**A Phytopharmacological scientific update on *Eleocarpus ganitrus* (Rudraksh)**

**Dr. Mayank Kulshreshtha1\*,** Dr. Manjul Pratap Singh2

1Department of Pharmacology, School of Pharmacy, Babu Banarasi Das University, Lucknow, Uttar Pradesh, India.

2Professor and Principal, ABESIT Collage of Pharmacy, Ghaziabad (U.P.), India.

**Address for correspondence:**

**Dr. Mayank Kulshreshtha**

Bentham Science Ambassador and Sr. Assistant Professor, School of Pharmacy. Babu Banarasi Das University, Babu Banarasi Das City, Faizabad Road, Chinhat, Lucknow-227105, Uttar Pradesh, India.

Moble number: +91-9897083663

E.mail: [professormayank@gmail.com](mailto:professormayank@gmail.com)

**Abstract**

Nature is the main and important source of many things in which plants are like a boon for humane population in which *Eleocarpus ganitrus* (*E. ganitrus*) is found to be most important cardio protective plant. It is a huge tree, commonly known as Rudraksha tree in India. Rudraksha tree is considered as a holy tree and enjoys great respect and devotion of Hindu community. Here this chapter constitutes the phytopharmacological and molecular aspects of *E. ganitrus* which may be helpful in near future on behalf of available data on google, pubmed, scholar etc. This chapter opens the various new aspects in near future. This chapter contained all necessary aspects and facts regarding *E. ganitrus* which proved that it is most important plant for humans.

**Key words;** *Eleocarpus ganitrus,* pharmacology, pharmacognosy.

**INTRODUCTION OF MEDICINAL PLANTS**

Before the timing of synthetic compounds or medicines, humans being trusted the curing properties of herbals compounds. People made this believed due to mythological point of view, according to this herbals plants are god gifted to fulfill the demands of humans with food, treatment, and lots of necessary things. According to World Health Organization, 80% of people believed on herbal medicine for their basic healthcare system. Medicinal plants are the main foundation of traditional medicine system, which means more than 3.3 billion people in the less developed countries utilize medicinal plants on a daily basis [1]. Near about 2000 mythological groups exist in the world and they believe in their own medicinal system and their experience [2, 3].

By definition, ‘traditional’ use of herbal medicines implies substantial historical use, and this is certainly true for many products that are available as ‘traditional herbal medicines’. In many developing countries, a large proportion of the population relies on traditional practitioners and their armamentarium of medicinal plants in order to meet health care needs. Although modern medicine may exist side-by-side with such traditional practice, herbal medicines have often maintained their popularity for historical and cultural reasons. Such products have become more widely available commercially, especially in developed countries. In this modern setting, ingredients are sometimes marketed for uses that were never contemplated in the traditional healing systems from which they emerged. An example is the use of ephedra (= Ma huang) for weight loss or athletic performance enhancement [4]. While in some countries, herbal medicines are subject to rigorous manufacturing standards, this is not so everywhere. In Germany, for example, where herbal products are sold as ‘phytomedicines’, they are subject to the same criteria for efficacy, safety and quality as are other drug products. In the USA, by contrast, most herbal products in the marketplace are marketed and regulated as dietary supplements, a product category that does not require pre-approval of products on the basis of any of these criteria [5].

**INTRODUCTION OF *Eleocarpus ganitrus***

*Eleocarpus ganitrus* (*E. ganitrus*) is a huge tree (commonly known as Rudraksha tree) in India. Rudraksha tree is considered as a mythological tree and has a great respect and devotion in Hindu community. *E. ganitrus* is an evergreen tree which grows up to 50-200 feet height. *E. ganitrus* is famous for its beautiful fruit stones called beads which are covered by an outer shell of blue color on fully ripening so that they are also called blueberry beads [6]. It finds a prominent place in Hindu religion and Ayurveda, the ancient Indian system of medicine. In Hindi it is known as Rudraksha [7]. Rudrakasha fruits are thermogenic, sedative and are useful in cough, bronchitis, neuralgia, cephalagia, anorexia, migraine, manic conditions and other brain disorders [8]. The flesh or pulp of drupe is given in epilepsy, diseases of head and in mental illness [9]. Besides it is reported to exhibit multifarious pharmacological activities that include anti-inflammatory [10], analgesic[11], sedative[11], antidepressant [12], antiasthmatic [13], hypoglycemic [14], antihypertensive [15–17], smooth muscle relaxant [18], hydrocholeretic [18], antiulcerogenic [19] and anticonvulsant [20]. A detailed study on pharmacognostic standards of Rudraksha is lacking. In ancient Indian medicine, the fruits were employed to ward off evil spirits and omens which can be considered to be at least partly manifestations of microbial infection. In addition, the Rudrakasha extracts also known to exhibit very high antimicrobial activity [21].

**Scientific Classification [22]**

**Kingdom**: Plantae

**Division:** Magnoliophyta

**Class:** Magnoliopsida

**Order**: Oxalidales

**Family**: Elaeocarpaceae,

**Genus:** Elaeocarpus

**Species:** *E. ganitrus* Roxb.

**Vernacular name [23]**

**Sanskrit:** chattu sampangi, rudraksha, bhutnasan

**Hindi:** rudraki, rudraksha

**English:** utrasum bead tree, wooden, begger bead

**Gujarati:** rudraksh

**Bengali:** rudrakya

**Kannada:** rudrakshi mara, rudraksh

**Malayalam:** rudraksha, rudraksam

**Marathi:** rudraksha

**Punjabi:** rudraksha

**Tamil:** rudraksha, ruttiratcam

**Telgu:** rudraksha, rudraksi

**Assam**: rudrai, ludrok,udrok

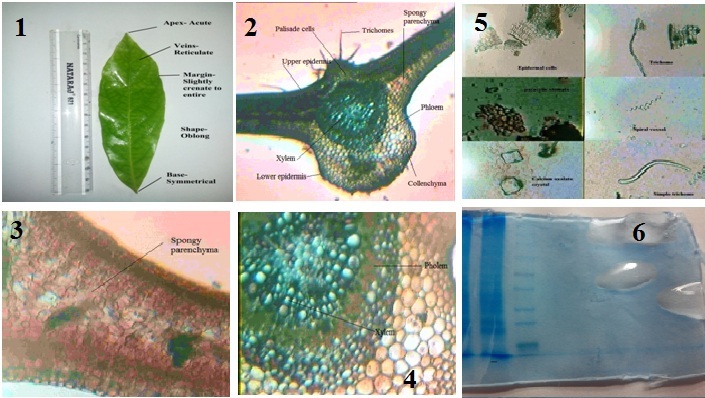
**Other:** sivaksha, sarwaksh, paawan, nilkanthaksha, haraksha, sivpriy

