A comprehensive review on Enicostemma Littorale Blume as an Ayurvedic Herb

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ABSTRACT

Natural herbs innate power is harnessed by Ayurveda to produce amazing effects on the human body. The herbs are entirely natural and safe for human consumption. Enicostemma littorale blume (E. littorale), a perennial herb belonging to the Gentianaceae family, is found throughout India. As a laxative, the bitter herb helps treat rheumatism, fever, skin conditions, stomach issues, snake bites, obesity, and blood sugar regulation. Alkaloids, catechins, saponins, sterols, triterpinoids, phenolic acids, flavonoids, and xanthones are all abundant in E. littorale. Numerous illnesses, such as viral diseases, malaria, cancer, tissue damage, inflammation, transplant rejection, and other disease states, can cause pyrexia or fever as a side effect. Minerals including silica, phosphate, calcium, potassium, iron, carbonate, and chloride sulfate are also present. Antimicrobial, antioxidant, antiulcer, anti-inflammatory, hypolipidemic, hepatoprotective, and hypoglycemic qualities have all been found for the plant ingredients. India's traditional medical system uses a range of natural herbs that are important for human health. One of the herbaceous plants in the Gentianaceae family is Enicostemma littorale Blume. The biter nature plant is beneficial for a variety of ailments, including diabetes, obesity, rheumatism, skin conditions, snake bites, gastrointestinal problems, and fever. It also acts as a laxative. The plant has long been used in folklore to treat a variety of illnesses. Antimicrobial, antioxidant, antiulcer, anti-inflammatory, hypolipidemic, hypoglycemic, hepatoprotective, and anticancer properties are among the plant ingredients. Enicostemma littorale Blume's detailed description, literature review, ethnobotanical applications, phytochemical, pharmacological, and toxicological analyses are all included in this review. This review's methodology makes use of both contemporary scientific research-based publications, such as journals and newsletters, and Ayurvedic literature.

Keyword - *Enicostemma Littorale Blume, Medicinal plant, pharmacological properties, phytoconstituents*.

1. Introduction

Two systems of Medicine particularly Allopathic and Indigenous are specially practiced in Sri Lanka. In all, the 3 indigenous structures (Ayurveda, Siddha and Unani Medicine) in Sri Lanka, unique elements of the medicinal flowers play a primary role and constitute the spine of the gadget. Enicostemma littorale Blume (family Gentianaceae) is a Perennial herb and discovered in thecourse of India, most typically. In coastal regions. Ancient literature indicates the aqueous Extract of the plant became used within the treatment of diabetes, Fever, rheumatism, stomachache, dyspepsia, hernia, itching, insect poisoning malaria.

Nature is an integral gadget, which shapes the backdrop for the emergence, evolution and Life of existence and is a first-rate supply for huge range of innocent and effective drug treatments. Plants offer a terrific source of natural drugs for diverse ailments. The secondary metabolites of plant Beginning function a useful chemical library for drug discovery in the pharmaceutical industry. Human Intervention trials have furnished evidence for shielding Effects of numerous polyphenol-wealthy ingredients against persistent Diseases along with diabetes mellitus, neurodegenerative

Issues and cancer.

In Ayurveda, Enicostemma littorale has been traditionally used for centuries,revered for its ability to maintain balance within the body and treat specific disorders. With the modern rise of lifestyle-related diseases, there is a growing interest in exploring the potential health benefits of this plant as a natural remedy for conditions like diabetes, high blood pressure, and oxidativestress-related diseases.

Ayurveda uses the innate power of herbal Medicine to bring out wonderful results on the human Body. Ayurvedic herbs are natural and safe for human Life. The use of different parts of the herbs in Traditional medicinal system viz., Ayurveda, Siddha and Unani etc. Treat various disease is in vogue for several Centuries. Medicinal plants act as alternative source for treating several ailments since their use increase day by day. According to World Health Organization (WHO) herbal medicine serve the health need of about 80% of world's population, especially for millions of People in the vast rural area of developing countries.

