International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 1 Jan-Feb 2022, pp: 639-643 www.ijprajournal.com ISSN: 2249-7781

Effect of flaxseed (Linum usitatissimum) on renal function

Shashikala Bhagat, Ms. Hemlata Rathore
School of Pharmacy, Chouksey Engineering College, Bilaspur, CG.
Corresponding Author: Ms. Hemlata Rathore
School of Pharmacy, Chouksey Engineering College, Bilaspur, CG.

Submitted: 15-01-2022 Accepted: 27-01-2022

ABSTRACT:
Aim:- Effect of flaxseed (linum usitatissimum) on renal function.
Methods:- The rats were divided into four groups, the first group are control group received saline, the second group are test group received flaxseed extract (100mg/kg body wt.), the third group are test group received flaxseed extract (500mg/kg body wt.) and the fourth group are standard group received furosemide (10mg/kg body wt.). The urine volume, serum creatinine, serum urea, uine creatinine and creatinine clearance were measured. After a single dose of each inervantion the variables were measured during 24hrs and the variables were measured during 24hrs and the variables were measured after the daily dose for 14 days.
Results:- The increase in urine volume by flaxseed was observed as compared to control group and a significant increase in creatinine clearance was observed in the groups treated with flaxseed (100mg/kg and 500mg/kg).
KEYWORDS: Linum usitatissimum, renal function, serum creatinine, serum urea, creatinine clearance.

I. INTRODUCTION

The dietary flaxseed and flaxseed oil attenuated the decline in renal function and reduced glomerular injury with favourable effects on blood pressure, plasma lipids, and urinary prostaglandins.Renal function is essential for homeostasis. The kidneys play important pleiotropic roles including removal of metabolic waste products and maintenance of water-electrolyte balance and blood pressure. Early diagnosis of renal dysfuction of appropriate therapy are vital to survival.

PLANT PROFILE

Flaxseed is also known as Linseed, Linisemina, Linum. Flaxseed is the dried seed of Linum usitatissimum Linn, an annual herb of the family Linaceae. The plant is cultivated for its fibers and seeds in south America, India, Bangladesh, Russia, Canada, united states and Holland. The chief constituents of Linseed are Fixed oil (30 to 40 percent), proteins (25 percent), mucilage (6 percent) and a small quantity of linamarin (a cynogenetic glycoside). Whole seeds are used to make demulcent preparations and the crushed seds are used as a poultice. The linseed oil is used in liniments, paints, etc. The linseed cake is a valuable cattle food.

Flaxseed is a plant-based food that provides healthful fat, antioxidants, and fiber. Some people call it a “functional food,” which means that a person can eat it to boost their health. People grew flax as a crop in ancient Egypt and China. In Asia, it has had a role in Ayurvedic medicine for thousands of years. Flaxseed was cultivated in Babylon as early as 3000 BC. In the 8th century, King Charlemagne believed so strongly in the health benefits of flaxseed that he passed laws requiring his subjects to consume it. Now, thirteen centuries later, some experts say we have preliminary research to back up what Charlemagne suspected.

The in flaxseed include lignans, antioxidants, fiber, protein, and polyunsaturated fatty acids such as alpha-linolenic acid (ALA), or omega-3. Consuming these nutrients may help lower the risk of various conditions. Eating flaxseed daily may also help to maintain cholesterol levels. The level of LDL or "bad" cholesterol in the bloodstream has been linked to an increased risk of heart disease, obesity, diabetes, and metabolic syndrome.

USES

- Constipation
- Diabetes
- High cholestrol
- Heart diseases
- Blood pressure
- Cancer

PLANT DESCRIPTION

Macroscopical characters

International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 1 Jan-Feb 2022, pp: 639-643 www.ijprajournal.com ISSN: 2249-7781

- The seeds are produced in globular capsules, 10 seeds m each.
- They are elongated ovoid, flattened and obliquely pointed at one end, about 4 to 6 mm long and 2 to 3 mm broad.
- The hilum is in a slight hollow on the more acute edge close to the pointed end.
- The raphe is present on the acute edge and extends from the hilum to the distal rounded end of the seed.
- The testa is thin, brown, glossy and finely pitted.
- The endosperm is narrow surrounding a straight embryo, which is composed of two large plano-convex cotyledons and a radicle.
- The seeds are colourless and have a mucilaginous and oily taste.

