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UNVEILING THE MYSTIQUE OF *Aerva sanguinolenta*:A COMPREHENSIVE REVIEW

Iftikar Hussain[1], Iba Kordor Khongjoh[1], Dipumoni Kalita[1], Tamanna Khanom[1], Rofiqul Islam[1*]

School of Pharmaceutical Sciences, University of Science and Technology, Meghalaya, Ri-Bhoi, Meghalaya, India-793101

Corresponding author: rofiqul52940@gmail.com

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ABSTRACT:

Aervasanguinolenta, also referred to as bleeding or bloodleaf Aerva, is a plant used in medicine having a long history of use in traditional medicine. In order to shed light on its possible therapeutic applications, this review examines the phytochemical composition, pharmacological activity, and safety profile of the substance. Its many pharmacological qualities are attributed to the presence of bioactive substances such flavonoids, alkaloids, tannins, and saponins, as shown by the phytochemical study. Because *Aervasanguinolenta* contains a high concentration of flavonoids and phenolic chemicals, it has been shown to have considerable antioxidant action. Its ability as an antioxidant offers protection against diseases linked to oxidative stress, which makes it a viable option for treating ailments like neurological disorders and cardiovascular disease. Additionally, the plant exhibits strong anti-inflammatory qualities that are mediated through the suppression of pro-inflammatory enzymes and cytokines. *Aervasanguinolenta* is beneficial because of these anti-inflammatory properties.*Aervasanguinolenta* emerges as a valuable medicinal plant with diverse pharmacological activities, including antioxidant, anti-inflammatory, antimicrobial, antidiabetic, and anticancer properties. Its safety and toxicity profile underscore its potential as a natural remedy for various ailments, although additional research is needed to fully elucidate its therapeutic potential and ensure its safe use in clinical practice.

KEYWORDS: *Aervasanguinolenta*; Anti-inflammatory; COX-2; PGE2; *Aervalanata*, Bakuchiol; Anti-microbial activity; Anti-oxidant activity.

INTRODUCTION

Medicinal plant are most widely used all over the world today. India is a well-known repository for medicinal plants. Plants and their extracts have been employed in Ayurveda, siddha, and Unani medicine for treating various disorders since the beginning of time. Important pharmacological characteristics of phytochemical components include chemopreventive and cytotoxic actions. More than 80% people of the developing countries in the world depend up on traditional medicine basically plant drug used for the primary health care(Sarker et al. 2021) About 29 species make up the *Aerva*genus (Amaranthaceae), which is found in Asia, Africa, and Australia. In Pakistan's dry desert regions, there are six species of this genus found. They are an effective treatment for wounds, rheumatism, cough, sore throat, and fever. And in some

Preclinical research has shown that some species of this genus, including *Aerva sanguinolenta* and *Aerva lanata*, exhibit analgesic and anti-inflammatory properties.(Pandey et al. 2017). Its extensive medicinal properties are linked to the presence of active ingredients including alkaloids, saponins, terpenoids, and various phenolic compounds.(Pieczykolan et al. 2021)*Aerva sanguinolenta's* many parts have been used to treat a range of conditions, including kidney stones, UTIs. This plant also contain alkaloids, flavonoids, saponins, and tannins are a few of the plant's active constituents that are thought to be responsible for the phototherapeutic effects. Due to the plant's abundance of secondary metabolites in all of its parts, which can be found in herbal teas, powders, and capsules, these preparations are frequently utilized in Ayurvedic medicine(Sarker et al. 2021). The *A. sanguinolenta* plant's in vitro CCs were used in the current work to produce a variety of antioxidant metabolites as well as practical botanicals like aervine.(Maqbool et al. 2023) Traditional uses for the entire plant of *Aerva sanguinolenta* (A. sanguinolenta) include dermatitis, sedation, and tonic. The internal use of a plant decoction produced from young branches is used in haematurea and painful or irregular menstruation. In order to treat dysentery the roots of the plant is used and paste of the plants root is used for headaches, roots are externally administered. Bhoxas Dehradun tribal people wear the plant's twig around their necks (Sarker et al. 2021).Further in another ethnobotanical survey of medicinal plant the blood in urine is treated by this tribe by the indegeneous methods like the bark of *Aerva sanguinolenta* is crushed, turned into pills, dried, and combined with three ghughuras (a species of insect). For a month, the pills must be taken three times every day.(Shahidullah et al. 2009)Renowned source for medicinal plants and their extracts, which are used to cure a variety of illnesses in the Siddha, Unani, and Ayurvedic medical systems. Among these is *Aerva lanata*, sometimes referred to as "bui" or "polpala" in the local language, which belongs to the Amaranthaceae family. Found in the wild, it is an erect or prostrate shrub with numerous wolly-tomentose branches and a long taproot. It goes by multiple names in India, including Bhadra (Sanskrit), Sirupulai (Tamil), Bhaya (Bengali), and Gorakhbuti (Hindi). Another way to describe it in English is as a stone-breaking plant. A. *lanata* is significant in medicine and pharmacology. This significant ethnomedicinally plant has been linked to a number of pharmacological actions, including the following: hepatoprotective, nephroprotective, expectorant, demulcent, and anti-inflammatory. An alcoholic extract of A. *lanata* shoots possesses(Bharitkar et al. 2015) Indigenous cultures employ *Aerva sanguinolenta* (L.) Blume for a variety of therapeutic purposes. It is a little perennial herb known by colloquial names like "kapok bush," "mountain knotgrass," and "chiti booti." It is a member of the Amaranthaceae family and has a sub-shrubby, bushy appearance. Different portions of *Aerva sanguinolenta* have been used in traditional ethnomedicines (TEMs) to treat a wide range of illnesses, including kidney stones, urinary tract infections, diarrhoea, dysentery, asthma, and diabetes. The plant's many

