



A REVIEW ON COLEUS FORSKOHLII AS MEDICINAL PLANT

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ABSTRACT

India is well known as chain store of medicinal plant. As India has rich history in the uses of medicinal plant and their derivatives since ancient times. Medicinal plant has great significance on the health of community. Coleus forskohlii is important medicinal plant, it is described into Ayurveda for its medicinal properties. Plant has been described as 'MKANDI' in Ayurveda. Coleus forskohlii is mint (Lamiaceae) family member and grow in country like India, Srilanka, Thailand, Nepal. Chemical studies of Coleus forskohlii plant introduce forskolin as diterpenoid present in root of plant. Forskolin is most widely used substances in weight loss supplements and fat burning agent in various formulation available in Indian market. Coleus forskohlii plant is used in various diseases : Asthma, painful menstrual periods, hypertension, skin conditions, bronchodilator, urinary tract infection, glaucoma etc. Because of wide uses their will chances of adulteration with their species and other varieties. This review work discusses the botanical and geographical distribution, phytochemistry, morphology, Pharmacognostic, pharmacology and therapeutic efficacy on various diseases of Coleus forskohlii with help of Journal, book, articles present on internet source.

KEY WORDS : Medicinal Plant , Makandi , Coleus forskohlii , Anti-glucoma agent .

INTRODUCTION

As the medicinal plants have great significance to the health of community and individuals. India has rich history within the uses of medicinal plant and their derivatives for medicinal purpose large numbers of medicinal plants are employed in traditional medicine since time of yore. So India is well-known as 'big box of medicinal plant'.

As per WHO (2003) about 80% of the world's population depends on traditional medicine for his or her (individual) health need. As consumers tend to believe that natural products are safe, herbal and dietary supplements so, traditional herbal products in many developed nations are used as alternative to modern medicine. Moreover uses of herbal medicine for the treatment of various disorders is extremely important in developing countries where cost of conventional medicine is a burden to population. quite 30% of entire plant species are useful in medicinal purpose.[17]

Coleus forskohlii is medicinal plant and describes in Ayurveda as a 'MKANDI'. *C. forskohlii* belonging to Labiatae. In India major medicinal species of coleus is tuberous *C. forskohlii*, *C. blumei*, *C. Malabaricus* etc. *C. forskohlii* also used as powerful source of essential oils. Essential oils present within the tubers which has attractive and delicate odor. [3]

2.1) Botanical description of *C. forskohlii* :

Coleus forskohlii is Lamiaceae member and grows in subtropical temperature climate of country's like India, Srilanka, Thailand and, Nepal. *Coleus* is aromatic plant with an straight stem and tuber like roots reaching 65 cm. *Coleus* is about 1-3feet tall having teardrops striking shimmering green leaves with bright purple colour at center. Leaf color could also be differs with the amount of shade. Flowers are placed purple or blue color. Roots of *C. forskohlii* are thick, rapidly spreading, fibrous and golden brown in color. *C. forskohlii* could be a perennial plant that grows to about 45–65 cm tall. Its four angled stems that are branched and nodes are hairy. Leaves are 6.5 to 13.5 cm long and 4 to five cm in breadth. [4] flowers are round, 1 to 2.5 cm in size, usually perfect and calyx hairy inside. Upper lip of calyx is broadly ovate. The blue corolla is bilabiate. Lower lobes are elongated and concave so they enclose the essential organs. The ovary is four parted and stigma is 2 lobed and therefore the flower is cross-pollinated by wind or insects. Roots are tuberous, 20 cm long and 0.5 to 2.5 cm in diameter, orangish within and strongly aromatic. *C. forskohlii* is that the only species of the genus to own fasciculated tuberous roots. The whole plant is aromatic. The leaves and tubers have quite different odours. [2].



Fig 1 : flowers of *C. forskohlii*



Fig 2 : leaves of *C. forskohlii*



Fig 3 : Roots of *C.forskohlii*



Fig 4 : stem of *C.forskohlii*

2.2) GEOGRAPHICAL DISTRIBUTION :

Coleus forskohlii is available in different countries and used for different disorders. India is considered as the place of origin of *coleus forskohlii* . It grows wild in subtropical temperature climate of India, Srilanka, Thailand , Nepal and Burma . Apparently it has been distributed to Egypt , Arabia , Ethiopia , Brazil . In India *C.forskohlii* found in Tamil Nadu Rajasthan, Maharashtra and Karnataka . In Tamil Nadu, it is approximately grown in Salem, Dharmapuri, Trichy, Erode, Coimbatore and Dindigul Districts of 6000 acres. In India, plant is also found mostly on the dry and barren hills . Longitudinal and altitudinal range for the occurrence of the species is between 80 and 310 N and 600-800m, respectively. [3]



