WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 13, Issue 15, 1291-1304. Research Article ISSN 2277–7105

ANTICATARACT ACTIVITY OF *STACHYTARPHETA JAMAICENSIS* L. AGAINST GLUCOSE-INDUCED CATARACTOGENESIS USING GOAT EYE LENSES

Vishali Arulkumar*[1], Umamaheswari Muthuswamy[2]

[1]Department of Pharmacology, KMCH College of Pharmacy, Coimbatore, Tamil Nadu, India.

[2]Department of Pharmacology, SRIPMS College of Pharmacy, Coimbatore, Tamil Nadu, India.

Article Received on
21 June 2024,

Revised on 11 July 2024,
Accepted on 01 August 2024

DOI: 10.20959/wjpr202415-33442

***Corresponding Author**
Asst. Prof. Vishali Arulkumar
Department of Pharmacology, KMCH College of Pharmacy, Coimbatore, Tamil Nadu,

ABSTRACT

The current study aims to assess the efficacy of an ethanolic leaf extract of *Stachytarpheta jamaicensis* L. against glucose-induced cataract using isolated goat lenses. Goat lenses taken from local slaughterhouses were incubated in artificial aqueous humour containing 55 mM of glucose (cataractogenesis) with the ethanolic leaf extract of *Stachytarpheta jamaicensis* L in varied doses at room temperature for 72 hours. The opacification of the lens began after 8 hours in the negative control group and was completely opacified after 48 hours. In addition, there was a significant rise in malondialdehyde, lipid hydroperoxides, and protein carbonyl content, as well as a decrease in Ca^{2+} ATPase activity, protein content, and antioxidant enzymes when compared to the control group. The extract and quercetin reversed these changes. The results indicate that ethanolic leaf extract of *Stachytarpheta jamaicensis* L. protected lens against glucose-induced cataractogenesis which might be helpful in delaying the progression of cataract.

KEYWORDS: Cataract, *Stachytarpheta jamaicensis* L, Goat lenses, quercetin, Glucose, Antioxidant.

INTRODUCTION

Cataract is defined as clouding or opacification of lens which results in decreased contrast sensitivity, color disturbance, visual impairment or blurred vision. Various factor such as smoking, diabetes, ultraviolet radiation, diet, oxidation of lens, lack of consumption of antioxidants, steroid consumption, nutritional deficiency attributes to the development of cataract. Crystallins is a water-soluble protein present within the lens have an imperative role in the lens transparency. Diabetes mellitus is the most common metabolic disorder. In particular, hyperglycaemia or sustained increase of blood glucose contributes to cataract formation in three way they are activated polyol pathway in glucose disposition, nonenzymatic glycation of eye lens proteins and oxidative stress. The use of traditional medicine is widespread and plants are large source of natural antioxidants that might serve as leads for the development of novel drugs.[1][2] Many plants have been reported in the ancient literature for ophthalmic use, but most of them have no scientific data. *Stachytarpheta jamaicensis* L. belonging to the family Verbenaceae. It is a weedy herbaceous plant. The leaves of this species are used in Indian traditional medicine for the treatment of cataract, open sores in children's ears, heart trouble, rheumatic inflammation.[3] However scientific information on the use of this plant in treating cataract is not available yet. Hence, the objective of the present study is to evaluate the effect of the ethanolic leaf extract of *Stachytarpheta jamaicensis* against glucose -induced cataractogenesis using goat lenses.

MATERIALS AND METHODS

Drugs and Chemicals

Glucose was obtained from Sigma Aldrich, Mumbai. Quercetin, Glyceraldehyde, Acetonitrile, Dimethyl sulfoxide, Nicotinamide adenine dinucleotide phosphate, Trichloroacetic acid, Thiobarbituric acid, Hydrochloric acid, Fox reagent, H_2O_2, Ellman's reagent, Glutathione, Nitro blue tetrazolium chloride (NBT), 1-amino-2-naphthol-4-sulfonic acid, 5,5'-dithiobis-(2-nitrobenzoic acid) (DTNB) was obtained from HiMedia Laboratories Ltd., Mumbai. All other drugs and chemicals used in the study were obtained commercially and analytical grade.

