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Review Article

Pharmacognostic study, traditional uses and pharmacological study of *Ficus racemosa*- A Critic Review.

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ABSTRACT

Ficus racemosa is a common Indian medicinal plant *belonging to family* Moraceae which is being used in ancient Indian medical method for long period of time to treat and control over the numerous diseases / disorders like diabetes, liver disorders, inflammatory symptoms, diarrhea, respiratory and urinary diseases. The different plant parts were found to be posses different pharmacological properties such as; anti-oxidant, anti-cancer, antidiuretic, antibacterial, anti-inflammatory, memory enhancing and gastro-protective agent etc. Given the many recent studies of interest on this herb, a detailed analysis of its typical applications, phytochemical constituents, and pharmacological effects is provided in this study. The focus in this review is on work relevant to Ficus racemosa Linn's pharmacognostic study, traditional uses and pharmacological study.

KEYWORDS

Ficus racemosa, pharmacognostic study, traditional uses, pharmacological study.

1. INTRODUCTION

Human beings have depended on nature for their simple requirements as being the sources for food stuffs, medicines, shelters, clothing, flavors, growth regulators and means of transportation throughout the ages. Medicinal plants have been playing an essential role in the various stages of human culture development. As a source of every medicine, Medicinal plants have always been at forefront virtually all cultures. From ancient time medicinal plants are regarded as rich resources of traditional medicines and which result these plants many of the modern medicines are prepared. So the large proportions of world's population medicinal plants continue to show a promising role in the healthcare system, especially in truly developing countries. For thousands of years medicinal plants have been used to treat health disorders, to add colour, flavour and to prevent diseases epidemics. The biological characteristics of plant generated secondary metabolites are usually responsible for of plant species used worldwide. [1] The development and recognition of medicinal as well as financial aids of these plants are on rise in both industrialized and developing countries. [2]

The plant *Ficus recemosa* Linn. is a large deciduous tree, belonging to the Order Rosales, Family Moraceae, eearlier this plant was placed in family Urticaceae but according to the modern views it should be fixed in a separate family Moraceae which is separated from family Urticaceae. It is globally scattered especially in Asia: India, China, Indonesia, Sri Lanka, Thailand, Vietnam, Myanmar, Nepal, Pakistan. Locally it distributed at Andhra Pradesh, Assam, Bihar, Delhi, Goa, Gujarat, Tamil Nadu, Uttar Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Odisha, Rajasthan, Uttarakhand and West Bengal.[3-7]

It also found to be showed promising activity in the treatment of depression. Depression applies to a broad range of mental health issues characterized by the lack of a positive effect (loss of motivation and pleasure of ordinary things and experiences), poor mood and a number of social, cognitive, physical and behavioral symptoms associated with them. Distinguishing mood changes between clinically significant degrees of depression (e.g., major depression) and those that develop ' normally ' is difficult, and the signs of depression should be viewed as arising on a scale of intensity. In a major depressive disease, mood and affect are usually unreactive to the situation that stays depressed over the course of each day, while mood changes diurnally for certain people, with incremental change during the day only to revert to a poor mood on waking. In other situations, the attitude of an individual may be sensitive to positive experiences and activities although these mood elevations are not maintained with negative emotions that often re-emerge rapidly. Depression is one of the most popular and severe mental health issues affecting the nation. Earlier people were of the opinion that depression is not as common in India as a British doctor Venkaba R. A said. Nominated to the country's mental asylums. The incidence of multiple depressive disorders in the general population ranges from 1.5 to 32.9 percent in different parts of the country and the prevalence of outdoor and indoor divisions in general hospital departments differs from 1.8 to 34.7 percent. While many studies have been performed on the socio-demographic and psychiatric factors of depression, the incidence of specific symptoms has not explicitly identified in India. While it is only normal to suffer every

now and then feelings of sadness, somnolence, or sorrow, clinical depression happens when these emotions last for long periods of time, which can last for many weeks to several years, if left untreated. Depression may interfere with a person's ability to function effectively all day long, or even the daily desire to get out of bed.