**Geographical Distribution**

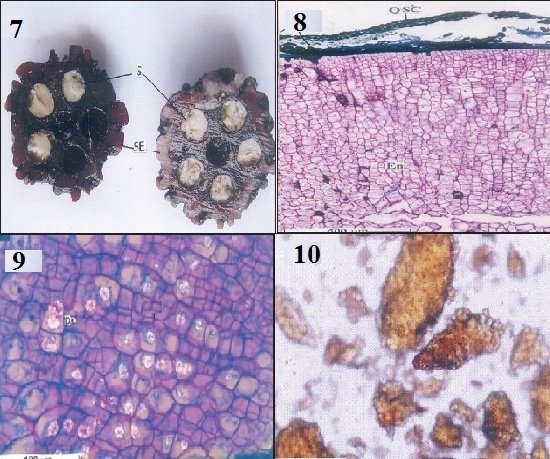
*E. ganitrus* is commonly grows in many countries including India, Bangladesh, Bhutan, Maldives**,** Nepal, Pakistan Indonesia, New Guinea to Australia, Guam, Hawaii and Srilanka. In India *E. ganitrus* is distributed in Eastern Himalayas in Arunachal Pradesh, Bihar, Madhya Pradesh and the Konkan Ghats. As per recent studies, the population of the rudraksha tree in India is dwindling at an alarming rate. The decrease in the population is mainly attributed to the over-exploitation of the species and also, to the large-scale disturbances in their habitats. The tree reproduces by means of seeds. The increased seed collection by local people has resulted in the shrinkage of the natural seed bank in the soil. This in turn has adversely affected the regeneration of the species. Thus, the tree is being pushed to the threatened category (currently not listed in the Red data book) and may even become extinct in the future if immediate conservation measures are not taken up [24].

**PHARMACOGNOSY OF *Eleocarpus ganitrus***

Pharmacognosy of different parts are as follows.Accourding to Mayank et al., (2019) *E. ganitrus* is an evergreen tree, grows up to 50-200 feet height. the leaf of *E. ganitrus* (Fig. **1**) is compound, light green in color, acute apex, reticulate veins,12 to 15 pairs of vein, slightly crenate to entire margin, oblong shape with symmetrical base. The size of leaf is average 15 cm long and 4cm in width. Leaf is bitter in taste and odorless. Transverse section of *E. ganitrus* leaf (Midrib and Lamina) also showed the presence showed the presence of the different areas such as upper epidermis, lower epidermis and mesophyll (Fig. **2**). The upper epidermis and lower epidermis both were single layered covered with cuticle, polygonal, straight and few contain mucilage. The spongy parenchyma 5- 8 layered, tight, no intracellular spaces (Fig. **3**). Covering trichomes were present on both of the epidermis and they were unicellular, long, dagger shaped with bulbose base. The middle portion showed the presence of xylem was lignified cells present at ventral surface where phloems were non lignified present at dorsal surface (Fig. **4**). Powder microscopy of *E. ganitrus* proved the presence of calcium oxalate crystals, epidermal cells, paracytic stomata, lignified trichomes, spring shape trichomes (Fig. **5**). Screened proteins from *E. ganitrus* leaves extract were 10, 25, 30, 35, 48, 50, 55, 70 kilodaltons (kDa) etc which may play an important role in various disease in future (Fig. **6**) [19].

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**Figure 1:** Morphology of fresh leaf**, Figure 2:** Transverse section of *E. ganitrus* leaf**, Figure 3:** Transverse section of *E. ganitrus* leaf showing spongy parenchyma**, Figure 4:** Transverse section of *E. ganitrus* leaf showing Pholem and Xylem, **Figure 5:** Powder microscopy**, Figure 6:** Screening of different proteins.

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**Figure 7:** Transverse section (TS) of stony endocarp of *E. ganitrus* fruit,  **Figure 8:** TS of E. ganitrus seed**, Figure 9:** Transverse section of E. ganitrus seed with calcium oxalate druses (Dr) in the endosperm **Figure 10:** TS of E. ganitrus seed showing thick masses of sclereids.

The fruit had a hard, stony endocarp or sclerotesta. The surface of the endocarp was black, deeply folded, and hard with ridges and furrows. Mesocarp was not seen in the fruit. The fruit included five or six carpels, each carpel having a single large seed ([Fig.](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2929793/figure/F0001/) **7**). In sectional view, the seed was elliptical and consisted of a membranous seed coat. The seed coat enclosed a dense cellular endosperm ([Fig. **8**](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2929793/figure/F0002/)). The seed coat, though membranous, is differentiated into outer darkly staining cell layer and inner vertically oblong compact dark cell layer. They have dense accumulation of tannins. The middle seed coat has two or three layers of circular brachysclereids or stone cells. Their walls are highly lignified. The sclereids have dark cell contents. The endosperm cells are in parallel compact rows. They extend from periphery to the centre; the cells are squarish and thin walled. The cells towards the periphery are smaller and they become gradually larger towards the centre of the seed. The endosperm cells have large calcium oxalate druses or sphaerocrystals. The crystals are either one or two per cell. They are random in distribution ([Fig. **9**](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2929793/figure/F0003/)). The druses are 10 μm in diameter. The stony endocarp or sclerotesta consists of only sclereids. No other cell types or cell inclusions are evident in the powder ([Fig. **10**](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2929793/figure/F0004/)). The sclereids may be short or elongated. The short sclereids are isodiametric. The sclereid walls are highly lignified; the cells have wide lumen with brownish content [25].