Plant material

The plant materials consist of leaves of *Stachytarpheta jamaicensis* L. belonging to the family Verbenaceae. The plant was collected from Coimbatore, Tamil Nadu during the month of January 2019. The plant was identified and authenticated by Dr. C. Murugan, Scientist 'D'

& Head of Office, Botanical Survey of India, Southern Regional Centre, TNAU Campus, Coimbatore bearing the reference number BSI/SRC/5/23/2020/Tech/1525.

Preparation of extract

Fresh leaves of the plant were collected and dried in shade under room temperature, coarsely powdered mechanically and sieved through No. 20 mesh sieve and stored in an airtight container until the time of use. The extraction was carried out by continuous hot percolation method using a Soxhlet apparatus. About 250g of the coarse powder was defatted, air dried and refluxed with ethanol using Soxhlet extractor for 72hrs. The extract was concentrated to dryness under controlled temperature between 40-50 ºC.

Experimental protocol

Fresh goat eyeballs were obtained from a local slaughter house within two hours after killing of the animals. After careful enucleation of the eyes, the lenses were removed by extra capsular extraction. The lenses were separated from the vitreous without damaging the posterior surface. The lenses were removed. Each isolated lens was incubated in artificial aqueous humor at room temperature and pH 7.8 for 72hrss. The composition of aqueous humor was as follows: $NaCl_2$- 140 mM, KCl - 5 mM, $MgCl_2$- 2 mM, $NaHCO_3$- 0.5 mM, NaH $(PO4)_2$- 0.5 mM, $CaCl_2$- 0.4 mM and Glucose-5.5 mM. The penicillin- 320mg and streptomycin-250 mg were added to the culture media to prevent bacterial contamination. Glucose at a concentration of 55 mM was used to induce cataract. Thirty goat lenses were used and divided into five experimental groups consisting of six in each group.[4]

Group I – Normal control (aqueous humor alone)

Group II – Negative control (Glucose 55 mM alone)

Group III – *Stachytarpheta jamaicensis* L (100µg/ml) + Glucose 55 mM

Group VI – *Stachytarpheta jamaicensis* L (200µg/ml) + Glucose 55 mM

Group V – Quercetin (100µg/ml) + Glucose 55 mM (positive control)

Examination of lens opacity

During the experimental period the lenses were placed on wired mesh in which lines were observed to evaluate the grades of opacity at different time intervals. The degree of opacity was graded as follows: Grade 0-absence of opacity, Grade 1-slight degree of opacity, Grade 2-presence of diffuse opacity, Grade 3-presence of extensive thick opacity.[5]

Formation of superoxide anion

The formation of superoxide anion in the lens was identified by NBT reduction method. After 72hrs the whole lenses were incubated with 100 µL of 0.3% NBT for 1hrs at room temperature. After the incubation, the eye lenses were washed with Tris-HCl (0.1 M; pH 7.4) and then observed under bright field microscope for blue-colored formazan deposits.[5]

Preparation of lens homogenate

After incubation, lenses were homogenized with 0.1M potassium phosphate buffer, pH 7.0. The homogenate was centrifuged, and the supernatant was used for the analysis of total protein, carbonyl, lipid hydroperoxide, Ca^{2+}ATPase. Catalase was estimated by the Sinha 1972. Glutathione peroxidase activity was measured by the procedure of Paglia and Valentine 1967. Peroxidase activity was measured spectrophotometrically by following the change in absorbance at 460 nm due to O-dianisidine. The estimation of nonenzymatic anti-oxidant reduced glutathione was based on the reaction of reduced glutathione with dithionitrobenzoic acid to give a compound that absorbs at 412 nm. The aldose reductase inhibitory activity was performed according to the method described by Hayman and Kinoshita.[6][7][8][9][10][11]

Histopathological analysis

The isolated lenses were fixed in 10%formalin. The paraffin embedded lenses were sectioned at 7 mm thickness and stained with haematoxylin and eosin.[12]

Statistical analysis

Statistical analysis was carried out by one-way analysis of variance (ANOVA) followed by Dunnett's test. Results are expressed as mean ± SEM of six lenses in each group.

