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HISTOPATHOLOGICAL STUDY OF ETHANOLIC EXTRACT OF *PORTULACA OLERACEA* (WHOLE PLANT), FRUITS AND SEEDS OF *ERIOBOTRYA JAPONICA* ON KIDNEYS OF STREPTOZOTOCIN INDUCED DIABETIC RATS

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ABSTRACT

Background: The present study was undertaken for histopathological study of ethanolic extract of *Portulaca oleracea* (whole plant), fruits and seeds of E*riobotrya japonica* on kidneys of streptozotocin induced diabetic rats. **Methods:** The phytochemical screening of the plant extracts was done. Initially nine groups of rats were taken and each group comprising of six animals were employed in present study. Different doses of plant extracts were administered during experiment. The first group was Normal Control group which received only the vehicle. The 2nd group was toxic group which included those animals in which diabetes was induced by streptozotocin. The 3rd group were those animals which received streptozotocin and standard antidiabetic drug-glibenclamide. 4th group was diabetic animals receiving 50 mg/kg b.w dose of plant extract of *Portulaca oleracea*. 5th group included those diabetic animals which received 100mg/kg b.w of the plant extract of *Portulaca oleracea* 6th group was diabetic animals receiving 50 mg/kg b.w dose of fruits of *Eriobotrya japonica*. 7th group included those diabetic animals which received 100mg/kg b.w of the fruit extract of *Eriobotrya japonica* 8th group was diabetic animals receiving 50 mg/kg b.w dose of seed extract of *Eriobotrya japonica*. 9th group included those diabetic animals which received 100mg/kg b.w of the seed extract of *Eriobotrya japonica* The biochemical parameters that were evaluated were blood glucose levels. At the end, the animals were sacrificed and histopathology of kidneys was also done. **Results:** The results showed significant decrease in blood glucose levels in animals treated with different doses of the plant extracts. The phytochemical screening revealed the presence of various bioactive components such as alkaloids, glycosides and flavonoids. **Conclusion:** It can be assumed that the potential pharmacological activity might be due to the presence of phytochemicals present in the seeds. The histopathology of kidneys also showed protective results.

KEYWORDS: *Portulaca oleracea* (whole plant), *Eriobotrya japonica* fruits and seeds, glucose lowering, histopathology, kidneys.

INTRODUCTION

Diabetes is India's fastest growing disease nowadays. About 72 million cases are recorded in 2017 and the figure is expected to nearly double by 2025. There is urgent need to find a herbal drugs which can lower the complications related to diabetes especially diabetic nephropathy. Diabetes mellitus is taking the shape of an epidemic in India. As the salaries have increased and all the socio-economic people have experienced a rise in living standards, diabetes, a metabolic disease with hyperglycaemia leads to many complications like diabetic neuropathy, diabetic nephropathy, diabetic retinopathy and many other complications. WHO defines the disease as the 7th cause of death in 2030. India currently represents 49% of the world's diabetes burden, with an estimated 72 million cases in 2017, this figure is expected to almost double to 134 million by 2025. This disease can lead to cardiovascular disease which doubles the risk of death.[1-5]

Searches are going on to understand and manage diabetes mellitus because the disease related complications are increasing day by day. There is presence of large number of medicines in the pharmaceutical market, remedies from medicinal plants are used with success to treat this disease. Literature shows India has 45,000 plant species and several thousand have medicinal properties. Data shows more than 800 plant species have anti- diabetic activity. There has been great demand for herbal products due to easy availability, lesser side effects and low cost,. For this purpose, herbal plants are scrutinized continuously and explored for their effect as antidiabetic agents.[6-10]

Portulaca oleracea, cosmopolitan weed, is most abundant in Kashmir, commonly called as Nunar. In English, its common name is Common Purslane, in Hindi as Lunia. It mainly grows in warm, temperate, tropical and subtropical regions of the world. This plant has shown many pharmacological activities such as anti-fungal, analgesic, anti-inflammatory, anti-ulcerogenic, bronchodilator and anti-tumour activities.[11-27]

Eriobotrya japonica locally known as loquat, is native to China and Japan, it grows in many parts of the world including India. One variety is found in Kashmir also. It is an evergreen tree which is having many medicinal uses. The leaves are of great importance and have been used to treat nausea, vomiting, belching, hiccups and gastro-intestinal disorders. The reported pharmacological activities include anti-inflammatory anti-oxidant, anti-mutagenic, anti-viral, and other activities.[28-38] The present study was aimed to investigate glucose lowering activity of ethanolic extract of *Portulaca oleracea* (whole plant), *Eriobotrya japonica* fruits and seeds in streptozotocin induced diabetic rats.[11-21] and its effect on histopathology of kidneys was also studied.

MATERIALS AND METHODS

Identification and authentication of Plant Materials

The whole plant of *Portulaca oleracea* and *fruits of Eriobotrya japonica* were collected from Shalimar area of Srinagar City, collected in the months of April to June. The plants was then authenticated by plant taxonomist in the Centre of Plant Taxonomy in the Centre of Plant Taxonomy in the University of Kashmir, Srinagar. In the herbarium of the Department of Taxonomy, University of Kashmir, a sample of the plant under Voucher number 1012 (KASH) was kept for future reference. The whole plants was dried in shade, kept in well ventilated room with outside temperature from 18-32^{o}C.