1.1 Detail Description of Plant

A perennial glabrous herb 10-50cm high, Branched from the base, stem erect or procumbent, Sub quadrangular or subterete, glabrous. Leaves are Sessile, variable, 3.2-6.3cm by 3-16mm, linear or linear to oblong or elliptic-oblong or lanceolate, obtuse or Acute, glabrous, 3-nerved, the midnerve is strong and the marginal nerves often obscure. Flowers are sessile, Arrange in axillary clusters all along the stem. Calyx 3mm long, lobes 1.5mm long, ovate-oblong, obtuse with narrow membranous margins. Corolla white in Colour, 6-8mm long, tubular, lobes 2.5mm long, Lanceolate, acute. Capsule 4mm long, ellipsoid, slightly narrowed at the base, rounded at the apex, apiculate. With the remains of the style, therapeutics based upon herbal products extracted from plant life. The rising incidence of multidrug resistance among pathogenic microbes has in addition for newer antibiotic resources due to its abundant and extensive availability.

Fig 1 Enicostemma Littorale Blume

1.2 Taxonomy

- Kingdom: Plantae
- Subdivision: Angiosperm
- Class: Dicotyledonous
- Subclass: Gamapetalae
- Serius: Bicarpellatae
- Order: Gentianales
- Family: Gentianacae
- Genus: Enicostemma

- Species: Littorale

2. Nomenclature

The word Enicostemma is probably fashioned from the three words, “en” manner inside, “icos” manner 20 and “stemma” method wreath or circle due to the various plants Organized in circles within the leaf axils along the stem.

2.1 Vernacular Names

Common names (Nadkarni 1976: 485): Ayurvedic scientific: Mamejava, Mamejav, Mamejavo, Mamjjak, Mamejva; Hindi/Hindustani: Kariyatu, Chotakirayat, Chota-chiretta, Chota-chirayata; Bombay: Kada-vinayi, Manucha; Tamil: Vallari Telugu: Nela-guli, Nela-gulimidi; Additional names: Gormadi koora (In the United Kingdom product description for Glucostat, Maharishi Ayurveda Products (2006), incorrectly refers to E. Littorale as Indian Gentian; this English not unusual name normally refers to Swertia spp.
In the New World, E. Verticillatum is commonly referred to as Whitehead.

Table 1: Organoleptic properties of whole plant of E.littorale

Parameters	Raw	Aqueous Extract	Ethanolic Extract
Appearance	Powder	Liquid	Liquid
Toucyh	Coarse	Smooth	Smooth
Colour	Greenish Brown	Light Brown	Dark Green
Taste	Bitter	High Bitter	High Bitter
Odour	Characteristics	Characteristics	Characteristics

Table 2: Physiochemical parameters of whole plant of E.littorale

Parameter	Whole plant of E.littorale
Loss on drying	10.25 ± 0.33
Total Ash value	08.16 ± 0.09
Water soluble ash	02.75 ± 0.08
Acid insoluble ash	01.89 ± 0.07
Sulfated Ash value	01.30 ± 0.10
pH of 1% w/v formulation solution	05.12 ± 0.02
pH of 10% w/v formulation solution	04.87 ± 0.04
Water soluble (hot) extractive value	37.21 ± 1.27
Ethanol soluble (hot) extractive value	24.92 ± 0.64

2.2 Nutritional Information

A nutritional assessment of E. littorale conducted by the Indian Council of Medical Research's National Institute of Nutrition states that 100g of fresh E. littorale vegetables consist of–

Table 3: Nutritional Information of whole plant of E.littorale

Nutrient	Quantity in 10g fresh E.littorale
Energy	140 Kcal
Protein	7 gm
Fat	0.7 gm
Carbohydrates	26.5 gm
Fiber	4.2 gm
Minerals	8.4 gm
Iron	49.9 mg
Calcium	1641 mg
Phosphorous	81 mg
Moisture	53.2 gm (Dalit Database 2006)