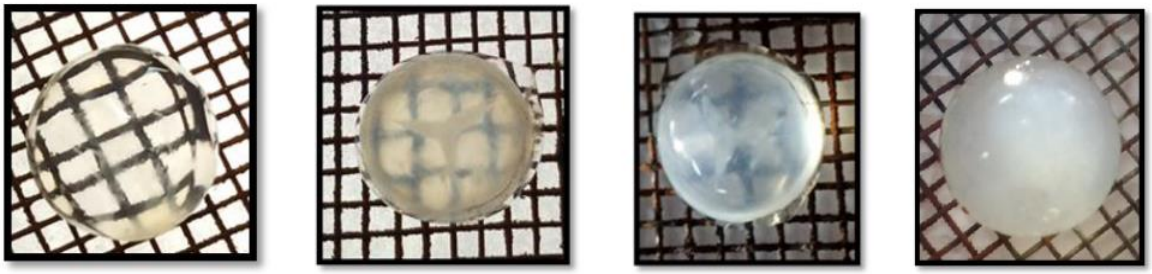
RESULTS

During experimental period, the lenses from the control and experimental groups were placed on mesh and changes in lens transparency were observed by noting the number of squares on the mesh thrsough the lens. Generalized opacity, swelling, disruption and other morphological changes were also noted. The grades of cataract changes were observed at the time intervals of 0hrs, 1hrs, 2hrs, 4hrs, 8hrs, 24hrs, 48hrs, 72hrs and was tabulated in table 1.

Table 1: Evaluation of opacity grade at different time intervals in the Control and Experimental goat lenses.

S.no	Groups	Opacity grade							
		0hrs	1hrs	2hrs	4hrs	8hrs	24hrs	48hrs	72hrs
1.	Normal control	0	0	0	0	0	0	0	0
2.	Negative control	0	0	0	0	1	2	3	3
3.	SJ 100 µg/ml + glucose	0	0	0	0	0	0	0	0
4.	SJ 200 µg/ml + glucose	0	0	0	0	0	0	0	0
5.	Quercetin	0	0	0	0	0	0	0	0

After 72hrs of incubation the results indicated that all the lenses in the normal control, SJ at the dose of 100,200 µg/ml, quercetin 100 µg/ml groups appeared to be normal and free from opacity. In group 2 (Negative control) slight degree of opacity was observed after 8hrs, diffuse opacity was observed after 24 hrs, extensive thick opacity was observed after 48 & 72hrs of incubation was shown in Fig-1. Maturation of cataract was not shown in extract treated groups. As a result, the extract of SJ (*Stachytarpheta jamaicensis* L.) showed promising effects on delaying the progression of cataract that was similar to quercetin treated group.



Grade 0 **Grade 1** **Grade 2** **Grade 3**

Fig. 1: Opacity grade of negative control at different time intervals.

The lenses were incubated in artificial aqueous humor containing glucose as well as the *Stachytarpheta jamaicensis* L for 72hrs and after the incubation period photographs of lenses were taken and is shown in Fig-2 (a-e). The normal lens incubated with artificial aqueous humor (Fig-2a) showing complete transparency compared with the experimental groups. The lens incubated with glucose 55mM alone for a period of 72hrs showing complete opacification of the lens compared to normal control (Fig-2b). The lenses incubated with glucose 55mM and *Stachytarpheta jamaicensis* L at a concentration of 100 µg/ml and 200 µg/ml which reduced the opacity (Fig-2c& 2d) when compared to cataractous lens. The lens

incubated with glucose 55mM and quercetin at a concentration of 100 µg/ml showing almost normal transparency (Fig- 2e) when compared to cataractous lens. Photographic evidence showed that the extract treated groups had a protective effect on the lens against the development of cataract. The opacification of the lenses were found to be decreased which is almost similar to the standard group.

Fig-2a **Fig-2b** **Fig-2c** **Fig-2d** **Fig-2e**

Fig. 2(a-e): After the incubation period photographs of lenses were taken in Control and Experimental groups.

After 72hrs the whole lens was incubated with 100 µL of 0.3% NBT for 1h at room temperature. After the incubation, the lenses were washed with Tris-HCl (0.1 M; pH 7.4) and then observed under bright field microscope for blue-colored formazan deposits was shown in Fig-3. The formation of blue-colored formazan deposits indicated the presence of superoxide anion which was observed in negative control as compared to normal control group. The blue-colored formazan deposits were not formed in quercetin and extract treated groups which shows that ethanolic leaf extract of *Stachytarpheta jamaicensis* L. prevented the formation of superoxide anion radical.

