STZ) [Hyperglycemia] and rats of Group B were fed with high fat diet (Hypercholesterolemic) group. After induction of diabetes and hypercholesterolemia 6 rats from each group were sacrificed for the confirmation of diabetes and hypercholesterolemia.

Further the rats of group A were divided into three groups, Group I, II and III. Rats of Group I were considered asControl GroupThey were only fed with the pellet diet and water throughout the study period.Group II rats were considered as STZ Control group. They were induced with STZ. The rats of group III were considered as Flaxseed Group. There were 20 rats taken in this group. They were also induced with STZ. The rats were acclimatized for 7 days and reweighed. The group was further divided into two subgroups (n=10) in each group as low flaxseed group (given 250 mg of flaxseed/kg body weight) and high flaxseed group (given 500 mg of flaxseed/kg body weight).In between feeding period the weight of the rats were checked biweekly.

The rats of group B were divided into three groups, Group I, II and III. Rats of Group I were considered asControl Group.They were only fed with the pellet diet and water throughout the

study period.Group II rats were considered as Food Control group. They were induced with high fat diet. The rats of group III were considered as Flaxseed Group. There were 20 rats taken in this group. They were also induced with high fat diet. The rats were acclimatized for 7 days and reweighed. The group was further divided into two subgroups (n=10) in each group as low flaxseed group (given 250 mg of flaxseed/kg body weight) and high flaxseed group (given 500 mg of flaxseed/kg body weight).In between feeding period the weight of the rats were checked biweekly. After a period of 42 days the rats of both the groups were sacrificed and blood glucose and lipid profile were analyzed and the efficacy of the flaxseed were checked.

Results: Flaxseed is an abundant source of various bioactive compounds. After nutritional analysis the moisture percent of the flaxseed was found to be 12.21% whereas fat was 39.72% per 100 gram of flaxseed.Protein content in flaxseed was found to be 19.2% per 100 gram of flaxseed whereas carbohydrate was present 25.32% per 100 gram of flaxseed.Flaxseed also contains minerals in trace amount. It was observed that flaxseed contains about 27.13% per 100 gram of flaxseed while the fiber content of flaxseed was found to be 27.13% per 100 gram. After analysis it was observed that flaxseed exhibit about 5643 mg and lignan contents were found to be 360 mg/100 gram.Omega-3 type of fatty acid is also present in flaxseed. In the present study it was observed that flaxseed treatment at different doses lead to the reduction in the blood glucose level, however it was also observed that the supplementation with high dose (500 mg/kg bw) was found to be more effective in comparison with low dose (250 mg/kg body wt.).The treatments of rats with the flaxseed lead to the significant reduction in the blood total cholesterol and LDL cholesterol. HDL cholesterol that helps in scavenging lipids from peripheral tissues was found to be lowered in diseased animals. Treatment with the flaxseeds restored the HDL cholesterol with the reduction in the total and LDL cholesterol level. Marked elevations in the body weight were also observed among the rats treated with flaxseed. This clearly indicated that the supplementation of flaxseed prevented the hypercholesterolemic condition and contributes towards the management of normal body weight.

Conclusion: It is concluded that flaxseed was found to be having pronounced hypocholesterolemic and hypoglycemic activity. ALA (omega-3 fatty acid), dietary fiber and

Lignan (specifically SDG) content attracts food technologists to explore its abilities at fullest extent in commercial food processing sector. Today a major portion of world is suffering from disorders like cardiovascular diseases, diabetes, hypertension, neurological disorders hence there is a need to cure the people by adopting natural strategy. Flaxseed is one of the emerging foods which have the potential of curing these disorders. Flaxseed is emerging as one of the nutritive and functional ingredient in food products. This encourages development of new branded healthy and functional foods using flaxseeds.

Keywords: Flaxseed, Nutritional Profile, Cholesterol, STZ, blood glucose, hypercholesterolemia.