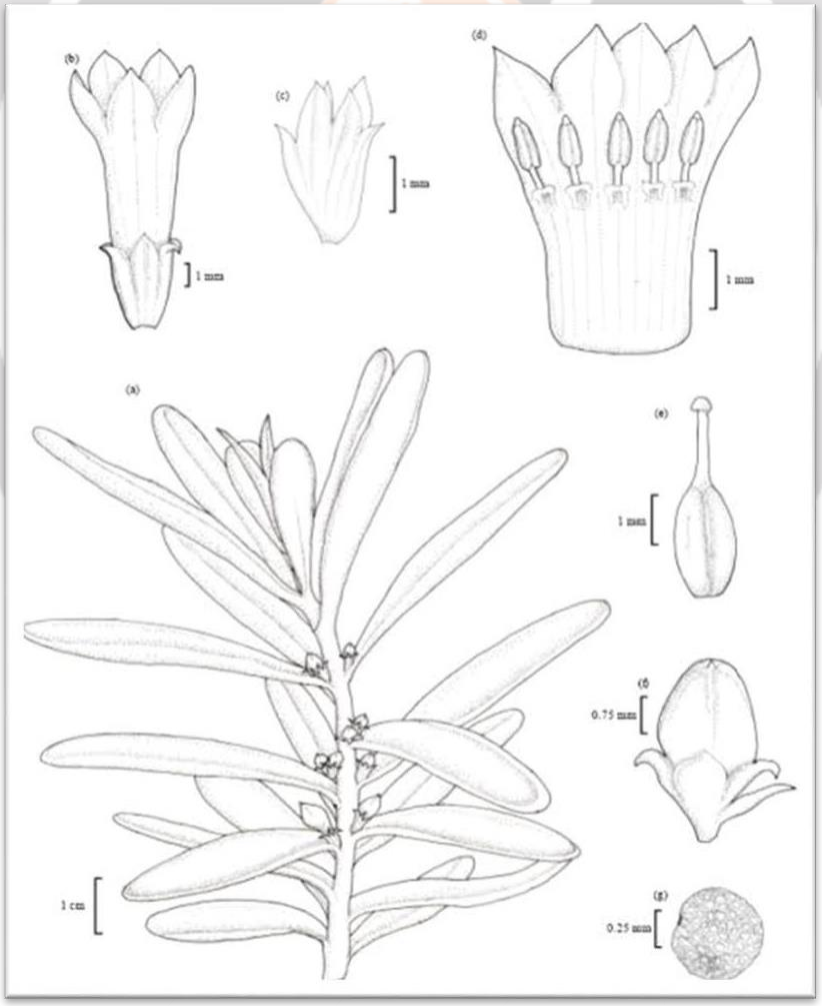

Fig 2: Illustration of E. axillare subsp. axillare (Lam.), (a) Raynal: A. Habit, (b) Single flower, (c) Calyx, (d) Corolla opened, (e) Pistil, (f) Fruit and (g) Seed (from Shahina P.M and Santhosh Nampy 3335)[9]