Today, there is a renewed interest in traditional medicine, and a growing demand for more plant medicines. The resurgence in interest in plant-derived medicines is due primarily to the existing widespread belief that "natural medication" is healthy and more effective than the costly synthetic drugs, many of which have adverse side effects. According to Ventakamaran1, the Moraceae family's taxonomy diagnosis includes broad taxa of more than fifty genera and almost 1400 members, including some significant classes such as Artocarpus, Morus, and Ficus. Several species belonging to the Ficus genera have been documented to produce furano coumarins which are an important plant phototoxin.

Many scientists reported that the family Moraceae includes Phytochemistry similar to flavonoids, isoprenoid substituent flavonoids, steroidal compounds and stilbenes. Antioxidants from figs can shield lipoproteins from degradation in plasma and cause a significant increase in antioxidant potential in plasma.

Ficus racemosa Linn (Moraceae) is an evergreen, small to wide growing, lactiferous, deciduous tree, with little prominent aerial roots found in moist localities throughout much of India, and is often grown in villages for its edible fruit. Various pieces F. racemosa. Traditionally is used as forage, edible and ritual. All parts of this plant (leaves, seeds, bark, latex, and root sap) are medicinally essential in India's conventional medicinal scheme.

The dried leaves and combined with honey was given in bilious infections. Fruits are a good remedy for gastrointestinal congestion and are also helpful for diarrhea and constipation management. The astringent quality of the bark has been used in spongy gum as well as in dysentery, menorrhagia and haemoptysis internally as mouth wash. The bark is antiseptic, antipyretic and vermicidal, and bark decoction is used to cure various skin disorders, ulcers and diabetes. It is also used in inflammatory swellings / boils as a poultice and is found effective in treating masses, dysentry, asthma, gonorrhea, gleet, menorrhagia, leucorrhea, hemoptysis, and urinary diseases. Many drawbacks for evidence-based trials such as effectiveness and healthy on the conventional drugs framework.

The species *Ficus racemosa* Linn is among hundreds of popular medicinal plants of interest. Has traditional meaning in the Vedic scriptures i.e. 'Atharva veda. ' It is known as ' udumbara flower ' in Sanskrit.

According to the literature analysis *F. racemosa* has numerous biological effects such as Antidiabetic activity, Anti-inflammatory effect, Anti-bacterial activity, Anticancer effect, Analgesic, Antidiuretic, Antihelmintic, Antidiarrhoeal, Antifungal activity of Ficus racemosa, Anti-bacterial activity, Hepatoprotective, Antioxidant and a probable radio protector, Wound healing, Renal anti-carcinogenic, Hypolipidemic activity and hypoglycemic activity.

The forehead review covers all the detail information related to pharmacognostic study, traditional uses and pharmacological study of *Ficus recemosa*. It also focuses on current and future prospects of *Ficus recemosa* plant in research and development.

2. LITERATURE SURVEY

Hypoglycemic activity

The ethanol extract (250mg/kg/day) lowered blood glucose level within 2 weeks in the alloxan diabetic albino rats confirming its hypoglycemic activity. Bsistosterol isolated from the stem bark was found to possess potent hypoglycemic activity when compared to other isolated compound. (Swain LE *et al.* 1990)

Hypolipidemic activity

Fruits when fed to rats in diet induced hypocholesterolemic effect, as it increased faecal excretion of cholesterol. (Agarwal V et. al. 1988)

Renal anti carcinogenic

Ficus racemosa extract at a dose of 200 and 400 mg/kg when given orally a significant decrease in lipid peroxidation, xanthine oxidase, γ -glutamyl transpeptidase and hydrogen peroxide (H2O2) generation with reduction in renal glutathione content and antioxidant enzymes generated by Potassium bromate (KBrO3), a potent nephrotoxic agent that induces renal carcinogenesis in rats. There was significant recovery of renal glutathione content and antioxidant enzymes. There was also reversal in the enhancement of renal ornithine decarboxylase activity, DNA synthesis, blood urea nitrogen and serum creatinine. This result suggests that *Ficus racemose* extract is a potent chemopreventive agent and suppresses KBrO3mediated nephrotoxicity in rats. (Naghma K. *et. al.* 2005)

Wound healing

Ethanol extracts of stem bark show a potent wound healing in excised and incised wound model in rat. (Biswas T.K. *et al.* 2003)

