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Potential plants used against eye problems

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ABSTRACT

The modern medicines are creating lots of problems in the form of side effect and anti-microbial resistance. Researchers throughout the world are searching for new sources to cure diseases & disorders. Among them, eye problems are very common and they are cured traditionally using plant parts too. Keeping this in view, an attempt has been made to gather the information through survey in different parts of Odisha and from literature. Results revealed that about 30 plants are commonly used against different types of eye problems in the state. *Aloe vera*, *Zingiber officinalis*, *Ocimum sanctum* etc are commonly used plant species. The present day provide information for doing antibacterial activity against *Klebsiella pneumoniae* and other pathogens which is responsible for eye disease.

INTRODUCTION

Organ of the visual system, the eye has several natural mechanisms to defend itself against infection or trauma (Dharma et al. 2013). Tears keep the eye lubricated and physically clear away foreign particles, such as dust or microorganisms. The tear contains lysozymes and interferon that also protect the eyes from infections (Dharma & Mahendran 2008). The eye lashes and

eye lids protect the ocular surface from the biotic & abiotic components. However, occasionally when these defence mechanisms disrupted, diseases occurs such as, ocular inflammation, sore eyes, glaucoma, conjunctivitis, cataract, ocular allergies etc (Table 1). From ancient times plants have been used for curing several diseases. Due to side effects of allopathic drugs, huge number of herbal drugs is being used in treatment of ocular diseases

now-a-days (Lucca 2007). Tribal people and rural population are still dependent on herbs and plants of medicinal interest only. Therefore, authors made survey in different parts of Odisha and gathered the information from literature on plant species used to cure eye problems. The present study also bring attention towards herbal extracts might be responsible to inhibit the pathogens.

Various Eye Infections

Glaucoma

Glaucoma is often called the silent thief of sight, because most of its types typically cause no pain and produce no symptoms until noticeable vision loss occur. Glaucoma is type of eye diseases that damage the optic nerve that carries information from the eye to the brain. Damage usually occurs as a result of elevated pressure of the fluid in the eyes (Weinreb et al. 2015). In most cases, glaucoma is associated with higher than normal pressure inside the eye – a condition called ocular hypertension. But it can also occur when intraocular pressure (IOP) is normal. Possible factors leading to glaucoma include glutamate induced neurotoxicity, nitric oxide based damage, disruption of neurotropic factor transport and immune induced neurodestruction (Leite et al. 2011).

Ocular Infection

Bacterial eye infection

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*. It is the world's leading cause of blindness and leading cause of ocular morbidity. Symptoms of bacterial eye infection include burning, irritation, tearing and usually a mucopurulent or purulent discharge. Eyelids may be stuck together, particular in the mornings (Watson et al. 2018).

Fungal Eye Infection

The eye infections caused by various fungal species are *Fusarium solani*, *Fusarium oxysporum*, *Aspergillus niger*, *Aspergillus flavus*, *Candida albicans* and *Penicillium notatum*. These infections are difficult to treat and can cause blindness. Symptoms include redness, blurring vision and photophobia (Klotz 2000).

Viral eye infection

Viral infection to the eye is caused by *Herpes simplex virus 1*, *Adenovirus* and *Coxsackie virus*. HSV-1 ocular infection is the leading cause of blindness in developed countries. Over 95% of ocular Herpes infections are caused by HSP-1 (Sandhu et al. 2011). Viral infections are highly contagious and are spread by contact, usually with objects which have come into contact with the infected person's eye secretion. For example, the virus can be transmitted when infected person touch their eyes and then touch another surface, for example door handle or share an object that has touched their eyes (Semwal et al. 2016).

Cataract

Cataract is the most frequent cause of visual impairment worldwide and covers about 42% of overall visual infection. A cataract is a dense, cloudy area that forms

in the lens of the eye. It begins when proteins in the eye form clumps that prevent the lens from sending clear images to the retina. The retina works by converting the light that comes through the lens into signals. Cataract is a multifactorial disease process and is induced by various toxic factors, environmental stressors and gene mutations (Nizami & Gulani 2019).