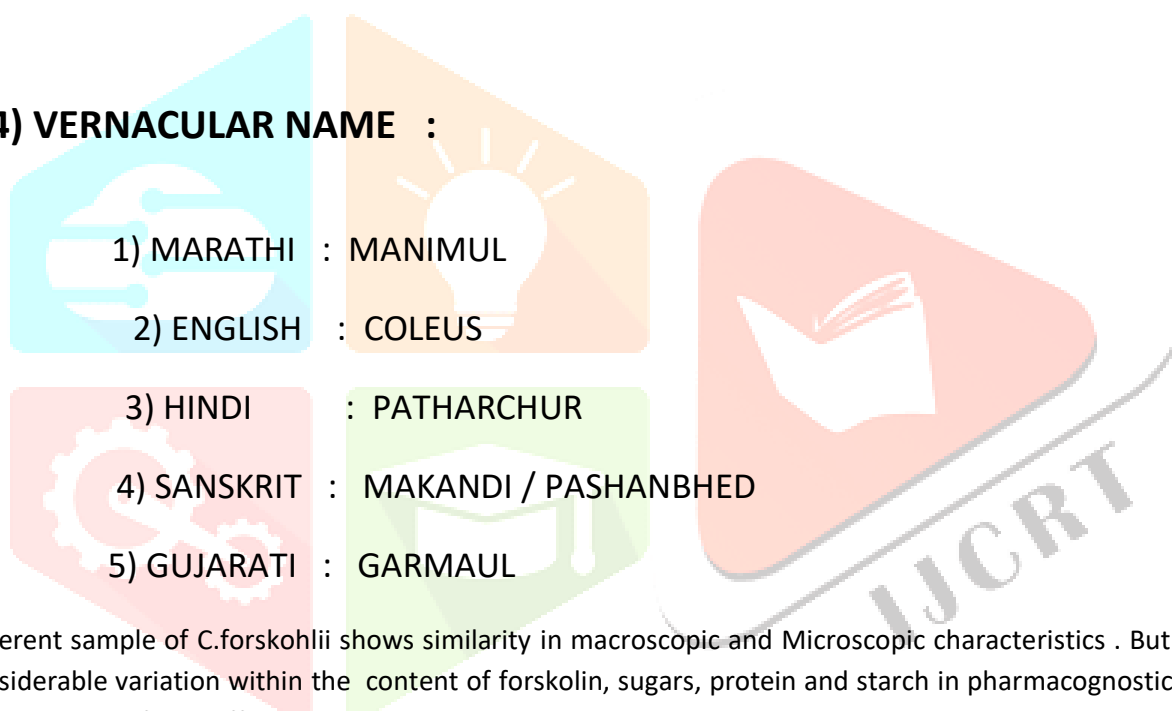
Table No 1 : Botanical description

Parts Of <i>C.forskohlii</i>	Feature
Leaves	
1.Size	Length:8.5-13.5 Cm Width : 4-6 Cm
2 .colour	Shimmering green color with purple at the center
3.Shape	Teardrop
Flowers	
1.Size	Length:15-30 Cm
2.Calyx	Upper lip of calyx is broadly ovate
3.Ovary	Ovary is four parted And stigma is two lobed
Roots	
1.Colour	Golden brown
2.Shape	Conical fusiform
3.Size	Length:20Cm approximately
4.Odour	Strongly aromatic

2.3) TAXANOMIC POSITION :

Kingdom : PLANTAE
 Division : MAGNOLOPHYTA
 Class : MAGNOLIOPSIDA
 Order : LAMIACEAE
 Family : LAMIACEAE
 Genus : COLEUS
 Species : FORSKOHLII

2.4) VERNACULAR NAME :



Different sample of *C.forskohlii* shows similarity in macroscopic and Microscopic characteristics . But there was considerable variation within the content of forskolin, sugars, protein and starch in pharmacognostical study of roots procured from different geographical areas .

3)CULTIVATION OF COLEUS FORSKOHLII :

3.1) History :

As an enquiry programme was initiated within the 1970s by the European pharmaceutical companies Hoechst. The project was on the event of a hypotensive agent from herbal source. Forskolin, earlier named colenol was the result of this research 89. There are many interesting biological properties, of *C.forskohlii*. A decade later Dr. Muhammed Majeed, the founding father of Sabinsa Corporation, New Jersey, obtained a U.S. patent for the employment of forskolin in promoting lean body mass. While forskolin was used parenterally in earlier studies, Majeed et al (1998)90 demonstrated that when introduced into humans via oral route, forskolin is in a position to market lean body mass. As a result of this commercial success, *Coleus forskohlii* has become a pharmaceutical crop, from the standard status of a weed. Presently about 40,000 acres are under *Coleus forskohlii* cultivation in India, Africa and South East Asia 91 *Coleus forskohlii* thrives well in porous and well-drained soils having a pH range of 5.5-7. It's cultivated widely in many parts of India, up to an altitude of 2400 metres. Because it doesn't require very fertile soils, it is grown with less expense in soils with marginal fertility. Experience shows that red, sandy loam is that the ideal soil. [9]

3.2) Irrigation :

The primary irrigation should incline immediately after transplanting. The irrigation should be avoided if there are rains during the amount. Thereafter, the crop should be irrigated once in three days, for 2 weeks after transplanting. Then after Only weekly irrigation is required. Good growth of plants and yield of Tubera may be ensured after a irrigation. it's beneficial for plant growth. [9]

3.3) Weeding :

Because of supply of fine amount of water within the fields, there intense competition from Weeds. Frequent weeding is required within the periods of time to encourage growth of the young pants.

