

Potential Herbs Used in Ocular Diseases

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Abstract

Medicinal plants have been used as traditional treatment for numerous human diseases for thousands of years in many parts of the world. In rural areas of developing countries, herbal materials continue to be used as the primary source of medicines. Eye is one of the most sensitive organ of human body and is permanently exposed to different environmental agents. The common ocular diseases are glaucoma, conjunctivitis, cataract, ocular allergies, ocular inflammation etc. Due to side effects of allopathic drugs, now a day's huge numbers of herbal drugs are used for treatment of ocular diseases. This review explains the herbal drugs used in treatment of ocular diseases and it provide a platform for the researcher to develop more efficient new herbal formulations.

Key words: Ocular diseases, glaucoma, conjunctivitis, ocular infection, cataract, herbal drugs.

INTRODUCTION

The eye has several natural mechanisms to defend itself against infection or trauma. For example, tears keep the eye lubricated and physically clear away foreign particles such as dust or microorganisms. In addition, the tears contain several substances (e.g. lysozymes and interferon) that protect against infection. The eyelids and eye lashes protect the ocular surface from the environment and help maintain the moist surface of the eye. However, occasionally these defense mechanisms may be disrupted, resulting in ocular inflammation. Eye infections are caused by exposure to bacterial, fungal, viral and other microbial agents, and are commonly and frequently reported in the Eastern Cape Province of South Africa. Plant materials are still being prescribed by traditional healers and herbalists for the treatment of these infections [1].

Bacterial eye infections:

The eye infection is caused by various microorganisms *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus epidermidis*, *Bacillus cereus*, *Chlamydia trachomatis* and *Neisseria gonorrhoea* [2-5]. The most common causative agents for external ocular infections are *S. aureus* and *S. epidermidis* [2-3]. Trachoma is caused by *C. trachomatis*. It is the world's leading infectious cause of blindness and the leading cause of ocular morbidity [6].

According to WHO, there are 146 million people worldwide with trachoma. Symptoms of bacterial eye infections include burning; irritation, tearing and usually a mucopurulent or purulent discharge. Eyelids may be stuck together, particularly in the mornings. Although bacterial eye infections are usually considered to be self-limiting [7], if left untreated they may develop into more serious, sight-threatening conditions.

Fungal eye infections:

The eye infections caused by various fungal species are *Fusarium solani*, *Fusarium oxysporum*, *Aspergillus niger*, *Aspergillus flavus*, *Candida albicans* and *Penicillium notatum* [8-11]. These infections are difficult to treat and can cause blindness^[12]. Symptoms include redness, blurring vision and photophobia. Amphotericin B and Natamycin are of topical ocular use as treatment for fungal eye infections [12-14].

Viral eye infections:

Viral infection to the eye is caused by *Herpes simplex virus-1*, *Adenovirus* and *Coxsackie virus* [15-17]. HSV-1 ocular infection is the leading cause of blindness in developed countries^[16]. Over 95% of ocular herpes infections are caused by HSV-1 [18]. To date, 51 human adenovirus serotypes have been described, grouped into six species (A-F). In particular, species D infects the eyes^[17]. Viral eye infections are highly contagious and are

spread by contact, usually with objects which have come into contact with the infected person's eye secretions. For example, the virus can be transmitted when infected persons touch their eyes and then touch another surface (e.g. door handle) or share an object that has touched their eyes (e.g. a towel or pillow case). The antiviral agents Famciclovir, Valacyclovir and Acyclovir can be used to shorten the course and decrease the severity of the infections [19].

Glaucoma is a widespread human ocular disease, characterized by retinal ganglion cell degeneration, excavation of the optic nerve head, and in most cases, increase of intraocular pressure (IOP). Its cause remains unclear, and although increased IOP has long been thought to be the primary cause of ganglion cell degeneration and optic disc cupping, evidence from the studies of low-tension glaucoma suggests that it is neither necessary nor sufficient to induce the disease. Other mechanisms have been proposed that involve the neurosensory retina directly [20]. Results in recent studies suggest that apoptotic mechanisms could be involved in the degeneration of ganglion cells [21-22] and emphasize the potential neurotoxic role of glutamate [23-24]. Abnormally high levels of glutamate have been detected in the vitreous of glaucomatous eyes of dogs, monkeys, and humans [25-26]. Several morphologic characteristics such as enlargement of the retinal surface, abnormal corneal endothelium with degenerating cells, poorly differentiated cells with collapsed trabecular meshwork, and attachment of the anterior face of the iris to the posterior cornea, suggest that it also possesses some characteristics of human congenital glaucoma [27-28]. A variety of stimuli are thought to initiate or activate apoptosis in glaucoma. Thus, increased IOP and/or organelle accumulation at the optic nerve head could block axoplasmic flow, hindering the circulation of trophic factors [29-31].

The inflammatory response in the eye consists of miosis, conjunctival hyperaemia and breakdown of the blood-aqueous barrier with subsequent leakage of protein into the aqueous

humour. The magnitude of these responses depends on the intensity, duration and type of the noxious stimulus. There is much evidence to suggest that C-fibre neurotransmitters, such as substance P and calcitonin gene-related peptide (CGRP), play a key role in the ocular response to injury [32-34]. Recently, pituitary adenylate cyclase activating peptide (PACAP) has been identified as a C-fibre neuropeptide, which takes part in the inflammatory responses of the rabbit eye [35]. As there is no barrier separating the iris and the ciliary body from the anterior chamber, any transmitter that is released from local nerve fibres will diffuse into the anterior chamber, making the eye an excellent model for studies of transmitter release. Nitric oxide (NO) is a short-lived molecule displaying numerous bio activities [36]. Recent observations suggest that NO may be of physiological and/or pathophysiological significance in the control of ocular function. Thus, NOS activity has been demonstrated in the anterior uvea of the rabbit [37] and NOS immunoreactivity has been visualized by immunostaining in nerve fibres in the uvea of the rat eye [38]. Intravenous injection of L-NAME was found to reduce the regional blood flow in the uvea of the rabbit [39]. Interestingly, NO seems to play a role in the activation of ocular C-fibers in response to a minor injury (infrared irradiation of the iris) [40].