**Antimicrobial potential**

Accourding to research, In vitro antifungal activity of all the extracts [petroleum ether extract (PE), chloroform extract (CE), ethanol extract (EE) and water extract (WE)] was carried out using the disk-diffusion assay and broth dilution test. The disk-diffusion assay was applied to determine the growth inhibition of fungi by extracts to be tested. Overnight fungal cultures (100 µl) were spread onto SDA. The extracts were applied to 8 mm disks (Whatman paper No.1). After 48 h of incubation at 25°, the diameter of growth inhibition zones was measured. MIC of all extractives was determined by broth dilution test which was performed in test tubes. The conidial suspension, which gave the final concentration of 1×105 CFU/ml, was prepared. A growth control tube and a sterility control tube were used in each test. After 24-72 h incubation at 25°, the MIC was determined visually as the lowest concentration that inhibits growth, evidenced by the absence of turbidity on the fungal strains, Asperagillus niger (MTCC-281), Candidum geotrichum (MTCC-3993), Candida albicans (MTCC-227), C. glabrata (MTCC-1637) and C. tropicalis (MTCC-230) using ketoconazole as the positive control. Minimum inhibitory concentration (MIC) is the concentration required to inhibit fungal cell proliferation by 50% after exposure of cells to test compounds. Inhibitory concentration in terms of MIC (mg/ml) was determined using turbidimetry method ([Table 1](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2929793/table/T0001/)). Maximum inhibition was observed for CE (MIC 1.5 mg/ml), followed by EE (MIC 4.0 mg/ml) on C. albicans. In the case of C. tropicallis maximum inhibition of MIC 5.0 mg/ml was observed for CE, whereas, no inhibition was observed for EE and WE. Maximum inhibition of MIC 3.0 mg/ml on A. niger was observed for CE and EE, which is followed by WE (MIC 5.0 mg/ml). It is also pertinent to mention here that various plant extracts showed no sign of inhibition on C. glabrata and G. candidum even at higher concentration [25]. Table 2 showed the antimicrobial activity of aqueous extract of *E.ganitrus* and ethanolic extract of *E.ganitrus* against *E.coli, Psudomonas aeruginosa, Aspergillus tubergensis, Bacillus subtilis* and *Staphylococcus aureus.*

**Table 1:** In vitro activity of *E*. ganitrus on various fungal strains

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Strains | Extracts | Dilutions (mg/ml) | | | | | | | | |
| C. albicans | 0.125 | 0.5 | 1.0 | 1.5 | 2.0 | 3.0 | 4.0 | 5.0 | Ketoconazole |
| CE | +++ | ++ | + | - | - | - | - | - | - |
| EE | +++ | +++ | +++ | +++ | ++ | + | - | - | - |
| WE | +++ | +++ | +++ | +++ | +++ | +++ | + | +++ | - |
| C. tropicallis | CE | +++ | +++ | +++ | +++ | +++ | ++ | + | - | - |
| EE | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | - |
| WE | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | - |
| C. glabrata | CE | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | - |
| EE | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | - |
| WE | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | - |
| C. geotricum | CE | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | - |
| EE | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | - |
| WE | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | - |
| A. niger | CE | +++ | +++ | +++ | +++ | +++ | - | - | - | - |
| EE | +++ | +++ | ++ | ++ | + | - | - | - | - |
| WE | +++ | +++ | +++ | ++ | ++ | + | + | - | - |

Where +++ (Highly turbid), ++ (moderately turbid), + (weakly turbid) and ‐ (No turbidity).

**Table 2:** Effect of different extracts of leaves on different microbial strains [26]

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Zone of inhibition by compounds at various conc. against different strains**  **(in mm)** | | | | | | |
| **Test Compounds** | **Conc.**  **(μg/ml)** | **Gram negative stains** | | **Fungal strain** | **Gram positive stains** | |
| ***EC*** | ***PA*** | ***AT*** | ***BS*** | ***SA*** |
| AEEG | 25 | 2.6±0.59 | 8.6±0.57 | 5.4±0.10 | 3.7±0.15 | 4.6±0.15 |
| 50 | 3.3±0.56 | 10.0±1.16**\*\*\*** | 7.3±0.56 | 5.0±0.73 | 5.7±0.18 |
| 100 | 4.3±0.54 | 11.3±0.57**\*\*** | 8.4±0.15**\*\*** | 8.2±0.15**\*\*** | 7.7±0.05 |
| EEEG | 25 | 2.6±0.59 | 8.6±0.57**\*\*** | 5.2±0.10 | 5.2±0.10 | 5.4±0.20 |
| 50 | 3.6±1.15 | 10.3±1.17**\*\*\*** | 6.4±0.26 | 6.4±0.26 | 6.7±0.22 |
| 100 | 4.3±0.54 | 12.3±0.59**\*\*\*** | 7.8±0.13 | 8.4±0.15**\*\*** | 7.7±0.18 |

Where**-**AEEG (aqueous extract of *E.ganitrus*), EEEG (ethanolic extract of *E.ganitrus*), *EC (E.coli), PA (P. aeruginosa), AT (A. tubergensis), BS (B. subtilis), SA (S. aureus)* (Fig. **11**)*.*

Values are mean ± SEM (n=3) one way ANOVA followed by Student- Newman-keuls test Where \* represents significant at p<0.05, \*\* represents highly significant at p< 0.01, \*\*\* represents very significant at p<0.001. When compared to control group.



**Figure 11:** Effect of ethanolic extract of *Eleocarpus ganitrus* against *Pseudomonas aeruginosa*

**Phytochemistry**

Rudraksha contains indolizidine type of alkaloids. Indolizidines are widely distributed in nature – in plants as well as in many animals. Their structures can be described either as derivatives of the aromatic bicyclic indolizine or as azabicyclo [4.3.0]-nonanes. The indolizidine alkaloids display a wide range of biological activities and have been the subject of numerous synthetic studies [27]. It also contains minerals, vitamins, steroids, flavanoids. Aqueous extract of leaves contains glycosides also. Ethanolic extract of leaves contains gallic acid, ellagic acid & quercetin. Seven isomeric alkaloids of molecular formula, C16H21NO2, have been isolated from the leaves of *Elaeocarpus sphaericus* (Gaertn.) K. Schum. Two of the alkaloids are identical (-)-isoelaeocarpiline and (+)-elaeocarpiline previously isolated from *E. dolichostylis*. The other alkaloids are Elaeocarpidine, (+)-Elaeocarpine, (+)-Isoelaeocarpin, Isoelaeocarpidine, Rudrakine . Study has been made of the alkaloids obtained by sodium borohydride reduction of some isomeric alkaloids. The structures and absolute configuration of seven alkaloids isoelaeocarpiline and elaeocarpiline and five new alkaloids have been determined [27].