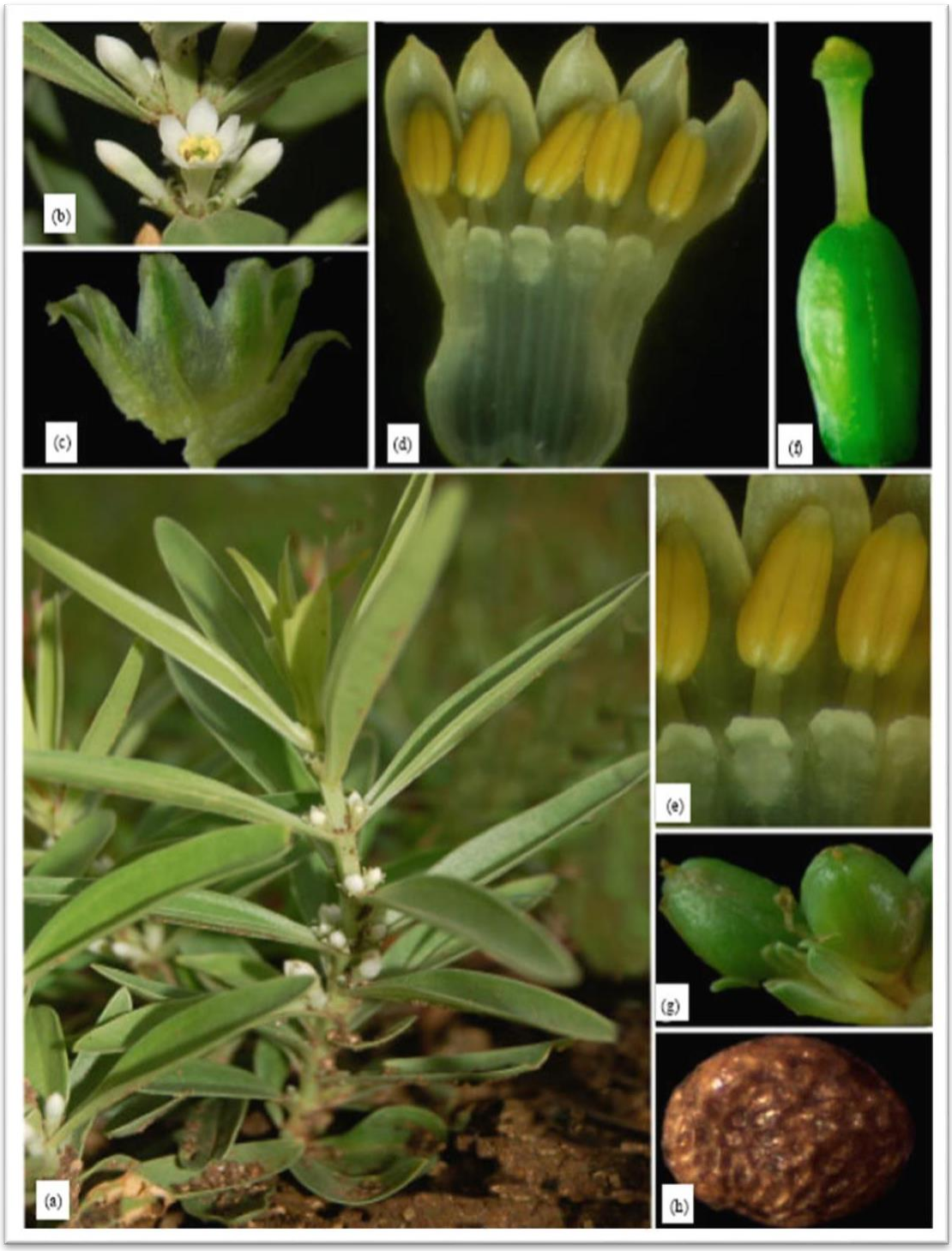

Fig 3: Morphological characters of *E. axillare* subsp. *axillare* (Lam.), (a) Raynal: A. Habit, (b) Axillary cyme showing opened flower, (c) Calyx, (d) Corolla opened, (e) Stamen, (f)Pistil, (g) Fruit and (h) Seed (from Shahina P.M. and Santhosh Nampy 3335)[19]

3. Medicinal properties of Enicostemma Littorale Blume

3.1 Antimicrobial activity of E. littorale

Tanna et al. mentioned the antifungal interest of E. Littorale blume. The chloroform extract indicates suggested activity in opposition to Aspergillus niger (A. Niger) and negligible hobby against Candida albicans (C. Albicans) at the attention of 100, 200 micro g/mL. The ethyl acetate extract indicates slight interest in opposition to A. Niger and moderate activity against C. Albicans. The ethanol extract suggests pronounced pastime against A. Niger and C. Albicans.

Praveena et al. Located that the antimicrobial pastime of E. Littorale in opposition to many pathogenic microorganisms by way of using specific solvents like chloroform, ethyl acetate,methanol, petroleum ether. E. Littorale's methanolic and ethyl acetate extracts shown exceptional antibacterial activity against Salmonella typhi, Pseudomonas aeruginosa, Shigella sonnei, and Staphylococcus aureus, as well as antifungal activity against Aerom onas hydrophila and Candida albicans.

3.2 Antihelminthic activity of E. littorale

According to Mishra and Shukla, E. littorale exhibits antihelminthic properties. To identify an antihelminthic action on adult Indian earthworms, Pheretima posthuma, petroleum ether and ethanolic extracts of the aerial portions of E. littorale Blume were produced and tested sequentially. The duration of the trojan horse's paralysis and death was determined using five different concentrations of each extract in this antihelminthic activity. The findings showed that an ethanolic extract of E. littorale outperformed the petroleum ether extract in terms of potency.