active ingredients, which include tannins, alkaloids, flavonoids, and saponins, are thought to be the source of its phototherapeutic benefits. The plant's wide range of secondary metabolites make it a popular ingredient in many Ayurvedic medicines, such as herbal teas, powders, and capsules.(Maqbool et al. 2023) In a similar way, the plant has high levels of flavonoids, such as rutin, kaempferol, and quercetin. These substances are well-known for having antioxidant qualities. *Aerva sanguinolenta* also includes chemicals called saponins, which have the potential to be therapeutic in nature and can foam when combined with water. Due to variations in altitude, temperature, and other factors, the availability of different phytochemicals in wild medicinal plants is typically restricted and unpredictable. This indicates that in order to maximise the contents of these botanicals and medicinal phytochemicals for their prospective application in TEMs and the synthesis of different allopathic medicines, it is imperative. The body naturally produces antioxidant enzymes, which function to counteract free radicals and stop them from doing harm. (Maqbool et al. 2023)(Bharitkar et al. 2015). One of the diseases plaguing humanity today is hyperglycemia, which is a "gift" of the modern lifestyle. These ailments are typically prevalent, especially among the wealthier social classes. In terms of medicine, the former is caused by an insufficiency of the hormone "insulin" within the body. In many situations, these illnesses are regarded as genetic as well. If addressed promptly, they can be effectively managed; but, if left untreated, major difficulties may develop. Additionally, hyperglycemia impairs the body's natural defence mechanism and increases its susceptibility to opportunistic microbial infections. The only thing that modern medicine can do for them is temporarily reduce patients' symptoms; there is no cure. On the other hand, traditional herbal treatments treat them at the aerial part. By getting the affected organ (the pancreas) back to normal functioning, they actually increase the body's production of Insulin. *Aerva lanata* Linn. (*Amaranthaceae*), called 'pulai' in Tamil, 'chaya' in Hindi, and 'Bhadram' in Sanskrit. The woody plant *Aerva lanata* Linn. Is ramous and has several branches. It grows to a height of 30 to 80 cm. The main stem is short but sturdy, with a woody base, and it produces four to ten or more elongate, hairy branches. Numerous tiny hairy white blooms and short, nearly orbicular, 8–20 mm long petioles are seen on the stems. The herbaceous perennial weed *Aerva lanata* Linn (*Amaranthaceae*) grows wild in hot regions of India. There have been claims that *Aerva lanata* is beneficial as an expectorant, anthelmintic, diuretic, and anti-diabetic.(Krishnan et al. 2009). Traditional medical systems such as Tibb-e-Unani and Ayurveda have deep roots in herbal medicine, utilizing medications derived from natural sources like plants, minerals, and animal products. These systems have evolved over centuries, incorporating empirical knowledge, clinical experience, and theoretical frameworks to treat various ailments. However, there exists a misconception regarding the classification of medications used in traditional medicine, particularly those associated with tribal and rural communities. The notion that medications used in traditional medical systems are equivalent to folk or ethnic drugs oversimplifies the complexity and sophistication of these healing traditions. Tibb-e-Unani, for example, is a well-established medical system with a rich theoretical foundation and a systematic approach to diagnosis and treatment. Similarly, Ayurveda, originating from ancient India, encompasses a holistic understanding of health and wellness, emphasizing the balance of body, mind, and spirit. Unlike the fragmented and uncompiled drug information found in rural communities and forest dwellings, traditional medical systems like Tibb-e-Unani and Ayurveda offer a structured framework for understanding pharmacology. These systems are rooted in systematic principles of physiology and pathology, which guide the selection, preparation, and administration of medications. The pharmacological properties of herbs and other natural substances are studied within the context of the body's systems, such as the digestive, respiratory, and