Microscopical Characters

- The testa consists of a mucilage containing outer epidermis with polygonal tabular cells.
- One or two layers of collenchyma forming the "round-celled layer".
- Single layer of elongated selerenchyma.
- Below this layer of lignified pitted sclereids is a thin multiple hyaline layers composed of collapsed cells.
- The inner layer of the testa, called the pigment layer, consists of a layer of flat subrectangular to polygonal tabular cells containing dark brown pigments.
- The narrow endosperm and the embryo consist of polyhedral parenchymatous cells containing fixed oil and aleurone grains.

ANIMALS

Wister rats were provided by the animal house of School of Pharmacy, CEC, Bilaspur Institutional Animal Ethics Committee (AICE).

METHODS

Renal function was estimated by measuring the following variables:-

- Urine volume
- Serum creatinine
- Serum urea
- Urine creatinine
- Creatinine clearance

Diuretic activity after a single dose of interventions

The animals were kept in an individual cage for 24hrs. The rats were divided into four groups, the first group are control group received saline, the second group are test group received flaxseed extract (100mg/kg body wt.), the third group are test group received flaxseed extract (500mg/kg body wt.) and the fourth group are standard group received furosemide (10mg/kg body wt.). To measure the urine volume the urine was collected in a graduated cylinder and measured at 1, 2, 4, 8, and 24 hr. after the administration of intervention. The extracts were given orally through gavages.

Diuretics activity after a daily dose of intervention

The animals were kept in an individual cage for 24hrs. The rats were divided into four groups, the first group are control group received saline, the second group are test group received flaxseed extract (100mg/kg body wt.), the third group are test group received flaxseed extract (500mg/kg body wt.) and the fourth group are standard group received furosemide (10mg/kg body wt.). To measure the urine volume the urine was collected in a graduated cylinder and measured at 1, 2, 4, 8, and 24 hr. after the administration of intervention. The extracts were given orally through gavages. The daily dose of interventions were given through gavages for 14 days. The 24 hr urine was collected from each rat in a graduated cylinder and its volume was measured. Samples of urine were tested for measurement of urine creatinine. On the day 14 the blood samples were collected and plasma was separated by centrifugation. Then Serum creatinine and Serum urea was analyzed from autoanalyzer. On day 14 the creatinine clearance was calculated from the plasma and urine creatinine level.

II. RESULTS

Table 1. Urine volume during 24hrs after a single oral dose of flaxseed extract and furosemide (ml)

Groups	1h	2h	4h	8h	24h
Control	0.48±0.10	1.08±0.10	1.40±0.10	2.02±0.10	5.80±0.20
Flaxseed (100 mg/kg)	4.20±0.20	8.01±0.20	9.08±0.40	12.04±0.28	16.20±0.48
Flaxseed (500 mg/kg)	6.10±0.20	8.92±0.20	12.10±0.10	14.02±0.10	18.10±0.10

International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 1 Jan-Feb 2022, pp: 639-643 www.ijprajournal.com ISSN: 2249-7781

Furosemide	8.01±0.40	10.09±0.21	13.05±0.40	15.08±0.40	18.40±0.20

Table 2. Urine volume after oral dose of the flaxseed extract (ml/48h)

Groups	Day 0	Day 2	Day 4	Day 6	Day 8	Day 10	Day 12	Day 14
Control	4.80±0.2	5.40±0.12	6.21±0.21	6.98±0.18	7.01 ±0.2 1	7.10±0.11	7.18±0.21	7.24±0.20
Flaxseed (100mg/kg)	5.02±0.2	11.90±0.14	12.80±0.23	14.2±0.21	17.0 2±0. 21	17.10±0.21	18.01±0.22	18.4±0.18
Flaxseed (500mg/kg)	5.28±0.2	12.81±0.20	15.21±0.10	18.10±0.21	20.1 0±0. 24	20.28±0.21	20.62±0.22	21.10±0.10
Furosemide	5.42±0.2	14.80±0.28	16.26±0.24	20.89±0.24	22.1 2±0. 21	22.20±0.22	22.51±0.20	22.84±0.24

Table 3. Effect of daily administration of the flaxseed extract on plasma levels of urea and creatinine after 14 days.

Groups	Blood Urea (mg/dl)	Creatinine (mg/dl)
Control	35.6 ± 0.5	0.8 ± 0.4
Flaxseed (100 mg/kg)	38.4 ± 1.2	0.91 ± 0.1
Flaxseed (500mg/kg)	38.92 ± 1.02	0.98 ± 0.1
Furosemide	40.2 ± 0.5	1.0 ± 0.2

Table 4. Effect of daily administration of the flaxseed extract on urinary excreation of creatinine.