Ocular injuries in the working place are usually related to exposure to industrial chemical substances e.g. acid and alkaline, radiation energy e.g. ultra-violet light or even direct trauma. Ocular injuries by saps of plants are uncommon but can result in serious ocular complications [41].

Conjunctivitis is the disease when the mucous membrane on the inner surface of the eyelid is irritated. There are many factors that cause conjunctivitis, including virus, bacteria, allergies, injury, or other foreign substances. Symptoms include: itchy, watery, bloodshot eyes, pain and, on occasion, blurred vision. There are several treatments for conjunctivitis, depending on the cause. Bacterial infections are usually treated with an antibiotic. There are also several herbal mixtures used as eyewashes [42].

Table 1:- List of Medicinal plants used in various types of Ocular diseases

Sr. no.	Scientific name/ Common name	Family	Part used	Uses in Ocular diseases	References
1.	<i>Abelmoschus esculentus</i> (L.)/ Okra	Malvaceae	Fruit, flower	Conjunctivitis	[42-43]
2.	<i>Abelmoschus moschatus</i> Medik/ Musk mallow	Malvaceae	Root, seed, leaf	Eye diseases	[44]
3.	<i>Abrus precatorius</i> L./ Crab's Eye	Fabaceae	Leaf, seed, root	Ocular infections	[45-48]
4.	<i>Acacia arabica</i> (Lam.) Willd/ Babul	Mimosaceae	Bark	Conjunctivitis	[49-50]
5.	<i>Acacia macracantha</i> Humb.& Bonpl. ex Willd./ Faique	Mimosaceae	Bark	Conjunctivitis	[51]
6.	<i>Acacia nilotica</i> L./ Kikar	Mimosaceae	Whole plant	For burning sensation in eyes	[52]
7.	<i>Acalypha indica</i> L./ Kuppaimeni	Euphorbiaceae	Leaf	Ocular infections	[45]
8.	<i>Acer tataricum</i> L./ Tatar Maple	Aceraceae	Seed	Reduce inflammation, dry eye disease	[53]
9.	<i>Achranthes aspera</i> L./ Prickly-Chaff Flower	Amaranthaceae	Leaf	Cures eye disorders	[44-45, 54-55]
10.	<i>Acorus calamus</i> Linn./ Sweet flag	Araceae	Rhizome	Eye diseases	[44]
11.	<i>Adenium multiflorum</i> Koltzsch./ Impala lily	Apocynaceae	Bulb	Sore eyes	[55-56]
12.	<i>Adhatoda vasica</i> L./ Adusa	Acanthaceae	Flower	Cures eye disorders	[49]
13.	<i>Aegle marmelos</i> L. Correa/ Bilva patri	Rutaceae	Leaf, fruit	Opacity of cornea, conjunctivitis	[44-45, 57-59]
14.	<i>Ageratum conyzoides</i> L./ Goat weed	Compositae	Leaf	Conjunctivitis, cataract, injury	[60-64]
15.	<i>Alangium salvifolium</i> (L.F.) Wanger/ Ooduga	Alangiaceae	Fruit	Eye diseases	[65]
16.	<i>Albizia coriaria</i> Oliv./ Musengerttet	Mimosoideae	Whole plant	Sore eyes	[66]
17.	<i>Albizia lebbeck</i> (L.) Willd/ Woman's tongues Tree	Mimosaceae	Leaf, Bark	Conjunctivitis	[45, 67-68]
18.	<i>Albizia odoratissima</i> (L.f.) Benth./ Tea Shade Tree	Mimosaceae	Leaf	Ocular infections	[45]
19.	<i>Alhagi maurorum</i> Medic/ Seez	Papilionaceae	Flower	Improves eyesight	[69]
20.	<i>Allium sativum</i> L./ Garlic	Liliaceae	Bulb	Ophthalmopathy, sore eyes	[70-72]
21.	<i>Alocasia macrorrhizos</i> (L.) G.Don./ Maan-kochu	Araceae	Lower part of plant	Improves eye sight	[73]
22.	<i>Aloe barbadensis</i> Mill./ Aloe	Liliaceae	Leaf	Eye infections	[74]
23.	<i>Aloe vera</i> (L.) Burm. f./ China kalabanda	Liliaceae	Leaf	Eye diseases	[75-76]
24.	<i>Alphitonia excelsa</i> (Fenzl) Benth. / Soap bush	Rhamnaceae	Leaf	Sore eyes	[77-78]
25.	<i>Alstonia boonei</i> De Wild./ Indian Devil tree	Apocynaceae	Latex	Eye problems	[64]
26.	<i>Alternanthera sessilis</i> (L.) R. Br. ex DC./ Koduppai	Amaranthaceae	Leaf	Eyesight improvement	[66, 79]
27.	<i>Amygdalus brahuica</i> subsp./ Mashmonk	Rosaceae	Gum	Wounded eyes	[80]
28.	<i>Anagallis arvensis</i> L./ Red pimpernel	Primulaceae	Leaf	Ophthalmia, keratitis, improve eye sight	[81]
29.	<i>Annickia chlorantha</i> (Oliv.) Setten & Maas/ African whitewood	Annonaceae	Bark	Conjunctivitis	[82]
30.	<i>Annona senegalensis</i> Pers./ African custard-apple	Annonaceae	Root, bark, leaf, seed	eye infections	[83-84]
31.	<i>Anthocephalus chinensis</i> (Lam.) A. Rich. ex Walp/ Kodom	Rubiaceae	Leaf, flower	Eye diseases	[85]
32.	<i>Argemone maxicana</i> L./ Vuluvanjel	Papavaraceae	Latex	Eye diseases, Poultice for the eyes, conjunctivitis	[45, 52, 58, 67, 86-87]
33.	<i>Asclepias curassavica</i> L./ Blood-flower	Apocynaceae	Leaf	Eye inflammation	[88]