Fig. 3: Formation of superoxide anion by NBT reduction method in Control and Experimental goat lenses.

The IC_{50} value of aldose reductase for the ethanolic leaf extract of *Stachytarpheta jamaicensis* L was found to be 51.14 µg/ml. As a positive control, quercetin a naturally

occurring compound that has been demonstrated to be a potent aldose reductase inhibitor and the IC_{50} value of quercetin was found to be 51.83 µg/ml. The aldose reductase inhibitory values of *Stachytarpheta jamaicensis* L were almost similar to quercetin treated group was tabulated in table 2.

Table 2: Aldose reductase inhibitory activity of *Stachytarpheta jamaicensis* L.

Test substance	Percentage inhibition Concentration (µg/ml)								IC_{50} (µg/ml)
	5	10	25	50	100	150	200	250	
Stachytarpheta jamaicensis L	21.07± 0.39	28.75± 0.37	35.58± 0.27	47.38± 0.23	58.79± 0.32	64.12± 1.6	72.83± 0.57	80.61± 0.22	51.14± 7.5
Quecretin	21.34± 0.02	28.93± 0.41	38.06± 2.48	49.14± 1.24	56.83± 2.85	65.98± 0.68	73.05± 1.4	81.35± 0.32	51.83± 7.5

There was a significant (P<0.01) decrease in the level of protein, Ca^{2+}ATPase and an increase in the level of protein carbonyl (PC), malondialdehyde (MDA) and lipid hydroperoxides (LH) in glucose-induced cataractous lenses when compared to normal control. Incubation with the ethanolic leaf extract of *Stachytarpheta jamaicensis* L, at both the doses of 100 & 200 µg/ml and quercetin 100 µg/ml simultaneously with glucose for 72hrs caused a significant (P<0.01) increase in the total protein and a decrease in the level of malondialdehyde, lipid hydroperoxides when compared to negative control.

Table 3: Effect of the extracts on Protein, MDA, LH, PC, Ca^{2+}ATPase in control and experimental groups.

S. no.	Groups	Protein	MDA	LH	PC	Ca^{2+}ATPase
1.	Normal control	37.87±0.48	0.09±0.02	0.13±0.031	0.19±0.06	1.5±0.11
2.	Negative control	6.15±0.10[a]	2.4±0.12[a]	1.03±0.07[a]	2.55±1.2[a]	0.083±0.02[a]
3.	SJ 100 µg/ml	19.5±0.30[b]	0.79±0.01[b]	0.41±0.04[b]	0.71±0.11[d]	0.42±0.01[d]
4.	SJ 200 µg/ml	29.44±0.50[b]	0.40±0.04[b]	0.25±0.065[b]	0.40±0.17[c]	0.93±0.02[b]
5.	Quercetin	32.74±0.09[b]	0.15±0.01[b]	0.20±0.03[b]	0.33±0.015[c]	1.34±0.20[b]

Values are expressed in mean ± SEM (n=6) [a]P < 0.01 when compared to normal control, [b]P < 0.01, [c]P < 0.05 and [d]P>0.05 when compared to negative control (One way ANOVA followed by Dunnett's test) Protein = mmoles/min/mg, MDA = nmoles/min/mg protein, LH = nmoles/min/mg protein, PC=µm/min/mg protein, Ca^{2+}ATPase=µm/min/mg inorganic phosphate

Stachytarpheta jamaicensis L at the dose of 200 µg/ml and Quercetin at the dose of 100 µg/ml caused a significant (P<0.05) on the protein carbonyl level and Ca^{2+}ATPase activity when compared to negative control group. Ca^{2+}ATPase activity was significantly (P<0.01) increased in the *Stachytarpheta jamaicensis* L treated groups at dose of 200 µg/ml and quercetin treated group when compared to negative control. The effect produced by the

standard and extract treated groups was found to be similar to the normal control. The effect produced by *Stachytarpheta jamaicensis* at the dose of 100 µg/ml was found to be insignificant (P>0.05) on the protein carbonyl level and Ca^{2+}ATPase activity when compared to negative control group tabulated in table 3.