Groups	Urine creatinine (mg/dl)
Control	45.80 ± 0.4
Flaxseed (100mg/kg)	51.02 ± 0.1
Flaxseed (500mg/kg)	51.80 ± 0.1
Furosemide	52.01 ± 0.2

Table 5. Effect of oral administration of flaxseed extract on creatinine clearance measured on day 1 and on day 14 after the treatment (ml/min)

Groups	Day 1	Day 14
Control	0.21 ± 0.1	0.25 ± 0.1
Flaxseed (100mg/kg)	0.40 ± 0.1	0.65 ± 0.1
Flaxseed (500mg/kg)	0.48 ± 0.1	0.84 ± 0.1
Furosemide	0.52 ± 0.10	0.89 ± 0.1

Two different doses of extract (100 and 500 mg/kg) of flaxseed were used to investigate the effect of this seed on renal function was showed in table 1,2,3,4, and 5. All experiment grous were compared to the control group. The administration of Furosemide (10 mg/kg) significantly increase the renal clearance respectively compare to contol group. And extract (100 and 500 mg/kg) significantly increase the renal clearance.

Flaxseed extract and standard drug significantly increase the creatinine clearance, control 0.25 ± 0.1, flaxseed (100 mg/kg and 500 mg/kg) 0.65 ± 0.1, 0.84 ± 0.1 and Furosemide(10 mg/kg) 0.89 ± 0.1, compared with the control. The result were demonstrated in tables.

III. DISCUSSION

The study showed that both the doses of flaxseed extract have a significant increase in renal clearance when used in a single dose or during doses over a period of 14 days. The flaxseed extract caused a significant increase in the urine volume beginning

International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 1 Jan-Feb 2022, pp: 639-643 www.ijprajournal.com ISSN: 2249-7781

from the second hour while the single dose.while the single dose of furosemide induced a significant increase in urine volume within the first hour of administration. With the use of daily administration of the interventions, furosemide and seed extract induced a significant urine volume from day 1. The urine output continued to increase throughout the period of 14 days.

The flaxseed extract caused a significant increase in creatinine clearance as adminstrated on day 1 and furosemide induced a significant increase in creatinine clearance on day 1. With the use of daily administration of the intervention, furosemide and flaxseed extract induced a significant creatinine clearance on day 14.

IV. CONCLUSION

From the results it was concluded that the doses of flaxseed extract (100 mg/kg and 500 mg/kg) showed significant increase in urine volume and creatinine clearance.

REFERENCES

[1]. El Menyiy, Nawal, et al. "Potential effect of Silybum marianum L. and Cistus ladaniferus L. extracts on urine volume, creatinine clearance and renal function." Asian Pacific Journal of Tropical Medicine 11.6 (2018): 393.

[2]. Mehrabi, Sadrollah. "Effects of the hydrophilic extract of Juniperus excelsa on renal function in male Wistar rats." Journal of Renal Injury Prevention 8.1 (2018): 34-37.

[3]. Bagheri, S. M., et al. "Effect of Ferula assa-foetida oleo-gum-resin on renal function in normal Wistar rats." Indian journal of nephrology 26.6 (2016): 419.

[4]. Barnes J, Osgood R, Reineck H, Stein J. Glomerular alterations in an ischemic model of acute renal failure. Lab Invest. 1981;45(4):378.

[5]. Friedman, Strober, Field E, Silverman E, MyersBD: Glomerular capillary wall function in human lupus nephritis. Am JPhysiol 246:F580—F591, 1984.

[6]. Clark WF, ParmI A, Huff MW, Reid B, HolubBJ, Falardeau P: Omega-3 fatty acid dietary supplementation in systemic lupus erythematosus. Kidney mt 36:653—660, 1989.

[7]. Bile BU, Becker 01, Wi-htworthJA, CI-r.mwood BA, Kincaidsmtni PS: The effect of protein restriction on the progression of renal insufficiency. N EngI J Med 321:1773—1777, 1989.

[8]. MacconiD, NorisM, Benfeneti E, EuagliaR, PagliarinoG,Remuzzi G: Increased urinary excretion of platelet activating factor in mice with lupus nephritis. Life Sci 48:1429—1437, 1991.