3.4) Seedlings :

The plant are often cultivated by both from steam cutting seeding. Raising seedlings from seeds may be a difficult process, because the viability of seeds is poor. This method should be adopted just for breeding new varieties. For mass propagation of the plant, stem cuttings are found to be easy and ideal. Generally, 10-13 cm long stem cuttings, consisting of two to 4 pairs of leaves, are planted in well-prepared nursery beds. The seedlings should be taken care of well and watering should be regular. The cuttings develop roots within every week. The young plants should be transplanted to the most field, in a few month, after they will have developed sufficient number of roots. In most of the areas, Coleus forskohlii is planted during June-July, when the south-west monsoon sets in. Farmyard manure should be applied evenly within the field. The sector is further prepared into ridges and furrows, at a spacing of 60 cm. The rooted cuttings are planted 15 to 20 cm apart during a row. About 25,000 to 28,000 rooted cuttings are required for planting during a hectare. [9, 4]

3.5) Pests :

The foremost common pests of Coleus forskohlii are leaf-eating caterpillars and root-knot nematodes. The Caterpillars is controlled by spraying the plants and soak their roots with 0.1% methyl Parathion. The nematodes will be controlled by the appliance of carbofuran granules within the soil, at the rate of 20 kg/hectare.

3.6) Diseases :

The foremost important disease attacking Coleus forskohlii plants is Bacterial wilt. this is often caused by the Soil-borne pathogens Fusarium chlamydosporum, Rhizoctonia bataticola and Sclerotium rolfsii. Wilt By Fusarium chlamydosporum is characterized by gradual yellowing and drying of leaves, followed By loss of vigor and premature defoliation, resulting in death of the plants. Roots get discolored and Tap roots and lateral roots are destroyed.

within the case of infection by Rhizoctonia bataticola, Infection starts at the collar region of plants and therefore the affected tissues change into a watery mass. The Roots are infected and eventually disintegrate. In advanced stage, the aerial parts also rot. Leaves Turn soft and drop off, when plants are suffering from Sclerotium rolfsii.

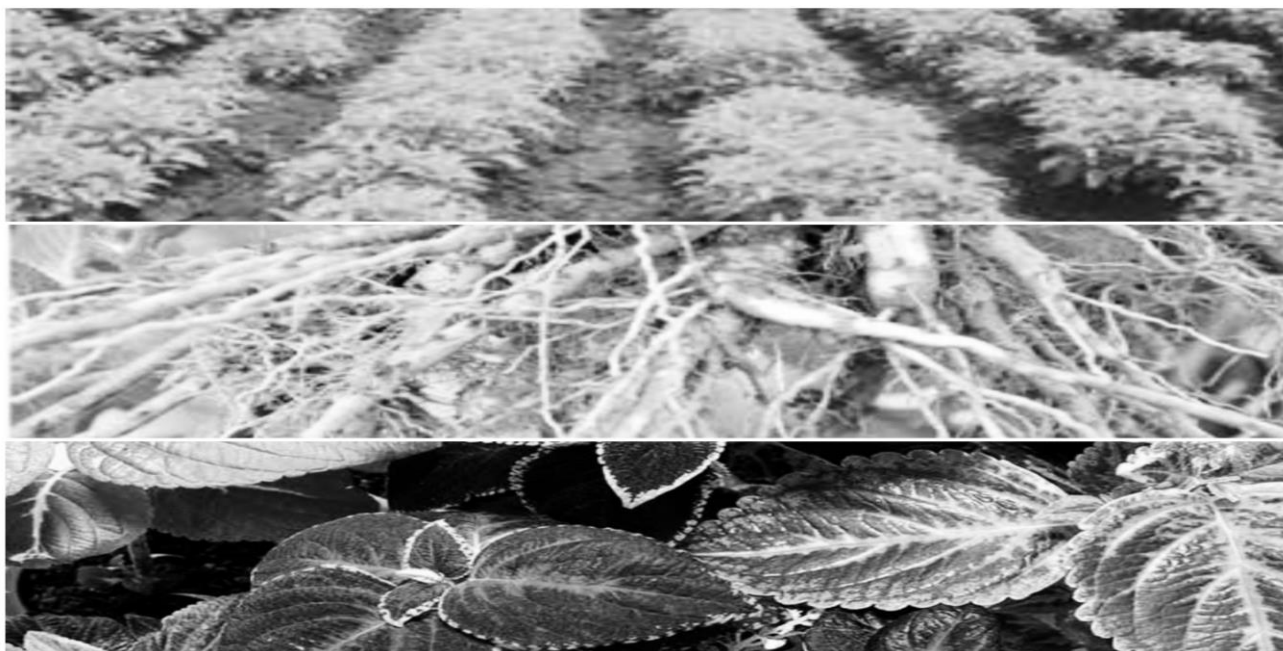
White, fan-shaped mycelia Strands creep over the stem and develop small, dark sclerotia on the affected parts. The sclerotia Soon turn brown and also the plants wither. Wilt will be controlled by applying farmyard manure and Trichoderma harzianum These Measures reduce wilt and improve root growth. Fernandes and Barreto (reported for the primary time leaf spots caused on the leaves by the Dematiaceous fungus Corynspora. [14, 9]