**Traditional Uses**

All legends pertaining to the origin of Rudraksha describe them as tears shed by Lord Shiva. According to one story, Lord Shiva once entered a profound state of meditation for the benefit of mankind. When he emerged from this state and opened his eyes, the deep joy and peace that he felt were expressed as tears, which ran down his cheeks and fell on the earth. From his tears emerged the rudraksha tree. The word Rudraksha, in fact, comes from two Sanskrit words – ‘rudra’, a synonym for Lord Shiva and ‘aksha’ meaning eyes [28]. Ayurveda refers to this wonderful bead and gives details of rudraksha for strengthening body constitutions. The beads of rudraksha, its bark and leaves all are used to cure various ailments like mental disorders, headache, fever, skin diseases etc. Rudraksha may be worn either on wrist, arm or other parts of the body. As a blood purifier: Rudraksha shall be used for treating the blood impurities and strengthens the body substance. As antibacterial: Rudraksha can be used for treating the burns and marks. It can also be used for curing cough and breathing problems. For blood pressure: Rudraksha can be used to treat high blood pressure, heart diseases etc. As cosmetic product: Rudraksha can be used in cosmetics to bring skin glow, also brings in a charming face. For improving memory power: Rudraksha can be used for improving memory power when taken with milk. For all brain diseases: Rudraksha can be used for treating all brain diseases like brain fever etc. For controlling epilepsy: By using pulp of Rudraksha fruit or bark, can be used for controlling epilepsy. For curing liver related problems, jaundice, and stomachache: Rudraksha can be used for treating stomach pain and liver problems [29]. Table 3 showed the different types of Rudraksha with their benefits.

**Table 3:** Different Type of Rudraksha with their astrological importance [30-34]

|  |  |  |  |
| --- | --- | --- | --- |
| **Rudraksha type with shape** | **Planet and Zodiac sign** | **Major benefits** | **Astrological uses** |
| 1 Faced with half moon shape. Ruling god is ‘Shiva’ | Sun/Leo | Chronic asthma heart problems, mental anxiety, T.B, paralysis, stroke, eye problem bone pain and head ache | Enlightens the super consciousness, provides improved concentration and mental structure changes specific to renunciation form Worldly affairs. The wearer enjoys all comforts at his command but still remains unattached |
| 2 Faced with Two natural  lines or facets  on its surface.  Ruling god is ‘Ardhnarees  hwar’ | Moon/Canc  er, Scorpio | Impotency, renal failure, stress, anxiety, lack of concentration, depression, negative thinking, eye problems, mental chaos, hysteria and intestinal disorder | Blesses the wearer with 'UNITY'. It could be related to guru-shishya, parents-children, husband-wife or friends. Maintaining oneness is its peculiarity |
| 3 Faced with Three natural lines or mukhas on its surface.  Ruling god is ‘Agni’ | Mars/Aries,  Cancer, Leo,  Pisces | Depression, schizophrenia, weakness multifarious, directive of the menstrual cycley/menstrual stress, fixation or guilt induced complexes, blood pressure, mood swings, fever or weakness, jaundice and mental disability | The wearer gets free from sins or wrongs from his life and returns to purity. Ideal for those who suffer from inferior complexes, subjective fear, guilt and depression |
| 4 Faced with Four lines (mukhas) on  its surface.  Ruling god is ‘Brahma ji’ | Mercury/Ge  mini, Virgo | Blood circulation, cough and brain linked illness, asthma, hesitate, memory lapse and respiratory strip problems. | The wearer gains power of creativity when blessed. Increases memory power and intelligence |
| 5 Faced with five lines (mukhas) on  its surface.  Ruling god is ‘Kalagnni ji’ | Jupiter/Arie  s, Scorpio,  Pisces | Blood pressure, heart problems, stress, mental disability, fatness, anger management, diabetics, piles, neurotic and maladjustment problems. | Wearer gains health and peace. It increases memory also |
| 6 Faced with six lines (mukhas) on its surface. Ruling god is ‘Karkikaya ji’ | Venus/Taur  us, Gemini,  Virgo, Libra,  Capricorn,  Aquarius | Epilepsy and gynecological problems. | Saves from the emotional trauma of worldly sorrows and gives learning, wisdom and knowledge. Affects understanding and appreciation of love, sexual pleasure, music and personal relationships |
| 7 Faced with seven lines (mukhas) on  its surface. Ruling god is ‘Maa Mahalaxmi ji’ | Saturn/Taur us, Libra, Capricorn, Aquarius | Asthma, pharyngitis, impotency, foot related disease, respiratory and confusion. | It should be worn by those who are suffering from miseries pertaining to body, finance and mental set-up. By wearing this man can progress in business and service and spends his life happily |
| 8 Faced with eight lines (mukhas) on its surface. Ruling god is ‘Ganesh ji’ | Rahu | Stomach ache, stress, skin diseases and anxiety. | Removes all obstacles and brings success in all undertakings. It gives the wearer all kinds of attainments-Riddhies and Siddhies. His opponents are finished i.e. the minds or intentions of his opponents are changed |
| 9 Faced with nine lines (mukhas) on  its surface. Ruling god is ‘Maa Durga ji’ | Ketu | Work as mysterious medicine for treating strange diseases. | Wearer is blessed with lot of energy, powers, Dynamism and fearlessness, which are useful to live a life of success |
| 10 Faced with ten lines (mukhas) on  its surface. Ruling god is ‘Vishnu ji’ | None | Hormonal inequality in the body, mental insecurity and whooping cough. | This contains the influence of ten incarnations and the ten directions. It works like a shield on one's body and drives evils away |
| 11 Faced with eleven lines (mukhas) on  its surface. Ruling god is ‘Hanuman ji’ | None | Body pain, backache, chronic alcoholism and liver diseases. | Blesses wearer with wisdom, right judgment, powerful vocabulary, adventurous life, fearlessness and success. Above all, it also protects from accidental death. It also helps in Meditation and removes the problems of yogic practices |
| 12 Faced with twelve lines (mukhas) on  its surface. Ruling god is ‘Surya’ | Sun/ Leo, Sagittarius | Bone diseases, rickets, osteoporosis, mental disability and anxiety. | Wearer gets the quality of the sun - to rule and to move continuously with brilliant radiance and strength. Good for ministers, politicians, administrators, businessmen and executives. Removes worry, suspicion and fear. Increases self image and motivation |
| 13 Faced with thirteen lines (mukhas) on  its surface. Ruling god is ‘Indra ji’ | Venus/ Taurus, Gemini, Capricom, Aquarius | Muscular dystrophies | Showers all possible comforts of life one can ever desire. It gives riches and honor and fulfills all the earthly desires and gives eight accomplishments (Siddhies), and the god cupid (Kamadeva) pleases with the man who wears it. It is helpful for meditation and spiritual and materialistic attainments. |
| 14 Faced with fourteen lines (mukhas) on its surface. Ruling god is ‘Hanuman ji’ | None/Tauru s, Gemini, Capricorn, Aquarius | Brain related and many other types of disease. | Most precious divine gem - Deva Mani. It awakens the sixth sense organ by which the wearer foresees the future happenings. Its wearer never fails in his decisions. Its wearer gets rid of all the calamities, miseries, worries. It protects from ghosts, evil spirits and black magic. It provides the wearer safety, security and riches and self power. |
| 15 Faced- Pasupatinath ji with fifteen lines (mukhas) on its surface. | Rahu | Skin diseases, recurring miscarriage and still birth. It is measured as a blessing for women who are incapable to imagine and in such case both the partner should wear it for fruitfulness | This represents Lord Pashupati and is especially beneficial for economic progress. Its possesor is neither bereft of wealth nor inflicted by any kinds of skin diseases |
| 16 Faced- Hari ji and Shanker ji with sixteen lines (mukhas) on its surface. | Ketu | Leprosy, tuberculosis and lung diseases | It represents victory and the possessor is never affected by heat or cold. It is especially useful for the saints living in jungles. The house in which it is kept is free from fire, theft or robbery |
| 17 Faced- Vishwakarma ji with seventeen lines (mukhas) on its surface. | None | Memory lapse and body functional disorders | It represents Vishvakarma the builder of this world. It is very effective in gaining unexpected money. It is especially useful in attaining property, vehicles and all physical assets |
| 18 Faced- Bhairav ji with eighteen lines (mukhas) on its surface. | None | Mental harmonization and loss or power | It represents the mother earth. The possessor remains happy and healthy. It is especially beneficial for the pregnant women in protecting their child |
| 19 Faced- Vishnu narayan ji with ninteen lines (mukhas) on its surface. | Mercury | Blood disorder and spinal disorder | It represents Lord Narayana. The possessor is bestowed with all worldly pleasures. There is no scarcity in their life |
| Gauri Shanker / Shiva & Parvati with Two naturally joined Rudrakshas | None/Cancer, Scorpio | Sexual and behavioral disorders. | Regarded the best for peace and comfort in the family. If a man worships Gauri Shankar at his worshipping place, the pain and suffering and other earthly obstacles are destroyed and the peace and pleasure 1of family are increased |
| Ganesh Rudraksha/ Garbha - gauri/Parvat i & Ganesha with Two beads joined together naturally | None | Gynecological disorders | For women wanting to have children. Her motherhood gains perfection |
| Trijuti/tribhagi with Three naturally joined Rudrakshas are a rare phenomenon | None | Internal and external body disorders | Wearer becomes invincible |