Ocular injuries

In the working place usually related to exposure to industrial chemical substances such as acid and alkaline and radiation energy, such as ultra violet light or even direct trauma can be some of the reason for external eye injuries. Ocular injuries by sap of plants are uncommon (Samwel et al. 2016)

Iritis / Uveitis

Iritis is swelling and irritation in the coloured ring around the pupil in the eye. Iritis that develops suddenly, over hours or days, is known as acute iritis . Symptoms that develop gradually or last longer than three months indicate chronic iritis. These infections cause redness of eye, discomfort, achiness & decreased in vision (Mahanadi et al. 2019).

Ophthalmia

Sympathetic ophthalmia with posterior inflammation may include optic nerve swelling (Chu & Chan 2013). It is also defined as a rare and specific bilateral granulomatous pan-Uveitis that occurs after the uvea of one eye Inflammation of uveal tract due to chronic irritation is subjected to a penetrating injury due to

either accidental trauma or surgery (Alkhaibari 2016).

Night blindness / Nyctalopia

Night blindness or nyctalopia, is the condition where the eye is unable to adapt low light conditions such as at night time. Night blindness itself is not a condition but the result of an existing eye disorder. Although night blindness adversely affects a person's ability to see in dim light, it does not cause complete blindness. It may also take longer time than usual for the eye to adapt when going from light to dark setting (Kandola 2018).

Sore eyes

Sore eyes are an unpleasant sensation in or around one or both eyes. Eyes may feel gritty, tender or tired. It may be caused by the excessive rubbing of the eyes. Airborne irritants including smoke and smog as well as other environmental factors such as exposure to chemicals or even too much sun can result in sore eyes. Some symptoms include eye pain, redness, itchiness, swelling, tearing or discharge from the eyes (Lloyd 2018)

Corneal infection

The cornea is often under attack by microorganisms. Antimicrobial proteins / peptides endogenously present in the tear film provide the first line of defence against the invading microorganisms and also regulate wound healing. The most common agents are bacteria, fungus, protozoa and parasites. Common risk factors include ocular trauma, contact lens wear, topical anaesthetics, neurotropic disease, lid or lash malposition tear insufficiency, stem cell deficiency and

sympathetic abnormalities. (Chaurasia et al. 2015)

Pathogens relating to eye infection

Bacteria are the major contributor of ocular infections and if these are not treated, it may lead to blindness and visual impairments. It may occur through dry eye state, surgery, contact lens, trauma, chronic nasolacrimal duct or previous ocular infection (Teweldemedhin et al. 2017). The leading isolates of ocular infections are: *Staphylococcus aureus*, *Coagulate negative Staphylococci* (CoNS), *Streptococcus pneumoniae*, *Pseudomonas aeruginosa*.

RESULTS AND DISCUSSION

A wide variety of plants have been found to have effective by used against number of eye problems. Literature indicates a high degree of plants being used against eye problems. The present study constitutes a good basis for further phytochemical and pharmacological research of *Vitex negundo*, *Allium sativum*, *Ricinu scommunis*, *Ventilago denticulate* and *Garcinia cowa* which could be of interest in the design of new inexpensive, effective and safe drugs. The detail in listed in Table 2 (Present study & Sandhu et al. 2011; Li et al. 2012; Auwai et al. 2014; Tiwari et al. 2019). The remaining plants are needed to be screened through standard pharmacological and clinical procedures for their activity. This explorer work would help researchers to develop new drug formulation which would be beneficial for society in future era. The result of this study would have significant contribution in conserving these medicinal plants at let the people be aware of the

sustainable harvesting of these plants at the same time.

REFERENCES

- Alkhaibari M.S (2016). British Journal of Medicine and Medical Research. 15(5): 1-5.
- Auwai MS, Sana S, Mairiga IA, Sanda KA, Shuaibu A and Ibrahim A. (2014). Preliminary phytochemical and elemental analysis of aqueous and fractionated pod extracts of *Acacia nilotica* (Thorn mimosa). Veterinary Research Forum. 5(2): 95-100.
- Biju R., Sushil D. & Georgy N.K. (2009). Successful Management Of Presumed Candida Endogenous Endophthalmitis With Oral Voriconazole. Indian Journal of Ophthalmology. 57(4):306-8.
- Calvo MI and Cavero RY. (2016). Medicinal Plants Used for Ophthalmological Problems in Navarra (Spain). Journal of Ethnopharmacology. 190:212-8.
- Chaurasia S, Lim R and Laxminarayan R. (2015). Nanomedicine Approaches for Corneal disease. Journal of Functional Biomaterials. (277-298): 2079-4983.
- Guly CM, Guly HR, Boumra O, Gray RH and Lecky FE. (2016). Ocular Injuries in Patients with Major Truma. Emerging Medicinal Journal. 23(12):915-917.
- Kandola A. (2018). Do I Have Night Blindness? Medical News Today. Healthline Media, UK.
- Li H, Jin L, Wu F, Thacker P, LiX, You J, Wang X, Liu S, Li S and Xu Y.