3.7) Harvesting :

Harvesting is sometimes done 5-6 months after planting the crop. To obtain more biomass of roots, flowers should be pinch off whenever they appear. It's advisable to irrigate the sector every day before the harvest, as this measure loosens the soil, making the pulling of roots easier. The roots are Pulled out manually, cleaned and washed. They are thereafter, chopped into small pieces, dried under Shade and stored in gunny bags.[9]

Cultivation in polyhouse:



Natural cultivation :

4)

PHYTOCHEMISTRY :

Forskolin was first reported as coleonol in 1974 by Dubey ; afterward it's been identified as Forskolin in 1977 . Forskolin have remarkable therapeutic efficacy and it's rapidly , directly or reversible activated adenylate cyclase resulting remarkable increases the intracellular Cyclic adenylic acid level . Forskohlin is reported as a fat burning agent . [4, 3 , 9]

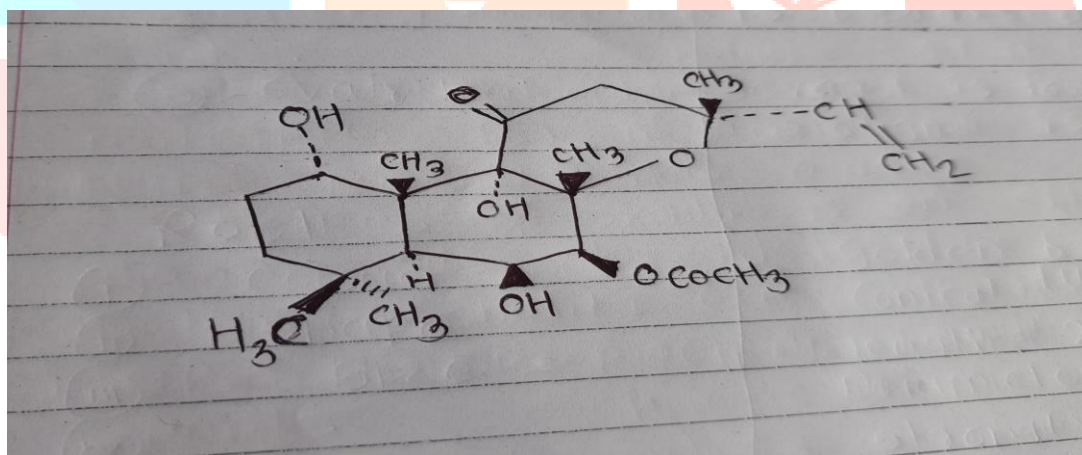
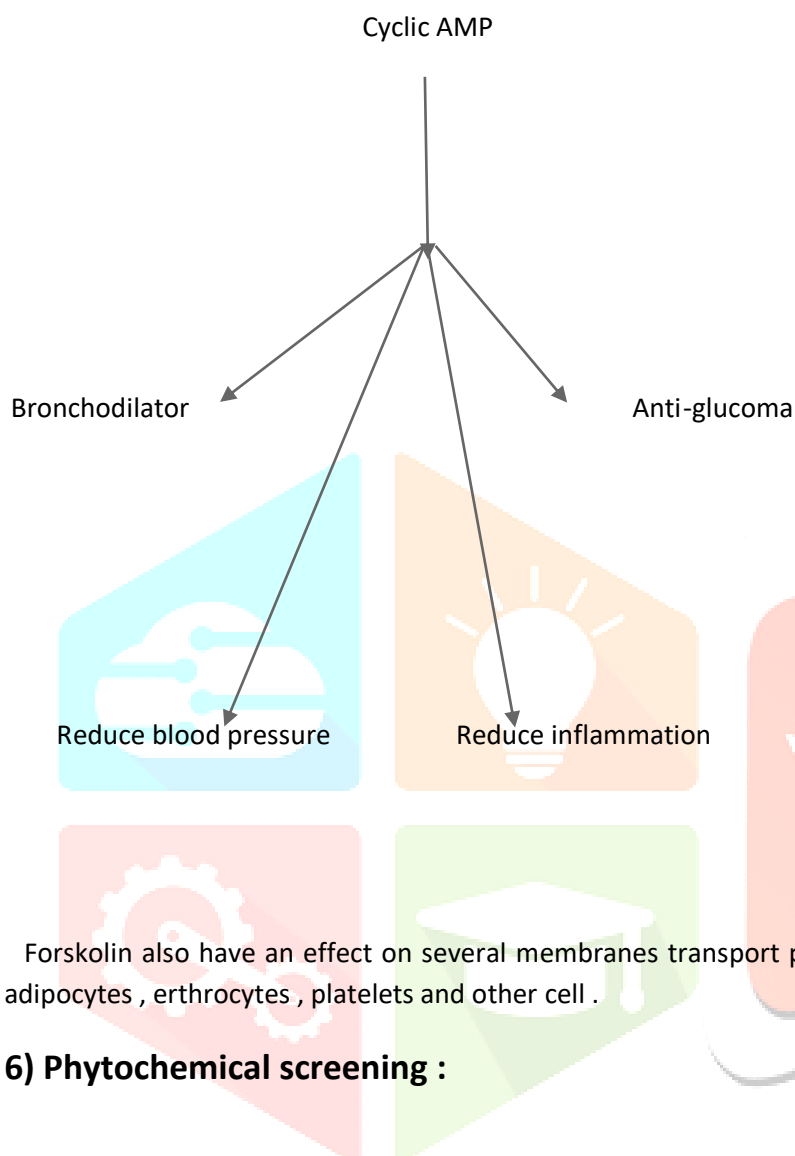