3.3 Antinociceptive effect of E. littorale

Many conventional Indian medicinal flowers which comprise huge quantity of secoiridoid, swertiamarin are being used to relieve ache. Iridoids found in a wide form of medicinal plant life own a massive wide variety of medicinal residences. In the study by means of Jaishree V, in vivo anti-nociceptive pastime of swertiamarin isolated from E. Axillare changed into achieved using distinctive methods in mice. In the hot plate technique, a large increase in the latency duration was found for the treatment with swertiamarin at 100 and 200 mg/kg frame weight after 30 and forty five min. The percent safety determined after forty five min changed into 109.Forty two, 147.42 and 157.14, respectively,for the same old paracetamol and swertiamarin at 100 and two hundred mg/kg frame weight treatments. A huge growth inside the tail withdrawal reflex changed into observed for the swertiamarin remedy at each the doses with percent protections of a hundred and fifty and two hundred, respectively.

In each those techniques, swertiamarin showed amazing hobby than trendy paracetamol. In the acetic acid prompted writhing,swertiamarin at 100 and 2 hundred mg/kg body weight reduced the variety of writhes appreciably. Dose established consequences were determined in all the 3 methods and the various two doses, swertiamarin at 200 mg/kg frame weight confirmed robust activity. These outcomes proved that swertiamarin from E. Axillare possess each peripheral and central antinociceptive activity.

3.4 Antioxidant activity of E. littorale

Hyperlipidaemia is an important problem of alcohol caused liver injury since it accumulates cholesterol and triglycerides within the liver in addition to within the blood ends in numerous complications. Thirumalai et al. treated hepatically damaged male albino rats (ethanol-induced) with an aqueous leaf extract of E. littorale at a dosage of 250 mg/kg body weight in order to examine the hyperlipidemic state and antioxidant effects. After management of aqueous leaf extract of E. Littorale, levels of cholesterol, triglycerides and unfastened fatty acids were decreased in serum and the pastime ranges of TBARS and lipid peroxidation levels have been decreased and SOD, CAT, GPx had been accelerated in liver tissue. He reviews that an aqueous leaf extract of E. Littorale blume has potent restorative impact on hyperlipidaemic and oxidative stress.

3.5 Antiulcer and anti-inflammatory activity of E. littorale

The aerial elements of E. Littorale in opposition to aspirin, ethanol and pyloric ligation triggered ulcers in rats and bovine serum albumin (BSA) denaturation were tested for antiulcer and anti-inflammatory consequences by means of Roy et al. The extract became administered to the in a single day fasted rats, one hour previous to aspirin or alcohol or pyloric ligation venture. The ulcer index, tissue GSH ranges and lipid peroxidation ranges in all the fashions of ulcers and the volume of gastric secretion, acidity and pH had been anticipated in the pyloric ligation model of ulcers. Pre-remedy with the aqueous extract of E. Littorale showed a dose-structured decrease inside the ulcer index towards aspirin, ethanol challenge and pyloric ligation.The previous management of the aqueous extract also reduces the total acidity, loose acidity, volume of gastric secretion and extended the gastric pH. In addition, it

became also determined that the aqueous extract inhibits the serum albumin denaturation in a dose-structured way. It was mentioned that the methanolic extract of E. Littorale possesses antiulcer activity. And its anti-inflammatory activity can be attributed to the antioxidant capability.

3.6 Antitumour activity of E. littorale

The antitumour pastime of methanolic extract of E. Littorale has been evaluated in opposition to Dalton's ascitic lymphoma (DAL) in Swiss albino mice through Kavimani et al. A giant enhancement of mean survival time of methanolic extract of E. Littorale dealt with tumour bearing mice became located with recognize to manipulate institution. Treating with methanolic extract of E. Littorale complements peritoneal mobile counts. When those methanolic extract of E. Littorale dealt with animals underwent intraperitoneal inoculation with DAL cells,tumour cell increase became determined to be inhibited.
The alterations in the haematological parameters, protein, and PCV brought on by tumor inoculation can be reversed by a methanolic extract of E. littorale after 14 days of inoculation.