Preparation of the extract

The whole plant of *Portulaca oleracea*, fruits and seeds of *Eriobotrya japonica* were coarsely powdered. The materials was macerated for 48 hrs with 50% ethanol, then filtered, again macerated with 50% ethanol. The filtrates from two macerations were combined and solvent recovered. The extracts was evaporated to dryness. The percentage yield was noted. The extracts was refrigerated at 4^{0}C for experimental studies to be used in future.

Phytochemical Screening[39-41]

The ethanolic extract obtained was subjected to qualitative tests for identification of different constituents like tannins, alkaloids, saponins, glycosides, terpenes, phenolics, flavonoids, carbohydrates, proteins and steroids. This was done by using simple and standard qualitative methods described by Trease and Evans.

Pharmacological Study[42]

Animals

Albino healthy rats of either sex weighing about 180-210 g were used. These animals were procured from Central Animal House, IIIM (Indian Institute of Integrative Medicine) Jammu. They were housed in clean polypropylene cages. The rats were acclimatized for a period of 7 days before starting the experiment. Standard environmental conditions such as temperature ranging from 18 to 32^{o} C, relative humidity (70%) and 12 hrs dark/light cycle were maintained in the quarantine. All these animals were fed with rodent pellet diet (Ashirwad Industries) and and were given water *ad-libitum* under strict hygienic conditions. All procedures were performed in accordance to CPCSEA guidelines after approval from the Institutional Animal and Ethics Committee (IAEC) of the Department of Pharmaceutical Sciences, University of Kashmir[No. F-IAEC (Pharm.Sc) APPROVAL.

Induction of Diabetes

Diabetes was induced by administering a single dose of streptozotocin (STZ) 50mg/kg b.w., which was freshly dissolved in 0.1 M citrate buffer (pH.4.5) and injected intraperitoneally within 15 minutes of dissolution in a vehicle volume of 0.4 ml with 1 ml of tuberculin syringe fitted with 24 gauge needle. Diabetes was confirmed on 3rd day post administration of streptozotocin by estimating the fasting blood glucose concentration. During this period these animals are given free access to water. Fasting blood glucose level is checked by glucostrips. The rats having blood glucose levels > 250 mg/dl were separated and selected for further studies. The animals are given the following treatment.

Group I. Normal Control receiving 2% of gum acacia.
Group II. Diabetic Control which received STZ 50mg/kg b.w single dose i.p
Group III. STZ + Glibenclamide (3 mg/kg)
Group IV. STZ+ PO [50mg/kg.b.w]
Group V. STZ+ PO [100mg/kg.b.w]
Group IV. STZ+ EBJF [50mg/kg.b.w]
Group V. STZ+ EBJF [100mg/kg.b.w]
Group IV. STZ+ EBJS [50mg/kg.b.w]
Group V. STZ+ EBJS [100mg/kg.b.w]

The experiment was started on the same day except normal control and diabetic control rats for a period of 15 days orally. These animals were given free access to standard diet and water during this period. Fasting blood glucose levels were estimated on 1st, 4th, 9th and 15th day of the treatment. On the 16th day, blood samples were collected from overnight fasting animals by cardiac puncture. The rats were anaesthesized by mild ether anaesthesia before cardiac puncture. The blood sample which was collected was kept aside for 30 minutes for clotting. By centrifuging the sample at 6000 r.p.m for 20 minutes, the serum was separated and analyzed for various biochemical parameters.[43-44]

RESULTS

PHYSICAL CHARACTERISTICS AND PERCENTAGE YEILD OF DIFFERENT EXTRACTS

a) Ethanolic extract of *Portulaca oleracea* (whole plant)

% age yield of the ethanolic extract = 14%

Extract	Colour	Odour	% Extractive value
50% Ethanolic	Dark Brown	Characteristic	14%

b) Ethanolic extract of *Eriobotrya japonica* fruits

% age yield of the ethanolic extract = 30%

Extract	Colour	Odour	% Extractive value
50% Ethanolic	Dark Brown	Characteristic	30%

c) Ethanolic extract of *Eriobotrya japonica* seeds

% age yield of the ethanolic extract = 11%

Extract	Colour	Odour	% Extractive value
50% Ethanolic	Dark Brown	Characteristic	11 %

Phytochemical screening of the three plant extracts showed the following results. *Portulaca oleracea* showed the presence of tannins, alkaloids, saponins, glycosides, terpenes, phenolics, flavonoids, carbohydrates, proteins and steroids.

Eriobotrya japonica fruits showed the presence of alkaloids, glycosides, flavonoids and carbohydrates.

Eriobotrya japonica seeds showed the presence of alkaloids, glycosides and flavonoids.

Biochemical parameters evaluated were

a) Serum Glucose Levels

b) Histopathology

At the end of the experiment, the animals were sacrificed and kidneys were taken out.