Fig : chemical structure of forskolin

5) MECHANISM OF ACTION :

Forskolin is extracted from root and tuber some how from leaves also . Forskolin could be a diterpene which is acts on adenylate cyclase. Adenylate cyclase enzyme activates cyclic AMP (CAMP) in cell . CAMP shows the assorted action like , bronchodilation , antiglucoma , reduce force per unit area , reduce inflammation etc . Forskolin stimulates adenylate cyclase activity without interacting with cell surface receptor . [5 , 17]

Forskolin activates adenylate cyclase



6) Phytochemical screening :

Phytochemical evaluation should be done using standard qualitative methods . Tests for presence of reducing sugars, tannis ,alkaloids, terpenoids , anthraquinones, cardiac glycosides, flavonoids , saponins, oils and fats, flavonoids and cardiac glycosides are listed below : [4 , 3 , 9 , 13]

6.1) Alkaloids (Wagner's test) :

The extract of plant (leaves, root or any a part of the plant) was added Wagner's reagent. A reddish-brown precipitate indicates the presence of alkaloids. [4]

6.2) Cardiac glycosides (Keller-Killiani test) :

The extract was diluted in water. Then glacial carboxylic acid was added with a drop of ferric chloride solution. Then concentrated sulphuric acid was wont to underplay this. A brown ring at interface shows presence of cardenolides. [9]

6.3) Carbohydrates :

In a test tube filtrate was treated with Fehling's solutions (A and B) and was heated. The looks of a red precipitate indicates the presence of reducing sugars. [3]

6.4) Flavonoids :

caustic soda was added to the extract. Formation of a deep yellow color that decrease when some drops of dilute vitriol (sulphuric acid) are added indicates presence of flavonoids. [4]

6.5) Saponins (Foamtest) :

In test tube H₂O was added to the extract and shaken vigorously. Their was the formation of froth or bubbles. Emulsion formation on mixture of the froth with oil indicates the presence of saponin. [9]

6.7) Amino acid :

The filtrate was treated with drops of ninhydrin solution placed in boiling water bath for 1-2 min and their is formation of purple color is indicates the presenceof amino acid. [4]

6.8) Reducing sugars (Fehling's test) :

Extract is added in water was mixed with boiling Fehling's solution (A and B). A brick-red, orange or yellow precipitate showed the presence of reducing sugars.

6.9) Steroids :

The powder was dissolved in of chloroform in an exceedingly dry tubing. Ten drops of anhydride and couple of drops of concentrated oil of vitriol (sulphuric acid) were added. Then solution became red, then blue and last it became bluish which indicates the presence of steroids. [9]

6.10) Terpenoids (Salkowski' stest) :

Extract was added to chloroform. Then 2 -3 drops of concentrated sulphuric acid was carefully added to the edges of the tubing mark layer. Reddish-brown color at the interface shows the presence of terpenoids.