- (2012). Effect of Red Pepper (*Capsicum frutescens*) Powder or Red Pepper Pigment on the Performance and Egg Yolk Color of Laying Hens. *Asian-Australasian Journal of Animal Science*. 25(11):1605-1610.
- Lloyd Wc. (2018). Sore Eyes. Healthgrades Operating Company, US.
- Majewski M. (2014). Allium sativum: Facts And Myths Regarding Human Health. US National Library of Medicine. National Institute of Health. 65(1):1-8.
- Pendota SC, Grierson Ds and Afolayan AJ (2018). An Ethnobotanical Study of Plants Used For the Treatment of Eye Infections in the Eastern Cape Province, South Africa. *Pakistan Journal of Biological Sciences*. 11(16): 2051-2053.
- Sakai JI, Ushi Y, Suzuki J, Kezuka T and Goto H. (2019). Clinical Features of Anterior Uveitis Caused By Three Different Herpes Viruses. US National Library of Medicine. National Institute Of Health. 39(12): 2785-2795.
- Sandhu PS, Singh B, Gupta V, Bansal P and Kumar D. (2011). Potential Herbs Used in Ocular Diseases. *Journal of Pharmaceutical Sciences and Research*. 3(4):1127-1140.
- Semwal A, Kumar V, Bhatt SP and Kumar Ashok (2016). Medicinal plants with antiocular activities. *International Journal of Medicine Research*. 1(2): 35-53.
- Sharma S. (2012) Diagnosis of Infectious Disease of the Eye. *The Scientific Journal of the Royal College of Ophthalmologist*. 26(2): 177-184.
- Solano D and Czyz CN. (2019). *Viral Conjunctivitis, Star Pearls* Publishing LLC.
- Spadea L, Maraone G, Verboschi F, Vingolo EM and Tognetto D. (2016). Effect of Corneal Light Scatter on Vision: A Review of The Literature. *International Journal of Ophthalmology*. 9(3):459-464.
- Tewari D, Samoila O, Gocan D, Mocan A, Moldovan C, Devkota H.P, Atanasov A,G, Zengin G, Echeverria J, Echeverria J, Vodnar D, Szabo B and Crisan G. (2019). Medicinal Plants and Natural Products Used in Cataract Management. *Frontiers in Pharmacology*. DOI: 10.3389/fphar.2019.00466.
- Teweldemedhin M, Gebreyesus H, Atsbaha AH, Asgedom SW and Saravanan M. (2017). Bacterial Profile of Ocular Infections: a systematic review. *BMC Ophthalmology*. 17:212.
- Weinreb RN, Aung T and Medeiros FA. (2014). The Pathology and Treatment of Glaucoma: a review. *National Institute of Health*. 11(18):1901-1911.
- Wotz SA, Penn CC and Butrus SI. (2000). Fungal and Parasitic Infections of The Eye. *Clinical Microbial Review*. 13(4):662-685.
- Zhang J, Tuo J, Wang Z, Zhu A, Machalinska A and Long Q. (2015). Pathogenesis of Common Ocular Diseases. *Journal of Ophthalmology*. DOI: 10.1155/2015/734527.