[9]. Hall AV, Parbtani A, William F, Spanner E, Keeney M, Yee CI, et.al. Abrogation of MRL/lpr Lupus nephritis by dietary flax seed. Am J Kidney Dis. 1993;22(3):326-32.

[10]. Ogborn, M. R.; Nitschmann, E.; Weiler, H.; Leswick, D.; Bankovic-Calic, N. Flaxseed ameliorates interstitial nephritis in rat polycystic kidney disease. Kidney Int. 55, 417-423（1999).

[11]. Nesbitt PD, Lain Y, Thompson LU: Human metabolism of mammalian hgnan precursors in raw and processed flaxseed. AmJClinNutr 69:549-555, 1999.

[12]. Ogborn MR, Nitschmann E, Weiler H, et al: Flaxseed ameliorates interstitial nephritis in rat polycystic kidney disease. Kidney Int 55:417-423, 1999.

[13]. Velasquez, M. T.; Bhathena, S. J. Dietary phytoestrogens: a possible role in renal disease protection. Am. J. Kidney Dis. 37, 1056-1068(2001).

[14]. Aragno M, Cutrin JC, Mastrocola R, Perrelli M-G, Restivo F, Poli G, et al. Oxidative stress and kidney dysfunction due to ischemia/reperfusion in rat: attenuation by dehydroepiandrosterone. Kidney Int. 2003;64(3):836-43.

[15]. Abdel Moneim AE, Dkhil MA, Al-Quraishy S. The protective effect of flax seed oil on lead acetate-induced renal toxicity in rats. J Hazard Mater. 2011;194:250-55.

[16]. Sayed HH, Zehairy D. Biochemical and biological study on the effect of flax seed on in rats suffer from nephropathy. J Environ SciToxicol Food Technol. 2014;8(1):59-66.

[17]. Goyal A, Sharma V, Upadhyay N, Gill S, Sihag M. Flax and flax seed oil: an ancient medicine & modern functional food. J Food Sci Technol. 2014;51(9):1633-53.

[18]. PARBTANI A, CLARK WF: Flaxseed and its components in renaldisease (Chapt 17), in Flaxseed in Human Nutrition, edited by CUN-NANE 5, THOMPSON LU, Champaign, American Oil Chemists SocietyPress, 1995, pp 262—278.

[19]. SERRAINO M, THOMPSON LU: Flaxseed supplementation and earlymarkers of colon

carcinogenesis. Cancer Lett 63:159—165, 199231.

[20]. . Rizwan S, Naqshbandi A, Farooqui Z, Khan AA, Khan F. Protective effect of dietary flaxseed oil on arsenic-induced nephrotoxicity and oxidative damage in rat kidney. Food Chem Toxicol2014;68:99-107.

[21]. Mongeau R, Beare-Rodgers JL. 1992. Chemical and nutritional studies of flax-seed (Variety Linott) in rats. J NutrBiochem 3: 232–240.

[22]. Risdon RA, Sloper JC, DeWardener HE. 1968. Relationshipbetween renal function and histological changes found inrenal biopsy specimens from patients with persistent glomerular nephritis. Lancet 2: 363–366.

[23]. Abdel Moneim AE, Dkhil MA, Al-Quraishy S. The protective effect of flaxseed oil on lead acetate-induced renal toxicity in rats. J Hazard Mater. 2011b;194:250–255.

[24]. Rizwan S, Naqshbandi A, Farooqui Z, Khan AA, Khan F. Protective effect of dietary flaxseed oil on arsenic-induced nephrotoxicity and oxidative damage in rat kidney. Food Chem Toxicol, 2014;68:99-107.

[25]. Ichikawa I, Yoshida Y, Fogo A, Purkerson ML, Klahr S: Effect of heparin on the glomerular structure and function of remnant nephrons. Kidney Int 34:638-644, 1988 .

[26]. Ter Wee P, Donker A: Clinical strategies for arresting progression of renal disease. Kidney Int 42: 114-120, 1992.

[27]. Ratnayke WMN, Behrens WA, Fischer PWF, L'Abbe MR, Mongeau R, Beare-Rogers JL: Chemical and nutritional studies of flaxseed (variety Linott) in rats. J Nutr Biochem 3:232-240, 1992.

[28]. PARBTANI A, CLARK WF: Flaxseed and its components in renaldisease (Chapt 17), in Flaxseed in Human Nutrition, edited by CUNNANE 5, THOMPSON LU, Champaign, American Oil Chemists Society Press, 1995, pp 262—278.