Antioxidant and a probable radio protector

Ethanol extract (FRE) and water extract (FRW) of *Ficus racemosa* were subjected to free radical scavenging both by steady state and time resolved methods such as nanosecond pulse radiolysis and stopped-flow spectrophotometric analyses. FRE exhibited significantly higher steady state antioxidant activity than FRW. FRE exhibited concentration dependent DPPH, ABTS, hydroxyl radical and superoxide radical scavenging and inhibition of lipid peroxidation with IC50 comparable with tested standard compounds. *In vitro* radioprotective potential of FRE was studied using micronucleus assay in irradiated Chinese hamster lung fibroblast cells (V79). Maximum radioprotection was observed at 20 µg/ml of FRE. The cytokinesis-block proliferative index indicated that FRE does not alter radiation induced cell cycle delay. Based on these results it is evident that the ethanol extracts of *F. racemosa* acts as a potent antioxidant and a probable radioprotector. (Veerapur V. P. et al. 2009)

Hepatoprotective

Methanol extract of *Ficus racemosa* stem bark were studied using the model of hepatotoxicity induced by carbon tetrachloride (CCl4) in rats. CCl4 administration induced a significant increase in total bilirubin associated with a marked elevation in the activities of aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP) as compared to control rats. Pretreatment with methanol extract resulted in significant decreases in the activities of AST, ALT and ALP, compared to CCl4-treated rats. The results indicate that *F. racemosa* possesses potent hepatoprotective effects against CCl4-induced hepatic damage in rats.

(Faiyaz A. *et al.* 2010)

Anti bacterial activity

Different extracts of leaves were tested for antibacterial action against Escherichia coli, Bacilus pumitis, Bacillus subtilis, Pseudomonas aureus. Out of all extracts tested, petroleum ether extract was the most effective extract against the tested microorganism. (Mandal S.C. *et al.* 2000)

Antifungal activity of Ficus racemosa

The 50% methylene chloride in hexane flash column fraction of the extract of the leaves of Ficus racemosa was found to have antifungal activity. The extract inhibited the growth of several plant pathogens (Curvularia sp, Colletotrichum gloeosporioides, Alternaria sp, Corynespora cassiicola and Fusarium sp). Psoralen was identified as the active compound and was shown to be biodegradable, having the potential to be developed as a fungicide against pathogens causing diseases on crops of economic importance. (Deraniyagala S.A. *et al.* 1998)

Antidiarrhoeal

Ethanol extract of stem bark has shown significant inhibitory activity against castor oil induced diarrhea and PEG2 induced enteropooling in rats and also showed a significant reduction in gastro intestinal motility in charcoal meal test in rats which proves its efficacy as antidiarrhoel agent. (Mukherjee P. K. *et al.* 1998)

Antihelmintic

The bark extract were evaluated for anthelmintic activity using adult earthworms, which exhibited a spontaneous motility (paralysis) With 50 mg/mL of aqueous extract the effects were compared with 3% piperazine citrate. There was no final recovery in the case of worms treated with aqueous extract in contrast to piperazine citrate, the worms recovered completely within 5 h. This result shows the anthelmintic nature of the extract. (Chandrashekhar C.H. *et al.* 2008) *Antidiuretic*

The decoction (D) of the bark of Ficus racemosa at a dose of 250, 500 or 1000 mg/kg induced antidiuresis, had a rapid onset (within 1 h), peaked at 3 h and lasted throughout the study period (5 h). However, antidiuretic potential of D was about 50% lower than that of ADH. The D was well tolerated even with subchronic administration. The D caused a reduction in urinary Na+ level and Na+/K+ ratio, and an increase in urinary osmolarity indicating multiple mechanisms of action. This proves its efficacy as antidiuretic agent. (Ratnasooriya W.D. *et al.* 2003)

Analgesic

The ethanol extract of bark and leaves evaluated for analgesic activity by analgesiometer at 100, 300 and 500mg/kg was found to possess dose dependent analgesic activity. (Malairajan P. *et al.* 2006)