**Pharmacological properties**

**Antiulcer potential**

**Mayank et al., 2019** evaluated the antiulcer potential of aqueous extract of *E. ganitrus* (AEEG) and ethanolic extract of *E. ganitrus* (EEEG) at the doses of 200 mg/kg and 400 mg/kg using pylorus ligation induced ulcers model, biochemical parameters. Hepatic, cardiac, hematological parameters have also done to find out the effect of different extracts on other major organs. Pharmacological potential showed that extracts treated and sucralfate treated groups showed significantly decreases in ulcer index in all above mentioned models, biochemical studies clearly showed the significantly decreases in volume, pH, free acidity, total acidity of gastric content and increases in gastric mucus parameters like protein, total hexoses, hexosamine, fucose, sialic acid and DNA level. The level of antioxidant enzymes like LPO (Lipid peroxidation), SOD (Superoxide dimutase) were decreased and CAT (Catalase) level was increased. Level of PC (Plasma corticosterone) was decreased. Hematological, hepatic, cardiac parameters found to be normal during extracts treatment. Histopathological analysis clearly supports the biochemical studies at various doses and it found to be effective in dose dependent manner. Conclusion of the research that obtained scientific data may helpful to prepare the monograph of the plant and *E. ganitrus* has antiulcer potential in a dose dependent. Detailed study needed for better exposure of plant (Tables 4 to 10) [19].

**Table 4:** Effect of different leaf extracts of *E. ganitrus* on ulcer index in pylorus ligation (PL) - induced ulcers

|  |  |  |  |
| --- | --- | --- | --- |
| **Group** | **Treatment** | **Pylorus ligation** | |
| **Dose (mg/kg)** | **Ulcer index (mm2/rat)** |
| 1 | Negative control | P.L | 13.5±0.94 |
| 2 | Sucralfate | 8.6 | 2.4±0.45\*\*\* |
| 3 | AEEG | 200 | 4.5±0.52\*\* |
| 4 | AEEG | 400 | 4.1±0.49\*\*\* |
| 5 | EEEG | 200 | 3.9±0.46\*\* |
| 6 | EEEG | 400 | 3.2±0.44\*\*\* |

Results were expressed as MEAN ±SEM, n=6 and \*p<0.05, \*\*p<0.001, \* \*\*p<0.001, when compared with negative control analyzed by one way ANOVA followed by Turkey test.

**Table 5:** Effect of AEEG and EEEG on gastric juice in pylorus ligation (PL) - induced ulcers

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Groups** | **Treatments** | **Dose**  **(mg/kg)** | **Volume of gastric content** | **pH of gastric content** | **Free acidity (mEq/I)** | **Total acidity (mEq/I)** |
| 1 | Negative control | P.L | 2.24±0.05 | 2.2±0.04 | 58.33±2.19 | 128±4.25 |
| 2 | Sucralfate | 8.6 | 1.02±0.01\*\*\* | 6.2±0.14\*\*\* | 26.34±0.21\*\*\* | 26.2±1.20\*\*\* |
| 3 | AEEG | 200 | 1.41±0.08\*\*\* | 3.6±0.10\*\*\* | 40.13±1.05\*\* | 49.8±1.23\* |
| 4 | AEEG | 400 | 1.36±0.06\*\*\* | 4.1±0.12\*\*\* | 39.12±0.26\*\*\* | 46.6±1.19\*\* |
| 5 | EEEG | 200 | 1.45±0.09\*\*\* | 4.2±0.13\*\* | 29.17±0.24\*\* | 57.6±2.01\* |
| 6 | EEEG | 400 | 1.39±0.06\*\*\* | 4.8±0.11\*\*\* | 22.14±0.15\*\*\* | 55.4±1.19\*\*\* |