Incubation with the glucose 55 mM for 72hrs produced a significant (P<0.01) decrease in the enzymatic antioxidants like catalase, glutathione peroxidase and the non-enzymatic antioxidant reduced glutathione in the lens homogenate when compared to normal control. Treatment with the ethanolic leaf extract of *Stachytarpheta jamaicensis* L at the doses of 100 & 200 µg/ml and the quercetin 100 µg/ml incubated with glucose 55 mM for 72hrs significantly (P<0.01) restored the levels of catalase, glutathione peroxidase and reduced glutathione when compared to negative control. The effect produced by the standard and treated groups was found to be similar to the normal control group was tabulated in table 4.

Table 4: Effect of the extracts on antioxidant enzymes in Control and Experimental groups.

S. no.	Groups	CAT	Gpx	GSH
1.	Normal control	17.72±0.19	2.04±0.14	7.72±0.19
2.	Negative control	0.11±0.02[a]	0.27±0.02[a]	0.14±0.026[a]
3.	*Stachytarpheta jamaicensis* L 100µg/ml	5.95±0.01[b]	0.51±0.038[b]	0.95±0.01[b]
4.	*Stachytarpheta jamaicensis* L 200µg/ml	13.2±0.22[b]	1.58±0.32[b]	3.20±0.22[b]
5.	Quercetin	15.31±0.21[b]	1.76±0.17[b]	5.3±0.21[b]

Values are expressed in mean ± SEM (n=6) [a]P < 0.01 when compared to normal control, [b]P<0.01 and [d]P > 0.05 when compared to negative control (One-way ANOVA followed by Dunnett's test) CAT = µmoles/min/ mg protein, GSH = nmoles/min/mg protein, GPx=µmoles/min/mg protein

Histopathological examination of lenses in the control and experimental groups incubated with glucose was shown in Fig.3(a-g). The histological sections of the normal control group lens showed that epithelium and laminated fibers are normal. The fibers are tightly packed and there is no evidence of degeneration (Fig.3a). The lenses incubated with glucose at a concentration of 55mM revealed sever injuries including the lens fibers degeneration, deformation, swelling, and rupture, with large vacuolization near the posterior poles (Fig.3b). The lenses incubated with glucose 55mM along with the ethanolic leaf extract of *Stachytarpheta jamaicensis* L at a concentration of 100 µg/ml and 200 µg/ml (Fig.3c and 3d) and quercetin (Fig.3e) revealed that fibers are tightly packed and the deformation, swelling was not found when compared to negative control.

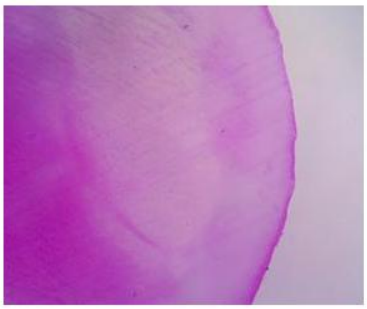


Fig.3a

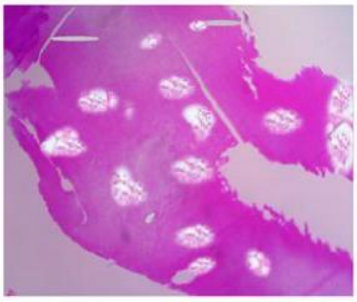


Fig.3b

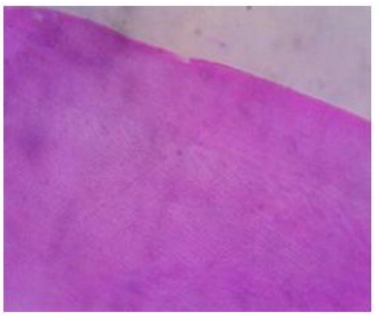


Fig.3c

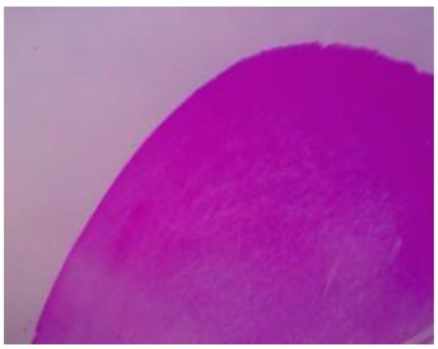


Fig.3d

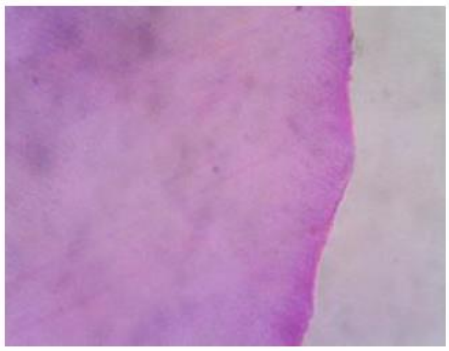


Fig.3e

Fig. 3(a-g): Histopathological examination of lenses in the control and experimental groups incubated with glucose.