Table 1: Pathogens related to eye problems

DISEASE	PATHOGEN	SYMPTOMS	REFERENCE
Blepharitis	<i>Pseudomonas aeruginosa</i>	Loss of eye lash, corneal blindness, communicable	Ubani et al., (2009) Teweldemedhin et al. (2017)
Conjunctivitis	<i>Klebsiella pneumoniae</i>	Inflammation of mucosa of conjunctiva	Teweldemedhin et al. (2017)
Dacryocystitis	<i>Pseudomonas aeruginosa</i>	Inflammation of nasolacrimal duct	Teweldemedhin et al. (2017)
Keratitis	<i>Staphylococcus aureus</i>	Corneal blindness, can lead to endophthalmitis	Teweldemedhin et al. (2017)
Endophthalmitis	<i>Streptococcus viridans</i>	Mild to severe eye pain, blurry vision, eye pus, sensitivity to bright light	Teweldemedhin et al. (2017)
Endogenous endophthalmitis	<i>Klebsiella pneumoniae</i>	Choroid layer is affected	Teweldemedhin et al. (2017)
FUNGAL INFECTION			
DISEASE	PATHOGEN	SYMPTOMS	REFERENCE
Fungal corneal ulcer	<i>Aspergillus fumigatus</i>	Visual impairment	Chen et al. (2015)
Microbial keratitis	<i>Aspergillus flavus</i>	Can cause corneal scarring and opacification	Embong et al. (2008)
Mycotickeratitis	<i>Aspergillus</i> spp.	Corneal blindness	Rautaray et al. (2011)

Table 2: Potential plants related to eye problems

SCIENTIFIC NAME	COMMON NAME	FAMILY	PART USED	USES IN EYE DISEASE
<i>Ageratum conyzoides</i>	Pokasunga	Asteraceae	Leaf	Conjunctivitis, Cataract, injury
<i>Abrus precatorius</i> (Figure 1c)	Kaincha	Fabaceae	Leaf, seed, root	Ocular infection
<i>Acacia nilotica</i>	Babul	Mimosaceae	Whole plant	Burning sensation in eyes
<i>Achyranthus aspera</i>	Apamaranga	Amaranthaceae	Leaf	Cure eye disorders
<i>Aegle marmelos</i>	Bela	Rutaceae	Leaf, fruit	Conjunctivitis
<i>Allium sativum</i>	Rasuna	Liliaceae	Bulb	Sore eyes
<i>Aloe vera</i>	Ghikunari	Liliaceae	Leaf	Eye diseases
<i>Argemone Mexicana</i>	Odosmari	Papaveraceae	Latex	Eye diseases
<i>Azadirachta indica</i>	Neem	Meliaceae	Whole plant	Night blindness, conjunctivitis
<i>Bixa orellana</i>	Kumkum	Bixaceae	Leaf	Eye disease

<i>Capsicum frutescens</i>	Dhanualanka	Solanaceae	Whole plant	Cataract, Blindness
<i>Acacia oxydentalis</i>	Chakunda	Caesalpineaceae	Leaf	Sore eyes
<i>Celastrus paniculatus</i> (Figure 1a)	Pengu	Celastraceae	Seed oil	Eye disease
<i>Cleome viscosa</i> (Figure 1d)	Banasorisa	Ranunculaceae	Whole plant	Eye disease
<i>Clitoria Ternatea</i> (Figure 1b)	Aparajita	Fabaceae	Root, Leaf	Eye diseases
<i>Datura metel</i>	Dudura	Solanaceae	Leaf, root, seed	To enlarge Pupil in eye
<i>Geracinia cowa</i>	Sarbana	Glutiferae	Seed	Glaucoma
<i>Jatropha gossypifolia</i>	Baigaba	Euphorbiaceae	Latex	Corneal opacity increases eye sight
<i>Ocimum sanctum</i>	Tulsi	Lamiaceae	Whole plant	Painful eye disease
<i>Psidium guajava</i>	Pijuli	Myrtaceae	Flower	Conjunctivitis
<i>Ricinus communis</i>	Jada	Euphorbiaceae	Fruit,Leaf	Blindness, Ophthalmicsurgery, Conjunctivitis
<i>Strychnos potatorum</i>	Nirmala	Loganiaceae	Seed	Eye disease
<i>Tamarindus indica</i>	Tentuli	Fabaceae	Leaf, Flower, Fruit	Cataract
<i>Terminalia bellerica</i>	Bahada	Combretaceae	Seed, Fruit	Eye disease
<i>Terminalia chebula</i>	Harida	Combretaceae	Fruits	Improve eye sight
<i>Tinospora cordifolia</i>	Guduchi	Menispermaceae	Stem , root, flower	Eye disease
<i>Ventilago denticulata</i>	Kantamalli	Rhamnaceae	Stem	Ocular inflammation
<i>Vitex negundo</i>	Begonia	Verbenaceae	Whole plant or leaf	Ocular infection
<i>Zingiber officinale</i>	Ada	Zingiberaceae	Rhizome	Eye disease
<i>Ziziphus mauritiana</i>	Barkoli	Rhamnaceae	Leaves	Sty of eye