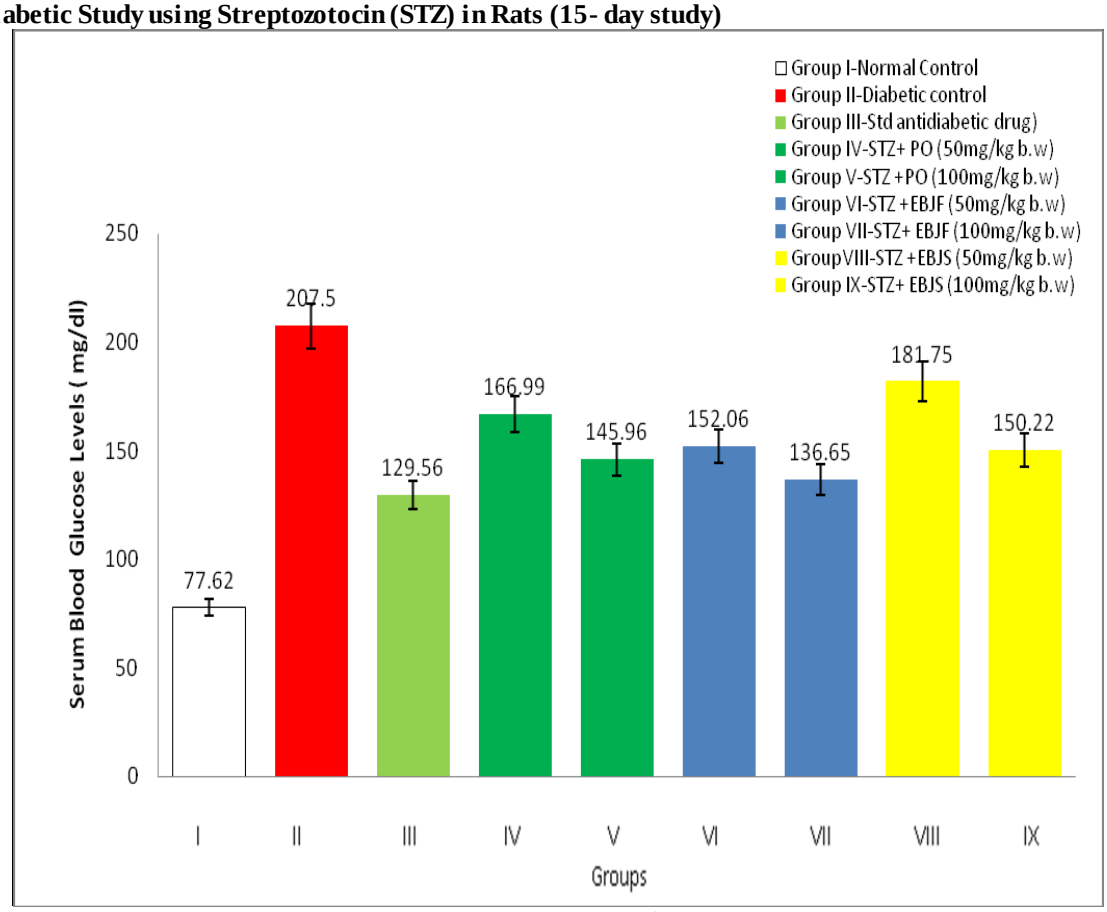
The organs were preserved in 10% formalin and sent for histopathological studies.[45-46]

Table 1: Effect of different doses of 50% ethanolic extract of *Portulaca oleracea* whole plant (PO), *Eriobotrya japonica* fruits (EBJF) and *Eriobotrya japonica* seeds (EBJS) on Serum Glucose Levels (mg/dl) against Streptozotocin (STZ) induced diabetes mellitus in rats.

S.No.	Group I	Group II	Group III	Group IV	Group V	Group VI	Group VII	Group VIII	Group IX
Rats	**Normal Control (0.2 ml of 2% gum acacia)**	**Diabetic control (STZ)**	**STZ + Std Antidiabetic drug Glibenclamide (3mg/kg)**	**STZ + PO (50mg/kg)**	**STZ+ PO (100mg/kg)**	**STZ + EBJF (50mg/kg)**	**STZ + EBJF (100mg/kg)**	**STZ+ EBJS (50mg/kg)**	**STZ+ EBJS (100mg/kg)**
1	72.05	200.45	120.34	170.23	145.34	155.73	130.41	189.71	160.03
2	92.23	220.31	190.51	165.06	143.12	153.14	145.16	184.64	153.46
3	90.63	210.32	110.05	175.05	154.31	164.63	138.41	169.14	157.03
4	68.42	205.36	100.42	155.45	145.32	138.23	135.21	187.56	163.06
5	80.05	207.32	130.72	160.62	147.45	140.32	130.42	190.12	135.45
6	62.34	201.24	125.32	175.56	140.23	160.31	140.34	169.36	132.32
Mean	**77.62**	**207.5*** **	**129.56*** **	**166.99** **	**145.96*** **	**152.06** **	**136.65*** **	**181.75** **	**150.22*** **
SD	12.14	7.28	31.77	8.07	4.76	10.67	5.81	9.87	13.08
SEM	**4.95**	**2.97**	**12.97**	**3.29**	**1.94**	**4.35**	**2.37**	**4.03**	**5.34**
P Value		**p < 0.001**	**p < 0.001**	**p < 0.01**	**p < 0.001**	**p < 0.01**	**p < 0.001**	**p < 0.01**	**p < 0.001**
Statistically Compound Groups		II **Vs** I	III **Vs** II	IV **Vs** II	V **Vs** II	VI **Vs** II	VII **Vs** II	VIII **Vs** II	IX **Vs** II

STZ Dissolved in 0.1M citrate buffer at a. dose of 50mg/kg b..w and injected i.p. single dose Diabetes confirmed on third day post administration of streptozotocin. Standard drug Glibenclamide & three plants given as 50% ethanolic extracts were administered orally for 15 days, in a single dose daily after confirmation of hyperglycaemia.
n = 6 (Number of animals in each group)
Group II is compared with Group I and all other groups are compared with group II
*** p < 0.001 Very highly significant; ** p< 0.01; Highly significant;

Anti-diabetic Study using Streptozotocin (STZ) in Rats (15- day study)



All extracts were administrated orally in 2% gum acacia once daily for 15 days.