circulatory systems. Moreover, traditional medical systems employ rigorous methods of drug formulation and standardization, ensuring consistency and efficacy in treatment outcomes. Herbal preparations are often compounded based on established formulations and dosage guidelines, taking into account factors such as the patient's constitution, the nature of the illness, and the stage of the disease. It is essential to recognize that while some medications may be commonly used in rural areas, their presence does not diminish the scientific validity or clinical effectiveness of traditional medical systems. Certain herbs and medicinal plants may be endemic to specific geographical regions or cultural traditions, reflecting the diverse biodiversity and indigenous knowledge of local communities. Furthermore, the characterization of medications as "borderline" due to their occasional use in urban areas overlooks the broader context of traditional medicine's influence on modern healthcare practices. Many pharmaceutical drugs and therapeutic interventions have their origins in traditional healing systems, with scientific research validating their pharmacological properties and clinical benefits. However, it is crucial to acknowledge that traditional medical systems face challenges in integration with mainstream healthcare systems, often due to cultural biases, regulatory barriers, and lack of institutional support. Efforts to bridge the gap between traditional and allopathic medicine should prioritize mutual respect, collaboration, and evidence-based practice. In conclusion, traditional medical systems like Tibb-e-Unani and Ayurveda represent sophisticated and holistic approaches to healthcare, grounded in centuries of empirical knowledge and clinical experience. While medications derived from herbs and natural substances are integral to these systems, they are not synonymous with folk or ethnic drugs. Rather, traditional medicine encompasses a diverse array of therapeutic modalities, supported by systematic pharmacology and comprehensive understanding of human physiology and pathology. Embracing the contributions of traditional healing traditions can enrich modern healthcare practices and promote health equity and cultural diversity.(Ahmad et al. 2022) Diabetes has emerged as a significant health concern in the 21st century, with a growing global prevalence that poses considerable challenges to public health systems worldwide. Type 2 diabetes, in particular, represents the most common form of the disease, characterized by insulin resistance or impaired insulin sensitivity, leading to elevated blood glucose levels (hyperglycemia). In this comprehensive elaboration, we will delve into the epidemiology, pathophysiology, management, and associated comorbidities of type 2 diabetes, exploring its multifaceted impact on individuals and societies. Type 2 diabetes has reached epidemic proportions, affecting an estimated 425 million people globally, a figure projected to increase to 629 million by 2045. This escalating prevalence is driven by various factors, including population aging, urbanization, sedentary lifestyles, unhealthy dietary habits, and genetic predisposition. Certain demographic groups, such as ethnic minorities and socioeconomically disadvantaged populations, are disproportionately affected by the disease, highlighting disparities in healthcare access and outcomes. The pathophysiology of type 2 diabetes is complex and multifactorial, involving a combination of genetic, environmental, and lifestyle factors. Insulin resistance, a hallmark feature of the disease, occurs when target tissues, such as muscle, liver, and adipose tissue, become less responsive to the action of insulin. This impairs glucose uptake and utilization, leading to elevated blood glucose levels. In response to insulin resistance, pancreatic beta cells initially compensate by increasing insulin secretion. However, over time, beta cell function may decline, resulting in relative insulin deficiency and further exacerbation of hyperglycemia.