6.11) Phenolic compounds :

1ml of extract has to added into 2ml of distilled water and some drops of 10% ferric chloride solution is added then formation of blue or green color indicates presence of phenol. [13]

6.12) Tannins (Ferric chloride test) :

Little amount of extract have to taken and after that mixing of extract with basic lead acetate solution shows the white precipitate formation which indicates presence of tannins. [13]

7) PHARMACOLOGICAL PROFILE :

7.1) Antiglaucoma activity :

Coleus leaves are getting used in treatment of Forskolin, increased intracellular CAMP concentration directly without cell surface mediation, consequently lowered intraocular pressure (IOP) or lowered force per unit area in monkeys, rabbits and human. In 1984 studied with 1% forskolin and acetazolamide suspension to rabbit eyes. Results indicated that IOP was reduced when administered topically. Study has been administered with 20 young normal Japanese volunteers. 50 µl of 1% forskolin was instilled in one eye. After two instillations of the drug at an interval of 5 min; IOP and aqueous rate was reduced. developed forskolin nanocrystals; which exhibits controlled drug release property and have greater potential in glaucoma therapy. 98 % forskolin were subjected to matrix-controlled ophthalmic administration. Results indicated that forskolin significantly reduced IOP up to 24 hrs and an increased corneal residence till 12 hrs, which is an enviable attribute for an antiglaucoma action. [6]

7.2) Asthma :

Forskolin was studied as bronchodilator for its potential use within the treatment of asthma. It blocked bronchospasm, the chief characteristic of asthma and bronchitis in guinea pigs caused by histamine and leukotriene C-4. In human basophils and mast cells, forskolin blocked the discharge of histamine and leukotriene C-4. A study involving human revealed that inhaled forskolin powder formulations were capable of causing bronchodilation in asthma patients. Forskolin seems to be a promising drug if utilized in an appropriate dosage for treatment of patients with asthma. Antiasthmatic activity Inhalation of forskolin by healthy nonsmoker volunteers and asthmatic patients was reported to boost respiration after provocation of bronchospasm. It has been reported that forskolin shared with salbutamol, relax the sleek (smooth) muscles of the airways and produced bronchodilator effects in guinea pigs. Clinical trial with forskolin dry powder capsules resulted in measurable bronchodilation in 16 asthmatic patients. At a public hospital in Mexico, 40 patients of either sex laid low with mild or moderate persistent asthma were assigned randomly to six months of treatment with forskolin at a dose of 10 mg/day orally (capsules) or with two inhalations of sodium cromoglycate in every 8 hrs. Results indicated that forskolin was almost 52.9 % or yet one more effective than sodium cromoglycate in preventing asthma attacks in patients. C. forskohlii extract (standardized with 10 % forskolin), could be utilized in alternate antiasthmatic therapy. [5]

7.3) Anti-obesity activity and weight management :

Crude extracts of C. forskohlii and its phytoconstituents are reported for potential therapeutic effects on weight management and obesity. Reports are available on topical application of forskolin cream to cut back local fat from the thigh of obese women without diet or exercise. Effects on appetite by C. forskohlii supplement in mildly overweight women were evaluated. Significant reduction within the satisfaction of food consumed in treated group, suggesting that there was less enjoyment in eating and thus intensity of food consumption was less. 250 mg of standardized C. forskohlii extract containing 10 % forskolin was administered to six overweight women twice daily for 8 weeks. After some days reduction of body fat was observed and average weight was reduced. Forskolin supplement enhanced fat loss without loss of muscle mass and is being available in conventional capsule dosage form in market. [6]

7.4) Antimicrobial activity :

C. forskohlii leaves extract exhibited antibacterial activity against 5 human pathogenic bacteria like Staphylococcus aureus, salmonella typhosa, staphylococcus epidermidis, Klebsiella pneumoniae and Vibrio parahemolyticus. Water, hexane, chloroform, Ethanol, methanol, ethyl acetate, petroleum ether, and acetone extracts showed promising antibacterial and antifungal activity. Remarkable antimicrobial potential of the C. forskohlii extracts against bacteria like S. aureus, K. pneumoniae, Pseudomonas fluorescens, Bacillus pumilus and fungi like Aspergillus parasiticus, Aspergillus flavus, Trichoderma rubrum, Microsporum gypseum are reported by Saklani et al. Hexane, ethanol, chloroform and water extracts of C. forskohlii showed superb inhibition potential against gastrointestinal pathogens. Several reports indicated that gram-negative bacterial strains are more susceptible to the Coleus crude extracts than gram-positive strains. Nanoparticles were synthesized from C. forskohlii root extract with caustic; it's been observed that synthesized nanoparticles were active against clinically isolated 7 pathogenic bacteria and 5 fungi. Crude root, shoot and leaf extracts have potential broad spectrum antibacterial activity. [6, 17, 11]

7.5) Antithrombotic effect :

Forskolin inhibits platelet aggregation through adenylate cyclase stimulation, increase the effects of prostaglandins. Its antithrombotic properties may be enhanced by cerebral vasodilation and it was observed in rabbits. The vasodilation was not potentiated by adenosine. The use of crude C. forskohlii extract as a rational phytotherapeutic antithrombotic has been proposed. [5]

7.6) Urinary tract protection :