**Table 6:** Effect of AEEG and EEEG on gastric mucus in pylorus ligation (PL) - induced ulcers

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Groups** | **Wt of mucus (gm)** | **Protein**  **(mg/g)** | **Total Hexoses (mg/g)** | **Hexosamine (mg/g)** | **Fucose (mg/g)** | **Sialic acid (mg/g)** | **Total Carbohydrate** | **DNA (µG/ml)** |
| 1 | 0.133±  0.001 | 36.67±  0.21 | 29.20±  0.10 | 35.32±  0.42 | 99.6±  1.64 | 1.58±  0.009 | 165.7±  1.29 | 93.6±  1.51\* |
| 2 | 0.182±  0.013\*\*\* | 52.29±  1.16\*\*\* | 42.29±  0.24\*\* | 73.28±  0.82\* | 139.3±  1.91\*\* | 4.24±  0.11\*\* | 259.11±  2.51\*\* | 246.5±  2.46\* |
| 3 | 0.156±  0.007\*\*\* | 44.32±  0.32\*\*\* | 39.29±  0.21\* | 62.21±  0.76\*\* | 132.5±  1.84\*\*\* | 3.52±  0.09\*\* | 237.52±  2.36\*\* | 184.2±  1.65\*\* |
| 4 | 0.161±  0.008\*\*\* | 51.67±  1.19\*\*\* | 44.31±  0.27\* | 64.29±  0.74\*\* | 135.4±  1.84\*\*\* | 3.61±  0.11\*\* | 241.67±  2.29\*\* | 188.3±  1.63\* |
| 5 | 0.162±  0.008\*\*\* | 41.26±  0.26\*\*\* | 40.16±  0.23\*\*\* | 59.21±  0.73\*\*\* | 124.5±  1.69\*\* | 3.51±  0.08\*\*\* | 227.38±  2.19\*\* | 173.8±  1.54\*\* |
| 6 | 0.165±  0.011\*\*\* | 44.08±  0.42\*\*\* | 46.28±  0.31\*\*\* | 61.23±  0.77\*\* | 131.3±  1.83\*\* | 3.54±  0.07\*\*\* | 242.35±  2.31\* | 182.4±  1.58\*\* |

Results were expressed as MEAN ±SEM, n=6 and \*p<0.05, \*\*p<0.001, \* \*\*p<0.001, when compared with negative control analyzed by one way ANOVA followed by Turkey test.

**Table 7:** Effect of AEEG and EEEG on hematological parameters in pylorus ligation (PL) - induced ulcers

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Groups** | **Treatments** | **Dose**  **(mg/kg)** | **HB (g/dl)** | **RBC**  **(×106 /µL)** | **WBC**  **(×103 /µL)** | **Urea (mg/dl)** | **Sugar (mg/dl)** |
| 1 | Negative control | P.L | 14.5±  0.61 | 7.2±  0.89 | 8.9±  0.92 | 18.22±  0.98 | 115.14±  2.01 |
| 2 | Sucralfate | 8.6 | 13.2±  0.53\*\*\* | 6.6±  0.23\*\*\* | 8.4±  0.86\*\*\* | 17.02±  0.69\*\*\* | 96.15±  1.44\*\* |
| 3 | AEEG | 200 | 14.5±  0.65\*\*\* | 6.9±  0.26\*\*\* | 9.0±  0.96\*\*\* | 17.09±  0.79\*\*\* | 96.10±  1.43\*\*\* |
| 4 | AEEG | 400 | 14.4±  0.59\*\*\* | 6.7±  0.24\*\*\* | 8.6±  0.89\*\*\* | 17.06±  0.74\*\*\* | 96.12±  1.41\* |
| 5 | EEEG | 200 | 13.7±  0.56\*\*\* | 6.8±  0.25\*\*\* | 9.2±  0.97\*\*\* | 17.12±  0.84\*\*\* | 96.07±  1.41\*\*\* |
| 6 | EEEG | 400 | 13.6±  0.55\*\*\* | 6.4±  0.23\*\*\* | 8.4±  0.86\*\*\* | 16.92±  0.61\*\*\* | 96.09±  1.43\*\*\* |

Results were expressed as MEAN ±SEM, n=6 and \*p<0.05, \*\*p<0.001, \* \*\*p<0.001, when compared with negative control analyzed by one way ANOVA followed by Turkey test.

**Table 8:** Effect of AEEG and EEEG on hepatic parameters in pylorus ligation (PL) - induced ulcers

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Groups** | **Treatments** | **Dose**  **(mg/kg)** | **Total protein**  **(g/dl)** | **Albumin**  **(g/dl)** | **Globulin**  **(g/dl)** | **ALP (U/L)** | **ALT (U/L)** | **AST (U/L)** |
| 1 | Negative control | P.L | 7.09±  0.17 | 3.07±  0.46 | 4.02±  0.39 | 82.26±  2.46 | 14.06±  0.95 | 14.05±  0.95 |
| 2 | Sucralfate | 8.6 | 8.06±  0.19\*\*\* | 3.22±  0.54\*\*\* | 4.84±  0.45\*\*\* | 78.02±  1.42\*\*\* | 13.01±  0.93\*\*\* | 10.32±  0.33\*\*\* |
| 3 | AEEG | 200 | 8.16±  0.21\*\* | 3.16±  0.51\*\* | 5.00±  0.58\* | 76.48±  1.26\*\* | 12.28±  0.92\*\* | 10.29±  0.31\*\* |
| 4 | AEEG | 400 | 8.18±  0.20\*\*\* | 3.19±  0.53\*\*\* | 4.99±  0.50\*\*\* | 77.12±  1.03\*\*\* | 12.36±  0.93\*\* | 9.97±  0.26\*\*\* |
| 5 | EEEG | 200 | 8.26±  0.23\*\* | 3.23±  0.54\*\* | 5.03±  0.59\* | 76.29±  1.24\* | 12.24±  0.91\*\* | 11.01±  0.35\*\*\* |
| 6 | EEEG | 400 | 8.29±  0.24\*\*\* | 3.13±  0.49\*\*\* | 5.16±  0.54\*\*\* | 78.23±  1.23\*\* | 11.26±  0.91\*\*\* | 10.11±  0.29\*\*\* |

Results were expressed as MEAN ±SEM, n=6 and \*p<0.05, \*\*p<0.001, \* \*\*p<0.001, when compared with negative control analyzed by one way ANOVA followed by Turkey test.