3.7 Hepatoprotective activity of E. littorale

Paracetamol caused hepatic damage is commonly used as an experimental model for observation of hepatoprotective outcomes of medicinal plant extracts and capsules. The histological assessment and the level of numerous biochemical parameters in move indicated the level of hepatic injury. Highly reactive trichloro loose radical formation, which assaults polyunsaturated fatty acids of the endoplasmic reticulum, is accountable for the hepatotoxicity of paracetamol. It produces hepatotoxicity by changing liver microsomal membranes in experimental animals examine by means of Gite et al. discovered that the extract became capable of reduce all of the elevated biochemical parameters because it has hepatotoxin detoxication assets. E. Littorale possesses a chemical compound known as swertiamarin which has antioxidant and hepatoprotective properties towards D-GalN prompted hepatotoxicity given at a hundred and two hundred mg/kg body weight orally for 8 days, which might be due to its in vitro antioxidant activity. The present research indicates that the ethanolic extract of E. Littorale reveals sizable hepatomodulation towards oxidative strain precipitated liver injury via CCl4 in rats thru antioxidant capacity and free radical scavenging sports alongside discount of fats metabolism. These attributes provide the purpose for the use of E. Littorale in liver issues by using traditional healers in India.

3.8 Hepatomodulatory activity of E. littorale

The hepatomodulatory reaction of ethanol extract of E. Littorale Blume have been tested for oxidative stress prompted liver harm through carbon tetrachloride (CCl4) in albino wistar male rats. The rats had been administered with an extract,orally at the doses of one hundred twenty five, 250 and 500 mg/kg body weight in line with day for 21 consecutive days in conjunction with CCl4 at the dose of zero.2 mL/kg frame weight two times per week with intraperitoneal management of olive oil, within the ratio of one:1 treatment. The rats subjected only CCl4 with olive oil, confirmed exquisite oxidative stress induced liver damage.
Supplementation of E. Littorale extract considerably increases glutathione, GPx, SOD, CAT, and diet-C within the liver, with a dose-based reduction of the TBARS as evidenced by reduced lipid peroxidation, general cholesterol and triglycerides levels in hepatic cells and it turned into considerably depleted within the handled organization whilst as compared to that of control institution.Further, the hepatic marker degrees aspartate transaminase and alanine transaminase, alkaline phosphatase, acid phosphatase, gamma glutamyl transpeptidase, lactate dehydrogenase, sorbitol dehydrogenase, overall bilirubin, total protein and albumin in serum have been additionally restored to ordinary level dose-dependently after the supplementation of E. Littorale extract in contrast to respective controls. Gupta et al. advised that hepatomodulation via E. Littorale Blume against oxidative strain mediated via interference with free radical era and discount in fat metabolism.

3.9 Antihyperlipidaemic activity of E. littorale

The aerial a part of the E. Littorale reduces the serum cholesterol stage in hepatoma bearing rats which induces hypercholesterolaemia. A component of plant complements ldl cholesterol acyltransferase via esterification of loose cholesterol in the HDL. A new have a look at demonstrates a brand new assets of swertiamarin as an effective lipid decreasing agent while compared to atorvastatin and it may also contributes cardioprotective and antiatherosclerotic role consequences. The swertiamarin and atorvastatin while orally fed additionally lowered the total serum cholesterol and triglycerides. Hypolipidaemic and antioxidant consequences have been evaluated by way of administrating an aqueous extract of E. Littorale to rats (1.Five g/100 g body weight/day) alongside with hypercholesterolaemic food regimen for 6 weeks. The treatment with this extract decreases the activities of erythrocyte CAT, SOD and LPO tiers, with an increase in decreased glutathione ranges, liver and kidney levels of cholesterol were also decreased in E. Littorale handled rats when in comparison to ldl cholesterol fed untreated rats.

3.10 Hypoglycemic activity of E. littorale

The effect of an aqueous E. Littorale whole plant extract on antioxidant protection in alloxan-triggered diabetic rats became located by Prince and Srinivasan. A good sized boom in blood glucose, TBARS and hydroperoxides in liver, kidney and pancreas, with an decreased attention of decreased glutathione and suppressed sports of SOD, CAT and GPx have been additionally determined in alloxan brought on diabetic rats.Treating diabetic rats with oral administration of aqueous E. Littorale complete plant extract daily for 45 days considerably decreases the blood glucose, TBARS, SOD, CAT and GPx. The effectiveness of E. Littorale extract was in comparison with popular drug insulin. It was observed that an administration of insulin (6 gadgets/kg) to alloxan prompted diabetic rats for forty-five days added returned all of the parameters to near regular status.

E. Littorale extract at the dose of two g/kg become more powerful.Hence it can be attempted in medical purpose to overcome those headaches.