Anticancer effect

A researcher proposed that the methanol extract of *F. racemosa* produced a cytotoxic effect on various hepatic cancerous cell lines like HL-60, HepG2, NCI-H23, and HEK-293T. The results obtained from their investigation suggested that the methanol extract produced higher cytotoxic effects on HL-60 and HepG2 cells with respect to other used cell lines with very low (50% inhibitory concentration) IC₅₀ values. **(Sukhramani P.S.** *et al.* **2000)**

Anti-bacterial activity

The hydroalcoholic extract from the leaves showed potent antibacterial activity, with an IC_{50} value of 0.08 mg/ml against *Actinomyces viscosus*. Petroleum ether extract of leaves exhibited an antibacterial potential higher than the other extracts against *Escherichia coli, Bacillus pumilis, Bacillus subtilis*, and *Pseudomonas aureus*. (Mandal S.C. *et al.* 2000)

Anti-inflammatory effect

The ethanol extract of leaves (400 mg/kg, orally) exhibited an anti-inflammatory activity on carrageenan-, histamine-, serotonin-, and dextran-induced paw edema models of rats. In the chronic inflammatory model of the cotton granuloma weight method, there was a reduction of 41.5% granuloma weight, which demonstrated its good anti-inflammatory activity as compared with phenylbutazone.., reported that the ethanol extract inhibited both cycloxiginase-1 and 5-lipoxiginase *in vitro* (90 and 18 μ M concentration, IC₅₀ values) due to the presence of a new glycoside compound, namely, racemosic acid. (Mandal S.C. *et al.* 2000; Li *et al* 2004).

The *in vitro* analyze anti-inflammatory property of *F. racemosa* bark using albumin denaturation activity was evaluated. The inhibition rate of egg albumin denaturation for water extraction increased gradually with concentration. Significantly higher inhibition was showed in hot water extracts than cold water extracts at the concentration of 0.01 µg/ml and 0.1 µg/ml. In addition, the inhibition rate of water extraction was significantly higher than the reference drugs (P < 0.05). it was concluded that the Anti-inflammatory activity increases with the concentration of *F. racemosa* bark. (Dharmadeva S. et al. 2018), (Ghosh M.N. et al. 1963), (Sostres C. et al. 2010), (Ahmed F. et al. 2010)

Antidiabetic activity

Ficus racemosa and other same genus plants was taken for screening of molecular interactions of selected diabetes mellitus (DM) targets with bioactive compounds In this analysis six potential bioactive compounds (gossypetin, herbacetin, kaempferol, leucoperalgonidin, leucodelphinidin and sorbifolin) were successfully identified on the basis of binding energy (>8.0 kcal/mol) and dissociation constant using YASARA. Out of six compounds, herbacetin and sorbifolin were observed as most suitable ligands for management of diabetes mellitus. (Sing P. et al. 2019), (Belhekar S.N., et al. 2013), (Phanse M.A., et al. 2016), (Sangeetha K.N., et al. 2017)

Macroscopic and microscopic study

Habit

A large deciduous tree upto 15m. to 30 m. height with smooth, grey bark, few aerial roots available.

Leaves

Alternate arrangement on twigs, entire, glabrous, ovate-elliptic to oblong-elliptic, imbricate, pubescent, linear-deltoid, 8-10 pairs of lateral pairs from broad to narrowly cuneate, oblique base, margin entire, acuminate at apex, glabrous on both sides deciduous, stipules 12-18 mm long, becoming brown scurfy, lamina 6-15 x 3.5-6 cm.

Flowers

Unisexual, staminate florets sessile, few diandrous, situated near the mouth of the receptacles. Male flowers sessile, ostiolar in 2-3 whorls, united, lobes dentate, stamens. Female flowers sessile or subsessile, ovary substipitate, glabrous style, stigma simple.

Inflorescence

Hypanthodium, globose to pyriform, pubescent, peduncled, androgynous solitary or binate, borne on the short, leafless scallybranchlets, from the trunk or larger branches, basal bracts 3, borne at the apex of the peduncle.

Fruit

Synconus orange-red to red, fleshy.

Seeds

lenticular 1 mm.

Bark

8-10 mm thick, surface reddish-brown or yellowish-brown smooth, coarsely flaky, fibrous; blaze creamy pink; latex milky; young shoots and twigs finely white hairy, soon glabrous; branchlets 1.5-3 mm thick, puberulous.