**Table 9:** Effect of AEEG and EEEG on cardiac parameters in pylorus ligation (PL) - induced ulcers

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Groups** | **Treatments** | **Dose**  **(mg/kg)** | **TC**  **(mg/dl)** | **TG**  **(mg/dl)** | **HDL (mg/dl)** | **LDL (mg/dl)** | **VLDL (mg/dl)** |
| 1 | Negative control | P.L | 64.32±  3.01 | 51.09±  1.98 | 18.19±  0.63 | 20.04±  0.99 | 10.02±  0.82 |
| 2 | Sucralfate | 8.6 | 53.31±  0.24\*\*\* | 50.26±  1.73\*\*\* | 20.19±  1.02\*\*\* | 17.19±  0.74\*\*\* | 9.53±  0.79\*\*\* |
| 3 | AEEG | 200 | 51.14±  2.06\*\* | 49.15±  2.01\*\* | 20.32±  1.08\*\* | 18.51±  0.79\*\* | 9.97±  0.83\*\*\* |
| 4 | AEEG | 400 | 50.12±  1.74\*\*\* | 50.16±  1.72\*\*\* | 21.29±  1.01\*\*\* | 18.52±  0.80\*\*\* | 10.02±  0.82\*\*\* |
| 5 | EEEG | 200 | 52.13±  2.10\*\*\* | 52.18±  2.15\*\* | 22.14±  1.12\* | 17.56±  0.83\*\* | 10.12±  0.79\*\* |
| 6 | EEEG | 400 | 50.16±  1.63\*\*\* | 51.16±  2.08\* | 22.09±  1.08\*\*\* | 18.01±  0.64\*\* | 10.11±  0.81\*\*\* |

Results were expressed as MEAN ±SEM, n=6 and \*p<0.05, \*\*p<0.001, \* \*\*p<0.001, when compared with negative control analyzed by one way ANOVA followed by Turkey test.

**Table 10:** Effect of AEEG and EEEG on LPO (Lipid peroxidation), SOD (Superoxide dimutase), CAT (Catalase), PC (Plasma corticosterone) in pylorus ligation (PL) - induced ulcers

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Groups** | **Treatments** | **Dose**  **(mg/kg)** | **LPO**  **(nmol/g wet tissue)** | **SOD (units/g wet tissue)** | **CAT (units/g wet tissue)** | **PC** |
| 1 | Negative  control | PL | 0.92±  0.04 | 216.5±  2.68 | 16.4±  0.12 | 36.2±  0.51 |
| 2 | Sucralfate | 8.6 | 0.42±  0.02\*\*\* | 133.6±  2.11\*\* | 26.5±  0.23\*\* | 22.4±  0.34\*\*\* |
| 3 | AEEG | 200 | 0.56±  0.08\* | 149.4±  2.26\* | 17.7±  0.16\*\*\* | 26.6±  0.64\*\* |
| 4 | AEEG | 400 | 0.53±  0.02\*\* | 148.7±  2.22\* | 18.6±  0.23\*\*\* | 25.9±  0.61\*\*\* |
| 5 | EEEG | 200 | 0.57±  0.04\*\* | 148.3±  2.26\*\* | 17.8±  0.18\*\*\* | 25.5±  0.58\*\*\* |
| 6 | EEEG | 400 | 0.54±  0.03\*\*\* | 145.7±  2.14\*\* | 18.8±  0.25\*\*\* | 24.2±  0.52\*\*\* |

Results were expressed as MEAN ±SEM, n=6 and \*p<0.05, \*\*p<0.001, \* \*\*p<0.001, when compared with negative control analyzed by one way ANOVA followed by Turkey test.

**Anti-diabetic potential**

The antidiabetic effects of the aqueous extract of E. ganitrus (EAG) was done in experimental animals. The hypoglycemic activity of the EGA was evaluated in normoglycemic rats by single dose at three graded dose levels, viz. 250, 500 and 1000 mg/kg of body weight. Antihyperglycemic activity of the extract was also evaluated at the same dose levels in streptozotocin (STZ) (60 mg/kg, i.p.)-induced diabetic rats during a 30-day treatment period. Metformin (500 mg/kg) was used as the reference drug. Fasting blood glucose and lipid parameters, viz. triglycerides, total cholesterol, high-density lipoprotein and low-density lipoprotein levels were measured. Acute oral toxicity of the EGA extract was carried out in Swiss albino mice. In normoglycemic rats, EGA showed a significant (P < 0.01) hypoglycemic effect at 2 h. In STZ-induced diabetic rats, the EGA treatment significantly (P < 0.05) decreased the blood glucose level in a dose-dependent manner during the 30 days of treatment period. EGA modulated lipid profile changes in STZ-diabetic rats in a dose-dependant manner. In the acute oral toxicity study, EGA showed no mortality till the 5 g/kg dose in mice. The present investigation shows that EAG seeds has potential antidiabetic effects (Table **11**) [35].

**Table 11:** Effect of the aq. extract of E. ganitrus on blood glucose levels in streptozotocin-induced diabetic rats

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Groups** | **Treatment** | **Blood glucose (mg/dl)** | | |
| **Day 0** | **Day 15** | **Day 30** |
| Normal control | |  |  |  |  | | --- | --- | --- | --- | |  |  |  |  |   0.5% NaCMC | 89.37 ± 3.92 | 93.67 ± 4.28 | 85.46 ± 4.81 |
| Diabetic control | 0.5% NaCMC | 294.66± 8.07# | 310.12 ± 10.85# | 332.71 ± 9.22# |
| EGA | 250 mg/kg | 282.75 ± 7.47# | 251.34 ± 9.09\*\* | 218.79 ± 10.08\*\* |
| EGA | 500 mg/kg | 305.11 ± 6.96# | 243.62 ± 7.61\*\* | 191.78 ± 10.75\*\* |
| EGA | 1000 mg/kg | 286.65 ± 6.53# | 201.73 ± 8.45\*\* | 168.37 ± 8.97\*\* |
| Metformin | 500 mg/kg | 288.89 ± 5.94# | 172.18 ± 7.3\*\* | 155.29 ± 9.68\* |

Values are expressed as mean ± SEM; *n* = 6; \**P* < 0.05;

\*\**P* < 0.01 vs. diabetic control group on different days

#*P* < 0.05 vs. normal control group; one-way ANOVA followed by Dunnett’s multiple comparisons test; EGA, aqueous extract of *Elaeocarpus ganitrus*

**Anti-anxiety potential**

In this research, The experimental study was conducted with the extract of *E. ganitrus* in comparison with Diazepam 1mg/kg in 60 mice using open field test and passive avoidance apparatus in six experimental groups. The data were analyzed using Mann-Whitney test and P<0.05 was considered statistically significant. There was a significant increase in number of square crossed, time spent in central square and rearing behavior of animal. There was also decreased significantly time prolongation in Step down latency and increase of attempts in step down errors as well as time spent in the shock zone. *E. ganitrus* showed anxiolytic effect. (Tables **12** and **13**) [36].