Fig. 1: Effect of different doses of 50% ethanolic extract of *Portulaca oleracea* whole plant (PO), *Eriobotrya japonica* fruits (EBJF) and *Eriobotrya japonica* seeds (EBJS), on Serum Glucose Levels (mg/dl) against streptozotocin induced diabetes mellitus in rats.

Table 2: Effect of 50% ethanolic extract of *Portulaca oleracea*(PO) whole plant, *Eriobotrya japonica* fruits(EBJF) and *Eriobotrya japonica* seeds (EBJS) on Blood Glucose Levels (mg/dl) against Streptozotocin induced diabetes mellitus in rats.

Groups	Treatment	Blood Glucose Levels(mg/dl)			
		DAY 1	DAY 4	DAY 9	DAY15
I	Normal control 0.2 ml of 2% gum acacia	80.83±3.63	79.58±3.37	80.26±3.96(NS)	77.62±4.96(NS)
II	Diabetic control 0.2 ml of 2% gum acacia	200.48±2.89	200.24±3.67	206.76±3.23(NS)	207.50±2.97(NS)
III	STZ+ Std drug Glibenclamide (3mg/kg.b.w)	220.85±2.37	201.98±6.58	158.71±4.04**	129.56±12.97**
IV	STZ + P.O (50 mg/kg b.w)	210.52±2.29	186.10±2.44	176.99±1.73**	166.99±3.29***
V	STZ + P.O1(00 mg/kg b.w)	220.84±1.70	193.01±3.47	167.87±3.67**	145.96±1.95***
VI	STZ + EBJF (50 mg/kg b.w)	215.50±2.09	184.83±1.91	167.98±3.06**	152.06±4.36***
VII	STZ + EBJF (100 mg/kg b.w)	225.27±1.98	202.59±4.19	176.92±3.82**	136.65±2.37***
VIII	STZ + EBJS (50 mg/kg b.w)	210.36±1.90	208.49±2.09	185.23±3.67**	181.76±4.03***
IX	STZ + EBJS (100 mg/kg b.w)	220.99±1.96	205.59±3.70	177.52±5.35**	150.23±5.34***

STZ Dissolved in 0.1M citrate buffer at a. dose of 50mg/kg b.w and injected i.p. single dose Diabetes confirmed on third day post administration of streptozotocin. Standard drug Glibenclamide & three plants given as 50% ethanolic extracts were administered orally for 15 days, in a single dose daily after confirmation of hyperglycaemia.

n = 6 (Number of animals in each group)

DAY 1 compared with DAY 15

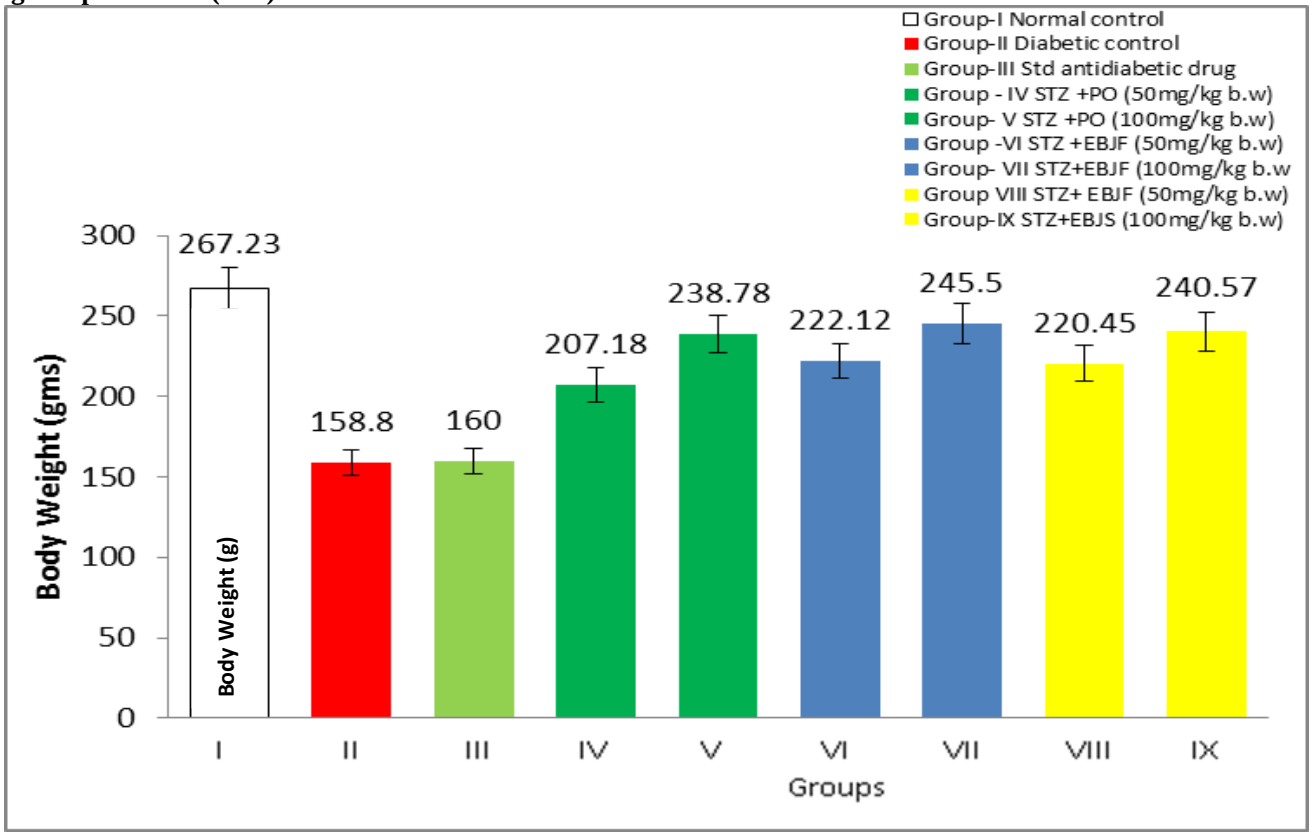
**p<0.01 highly significant; ***p< 0.001 very highly significant; p> 0.05 non significant (NS)