Vishwakarma et al. Standardized the dose established impact with warm and cold aqueous extracts of E. Littorale for three weeks in STZ brought about type 1 diabetic rat. Treatment of diabetic rats with STZ drastically produced the carnial signs of diabetes mellitus like weight reduction,polyuria and polydipsia, elevated the fasting blood glucose degree and AUC glucose related to decrease in insulin stage. Treatment of diabetic rats with warm aqueous extract of E. Littorale decreased the food, water intake and glucose and AUC glucose ranges and decreased the serum glucose, serum ldl cholesterol and triglyceride stages. TLC finger-print profiles had been set up for the aqueous extract the use of high performance skinny layer chromatography. Swertiamarin become located to be a main issue in warm extract of E. Littorale while it was absent in bloodless extract. The end result suggested that E. Littorale possesses potential antidiabetic activity and improves lipid profile at a dose of zero, Five g/kg.

3.11 Antihyperinsulinemic activity of E. littorale

Insulin resistance is answerable for the improvement of hyperglycemia in NIIDM sufferers. Aqueous extracts of Aegle marmelos and E. Littorale reduces hyperglycaemic situations in diabetic animal. Insulin resistance become caused in wistar rats by using fructose rich food plan (60% for 15 days). Treated businesses acquired fructose eating regimen plus aqueous extracts A. Marmelos (500 mg/kg/day) and E. Littorale (2 g/kg/day). Body weight,serum glucose, insulin, C-reactive protein and triglycerides degrees have been estimated after treating with an extract. Gohil et al. pronounced that the fructose feeding for 15 days drastically increased the serum glucose, insulin,

C-reactive protein and triglycerides degrees as compared to manipulate. Administration of aqueous extracts of A. Marmelos and E. Littorale for 15 days prevented hyperglycemia and hyperinsulinemia prompted through a weight loss plan high in fructose.

3.12 Diabteic neuropathy activity of E. littorale

Poor glycemic manipulate and oxidative strain is one of the fundamental reasons for the improvement of diabetic neuropathy.The defensive consequences of E. Littorale Blume turned into investigated for hypoglycemic and antioxidant effect in alloxan prompted diabetic neuropathy in male Charles foster rats by means of Bhatt et al. Nociceptive responses had been as compared via formalin and tail flick in hot immersion take a look at in each diabetic and non-diabetic rats. Treating with E. Littorale extract for 45 days extensively progressed nociception in diabetic rats. The modifications in lipid peroxidation and antioxidant enzymes like SOD, GPx and CAT tiers, lower in Na-K+ATPase pastime had been additionally restored with the aid of E. Littorale treatment. This take a look at provides an experimental evidence for the preventive effect of E. Littorale on nerve feature and oxidative strain in animal model of diabetic neuropathy. Hence, E. Littorale can be clinically tried for treating diabetic neuropathy due to the fact it became used as a folklore medication in diabetic sufferers.

3.13 Littorale as a new target for islet neogenesis

Gupta et al. Highlighted an islet neogenic belongings of one herbal plant E. Littorale Blume. An active natural compound SGL-1 became isolated and purified from extract of E. Littorale and used to differentiate two model stem cellular strains PANC-1 and NIH3T3 which confirmed extraordinary islet neogenic capability and tremendous islet yield as compared to control serum free medium. Morphological, molecular and immunological characterization of newly generated islet like mobile aggregates proved them differentiated and effective for islet hormones. Functional characterization of ICA's showed good sized glucose responsive insulin launch. This initial record does offer interesting opportunity of alternate source for growing islet mass which may be used the remedy of diabetic patients.

4. CONCLUSIONS

This overview furnishes the presence of numerous phytochemical additives in E. Littorale and its pharmacological homes. The recent evidences indicate an effective role of swertiamarin, a phytochemical compound derived from E. Littorale. It additionally showed anti-inflammatory,antimalarial, hepatomodulatory, hepatoprotective, antihyperglycemic, hypoglycemic, antioxidant, antitumor,hypolipidemic and antihelminthic activities of E. Littorale.This evaluate might also focus scientists to expand clinical studies which might be of amazing medical contribution for the society. The importance of medicinal vegetation in conventional healthcare practices provides clues to new regions of studies and in biodiversity conservation.

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