Sr. no.	Scientific name/ Common name	Family	Part used	Uses in Ocular diseases	References
34.	<i>Atropa belladonna</i> L./ Deadly nightshade	Solanaceae	Leaf, root	Iritis	[89]
35.	<i>Azadirachta indica</i> L./ Neem	Meliaceae	Whole plant	Night blindness, conjunctivitis	[44, 67, 90-91]
36.	<i>Barleria cristata</i> L./ Philippine violet	Acanthaceae	Flower	Eye diseases	[92]
37.	<i>Basella rubra</i> L./ Indian spinach	Basellaceae	Leaf	Ocular infections	[45]
38.	<i>Bauhinia variegata</i> Linn./ Kachnar	Caesalpinaceae	Bud	Eye diseases	[81]
39.	<i>Becium dhofarense</i> L. / Dhofari Basil	Lamiaceae	Leaf	Soothe eye itching	[93]
40.	<i>Berberis aristata</i> L./ Barberries	Berberidaceae	Root, Bark	Eye disease	[94]
41.	<i>Berberis asiatica</i> L./ Kingod	Berberidaceae	Root	Eye afflictions, conjunctivitis	[95-99]
42.	<i>Berberis lyceum</i> Royle./ Kasmal	Berberidaceae	Root	Ocular inflammation, acute conjunctive and chronic ophthalmia	[50]
43.	<i>Berberis osmastonii</i> Dunn./ Kingore	Berberidaceae	Root	Eye diseases	[65]
44.	<i>Berginia ligulata</i> (Wall.)Engl./Pashanbheda	Saxiferagaceae	Rhizome	Eye ailments	[100-101]
45.	<i>Bidens pilosa</i> L./ Spanish Needle	Asteraceae	Leaf	Conjunctivitis, oculotumour, cataract	[46, 102, 103]
46.	<i>Bixa orellana</i> L./ Annatto	Bixaceae	Leaf	Eye infection	[92]
47.	<i>Blumea mollis</i> (D.Don) Merr./ Kukka pogaku	Asteraceae	Leaf	Ocular infections	[45]
48.	<i>Boerhaavia diffusa</i> Linn./ Sathi	Nyctaginaceae	Whole plant	Eye diseases	[52]
49.	<i>Boerhaavia procumbens</i> Elegans Choisy/ Itsit	Nyctaginaceae	Leaf	Ophthalmia, eye wounds	[81]
50.	<i>Boerhavia diffusa</i> L./ Atukamamidi	Nyctaginaceae	Leaf, root	Conjunctivitis	[44, 67, 95, 104]
51.	<i>Borago officinalis</i> L./ Borraja	Boraginaceae	Leaf, flower	Conjunctivitis	[51]
52.	<i>Bothriocline ugandensis</i> (S. Moore) M.G. Gilbert/Gnathostomata	Astraceae	Leaf or whole plant	Blindness, conjunctivitis and related ocular affections	[62]
53.	<i>Brillantaisia patula</i> Ver texto/ Nkon - kohomaneeh	Acanthaceae	Whole plant	Cataract	[64]
54.	<i>Bunium persicum</i> (Boiss.) Fedts./ Black cumin	Apiaceae	Rhizome	Eyewashes	[105]
55.	<i>Butea monosperma</i> (Lank.) Kuntze / Palasa	Fabaceae	Root	Eye diseases	[44,48]
56.	<i>Cadaba indica</i> Lam./ Patrika	Capparaceae	Leaf	Eye diseases	[65]
57.	<i>Caesalpinia volkensii</i> Harms/ Msoro	Leguminosae	Leaf	Lid swelling, cataract. Conjunctivitis, retinoblastoma, refract errors	[46]
58.	<i>Calophyllum inophyllum</i> L./ Oil nut tree	Clusiaceae	Leaf	Eye ailments	[106]
59.	<i>Camellia sinensis</i> (L.) Kuntze/ Green tea	Commelinaceae	Inflorescences	Conjunctivitis	[46]
60.	<i>Capparis deciduas</i> Edgew./ Kareera,	Capparidaceae	Leaf	Corneal opacity	[52]
61.	<i>Capsicum annum</i> L./ Capsicum	Solanaceae	Seed	Eye diseases	[106]
62.	<i>Capsicum frutescens</i> L./ African devil	Solanaceae	Leaf or whole plant	Blindness, conjunctivitis and related ocular affections, cataract	[46, 62]
63.	<i>Carissa opaca</i> Stapf ex Haines/ Granda	Apyocynaceae	Stem, leaf, fruit	Eye disorders	[50]
64.	<i>Cassia absus</i> L./ pig's senna	Caesalpinaceae	Leaf, seeds	Eye diseases, strengthens eye sight	[104, 108]
65.	<i>Cassia auriculata</i> L./ Avaram Senna	Caesalpinaceae	Seed	Eye infections	[74]
66.	<i>Cassia italica</i> (Mill.) Spreng./ Balibali	Caesalpinaceae	Leaf	Eye diseases	[109]
67.	<i>Cassia obtusifolia</i> L./ Juemingzi	Leguminosae	Seed	Eye infection	[110-111]