Table 3: Effect of different doses of 50% ethanolic extract of *Portulaca oleracea* whole plant (PO), *Eriobotrya japonica* fruits (EBJF) and *Eriobotrya japonica* seeds (EBJS), on Average Body Weight (gms) against Streptozotocin (STZ) induced diabetes mellitus in rats.

S.No.	Group I	Group II	Group III	Group IV	Group V	Group VI	Group VII	Group VIII	Group IX
Rats	**Normal Control (0.2 ml of 2% gum acacia**	**Diabetic control**	**STZ +Std Antidiabetic drug Glibenclamide (3mg/kg.)**	**STZ+ P.O. (50mg/kg)**	**STZ+ P.O (100mg/kg)**	**STZ+ EBJF (50mg/kg)**	**STZ+ EBJF (100mg/kg)**	**STZ+ EBJS (50mg/kg)**	**STZ+ EBJS (100mg/kg)**
1	230.6	150.2	160	210.3	250.1	170.2	230.4	210.6	230.5
2	240.2	130.7	150	180.7	270.5	230.6	250.7	240.1	240.6
3	260.8	170.2	150	170.6	220.7	190.3	250.5	230.6	210.9
4	260.7	180.7	160	210.4	240.7	250.4	240.8	200.4	260.3
5	300.4	150.2	175	230.9	250.3	250.9	260.3	230.3	240.6
6	310.7	170.8	165	240.2	200.4	240.3	240.3	210.7	260.5
Mean	**267..23**	**158. 80*** **	**160**	**207. 18***	**238.78****	**222..12***	**245..50****	**220. 45***	**240..57****
SD	32.08	18.39	21.29	27.24	24.78	33.87	10.47	15.36	18.81
SEM	**13.09**	**7.51**	**8.69**	**11.12**	**10.12**	**13.83**	**4.28**	**6.27**	**7.68**
P Value		**p < 0.001**	**p >0.05**	**p < 0.05**	**p < 0.01**	**p < 0.05**	**p < 0.01**	**p < 0.05**	**p < 0.01**
Statistically compound groups		II **Vs** I	III **Vs** II	IV **Vs** II	V **Vs** II	VI **Vs** II	VII **Vs** II	VIII **Vs** II	IX **Vs** II

STZ Dissolved in 0.1M citrate buffer at a. dose of 50mg/kg b.w and injected i.p. single dose. Diabetes confirmed on third day post administration of streptozotocin. Standard drug Glibenclamide & three plants given as 505 ethanolic extracts were administered orally for 15 days, in a single dose daily after confirmation of hyperglycaemia.
n = 6 (Number of animals in each group)
Group II is compared with Group I and all other groups are compared with group II
*** p < 0.001 Very highly significant; ** p< 0.01; Highly significant; *p < 0.05 significant p>0.05 Non significant.

Anti-diabetic Study using Streptozotocin (STZ) in Rats



All extracts were administrated orally in 2% gum acacia once daily for 15 days

Fig 2: Effect of different doses of 50% ethanolic extract of *Portulaca oleracea* whole plant (PO), *Eriobotrya japonica* fruits (EBJF) and *Eriobotrya japonica* seeds (EBJS), on Average Body Weight (g) against streptozotocin induced diabetes mellitus in rats.

Table 4:Effect of 50% ethanolic extract of *Portulaca oleracea*(PO) whole plant, *Eriobotrya japonica* fruits(EBJF) and *Eriobotrya japonica* seeds(EBJS) on Average Body Weight (gms) against Streptozotocin induced diabetes mellitus in rats.

Groups	Treatment	Average Body weight (in gms)			
		DAY 1	DAY 4	DAY 9	DAY 15
I	Normal control 0.2 ml of 2% gum acacia	250.58±8.14	253.90±9.93	262.12±10.47(NS)	267.23±13.09(NS)
II	Diabetic control 0.2 ml of 2% gum acacia	205.83±7.64	202.16±6.61	175.56±6.77**	158.8±7.51**
III	STZ + Std drug Glibenclamide (3mg/kg. b.w)	203.17±4.91	200.67±4.94	180.92±7.63*	160.00±8.69**
IV	STZ + P.O (50 mg/kg b.w)	220.82±9.49	222.17±10.75	212.30±10.82*	207.18±11.12**
V	STZ + P.O (100 mg/kg b.w)	210.17±12.18	223.98±12.03	232.20±11.14*	238.78±10.12**
VI	STZ + EBJF (50 mg/kg b.w)	240.13±9.15	237.13±9.17	228.80±12.58*	222.12±13.83**
VII	STZ + EBJF (100 mg/kg b.w)	223.87±6.71	230.42±5.76	238.80±4.76*	245.50±4.27**
VIII	STZ + EBJS (50 mg/kg b.w)	248.98±3.06	242.23±4.80	232.10±4.74*	220.45±6.27**
IX	STZ + EBJS (100 mg/kg b.w)	213.73±7.14	223.86±7.11	233.88±7.53*	240.57±7.67**

STZ Dissolved in 0.1M citrate buffer at a. dose of 50mg/kg b.w and injected i.p. single dose Diabetes confirmed on third day post administration of streptozotocin. Standard drug Glibenclamide & three plants given as 50% ethanolic extracts were administered orally for 15 days, in a single dose daily after confirmation of hyperglycaemia.
n = 6 (Number of animals in each group)

DAY 1 compared with DAY 15
*p< 0.05 significant; **p<0.01 highly significant; ***p< 0.001 very highly significant; p> 0.05 non-significant (NS).