In case of E. coli infection in mice urinary bladder forskolin has been administered intravenously or injected directly into the bladder. This induced exocytosis of bladder epithelial cells fusiform vesicles and reduced the amount of intracellular E. coli. Calcium oxalate urolithiasis (kidney stone) urinary risk factor was studied with ethanolic extract of C. Forskohlii in albino rats. Positive effect on urolithiasis risk factors was observed and occurrence of stone was decreased. [6]

7.7) Cosmeceutical use :

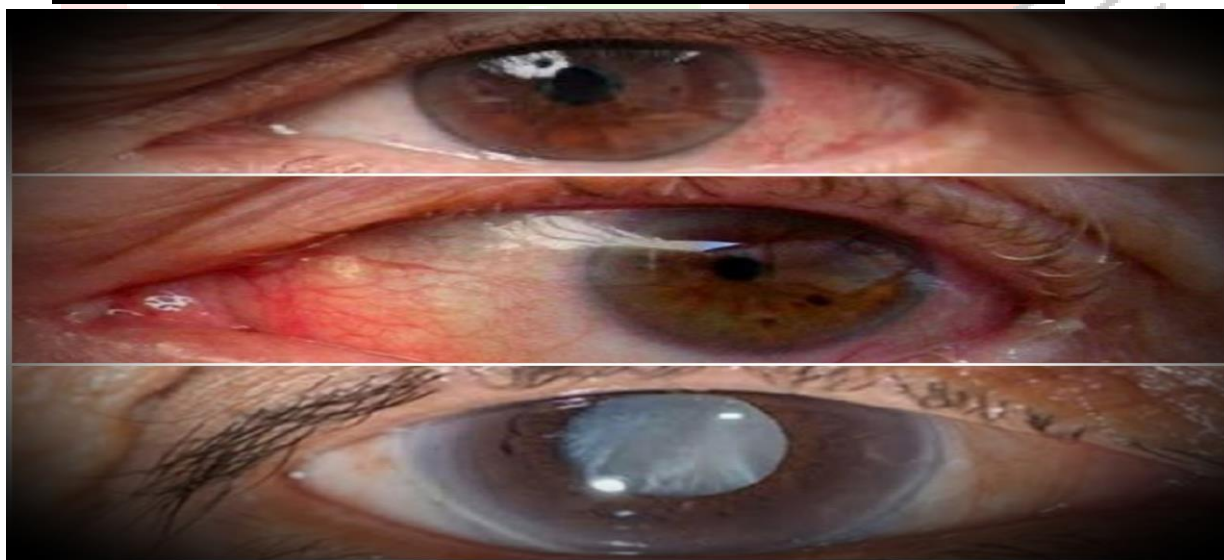
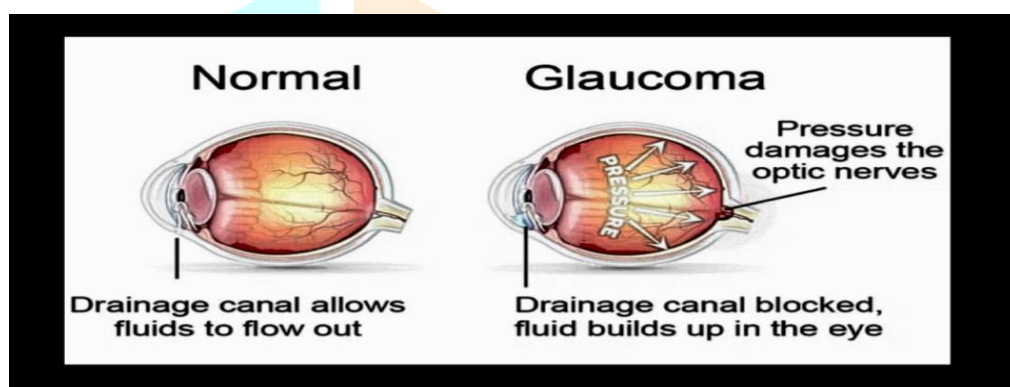
Coleus oil has been found to inhibit the expansion of Propion bacterium acnes related to acne. It's being employed in preparation of oral hygiene product to stop the expansion of Streptococcus mutans, the etiological agent of cavity. Extract has been reported to be safe for preparation of cosme-ceutical formulation. C.forskohlii root extract is also used as a billboard source to perform topical chemical manipulation of pigmentation. [6]

8) GLAUCOMA

Glaucoma could be a group of eye conditions that damage the optic tract, the health of which is significant permanently vision. This damage is usually caused by an abnormally high pressure in your eye.