The management of type 2 diabetes is multifaceted, encompassing lifestyle modifications, pharmacotherapy, and, in some cases, insulin therapy. Lifestyle interventions, including dietary modifications, regular physical activity, weight management, and smoking

cessation, play a pivotal role in glycemic control and overall disease management. Dietary recommendations often focus on carbohydrate restriction, glycemic index/load considerations, and portion control, aiming to optimize postprandial glucose levels and reduce cardiovascular risk factors. In addition to lifestyle changes, pharmacological interventions are commonly used to achieve glycemic targets and prevent diabetes-related complications. Oral hypoglycemic agents, such as metformin, sulfonylureas (e.g., glimepiride), thiazolidinediones (e.g., rosiglitazone), alpha-glucosidase inhibitors (e.g., acarbose), dipeptidyl peptidase-4 (DPP-4) inhibitors, sodium-glucose cotransporter-2 (SGLT-2) inhibitors, and glucagon-like peptide-1 (GLP-1) receptor agonists, are prescribed based on individual patient characteristics, comorbidities, and treatment goals.

Metformin, a first-line therapy for type 2 diabetes, works primarily by decreasing hepatic glucose production and improving insulin sensitivity in peripheral tissues. Sulfonylureas stimulate insulin secretion from pancreatic beta cells, while thiazolidinediones enhance insulin action by activating peroxisome proliferator-activated receptor gamma (PPAR-gamma) receptors. Alpha-glucosidase inhibitors delay carbohydrate absorption in the gastrointestinal tract, thereby reducing postprandial glucose excursions. In recent years, there has been a surge in the development of novel pharmacological agents and treatment modalities for type 2 diabetes. This includes incretin-based therapies, such as GLP-1 receptor agonists and DPP-4 inhibitors, which enhance insulin secretion, suppress glucagon release, and promote satiety. SGLT-2 inhibitors, which block renal glucose reabsorption, have also emerged as promising agents for glycemic control and cardiovascular risk reduction. Furthermore, advancements in insulin delivery systems, including insulin analogs and insulin pumps, have improved the convenience, safety, and efficacy of insulin therapy for individuals with type 2 diabetes. Continuous glucose monitoring (CGM) devices offer real-time glucose data and facilitate personalized insulin dosing, thereby optimizing glycemic control and reducing the risk of hypoglycemia. Effective management of type 2 diabetes extends beyond glycemic control to encompass the prevention and management of diabetes-related complications, such as cardiovascular disease, nephropathy, retinopathy, neuropathy, and foot complications. Multidisciplinary care teams, including physicians, nurses, dietitians, pharmacists, and behavioral health specialists, collaborate to provide holistic and patient-centered care, addressing the diverse needs and challenges faced by individuals living with diabetes. Moreover, diabetes self-management education and support (DSMES) programs empower patients to take an active role in their care, fostering self-efficacy, adherence to treatment regimens, and lifestyle behavior change. Regular monitoring of key clinical parameters, including glycated hemoglobin (HbA1c), blood pressure, lipid profile, renal function, and microalbuminuria, enables timely intervention and risk stratification for diabetes complications.(Bharitkar et al. 2015) Type 2 diabetes is associated with a myriad of comorbidities and complications, significantly impacting the quality of life and longevity of affected individuals. Cardiovascular disease, including coronary artery disease, stroke, and peripheral vascular disease, represents the leading cause of morbidity and mortality among individuals with diabetes. Chronic kidney disease (diabetic nephropathy), diabetic retinopathy, diabetic neuropathy, and diabetic foot ulcers are among the common microvascular complications of the disease. Furthermore, type 2 diabetes is recognized as a significant risk factor for other metabolic disorders, including obesity, dyslipidemia, hypertension, non-alcoholic fatty liver disease (NAFLD), and obstructive sleep apnea. The interplay between these comorbidities underscores the importance of comprehensive risk assessment, lifestyle interventions, and pharmacological management to mitigate long-term complications and improve clinical outcomes. Given the substantial burden of type 2 diabetes

on individuals, families, and healthcare systems, preventive strategies and public health initiatives are critical for curbing the rising tide of the disease. Primary prevention efforts focus on promoting healthy lifestyles, raising awareness about risk factors, and implementing population-based interventions to reduce the incidence of type 2 diabetes.