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68.	<i>Cassia occidentalis</i> L./ Peeda chennangi	Caesalpiniaceae	Leaf	Sore eyes	[58,75]
69.	<i>Cassia tora</i> L./ Tailancha	Caesalpiniaceae	Leaf, seed	Eye diseases, in children eye lid	[58, 75]
70.	<i>Celastrus paniculatus</i> Willd./ Malkanni	Celastraceae	Seed oil	Eye diseases	[95]
71.	<i>Celosia argentea</i> L./ Guruguaku	Amaranthaceae	Seed, leaf	blurred vision, eye inflammation	[45, 75, 112]
72.	<i>Centaurea calcitrapa</i> L./ Red starthistle	Asteraceae	Whole plant	eye diseases	[70]
73.	<i>Centipedia minima</i> Linn/ Spreading sneezeweed	Asteraceae	Whole herb	Ocular inflammation.	[100]
74.	<i>Chenopodium album</i> L. / Bathu Saag	Chenopodiaceae	Whole plant	Eye diseases	[81, 94]
75.	<i>Chomelia asiatica</i> O. Kze./ Kommi	Rubiaceae	Root	Eye diseases	[65]
76.	<i>Cichorium intybus</i> Linn./ Kasinikeerai	Asteraceae	Whole plant	Eye diseases	[108]
77.	<i>Citrullus vulgaris</i> Schrad./ Water melon	Cucurbitaceae	Fruit	Sore eyes	[70]
78.	<i>Cleome viscosa</i> Linn./ Naikadugu	Cleomaceae	Whole plant	Eye diseases	[69]
79.	<i>Clerodendrum myricoides</i> (Hochst.) Vatke/ Ophiang tong	Verbenaceae	Leaf, root	Ocular inflammation	[64, 102]
80.	<i>Clitoria ternatea</i> L./ Blue pea vine	Fabaceae	Root, Leaf	Eye inflammation	[52, 66, 113]
81.	<i>Coccinia grandis</i> L./ Voigt Donda	Cucurbitaceae	Leaf, root	Ocular infections	[45, 85]
82.	<i>Cocculus pendulus</i> (J.R. & G. Forst) Diels/ Zamur	Menispermaceae	Leaf	Eyes irritation	[80]
83.	<i>Codiaeum variegatum</i> (L.) A.Juss./ Tri-phorthok	Euphorbiaceae	Whole plant	Eye diseases	[85]
84.	<i>Colebrookea oppositifolia</i> Sm./ Dhurseli	Labiatae	Leaf	Corneal opacity or conjunctivitis.	[114]
85.	<i>Coleus forskohlii</i> Briq./ Garmai	Lamiaceae	Root	In reducing intraocular pressure in glaucoma	[70, 115-118]
86.	<i>Commelina benghalensis</i> L./ Benghal dayflower	Commelinaceae	Inflorescences	Eye diseases	[46]
87.	<i>Commelina diffusa</i> Burm. f./ Climbing day flower	Commelinaceae	Leaf or whole plant	Blindness, conjunctivitis and related ocular affections	[62]
88.	<i>Commelina erecta</i> L./ slender dayflower	Commelinaceae	Inflorescences	Conjunctivitis	[119]
89.	<i>Cordia perrottettii</i> A.DC./ Cordia	Boraginaceae	Leaf	Soothe eye itching	[93]
90.	<i>Coscinium fenestratum</i> Colebr./ False calumba root	Menispermaceae	Root	Eye diseases	[105]
91.	<i>Costus afer</i> Ker Gawl./ Spiral ginger	Costaceae	Rhizome, leaf	Ocular diseases	[82, 84, 120]
92.	<i>Crepis cameroonica</i> L./ Hawk's-beard	Asteraceae	Leaf	Ocular infections	[121]
93.	<i>Crotalaria brevidens</i> Benth./ Ethiopian rattlebox	Fabaceae	Leaf	Cataract	[46]
94.	<i>Croton macrostachyus</i> Del./ broad-leaved croton	Euphorbiaceae	Leaf	Ocular injuries	[46]
95.	<i>Curcuma longa</i> Linn./ Turmeric	Zingiberaceae	Rhizome	eye diseases	[70]
96.	<i>Curcubita pepo</i> Linn./ Pumpkin	Cucurbitaceae	Fruit	Good for eyes	[70]
97.	<i>Cyperus esculentus</i> Linn./ Korai	Cyperaceae	Whole plant	Eye diseases	[108]
98.	<i>Cyperus nevius</i> Retz/ Deela	Cyperaceae	Root	Eye sore	[80]
99.	<i>Cyperus rotundus</i> (L.) Palla/ Mustaka	Cyperaceae	Rhizome	Eye diseases	[44]
100.	<i>Dalbergia sisso</i> Roxb/ Shisham	Papilionaceae	Leaf	Eye diseases	[81]
101.	<i>Datura metel</i> L. / Dhutra	Solanaceae	Leaf, root, seed	To enlarge pupil in eye	[59]
102.	<i>Datura stramonium</i> L./ Datura	Solanaceae	Seed	Iritis	[89]
103.	<i>Daucus carota</i> Linn./ Carrot	Umbelliferae	Seed	Eye sight, glaucoma	[52, 122]