Common Flowering and Fruiting Time

November to January. [8-13]

Cultivation Details

The plant species ficus are common and form an important element of lowland rain forest. Most species prefer per-humid forest, but several are found in areas with a monsoon climate and in teak forest, including locations where the soil dries out. Succeeds in most soils that are reasonably moist but well-drained. The trees produce three types of flower; male, a long-styled female and a short-styled female flower, often called the "gall flower". All three types of flower are contained within the structure we usually think of as the fruit. The female fig wasp enters a fig and lays its eggs on the short styled female flowers while pollinating the long styled female flowers. [14, 15]

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Fig. 1. Ficus recemosa Leaves.



Fig. 2. Ficus recemosa Fruits.

Medicinal uses

Ficus Racemosa Linn. is widely cultivated in India and has been widely screened for its medicinal properties. All the parts viz. leaves, fruit, bark, latex and root have been reported to have medicinal properties.[21]

Leaves

Douche of decoction of leaves is used for the treatment of dysmenorrheal [22] Leaf juice is used for prevention of splitting of hairs, while latex is used for boils, blisters and measles[23].

Fruits

Fruits are useful in miscarriage, menorrhagia, spermatorrhoea, cancer, scabies, haemoptysis and visceral obstructions. They are found to be having properties as they are used for treatment of leucorrhoea, blood disorder, burning sensation, fatigue, urinary discharges, leprosy, intestinal worms and carminative[24].

Bark

Bark is found to be efficacious in abortion, urological disorders, diabetes, hiccough, leprosy, dysentery and piles[24].

Latex

The latex is aphrodisiac and useful in boils, diarrhea, dysentery, and hemorrhoids[25]. It is useful in the treatment of severe diarrhea in children[26] while has been reported as indigenous system of medicine in Shri Lanka for skeletal fracture treatment[27].

Roots

Sap of root is administered for gonorrhea, diabetes and topically in mumps and other inflammatory glandular enlargements[28] Sap root is found to be cure for heat stroke, chronic wounds and malaria in cattle[29].

Pharmacological Activities

Antidiuretic

A decoction of Ficus Racemosa has shown diuretics action following oral administration of 200, 500 and 1000 mg/kg in rats. It has reported with reduction in urinary Na⁺ level and Na⁺/K⁺ ratio with increased urinary osmolality[30].

Antiinflammatory

The extract of Ficus Racemosa has been found to be anti-inflammatory at the doses of 200 and 400 mg/kg from which 400 mg/kg was found with maximum anti-inflammatory effect exhibited 30.4, 32.2, 33.9 and 32.0 % at 3h using carrageenan, serotonin, histamine, dextran-induced rat paw edema respectively. The effect was comparable with standard drug phenylbutazone[31].

Antidiabetic

Methanolic extract of ficus racemosa shown antidiabetic activity and lowered glucose level in normal and alloxon induced diabetic rats. 200 and 400mg/kg dose was used and activity was compared with standard drug glibenclamide 10mg/kg[32].

Antimicrobial

The ethanoic and ethyl acetate extract of *ficus recemosa* were tested and found efficacious for antimicrobial activity and compared with water, hexane and chloroform extract. Ethyl acetate extract shown significant activity in wall diffusion method[33].

Hepatoprotective

Petroleum ether and methanolic extract of *ficus racemosa* stem bark was studied for carban tetrachloride induces its hepatotoxicity and shown good hepatoprotective activity. Both extracts resulted in decrease activity of AST, ALT and ALP as compared with CCl₄ treated rats. The protective effect of ficus racemosa was confirmed by histopathological study of liver[34].

Analgesic

Chloroform extract of *ficus racemosa* leaf was studied for analgesic activity using Eddy's hot plate method on albino mice. The extract at 50mg/kg dose does not show any significant analgesic activity but when tested for 100 and 200mg/kg found to be showing analgesic activity as compared to control group. Pentazocin was used as standard drug at the dose of 50mg/kg[35].

Anti diarrhoeal

The latex of *ficus racemosa* was studied for its antidiarrhoeal activity in albino rats. The latex has shown significant antidiarrhoeal activity in castor oil induces diarrhea in latex treated rats[36].