DISCUSSION

Cataractogenesis is one of the leading causes of visual disability often leading to blindness. The oxidative stress also plays an important role. The situation can be remedied surgically by extirpation of the cataractous lens. The limitations of cataract surgery have stimulated experimental cataract research in laboratory animals and epidemiological studies to determine the incidence, prevalence and risk factors for the development of cataract so as to focus on the preventive aspects of cataract.

The glucose induced cataract which resembles diabetic cataract. In hyperglycaemic conditions overutilization of glucose occurs in the lens. The polyol pathway is based on the enzyme called aldose reductase. The elevated glucose is converted into sorbitol by the enzyme aldose reductase by utilizing nicotinamide adenine dinucleotide phosphate (NADPH) as a cofactor. NADPH is an essential cofactor for regenerating the intracellular antioxidants known as glutathione. When the cofactor is utilized by the enzyme aldose reductase. The amount NADPH required for regenerating the glutathione will be reduced. The sorbitol will accumulate in the lens causes cell damage and pathological changes which results in

development of osmotic stress which finally result in the development of cataract. Sorbitol is converted into fructose by the enzyme Sorbitol dehydrogenase. Produced fructose can become phosphorylated to fructose-3-phosphate (F3P) and 3-deoxyglucose (3D). These two compounds leads to the production of advanced glycation end products (AGE). Reduced glutathione level, osmotic stress, non-enzymatic glycation further contributes to the generation of reactive oxygen species. The increased availability of reactive oxygen species promotes oxidative stress which causes cellular adenosine triphosphate (ATP) depletion owing to mitochondrial dysfunction. Cellular ATP depletion results in impaired function of the enzymes ATPases such as Na^+K^+ATPase and Ca^{2+} ATPase. The Na^+K^+ATPase is responsible for maintaining the ionic equilibrium in the lens. The Ca^{2+}ATPase which regulates the intracellular calcium homeostasis. Impaired function of Na^+ K^+ ATPase causes accumulation of sodium ion and loss of potassium ion with hydration and swelling of the lens fibers. The variation in the sodium potassium ratio alters the protein content leads to arise insoluble proteins and reduce the water-soluble proteins in the lens. Intracellular calcium level is elevated due to impaired function of Ca^{2+} ATPase. The high calcium level in the lens may give arise to opacities.[13][14]

The present thesis deals with the exploration of pharmacological and phytochemical screening of the selected Indian medical plant *Stachytarpheta jamaicensis* L. belonging to the family Verbenaceae against glucose - induced cataractogenesis in goat lenses. *Stachytarpheta jamaicensis* L. leaves are traditionally used for open sores in children's ears, cure heart trouble, cure of eye troubles such as cataract, rheumatic inflammation.

Cataract was induced in goat lenses by incubation with glucose at a concentration of 55 mM in aqueous humor medium at room temperature. In the present study investigation of lens opacity was carried out to differentiate the control and experimental lenses. Addition of high concentration of glucose 55 mM to the medium induced complete opacification of the lenses which may be due to oxidative stress, sorbitol accumulation, impaired functions of Ca^{2+}ATPase & Na^+K^+ATPase and aggregation of proteins. However, the groups incubated with the plant extracts have prevented the lens opacity which is almost similar to the standard drug quercetin. After incubation, the lens homogenate was used for the determination of aldose reductase and Ca^{2+}ATPase activity, estimation of total protein content, protein carbonyl, superoxide anion, determination of end products of lipid peroxidation namely malondialdehyde (MDA) and lipid hydroperoxides (LH), enzymatic antioxidants like catalase

(CAT), glutathione peroxidase (GPx), and non-enzymatic antioxidant reduced glutathione (GSH)

The lens crystalline as well as membrane proteins resulted in the formation of insoluble protein aggregates. Loss of soluble proteins from lens by their conversation into insoluble ones due to lens protein oxidation resulted in decreased total protein content. The present study shows that glucose treated groups caused a depletion in total protein level. The groups treated with the extracts of extracts of *Stachytarpheta jamaicensis* L significantly increased the level of total protein similar to the quercetin treated group.