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104.	<i>Delphinium vestitum</i> Wall. ex Royle/ Makhooti	Ranunculaceae	Flower	Eye redness, glaucoma and particularly for infections of eyes	[123]
105.	<i>Desmodium incanum</i> DC./ Creeping beggarweed	Fabaceae	Bark	Eye diseases	[95]
106.	<i>Dichrocephala integrifolia</i> (L.) O. Kuntze./ Wedahan	Compositae	Leaf	Eye infection, Blindness, conjunctivitis and related ocular affections	[61-62]
107.	<i>Dichrostachys cinerea</i> Wight et Arn./ Sicklebush	Fabaceae	Whole plant	Ocular infections	[45]
108.	<i>Dioscorea deltoidea</i> Wall. ex. Griseb./ Medicinal yam	Dioscoreaceae	Rhizome	Ocular inflammation, ocular infection	[70]
109.	<i>Diospyros lycioides</i> Desf./ Star-apple	Ebenaceae	Root	Eye infection	[57, 124]
110.	<i>Dissotis rotundifolia</i> (SM) Triana/ Dissotis	Melastomataceae	Leaf	Conjunctivitis	[125]
111.	<i>Dyschoriste radicans</i> Nees/ Chemurguiwetab Suswek	Acanthaceae	Leaf	Eye infection	[102]
112.	<i>Dysoxylum malabaricum</i> Bedd./ Vellaiyagil	Meliaceae	Stem	Eye diseases	[108]
113.	<i>Eclipta prostrata</i> L./ False Daisy	Asteraceae	Leaf	Eye troubles	[79, 98, 108]
114.	<i>Embllica officinalis</i> Gaertn / Amla	Euphorbiaceae	Fruit, seed	Ocular inflammation and other Eye diseases	[44, 75, 79, 94, 126]
115.	<i>Emila sonchifolia</i> (L.) DC./ Sadamandi	Asteraceae	Leaf	Ocular infections	[45]
116.	<i>Emilia praetermissa</i> Milne-Redh./ Sierra leone	Asteraceae	Leaf	Clears vision	[127]
117.	<i>Emilia sonchifolia</i> (Linn.) DC/ Lilac tassel flower	Asteraceae	Leaf	Eye inflammation	[76, 127]
118.	<i>Ervatamia divaricata</i> (L.) Burkill/ Crape Jasmine	Apocynaceae	Whole plant	Conjunctivitis, cataract	[90, 128]
119.	<i>Erythrina abyssinica</i> Lam. ex DC. / Flame tree	Papilionoideae	Stem bark	Blindness, conjunctivitis and related ocular affections	[62]
120.	<i>Euonymus tingens</i> Wall. ex Roxb/ Staff tree	Celastraceae	Bark	eye diseases	[129]
121.	<i>Euphorbia hirta</i> L./ Dodhi	Euphorbiaceae	Leaves, inflorescence	Redness of eyes, remove foreign body from eyes	[45,68]
122.	<i>Euphorbia royleana</i> Boiss./ Siundiko kanda	Euphorbiaceae	Milky Juice	Corneal opacity or Keratoconjunctivitis	[114]
123.	<i>Ficus benghalensis</i> Linn./ Bargad	Moraceae	Latex, stem	Eye pain	[52]
124.	<i>Ficus thonningii</i> Blume/ Bark-cloth fig	Moraceae	Leaf or whole plant	Blindness, conjunctivitis and related ocular affections	[62]
125.	<i>Flacourtia indica</i> (Burm.f.) Merr./ Rakatsonk	Flacourtiaceae	Leaf	Conjunctivitis	[67]
126.	<i>Foeniculum vulgare</i> Mill./ Fennel	Apiaceae	Leaf, flower	Conjunctivitis	[51]
127.	<i>Fuerstia africana</i> T.C.E.Fr./ Birirwobsot	Labiatae	Leaf	Eye problems	[102]
128.	<i>Fumaria officinalis</i> L./ Paptra	Fumariaceae	Leaf, stem, flower	Conjunctivitis	[50]
129.	<i>Garcinia cola</i> Heckel/ Bitter cola	Guttiferae	Seed	Glaucoma	[130]
130.	<i>Gentianodes tianschanica</i> (Rupr.ex Kusn.)/ Kamalay Char	Gentianaceae	Leaf	Eye problems	[123]
131.	<i>Ginkgo biloba</i> L./ Maidenhair Tree	Ginkgoaceae	Leaf	Retinal vein occlusion, glaucoma	[131-135]
132.	<i>Gloriosa superba</i> L./ Kalappaikkilangu	Colchicaceae	Flower	Eye infection	[136]
133.	<i>Glycyrrhiza glabra</i> Linn./ Liquorice	Papilionaceae	Rhizome	Eye diseases	[70]
134.	<i>Gymnema sylvestre</i> (Retz.) R.Br./ Gymnema	Asclepiadaceae	Leaf	In cornea opacity	[58, 70, 108]
135.	<i>Heliotropium dasycarpum</i> Ledeb./ Sagdaroo	Boraginaceae	Leaf	Eye diseases	[80]
136.	<i>Heliotropium indicum</i> L./ Hatisuri	Boraginaceae	Leaf, root	Conjunctivitis	[73, 119]