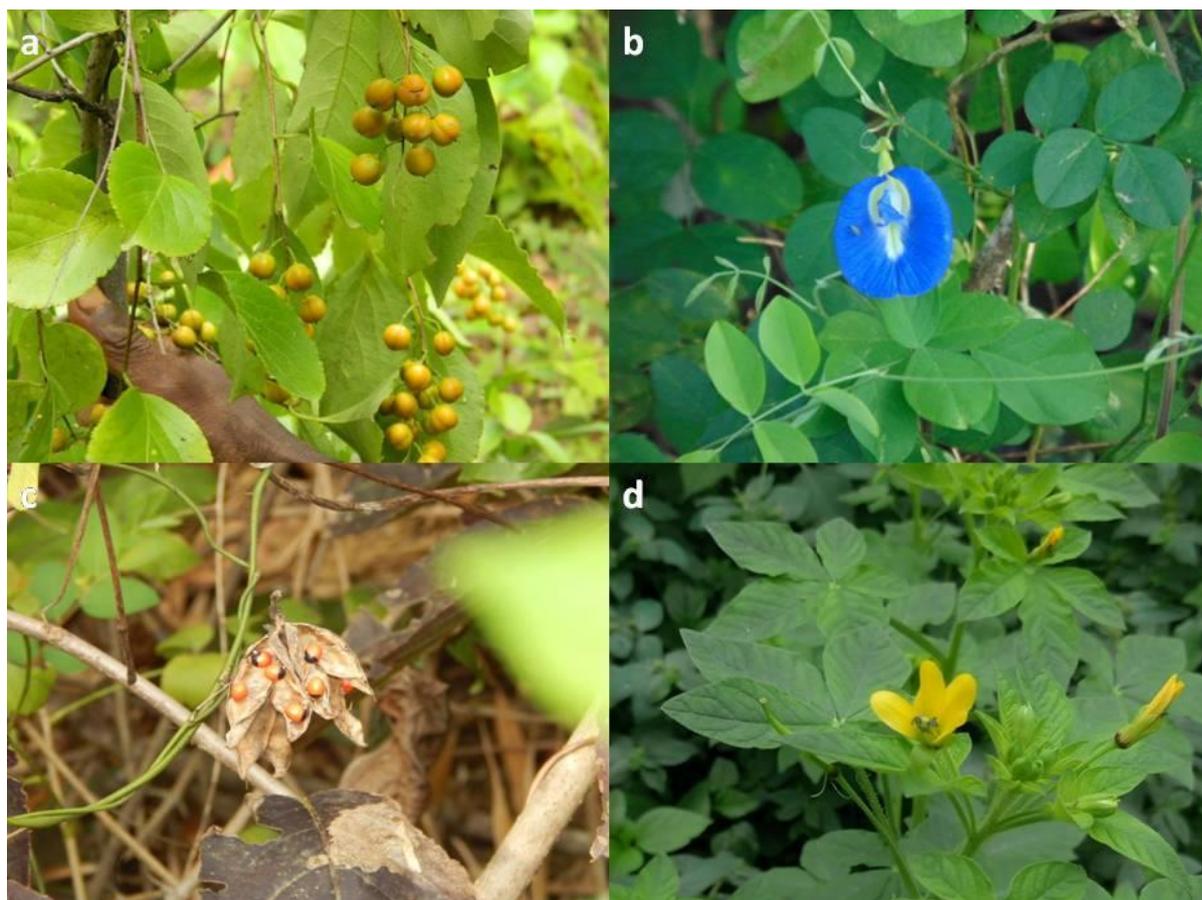


Figure 1: Some plants used against eye problems, a) *Celastrus paniculata*, b) *Clitoria ternatea*, c) *Abrus precatorius*, d) *Cleome vicosa*