Lipid peroxidation is an autocatalytic process, which is a common cause of cell death. Decomposition of lipid peroxides initiates the chain reactions that produce reactive protein carbonyl compound. The by-products of lipid peroxidation are the toxic compounds like malondialdehyde, protein carbonyl and lipid hydroperoxides which are considered as oxidative stress markers whose involvement in cataractogenesis has been suggested mainly due to its cross-linking ability.[15][16] Our result suggests that MDA, LH, protein carbonyl level was increased in negative control group and the treatment with extracts of *Stachytarpheta jamaicensis* L leaves significantly decreased the lens MDA, LH and protein carbonyl level. This effect was almost similar to the quercetin treated group. The protein carbonyl level was found to be insignificant ($P>0.05$) in the extract treated groups at the dose of 100 µg/ml when compared to negative control.

Free radicals are defined as molecules containing one or more unpaired electrons in atomic or molecular orbitals. Free radicals are two types they are ROS (reactive oxygen species) and RNS (reactive nitrogen species). When the levels of free radicals are increased, they generate oxidative stress a deleterious process that can damage all the cell structures. Oxidative stress plays a major part in the development of cataract. Superoxide anion is a reactive oxygen species formed by the enzymatic process called electron transport chain which occurs in mitochondria. In our study, the presence of dark blue colored formazan formation in the negative control group indicates the generation of superoxide anion radical. However, such blue colored formazan deposits were significantly reduced in the groups treated with the *Stachytarpheta jamaicensis* L which is similar to the quercetin treated group.

The Ca^{2+}ATPase is a transport protein present in the lens which is involved in the regulation of transport of the Ca^{2+}ions from the lens tissue. The lenticular calcium metabolism is

involved in the development of experimental and human cataract usually showing decreased Ca^{2+}ATPase activity. Our results suggest that plant extract incubated groups significantly increased the levels of Ca^{2+}ATPase which is similar to quercetin. The effect produced at the dose of 100 µg/ml was found to be insignificant when compared to negative control.

Catalase is present in all the mammalian cells which protects the cell from oxidative damage caused by H_2O_2 and hydroxyl radical. GPx has a major role in degrading the levels of H_2O_2 in cells. Since GPx acts on hydroperoxides of unsaturated fatty acids, the enzyme plays an important role in protecting membrane lipids. Reduced glutathione (GSH) is an intracellular reductant which plays a major role in catalysis, metabolism and transport. The normal lens contains a high concentration of GSH, which scavenges the toxic reactive oxygen species. The present study shows that treatment with the ethanolic leaf extract of *Stachytarpheta jamaicensis* L restored the levels of catalase, glutathione peroxidase and reduced glutathione when compared to negative control.[17]

Histopathology refers to the microscopic examination of tissue in order to study the manifestations of cataract. The lens capsule is a smooth, transparent basement membrane that completely surrounds the lens.The lens fibers form the bulk of the lens. They are long, thin, transparent cells, firmly packed, with diameters typically 4–7 micrometres and lengths of up to 12 mm long. There are several membrane protein that are only found in lens fiber cells. Disruption of the fibers by any means which leads to opacification. The histopathological examination of the present study revealed that the lens incubated with glucose 55mM alone shows sever injuries such as deformation, swelling, and rupture with vacuoles and degeneration of lens fibers. The lens fibers and epithelium appeared to be normal and the degeneration, deformation, swelling was not found in the lenses incubated with quercetin and both extracts treated groups which is almost similar to the normal control group.[18]

CONCLUSION

Till now surgery is the available treatment option for cataract. Surgical treatment for cataract consists of removing cataractous lens followed by implantation of artificial intraocular lens. Despite good postoperative outcomes, complications are also possible in the surgery. Therefore, it is essential to research on pharmacological intervention to maintain transparency of lens and prevent the cataractogenesis. Previous studies have suggested that preventing or delaying the formation cataract will reduce the need of surgery for 10 years. Great emphasis has been taken to explore the traditional plants and synthetic compounds to prevent, delay

and retard the progression of cataract. To conclude, the present study suggested that the leaf extract of *Stachytarpheta jamaicensis* L possess anticataract activity which might be helpful in preventing or slowing the progression of cataract. Further *in vivo* studies and investigations on the isolation and identification of active components in the leaves and fruits may lead to chemical entities with potential for clinical use in the prevention and treatment of cataract.