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137.	<i>Hibiscus panduraeformis</i> Burm. F./ Hibiscus	Malvaceae	Flower	Ocular infections	[45]
138.	<i>Holostemma ada-kodien</i> Schult/ Holostemma	Zingiberaceae	Root, leaf	Eye diseases	[44, 70]
139.	<i>Hoslundia opposita</i> Vahl/ Orange bird berry	Lamiaceae	Leaf sap	Sore eyes/ conjunctivitis	[137]
140.	<i>Hybanthus enneaspermus</i> (L.)F. Myell./ Ratna purusha	Violaceae	Whole plant	Eye diseases	[75]
141.	<i>Hyoscyamus niger</i> L./ Stinking nightshade	Solanaceae	Leaf	Iritis	[89]
142.	<i>Hyptis suaveolens</i> (L.) Poit./ Wild spikenard	Lamiaceae	Seeds	Remove dust from eyes	[119]
143.	<i>Iris germanica</i> L./ Lirio	Iridaceae	Flower	Conjunctivitis	[51]
144.	<i>Jasminum arborescens</i> Roxb./ Jasmine	Oleaceae	Leaf	Eye diseases	[52, 92]
145.	<i>Jasminum officinale</i> L./ Chameli	Oleaceae	Root	Eye problems	[48]
146.	<i>Jatropha curcas</i> L./ Adavi amudamu	Euphorbiaceae	Latex	Ocular infections	[45]
147.	<i>Jatropha gossypifolia</i> Linn./ Ratanjot	Euphorbiaceae	Latex	Corneal opacity increase eye sight	[52]
148.	<i>Juniperus excelsa</i> M. B./ Apurs	Cupressaceae	Seed	Eye diseases	[80]
149.	<i>Juniperus procera</i> Hochst. ex Endl. / African Juniper	Cupressaceae	Sap	Conjunctivitis	[46]
150.	<i>Kalanchoe densiflora</i> Rolfe/ Air Plant	Crassulaceae	Leaf	Conjunctivitis	[46]
151.	<i>Kalanchoe pinnata</i> (Lam.) Pers. / Air Plant	Crassulaceae	Leaf	Ocular diseases	[63]
152.	<i>Kigelia africana</i> (Lam.) Benth./ Sausage Tree	Bignoniaceae	Fruit	Eye wounds	[82]
153.	<i>Lantana trifolia</i> L./ Three leaf shrubverbena	Verbenaceae	Leaf or whole plant	Blindness, conjunctivitis and related ocular affections	[62]
154.	<i>Lepidium sativum</i> L./ Zachik	Brassicaceae	Seed	Eye diseases	[123]
155.	<i>Leucas aspera</i> Spreng./ Kubi	Labiatae	Leaf	Eye disease	[52]
156.	<i>Leucas aspera</i> (Willd) Link/ Thummi	Lamiaceae	Leaf	Ocular infections	[45, 108]
157.	<i>Leucas martinicensis</i> (Jacq.) Ait.f./ Chepkari	Labiatae	Flower, leaf	Conjunctivitis, corneal diseases	[46, 66]
158.	<i>Lippia nodiflora</i> L./ Poduthazhai	Verbenaceae	Whole plant	Eye disorders	[66]
159.	<i>Lophira tanceotata</i> Van Tiegh ex Keay/ Red iron wood	Ochnaceae	Leaf	Conjunctivitis	[121, 138]
160.	<i>Luffa acutangula</i> (Linn.) Roxb/ Ridged gourd	Cucurbitaceae	Leaf	Granular conjunctivitis, prevent excessive meihomian secretion	[70, 139]
161.	<i>Lygodium salcifolium</i> Linn./ Chumng	Lygodiaceae	Leaf	Pain in the eyes and night blindness	[140]
162.	<i>Madhuca indica</i> / Madhuka	Sapotaceae	Flower	Eye diseases	[44]
163.	<i>Maesa lanceolata</i> Forssk/ Kibabustanyiet	Myrsinaceae	Root	Bad eyes	[102]
164.	<i>Mallotus oppositifolius</i> (Geisel.) Mull.-Arg / Katep	Euphorbiaceae	Young leaf	Eye diseases	[64]
165.	<i>Mangifera indica</i> L./ Mango	Anacardiaceae	Unripe fruit	Blindness	[75, 82, 85]
166.	<i>Manihot esculenta</i> Crantz/ Bankye	Euphorbiaceae	Leaf, root	Eye trouble	[63]
167.	<i>Memecylon umbellatum</i> Burm.f./ Ironwood	Melastomataceae	Leaf, root	Conjunctivitis	[141]
168.	<i>Microglossa pyrifolia</i> (Lam.) Kuntze / Eyihi	Asteraceae	Leaf	Eye diseases	[65]
169.	<i>Mimosa pudica</i> Linn/ Chuimui	Mimosae	Leaf	Conjunctivitis	[142-143]
170.	<i>Momordica charantia</i> Descourt./ Bitter melon	Cucurbitaceae	Leaf	Correct impaired vision	[84, 144]
171.	<i>Moringa oleifera</i> Lam/ Drumstick Tree	Moringaceae	Flower, leaf	Eye diseases	[49, 94, 113]
172.	<i>Murraya koenigii</i> (Linn.) Spreng./ Karuvepelai	Rutaceae	Leaf	Eye diseases	[108]