Histopathological studies of the kidney of the slides of rats of Group I (Normal control) showed glomerulus is of normal size and cellularity, no increase in mesangium or thickening of the glomerulus basement membrane. Tubules were within the normal limits.

The kidneys from the slides of diabetic control group II shows the glomerulus shows increase in mesangial matrix and thickening of glomerulus basement membrane. Tubules were within the normal limits.

Glibenclamide (Standard antidiabetic drug) when administered at the dose level of 3 mg/kg b.w to rats of Group III showed the glomerulus is of normal size and cellularity, no increase in mesangium or thickening of glomerular basement membrane is seen. Tubules were within the normal limits.

Portulaca oleracea whole plant when administered at the dose level of 50 mg/kg b.w and 100mg/kg to rats of Group IV and Group V showed that the glomerulus is of normal size and cellularity, a **mild increase in mesangium is seen**. There is no thickening of glomerular basement membranes. Tubules were within the normal limits.

Eriobotrya japonica fruits when administered at the dose level of 50 mg/kg b.w and 100mg/kg to rats of Group VI and Group VII showed that the glomerulus is of normal size and cellularity, a **mild increase in mesangium is seen**. **There is also mild thickening of glomerular basement membranes**. Tubules were within the normal limits.

Eriobotrya japonica seeds when administered at the dose level of 50 mg/kg b.w and 100mg/kg to rats of Group VIII and Group IX showed that the glomerulus is of normal size and cellularity, a **moderate increase in mesangium is seen**. There is also **mild thickening of glomerular basement membranes**. Tubules were within the normal limits.

HISTOPATHOLOGY OF KIDNEY IN RATS DIABETES INDUCED BY STREPTOZOTOCIN (STZ)

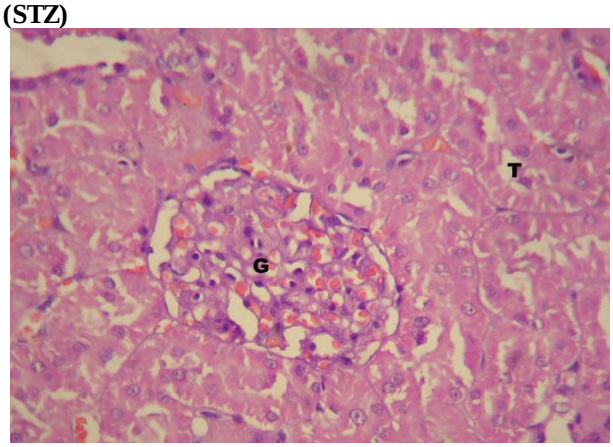


Fig. 3: Group- I – Normal Control

Renal parenchyma of rats. The Glomerulus is of normal size and cellularity, no increase in mesangium or thickening of glomerular basement membranes is seen. Tubules are within normal limits. (H&E x 40X)
G = Glomerulus T= Tubules

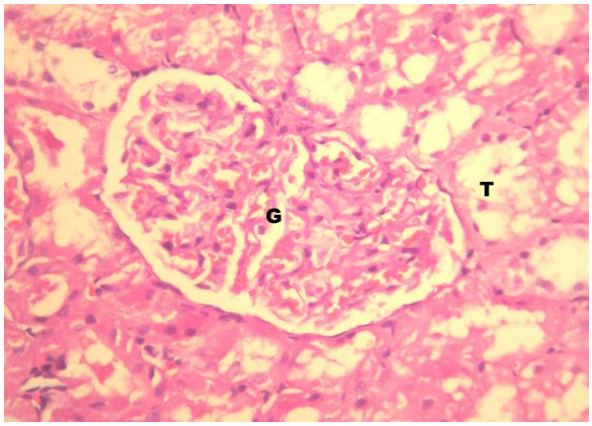


Fig. 4: Group II- Diabetic control.
Streptozotocin (STZ) (50mg/kg) b.w.
Renal parenchyma from diabetic rats. The Glomerulus shows increase in size and cellularity, and a mild increase in mesangium is seen. There is also mild thickening of glomerular basement membranes. Tubules are within normal limits. (H&E x 40X)
G = Glomerulus T= Tubules