Source of funding

Nil.

Conflict of interest

None declared declaration.

REFERENCES

1. Abdul Nasir NA, Agarwal R, Sheikh Abdul Kadir SH, Vasudevan S, Tripathy M, Iezhitsa I. Reduction of oxidative-nitrosative stress underlies anticataract effect of topically applied tocotrienol in streptozotocin-induced diabetic rats. Plos one, 2017; 12(3): 1-21.
2. Altomare E, Grattagliano I, Vendemaile G, Signorile A, Cardia L. Oxidative protein damage in human diabetic eye: Evidence for retinal participation. Eur J Clin Invest, 1997; 27: 141-47.
3. Kirtikar KR, Basu RD. Indian medicinal plants. International Book Distributors, Dehrsadun, 1981; 2: 781-83.
4. Sivashanmugam AT and Chatterjee TK. Anticataractogenesis activity of *Polyalthia longifolia* leaves extracts against glucose-induced cataractogenesis using goat lenses in vitro. European J of Exp Bio, 2012; 2(1): 105-113.
5. Barman S, Srinivasan K. Zinc supplementation ameliorates diabetic cataract thrsough modulation of crystallin proteins and polyol pathway in experimental rats. Biol Trace Elem Res, 2018; 1-6.
6. Lowry OH, Rosebrough NJ, Farr AL, Randall RJ. Protein measurement with the Folin phenol reagent. J Biol Chem, 1951; 193: 265-75.
7. Niehaus WG, Samuelsson B. Formation of malondialdehyde from phospholipid arachidonate during microsomal lipid peroxidation. Eur J Biochem, 1968; 6: 126-30.
8. Ellman GL. Tissue sulphydryl groups. Arch Biochem Biophys, 1959; 82: 70-77.
9. Sinha AK. Colorimetric assay of catalase. Anal Biochem, 1972; 47: 389-94.
10. Hayman S and Kinoshita JH. Isolation and properties of lens aldose reductase. J biol chem, 1965; 240(877).

11. Paglia DE, Valentine WN. Studies on the quantitative and qualitative characterization of erythrocyte glutathione peroxidase. J Lab Clin Med, 1967; 70: 158-69.
12. Tsai CF, Wu JY, Hsu YW. Protective Effects of Rosmarinic Acid against Selenite Induced Cataract and Oxidative Damage in Rats. Int J Med Sci, 2019; 16: 729-730.
13. Kyselova Z, Stefek M, Bauer V. Pharmacological prevention of diabetic cataract. J Diabetes Complications, 2004; 18: 129-40.
14. Hajarnavis AM, Bulakh PM. Anticataract effects of *S cumini* and *A marmelos* on goat lenses in an experimental diabetic cataract model. J Ayurveda Integr Med, 2019; 1-5.
15. Umamaheswari M, Asokkumar K, Lalitha V, Sivashanmugam AT, Subhadradevi V. Anticataract and antioxidant activities of *Citrus aurantium* L. Peel extract against naphthalene induced cataractogenesis in rats. J Pharm Res, 2011; 4: 680-2.
16. Umamaheswari M, Chatterjee TK. Effect of the fractions of *coccinia grandis* on naphthalene induced cataractogenesis in rats. Int J Bio Pharma Sci, 2008; 2(1): 70-4.
17. Shabeer AN, Niyas AI, Ashar WM. Anticataract activity of ethanolic extract of nigella sativa on glucose induced cataract in goat eye lens. International Journal of Applied Biology and Pharmaceutical Technology, 2011; 4(2): 274-277.
18. Tsai CF, Wu JY, Hsu YW. Protective Effects of Rosmarinic Acid against Selenite Induced Cataract and Oxidative Damage in Rats. Int J Med Sci, 2019; 16: 729-730.