Sr. no.	Scientific name/ Common name	Family	Part used	Uses in Ocular diseases	References
173.	<i>Nerium odorum</i> Soland/ Kaner	Apocyanaceae	Leaf	Eye diseases	[81]
174.	<i>Newbouldia laevis</i> (P.Beauv.) Seeman ex Bureau/ Sasanemasa	Bignoniaceae	Bark	Eye diseases	[82,138]
175.	<i>Ocimum gratissimum</i> L./ Alfavaca	Lamiaceae	Leaf	Conjunctivitis	[85, 145]
176.	<i>Ocimum sanctum</i> Linn/ Tulsi	Labiatae	Whole plant	painful eye diseases	[146]
177.	<i>Olea ferruginea</i> Royle/ Kahu	Oleaceae	Fruit	Burning of the eye	[81]
178.	<i>Otomeria cameronica</i> (Bremek.) Hepper / Kandere	Rubiaceae	Leaf	Eye redness	[64]
179.	<i>Oxalis corniculata</i> L./Nyonyoek	Oxalidaceae	Whole plant	Eye problems	[102]
180.	<i>Pandanus tectorius</i> Parkinson/ Screw pine	Pandanaceae	Fruit	Red eyes	[147]
182.	<i>Parkia filicoidea</i> Welw. ex Oliv./ African locust bean	Fabaceae	Root	Ocular injuries	[46]
183.	<i>Parnassia nubicola</i> Wallich ex Royle/ Mamira	Parnassiaceae	Leaf	Ocular inflammation	[100, 113, 148]
184.	<i>Paspalidium flavidum</i> (Retz.) A. / Madhana Ghas	Poaceae	Leaves	Eye disorders	[68]
185.	<i>Paspalum scrobiculatum</i> L./ Koda Millet	Juglandaceae	Root	Eye diseases	[29]
186.	<i>Pelargonium graveolens</i> L'H'er. ex Ait/ Rosas blancas	Geraniaceae	Flower	Conjunctivitis	[51]
187.	<i>Pentas longiflora</i> Oliv./ Cheroriet	Rubiaceae	Root	Sore eyes	[102]
188.	<i>Pergularia daemia</i> (Forssk.) Chiov./ Juttapaku	Asclepiadaceae	Leaf latex	Ocular infections	[45]
189.	<i>Persea americana</i> Mill./ Avocado	Lauraceae	Seed	Eye infection	[88]
190.	<i>Petalostigma pubescens</i> Domin/ Quinine tree	Euphorbiaceae	Leaf	Sore eyes	[77, 149]
191.	<i>Phyllanthus amarus</i> Schumach. & Thonn. / Nela usiri	Euphorbiaceae	Whole plant	Ophthalmopathy	[104]
192.	<i>Physostigma venenosum</i> (Ealf.)/ Ordeal bean	Fabaceae	Seed	Glaucoma	[82, 89, 150]
193.	<i>Piper longum</i> L./ Long pepper	Piperaceae	Fruit, root	Eye diseases	[44]
194.	<i>Plagiostyles africana</i> Prain/ Plantas con flores	Euphorbiaceae	Leaf	Ocular infections	[121]
195.	<i>Plantago lanceolata</i> L./ Kayay Khapay	Plantaginaceae	Leaf	Eye redness	[123]
196.	<i>Plantago ovata</i> Forssk./ Desert Indian wheat	Plantaginaceae	Seed	Eyelid inflammation, eye tumor, conjunctivitis, ophthalmia, cataract, sore eyes, red swollen eyes, inflammation of the retina	[147]
197.	<i>Plantago palmate</i> Hoof./ Masiririet	Campanulaceae	Root	Eye problems	[102]
198.	<i>Poggea stenura</i> Gilg / Kesak-kequok	Flacourtiaceae	Leaf	Eye diseases	[64]
199.	<i>Polygonum salicifolium</i> Willd./ Cheporotit	Polygonaceae	Root, leaf	Eye problems	[102]
200.	<i>Portulaca oleracea</i> L. / Gangavavli kura	Portulacaceae	Leaf, seed	Eye diseases	[104]
201.	<i>Pouzolzia zeylanica</i> (L.) Benn./ Pillidumpa	Uritaceae	Rhizome	Ocular infections	[45]
202.	<i>Primula macrophylla</i> D.Don/ Lilio	Primulaceae	Flower	Eye redness	[123]
203.	<i>Prosopis cineraria</i> (L.) Druce/ Jammichettu	Mimosaceae	Leaf	Eye diseases	[75]
204.	<i>Prunus africana</i> (Hook. f.) Kalkman/	Rosaceae	Bark	Retinoblastoma	[46]
205.	<i>Pseudognaphalium luteo-album</i> (L.) Hilliard & B.L. Burt / Jersey Cudweed	Asteraceae	Leaf	Eye infection	[57, 124]
206.	<i>Psidium guajava</i> Linn./ Guava	Myrtaceae	Flower	Conjunctivitis	[151-152]
207.	<i>Pycnanthus angolenses</i> Welw Warb/ African nutmeg	Myristicaceae	Exudates	Corneal Ulcers	[153]
208.	<i>Pyrus malus</i> L./ Seb	Rosaceae	Fruit	Improves weak eye sight	[100, 154]

Sr. no.	Scientific name/ Common name	Family	Part used	Uses in Ocular diseases	References
209.	<i>Pyrus pashia</i> Buch.-Ham. Ex D. Don/ Melu	Rosaceae	Fruit	Cataract, ocular injuries	[95, 130]
210.	<i>Rauwolfia vomitoria</i> Afzel./ Swizzle Stick	Apocynaceae	Root, leaf	Eye diseases	[82, 107]
211.	<i>Rhazya stricta</i> Dene/ Vena	Apocyanaceae	Fruit, leaf	Eye diseases	[81]
212.	<i>Rheum australe</i> D. Don/ Chhirchey	Polygonaceae	Whole plant	Eye disease	[100, 155]
213.	<i>Rhus abyssinica</i> Hochst. ex Oliv. / Xaxessa	Anacardiaceae	Leaf	Eye problems	[156]
214.	<i>Ricinus communis</i> Linn./ Castor	Euphorbiaceae	Fruit, leaf	Blindness, conjunctivitis, related ocular affections, ophthalmic surgery	[62, 70, 73]
215.	<i>Rosa brunonii</i> La Mortola/ Himalayan Musk Rose	Rosaceae	Flower	Eye diseases	[92]
216.	<i>Rosa centifolia</i> L./ Rosa de Castilla	Rosaceae	Flower	Conjunctivitis	[51]
217.	<i>Rosa indica</i> L./ Rose	Rosaceae	Flower, seed	Eye disorders	[68]
218.	<i>Rostellularia crinata</i> Nees./ Small Flowered Justicia	Acanthaceae	Leaf	Ocular infections	[45]
219.	<i>Saccharum munja</i> Roxb./ Munja	Poaceae	Stem	Eye diseases	[157]
220.	<i>Sansevieria intermedia</i> N.E. Br./ African Bowstring Hemp	Ruscaceae	Leaf Sap	Ocular injuries	[46]
221.	<i>Sarcostemma acidum</i> (Roxb.) Voigt/ Somavalli	Asclepiadaceae	Leaf Sap	Ocular infections	[45]
222.	<i>Scoparia dulcis</i> Linn./ Phanism	Scrophulariaceae	Flower	Conjunctivitis	[140]
223.	<i>Senecio discifolius</i> Oliv./ Chemamaiyat	Compositae	Leaf	Eye infection	[102]
224.	<i>Sesamum orientale</i> L./ Nuvvulu	Pedaliaceae	Seed	Ocular infections	[45]
225.	<i>Setaria megaphylla</i> (Steud.) T. Durand & Schinz/ Ribbon grass	Poaceae	Leaf	Eye diseases	[64]
226.	<i>Solanum nigrum</i> L./ European Black Nightshade	Solanaceae	Berries, whole plant	Eye diseases	[44- 45, 75, 81, 95, 109, 154, 158-161]
227.	<i>Solanum surattense</i> Burm. F/ Ramamulaga	Solanaceae	Whole plant	Ocular infections	[45]
228.	<i>Sonchus oleraceus</i> L./ Siruyanaichedi	Compositae	Leaf	Eye diseases	[66]
229.	<i>Spermacoce princeae</i> (K.Schum.)Verdc./ Chemurguiywet	Rubiaceae	Root, leaf	Eye problems	[102]
230.	<i>Spilanthes mauritiana</i> (Rich. ex Pers.) DC./ Toothache Plant	Asteraceae	Leaf or whole plant	Blindness, conjunctivitis and related ocular affections	[62]
231.	<i>Spondias tuberosa</i> Arruda/ Imbuzeiro	Anacardiaceae	Stem-bark	Conjunctivitis	[119]
232.	<i>Sprobolus virginicus</i> (L.) Kunth. Rev./ Dropseed	Poaceae	Leaf or whole plant	Blindness, conjunctivitis and related ocular affections	[62]
233.	<i>Sterculia quadrifida</i> R.Br. / Peanut tree	Sterculiaceae	Leaf	Sore eyes	[77, 162]
234.	<i>Strychnos potatorum</i> L.f. / Indian Gum Nuts	Loganiaceae	Seed	Eye diseases	[44]
235.	<i>Tabernaemontana divaricata</i> (L.) R. Br. ex Roem. & Schult./ Nandivardanam	Apocyanaceae	Flower	Sore eyes, Conjunctivitis	[69, 75, 152]
236.	<i>Tagetes erecta</i> L./ Mexican marigold	Asteraceae	Whole plant	Sore eyes	[74, 126, 162]
237.	<i>Tamarindus indica</i> L./ Indian Date	Fabaceae	Leaf, flower, fruit	Cataract	[113, 163]
238.	<i>Terminalia bellerica</i> (Gaertn.) Roxb./ Vibhethaki	Combretaceae	Seed, fruit	Eye diseases	[44, 70, 106, 108]
239.	<i>Terminalia chebula</i> Retz. / Harethaki	Combretaceae	Fruit	Improves eye sight	[44, 85, 94, 98, 108, 164]
240.	<i>Tetragonia tetragonoides</i> (Pall.) Kuntze / Shonta	Aizoaceae	Whole plant	Eye diseases	[85]
241.	<i>Thespesia populnea</i> (L.) Corr./ Indian Tulip tree	Malvaceae	Fruit, flower	Conjunctivitis	[114]