Glaucoma is one in every of the leading causes of blindness for people over the age of 60. It can occur at any age but is more common in older adults. Lots of people in rural and semi Urban areas suffer from eye diseases like Diabetic Retinopathy, Glaucoma, Age based Macular Degradation etc. Glaucoma may be a Pathological condition of nervus opticus damage And is second leading explanation for vision loss. It's called silent thief of sight. It comes together with an ongoing destruction of optic tract head (ONH) caused by a rise in force per unit area within eye. The optic Nerve carries image information to brain. Because of damage to sizable amount of nerve fibres, a Blind spot is made resulting in loss of vision. One amongst the indications of glaucomatous eye is Change in appearance of optic disc. Point is elliptical in shape having bright Orange-pink color with a pale centre. Due to Degeneration of fibre orange pink color Disappears and become pale. i.e enlargement Of depression called cup and thinning of Neuro retinal rim. The pale centre called cup Isbarren of neuro retinal tissue.

Fig : Normal eye vs glucoma infected eye



8.1) C . Forskohlii as a antiglucoma agent :

There are numbers of beneficial treatment for glucoma and coleus is one of them because it is more efficacious and have less side effects . C.forskohlii has a forskolin as diterpenoid which reduces intraocular pressure by reducing aqueous humor inflow without any change in outflow facilities which shows potential of forskolin as a therapeutic agent in the treatment of glucoma . Reduction in IOP using forskolin was studied with some animals like rabbits , monkeys . Forskohlin has been widely studied by many research for glucoma and IOP . But for an unspecified reasons nond of the companies materilastic it for treatment of glucoma and IOP for long time .

After exploratory studies forskolin 1%W/V aqueous solution has been developed from suspension form of it developed earlier by Hoeches . Hoechest formulate this formulation using forskolin in water suspension upto the concentration of water 6% . The efficacy and saftey of forskolin formulation has been studied in New Zealand on albino rabbits . Forskolin ophthalmic solution has been granted and also approved by drug controlled generally of India in august 2006 , which was developed by the Bangalore based semi labs . Semi labs first developed a 1% forskolin solution . [11]

Ophthalmic insert drug delivery system (OIDDS) for forskolin showed a significant reduction in IOP . In other study case forskolin and rutin are given in open angle glucoma as food supplements to 16-20 patients. After certain period of time their IOP level values are measured. This study case shows that their is decrease of IOP roughly by 20 % as compared to initial value .

9) Marketed preparation :

Now a day's their are different companies manufactured the various type of formulation using C. Forskolin some of the marked product of C.forskholii are listed below :

9.1) Organic forskolin : tablet

Brand : GEO – FRESH

Organic forskoli is traditionally used in Ayurveda for breakdown of store fats and weight management . Support metabolism to regulate body mass with lessens fatigue and maintain the blood pressure already within normal range .

Suggested use : Adults , 2 tablet twice a day before meals .



9.2) Forskolin 95+ : capsule

Brand : PEScience

Ingredient : C. Forskohlin root extract , Hemerocallis Fulva extract .

Used : Ditary supplements



9.3) Forskolin :

Brand : Nutriosys

Products detail : Forskolin root extract increases thermogenesis and help to manage fat level in body .

- Benifits :**
- i) It can help to increase thermogenesis in the body .
 - ii) forskolin helps to breakdown of body fat



9.4) Forskolin fat loss diet 68 liquid soft gel :

Brand : Irwin natural

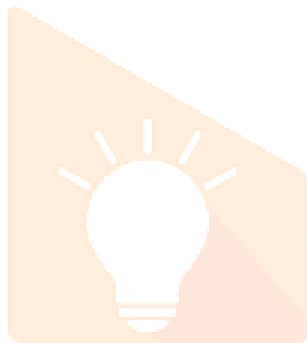
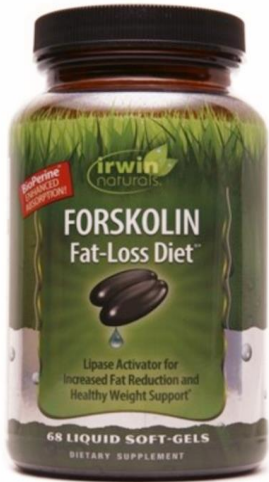
Ingrident : C.forskohlii root extract, beeswax , caramel etc .

Forskolin Fat-Loss Diet: Forskolin is an extract derived from the Coleus plant. Researchers have discovered that Forskolin promotes the breakdown of stored fat in the body.

Reduce Fat Mass

Lipase Enzyme Activator for Increased Fat Reduction & Healthy Body Weight

Lipo-Stimulator



9.5) Muscle Monk :

Benifits :

- It helps to manage craving
- Promotes natural energy
- Support metabolism



10) Conclusion :

During the review study I found that herbal medicine are most effective for various diseases. Herbal products have low toxic effects than conventional preparation. Herbal products helps in natural healing there are future scope for different preparation using Herbal Ingridents . Medicinal Plants provide basic raw material for medicine which have high demand now a day's .

Coleus forskohlii is an effective to various disorders or diseases like glucoma , asthma , urinary tract infection , etc . And their is fyture scope to prepare an formulation using this plant as it high high medicinal value .

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