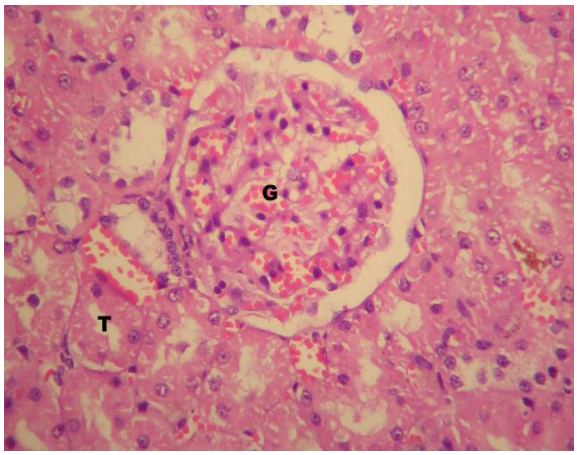


Fig. 5: Group –III – STZ*+Standard antidiabetic drug Glibenclamide (3 mg/kg b.w).
Renal parenchyma from diabetic rats. The Glomerulus is of normal size ad cellularity, no increase in mesangium or thickening of glomerular basement membranes is seen. Tubules are within normal limits. (H&E x 40X)
G = Glomerulus T= Tubules

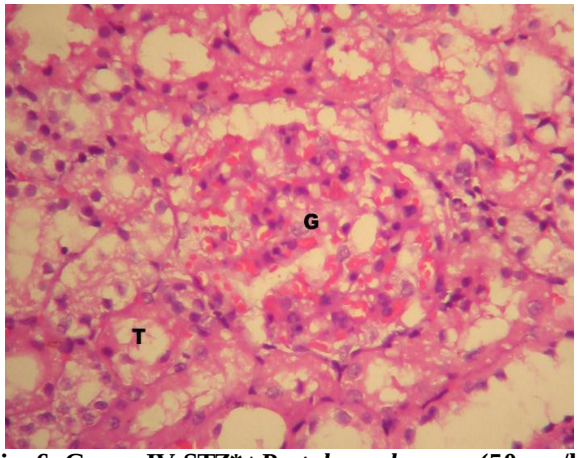


Fig. 6: Group IV-STZ*+*Portulaca oleracea* (50mg /kg b.w)

Renal parenchyma from diabetic rats. The Glomerulus is of normal size and cellularity, a mild increase in mesangium is seen. There is no thickening of glomerular basement membranes. Tubules are within normal limits. (H&E x 40X)

G = Glomerulus T= Tubules

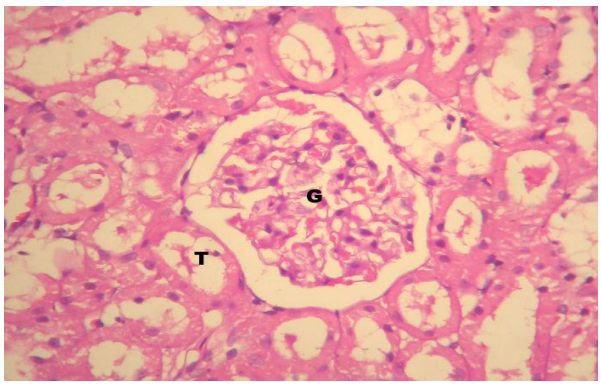


Fig 7: Group V STZ*+*Portulaca oleracea* (100 mg / kg.)

Renal parenchyma from diabetic rats. The Glomerulus is of normal size and cellularity, a mild increase in mesangium is seen There is no thickening of glomerular basement membranes. Tubules are within normal limits. (H&E x 40X)

G = Glomerulus T= Tubules

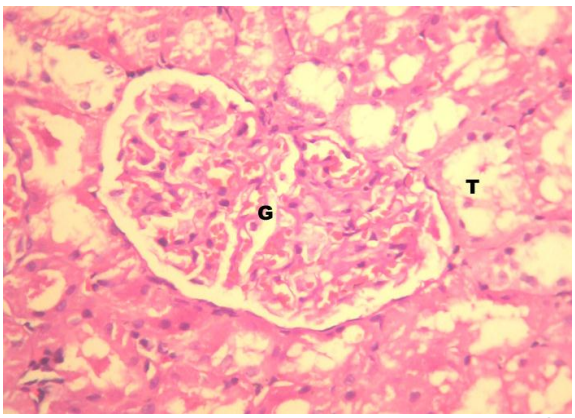


Fig. 8: Group VI- STZ*+*Eriobotrya japonica* fruit (50mg/kg b.w).

Renal parenchyma from diabetic rats. The Glomerulus) shows increase in size and cellularity, and a mild increase in mesangium is seen. There is also mild thickening of glomerular basement membranes. Tubules are within normal limits. (H&E x 40X)

G = Glomerulus T= Tubules

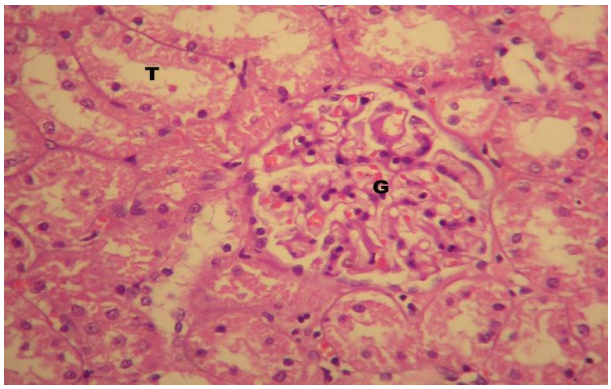


Fig. 9: Group-VII-STZ*+*Eriobotrya japonica* fruit (100 mg/kg b.w).