Sr. no.	Scientific name/ Common name	Family	Part used	Uses in Ocular diseases	References
242.	<i>Tinospora cordifolia</i> (Thunb.) Miers / Guduchi	Menispermaceae	Stem, root, flower	Eye diseases	[44, 105]
243.	<i>Trianthema portulacastrum</i> L./ Tella galijeru	Aizoaceae	Root	Ocular infections	[45]
244.	<i>Trichodesma indicum</i> (L.) R.Br./ Juri	Boraginaceae	Leaf	Eye diseases	[81]
245.	<i>Tridax procumbens</i> L./ Vettukayapundu	Compositae	Whole plant	Eye diseases	[66]
246.	<i>Triumfetta rhomboidea</i> Jacq./ Bhora chikti	Tiliaceae	Root	Inflamed eyelids	[67]
247.	<i>Vaccinium myrtillus</i> L./ Bilberry	Ericaceae	Leaf	Vision improvement, Glaucoma, Cataracts, Diabetic Retinopathy, myopia, eyestrain.	[165-166]
248.	<i>Valeriana jatamansi</i> Jones/ Sugandhwal	Valerianaceae	Leaf, rhizome	Eye problems	[98, 112, 167]
249.	<i>Ventilago denticulate</i> Willd./ Keonti	Rhamnaceae	Stem	Ocular inflammation	[67]
250.	<i>Vernonia albicans</i> DC/ Peddasahadevi	Asteraceae	Whole plant	Ocular infections	[45, 128]
251.	<i>Vernonia cineria</i> (L.) Less/ Sahadevi	Asteraceae	Leaf	Eye diseases	[45, 128]
252.	<i>Vitex doniana</i> Sweet/ Black Plum	Verbinaceae	Stem, bark	Ocular inflammation, ocular infection	[108, 168]
253.	<i>Vitex negundo</i> L./ Vavili	Verbinaceae	Whole plant or leaf	Ocular infections	[45]
254.	<i>Warburgia ugandensis</i> Spargue/ Uganda greenheart	Canellaceae	Leaf	Cataract, ocular injuries	[46]
255.	<i>Withania somnifera</i> Linn./ Indian Ginseng	Solanaceae	Leaf	Eye diseases	[68, 70]
256.	<i>Xanthium indicum</i> Koenig/ Gokharu	Asteraceae	Leaf	Conjunctivitis	[67]
257.	<i>Xanthium strumarium</i> L./ Kuthuru	Asteraceae	Leaf, Seeds	Chronic conjunctivitis, Inflammation of eye	[169]
258.	<i>Zehneria minutiflora</i> (Cogn.) C.Jeffrey/ Manereriati	Cucurbitaceae	Root, leaf	Eye problems	[102]
259.	<i>Zingiber officinale</i> Roscoe./ Ginger	Zigiberaceae	Rhizome	Eye diseases	[107]
260.	<i>Ziziphus glabrata</i> Roth./ Kondaregu	Rhamnaceae	Leaf sap	Ocular infections	[45]
261.	<i>Ziziphus oenoplia</i> (L.) Mill./ Pariki	Rhamnaceae	Shoot tip	Ocular infections	[45]
262.	<i>Zizyphus mauritiana</i> Lamk/ Ber	Rhamnaceae	Leaf	Sty of eye	[160]

CONCLUSION

Ayurveda is one of such inherited tradition of health and longevity. A wide variety of plants have been found to have effective against number of ocular diseases. In this review the information is recorded as common name, scientific name, family, part used & reference of the plants used in treatment of ocular diseases. This review helps the researcher to develop new formulations and toxicity studies which will be beneficial for the society in future era.

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