**Table 12:** Effect of drug observations in open field test

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S N** | **Group** | **Mean ±(SD)** |  |  |  |
|  |  | **No. of Animal** | **No. of Square** | **Central time** | **No. of rearing** |
| 1. | Control Normal Saline 10 ml/kg | 10 | 80.00± 2.98 | 5.80± 1.32 | 32.3 ± 1.89 |
| 2. | Diazepam 1 mg/kg | 10 | 145.70±4.29 | 17.80±1.54 | 58.10±2.51 |
| Diazepam vs control | |  | < 0.001 | < 0.001 | < 0.001 |
| 3. | Test drug 50 mg/ kg | 10 | 117.80±4.66 | 9.30±1.49 | 41.20±1.54 |
| Diazepam vs T 50mg | |  | < 0.001 | < 0.001 | < 0.001 |
| 4. | Test drug 100 mg/kg | 10 | 113.30±1.88 | 14.00±2.16 | 44.90±2.60 |
| Diazepam vs T 100 mg | |  | < 0.06 | < 0.001 | < 0.001 |
| 5. | Test drug 50mg + Diazepam 1mg | 10 | 163.40±9.14 | 20.00±2.10 | 60.20±2.39 |
| Diazepam vs T50mg+ diazepam | |  | <0.001 | < 0.029 | < 0.089 |
| 6. | Test drug 100mg + Diazepam 1mg | 10 | 164.00±8.11 | 20.80±2.09 | 61.30±1.88 |
| Diazepam vs T100mg + diazepam | |  | < 0.001 | < 0.004 | < 0.007 |

**Table 13:** Effect of drug observations in passive avoidance test

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S N** | **Group** |  | **Mean ± (SD)** | |  |
| **No. of** | **Step down** | **Step down** | **Time in** |
|  |  | **Animal** | **latency (second)** | **error** | **shock zone** |
| 1. | Control Normal Saline 10 ml/kg | 10 | 222.30±8.22 | 2.20± 0.42 | 30.70± 2.11 |
| 2. | Diazepam 1mg / kg | 10 | 90.10±4.38 | 7.70±0.82 | 152.60±3.13 |
| Diazepam vs Control | |  | < 0.001 | < 0.001 | < 0.001 |
| 3. | Test drug 50 mg/ kg | 10 | 87.40±5.73 | 4.10±1.19 | 118±5.23 |
| Diazepam vs T50mg | |  | < 0.190 | < 0.001 | < 0.001 |
| 4. | Test drug 100 mg/kg | 10 | 86.60±4.14 | 4.50±1.58 | 128.60±4.62 |
| Diazepam vs T100mg | |  | < 0.063 | < 0.001 | < 0.001 |
| 5. | Test drug 50 mg/kg + Diazepam 1 mg/kg | 10 | 76.10±4.77 | 3.10±1.37 | 147.60±2.06 |
| Diazepam vs T50mg + Diazepam | |  | <0.001 | < 0.001 | < 0.002 |
| 6. | Test drug 100 mg/kg + Diazepam 1 mg/kg | 10 | 83.20±6.47 | 3.90±1.28 | 144.80±3.79 |
| Diazepam vs T100mg +Diazepam | |  | < 0.019 | < 0.001 | < 0.001 |

**Antihypertensive potential**

Aqueous extract of *E. ganitrus* Roxb. seeds powder was evaluated for its antihypertensive activity in renal artery occluded hypertensive rats. Male Wistar rats (180-200g) were pretreated with aqueous extract of *E. ganitrus* for 6 weeks. Hypertension was induced in animals by clamping the renal artery with renal bulldog clamp for 4 h. Ischemia of the kidneys causes elevation of blood pressure by activation of the renin-angiotensin system. Elevated blood pressure of the animals was significantly (p<0.05) decreased by the aqueous extract of *E. ganitrus* at the dose levels of 25, 50 and 100mg/kg,i.v. Captopril, angiotensin converting enzyme inhibitor (ACE-I) at the dose of 1 mg/kg,i.v.showed significantly (p<0.05) reduced in the elevated blood pressure. The antihypertensive activity of aqueous extract of *E. ganitrus* may be due to the action on rennin-angiotensin system (Table **14**) [37].

**Table 14:** Effect of aqueous extract of *E. ganitrus* on renal artery-occluded hypertensive rats

|  |  |  |  |
| --- | --- | --- | --- |
| Groups |  | Mean Arterial Blood Pressure (MABP) in mmHg at different time interval |  |
|  | Treatment  (mg/kg) | MABP after 5 min 15 min 30 min  removing clip | 60 min |
| Normal  control | Distilled  water, *p.o.* | -------- 83.33±5.92 85.83±4.89 84.83±6.31 | 86.83±5.89 |
| Negative  control | Distilled  water, *p.o.* | 127.45±6.35 117.16±4.57@ 119.83±2.89@ 106.33±4.85@ | 103.33±6.19@ |
| *E. ganitrus* | 25, *i.v.* | 123.56±5.26 74.00±5.78\* 75.33±4.44\* 71.33±5.91\* | 69.00±4.81\* |
| *E. ganitrus* | 50, *i.v.* | 115.76±6.53 71.66±4.35\* 69.50±4.66\* 67.50±4.86\* | 71.33±6.64\* |
| *E. ganitrus* | 100, *i.v.* | 117.53±3.56 62.50±6.62\* 62.50±7.59\* 60.16±6.21\* | 60.50±6.97\* |
| Captopril | 1, *i.v.* | 122.89±4.89 49.66±2.34\* 39.16±4.08\* 34.50±3.86\* | 26.83±3.50\* |

Values in the results are expressed as mean± SEM, (n=6), @ p<0.05 significantly different in comparison with Normal control, \*p<0.05 significantly different in comparison with Negative control

**Anti-inflammatory activity**

Different fruit extracts (benzene, chloroform, acetone, petroleum ether and ethanol) of at a dose level of 200 mg/kg body weight was studied in rat paw edema using different inflammogens. The ethanolic and petroleum ether fruit extracts are effective against carrageenan, bradykinin and PGE. The chloroform fruit extract of showed effect against histamine. Chloroform extract, was essentially effective in 5-HT induced inflammation and ethanolic extract also inhibit histamine. In other study petroleum ether, benzene, acetone, chloroform, and ethanol fruit extracts showed significant antiinflammatory action against both acute and subacute models [38].

**CONCLUSION**

The chapter is clearly highlighted the all properties of *Eleocarpus ganitrus*. There are lots of important chemical constituents present in the plant which are responsible for the curing of disease. The plant traditionally very good cardio protective property. The above mentioned data regarding *Eleocarpus ganitrus* may be helpful for new researchers in future and more research are needed to better exploitation of plant.

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