Renal parenchyma from diabetic rats. The Glomerulus shows increase in mesangial matrix and thickening of glomerular basement membranes. Tubules are within normal limits (H&E x 40X)

G = Glomerulus T= Tubules

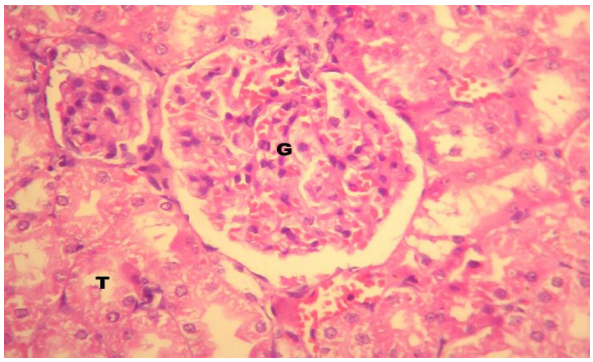


Fig 10: Group VIII –STZ*+*Eriobotrya japonica* seeds (50 mg/kg b.w).

Renal parenchyma from diabetic rats. The Glomerulus is of normal size and cellularity and a moderate increase in mesangium is seen. There is also mild thickening of glomerular basement membranes. Tubules are within normal limits. (H&E x 40X)

G = Glomerulus T= Tubules

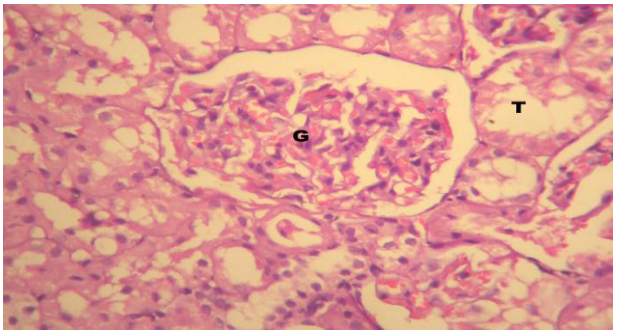


Fig 11: Group IX- STZ*+*Eriobotrya japonica* seeds (100 mg/kg b.w).

Renal parenchyma from diabetic rats. The Glomerulus (G) is of normal size and cellularity and a mild increase in mesangium is seen. There is no thickening of glomerular basement membranes. Tubules (T) are within normal limits (H&E x 40X)
G = Glomerulus T= Tubules
***Streptozotocin (STZ) (50mg/kg) b.w. given once i.p**

DISCUSSION

The primary organ of the body involved in sensing the organism's dietary and energetic states through glucose concentration in the blood and in response to elevated blood glucose is pancreas where insulin is secreted. Alloxan and Streptozotocin has been the usual substance used for the induction of diabetes mellitus. It destroys the beta cells of the pancreas whereby it causes a massive reduction in insulin release. Insulin deficiency can lead to various metabolic alterations in the animals viz increased blood glucose and increased lipid profile.

Herbal plants have been of greater attention as an alternative to conventional therapy. The demand for these remedies has currently increased. Experimental screening method is imperative in order to establish the safety and efficacy of traditional and herbal products and also to set up the active components of the herbal products.[35-36]

The Indian indigenous drugs has great importance both from economic and professional point of view. A large number of plants have been reported to possess anti-diabetic activity e.g., *Aconitum napeilus, Aloe vera, Carum carvi, Cichorium intybus, Allium cepa, Aralia cachemirica, Allium sativum, Momordia charantia.*

Albino rats whose weight was in the range of 180-210 g were procured from IIIM Jammu. They were kept in polypropylene cages under uniform conditions of food, water, temperature and degree of nursing care. It was ensured that the animals are in good health. Male and female rats were kept in separate cages so that there was no interference in evaluation of biochemical parameters. The temperature and the humidity were in the range of 15-25^{O}C and 70-75% respectively.

The phytochemical screening of ethanolic extract of whole plant of *Portulaca oleracea,* fruits and seeds of *Eriobotrya japonica* carried out by standard procedures revealed the presence of various phytoconstituents.

The results of the present study found that ethanolic extract of whole plant of *Portulaca oleracea, Eriobotrya japonica* fruits and seeds have reduced the glucose level in animals made diabetic with streptozotocin. Streptozotocin has been shown to induce free radical production and cause tissue injury. The pancreas is especially susceptible to the action of free radical damage caused by streptozotocin. In the present studies, ethanolic extract of whole plant of *Portulaca oleracea, Eriobotrya japonica* fruits and seeds showed significant glucose lowering activity. The glucose lowering effect of the ethanolic extract may be due to the enhanced secretion of insulin from the beta cells of pancreas or may be due to increased tissue uptake of glucose by enhancement of insulin sensitivity. There has not been much damage to kidneys as revealed by histopathology.

The literature reports reveal that flavonoids present in the ethanolic extracts known to possess glucose lowering activity. Since there is a strong well-established link between diabetes mellitus, dyslipidemia, obesity, hypertension and ischemic heart disease, effect of the ethanolic plant extracts on weight loss/gain needs to be explored on scientific base.[47-57]

CONCLUSION

The ethanolic extract of whole plant of *Portulaca oleracea, Eriobotrya japonica fruits and* seeds has beneficial effects on blood glucose levels as well as improving other metabolic aberrations. Further studies are needed on pharmacological and biochemical investigations which will clearly elucidate the mechanism of action and will help in projecting these plants as an therapeutic targets in diabetics research. The level of morbidity and mortality related to this disease and its potential complications which are enormous, pose significant healthcare burdens on the families and society in India. There has shown tremendous increase in younger people. There is an urgent need for change the lifestyle of people. The inclusion of fruits and vegetables is important that will reduce the frequency of taking medicines in near future.

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CONFLICTS OF INTEREST: NONE.

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