Antifilarial

Alcoholic and aqueous extract of fruit of *ficus racemosa* shown inhibition of spontaneous motility of whole worm and nerve muscle preparation of *Setariacrvi*. Alcoholic extract on whole worm and nerve muscle preparation reflected increase in amplitude and tone of contractions followed by paralysis. Alcoholic extract of Ficus Racemosa required 250 and 50µg/ml, while aqueous extract shown inhibition at 350 and 150 µg/ml respectively[37].

Antitussive

Methanolic extract of *ficus racemosa* stem bark was studied for its antitussive activity against cough induced model by sulphur dioxide gas in mice. The effect of methanolic extract was comparable with codeine phosphate (10mg). The extract at 2000mg/kg exhibited maximum inhibition of 56.9% after 90min of administration[38].

Chemopreventive

Ficus Racemosa extract when administered orally resulted in decrease in γ -glutamyl transpeptidase, lipid peroxidation, xanthine oxidase, H2O2 generation, blood urea nitrogen, serum creatinine, renal ODC activity, DNA synthesis and incidence of tumors. The *ficus racemosa* shown potent chemoprotective activity by suppression of Fe-NTA-induced renal carcinogenesis and oxidative damage response in Wistar rats[39].

Parts	Constituents
Leaves	Bergapten, bergaptol, lanosterol, β -Sitosterol, Stigmasterol, lupen-3-one, β - sitosterol-d-glucoside (phytosterolin), vitamin k, campestrol, stigmasterol, isofucosterol, α amyrin, lupeol, tannic acid, arginine, serine, aspartic acid, glycine, threonine, alanine, proline, tryptophan, tyrosine, methionine, valine, isoleucine, leucine, n-nonacosane, nhentricontanen, hexa-cosanol, and n- octacosan. [16]
Stem:	Campesterol, hentriacontane, hentriacontanol, kaempferol, stigmasterol, methyl ellagic acid.
Fruit	Glauanol, hentriacontane, β sitosterol, glauanolacetate, glucose, tiglic acid, esters of taraxasterol, lupeolacetate, friedelin, higher hydrocarbons and other phytosterol. [17]
Stem Bark	Leucyanidin-3-O-β- glucopyranosides, leucoperalogonidin 3-O-α-L- rhamnopyranoside, β-sitosterol, unidentified long chain ketone, lupeol, its acetate, α – amyrin acetate. A new tetracyclic triterpene, glauanol acetate which is characterized as 13 α , 14 β , 17 β H, 20- α H-lanosta-8, 22-diene 3- β –acetate and racemosic acid were isolated from leaves.[18-20]

Table 1. Phytochemical constituents present in *Ficus recemosa* species.

3. FUTURE TRENDS

Certainly *Ficus recemosa* species showed its importance in the treatment of different diseases and disorders discussed in the above text. Many studies are undergone and will be concluded in the near future, which will pose its promising coming out in many other treatments and may be extended in formulation of herbal tablet. This review is reported that *Ficus racemosa L*. plant parts have shown significant promising antidepressant activity. Alongside it showed good antimicrobial, anti-inflammatory, antioxidant, anti mycobacterial and antiinflammatory activity. Further it is suggested to extend the research work for development of suitable drug formulation for the community use.

4. CONCLUSION

The genus Ficus is an essential community of trees of immense medicinal interest. The conventional medicine practitioners use the medicinal plants extensively in their day-to-day work to treat growing diseases. Different sections such as base, berries, leaves, stem, seeds, latex and even entire plant Ficus racemosa (Linn) have been prescribed in the conventional medicine method for treating gastric ulcer, diarrhea, wound healing, diabetes, hypertension etc. Ficus Linn Racemosa Has demonstrated a broad variety of pharmacological activities such as hypoglycemic, hypolipidemic, anti-carcinogenic, anti-diuretic, hepatoprotective, anti-ulcer, anti-inflammatory, fungal, etc. The present research therefore demonstrates the therapeutic ability, pharmacological and phytochemical properties of various bioactive compounds found in Ficus racemosa (Linn). However, further therapeutic and biomedical research will be carried out to examine the active potential of bioactive compounds found in this plant that may help to show that it is a viable pharmaceutical source.

5. CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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