Community-based initiatives, workplace wellness programs, school-based interventions, and policy interventions targeting food environments, physical activity, and tobacco control play pivotal roles in diabetes prevention and health promotion. Screening programs for prediabetes and early detection of diabetes complications enable timely intervention and risk reduction, thereby improving outcomes and reducing healthcare costs. Type 2 diabetes represents a significant public health challenge with far-reaching implications for individuals, communities, and healthcare systems worldwide. Despite advances in prevention, diagnosis, and management, the escalating prevalence of the disease underscores the urgent need for comprehensive strategies to address its multifactorial etiology and complex pathophysiology. Effective management of type 2 diabetes requires a holistic and patient-centered approach, encompassing lifestyle modifications, pharmacotherapy, multidisciplinary care, and preventive interventions. By promoting health equity, fostering collaboration among stakeholders, and investing in research and innovation, we can mitigate the impact of type 2 diabetes, improve outcomes, and enhance the quality of life for millions of individuals affected by this chronic condition.(Akanji et al. 2018)

PLANTTAXONOMY

Botanical Name: *Aerva sanguinolenta* (L.) Blume

Synonyms: Achyranthes sanguinolenta L.

Local Name: Lal biksh hori, “chiti booti”, mountain knotgrass, kapok bushs.

Plant Family: Amaranthaceae

Plant Form: Herb

Geographical Location(s)

India, Bangladesh, Pakistan, central Asia and some part of Africa

PHARMACOLOGICAL ACTIVITIES:

ANTIOXIDANT ACTIVITY:-

In the body, antioxidant enzymes function to neutralise free radicals and stop them from causing harm via reactive oxygen species (ROS). To endure in hostile surroundings and defend themselves against them, plants create these antioxidant metabolites. A more effective antioxidant system enables the plant to withstand challenging conditions and rapidly changing climates, which ultimately affects the plant's phytochemical concentration. In the current study, we employed in vitro CCs of the A. sanguinolenta plant to produce a number of beneficial botanicals, including aervine, and antioxidant metabolites. The use of elicitors in in vitro callus cultures of *Aerva sanguinolenta* has received very less attention in comparison to the use of salicylic acid and nanoparticles in the generation of secondary chemicals by plants. The aervine production in CCs employing elicitors has not received much attention. Therefore, studies were conducted to ascertain the effects of various AgNPs and salicylic acid

concentrations on the generation of aervine and bioactive antioxidants in an *Aerva sanguinolenta* callus culture. The function of these elicitors on callus morphogenesis was also investigated in this work. and a suitable result was elucidated (Maqbool et al. 2023) the antioxidant activity was also seen by DPPH (1,1-diphenyl-2-picryl-hydrazil) free radical scavenging activity At 517 nm, the solution's absorbance was quantified. Standard antioxidant butylated hydroxyl toluene (BHT) was used. The following equation was used to compute the % DPPH scavenging effect:(Pandey et al. 2017)

DPPH scavenging effect(%)=$[A_0 – A_1/A_0]$ X 100

where , A_0 was the absorbance of the control and A_1 was the absorbance in the presence of the test.(Pandey et al. 2017)There are several actions of phenolic acids, including anti-diabetic properties, as established by recent pharmacological investigations. Phenolic acid-rich fractions were extracted for the research investigation, and their antioxidant activity as well as their capacity to inhibit -glucosidase and -amylase were evaluated.(Pieczykolan et al. 2021)The APAE's reduction power was ascertained using the previously mentioned methodology (Oyaizu Citation 1986). Various quantities of the extract (ranging from 100 to 1000 μg/mL) were made using double-distilled water. Potassium ferrocyanide (1.5 mL, 1%) and phosphate buffer (1.5 mL, 0.2 M, pH 6.6) were combined with each concentration (0.5 mL). For twenty minutes, the mixture was incubated at 50 °C. After adding 2.5 mL of 10% TCA to the mixture, it was centrifuged for 10 minutes at 3000 rpm. 1.5 mL of the solution's supernatant was diluted with 1.5 mL of distilled water. Afterwards, 300 μL of FeCl3 (0.1%) was added, and the solution's absorbance was measured at 700 nm. Three duplicates of the experiments were carried out.(Pandey et al. 2017)

ANTICANCER ACTIVITY:

In an International Journal of Drug Development & Research in that research they Evaluate the anticancer activity *of Aerva sanguinolenta* (L.) (Amaranthaceae) on Ehrlich's Ascites cell induced Swiss Mice and after the evaluation it has been found that the life span of the diseased mice was increased (Lalee et al. 2012). A significant decrease in the number of viable cells ($p<0.01$) and an increase in the percentage of life span were seen with ethanolic extract. The results showed that the plant's ethanolic extract had strong, dose-dependent anticancer activity that is similar to vinblastine(Value et al. 2012). The plant's ethanolic extract was discovered to have strong, dose-dependent anticancer activity that is similar to Vinblastine's. The presence of flavonoids is most likely the cause of the cytotoxicity and anticancer activities of the ethanolic extract of *Aerva sanguinolenta*. Additionally extending the life of the tumor-bearing object and bolstering the plant's anticancer properties.(6,7).In an article of European Journal of Integrative Medicine (2011) they studied the Anticancer activity of aerial parts of *Aerva lanata* Linn against Dalton's Ascitic Lymphoma (DAL) in Swiss albino mice and found a significant decrease in Dalton's Ascitic Lymphoma. DAL cells were injected intraperitoneally (1 × 106 cells/ml/mouse) to the mice. The methanolic extract of *Aerva lanata*(knml';dependent cellular cytotoxicity (ADCC). In addition, extract treatment markedly increased the in vivo production of both IFNg and IL-2.(Siveen and Kuttan 2012). In The Natural Products Journal, 2014, 4, 271-279 Antiproliferative and antioxidant Potential of Leaf and Leaf Derived Callus Extracts of *Aerva lanata* (L.) Juss. Ex Schult. Against Human Breast Cancer (MCF-7) Cell Lines it has been found that the Inhibition of cell cycle growth or the arrest of cancer cellproliferation through the induction of apoptosis was determined by the DNA fragmentation assay. The methanolic extracts of *A. lanata* was tested with MTT(MTT 3-(4, 5-dimethylthiazolyl-2)-2, 5-diphenyltetrazolium

bromide assay) and further examined to inhibition of MCF-7(Michigan Cancer Foundation (MCF) and is the most studied human breast cancer cell line) cells in a dose dependent manner.(Kamalanathan and Natarajan 2014)

PHYTOCHEMICAL COMPOSITION:

An analysis of the biochemical profile of *Aerva*species revealed that they are a valuable source of several groups of substances with biological activity. The review of earlier studies on the phytochemistry of the *Aerva*genus's members showed that the steroids, alkaloids, flavonoids, coumarins, terpenoids, and other phenolics have been discovered in these plants. Very few phytochemical investigations have been done on *A. sanguinolenta*. Following phyto-constituents have been isolated and published from this plant so far. Terpenoids: Ameroterpene, bakuchiol, has been isolated from the methanol extract of the dried leaves of *A. sanguinolenta*, which inhibited the growth of Streptococcus mutans -MTCC 497, Actinomyces viscosus -ATCC 15987 and Streptococcus sanguis ATCC 10556 with an MIC value of 0.98 µg/mL for each strain.

Sphingolipids: ASE-1, an anti-inflammatory cerebroside, is found in the ethanolic extract of A. sanguinolenta leaves.

Betacyanins: - In the inflorescence of *A. sanguinolenta*, acylated and simple betacyanins, such as amaranthine (i), isoamaranthine (ii), and celosianin I and II (iii), were detected and measured**.**It also contains flavonoids, tannins and polyphenolic compounds. (Sarker et al. 2021)

Alkaloids: Bioactive canthin-6-one alkaloids are found in plants, including 10-methoxy-canthin-6-one, 10-hydroxy-canthin-6-one, 10-O-β-D-glucopyranosyloxycanthin-6-one, 10-hydroxycanthin-6-one (ervine), 10-methoxycanthine-6-one (methylervine), 10-β-D-glucopyranosyloxycanthin-6-one (ervoside), aervine (10-hydroxycanthin-6-one), methylaervine (10-methoxycanthin-6-one), and aervoside (10-β-D-glucopyranosyloxycanthin-6-one). β-carboline -1-propionic acid, 6-methoxy-β-carboline-1-propionic acid, 6-methoxy-β-carbolin-1-ylpropionic acid (ervolanine), and aervolanine (3-(6-methyoxy-β-carbolin-1-yl) propionic acid) are among the alkaloids found in plants.(Goyal et al. 2011)Phytochemical screening and thin layer chromatographic studies of *Aerva lanata* extract:*Aerva lanata* In September and October of 2012, plant roots were gathered in the Khammam district of Andhra Pradesh, India, specifically from the Chintoor mandal. Prof. Vastsavaya.S. Raju of the Department of Botany at Kakatiya University in Warangal assisted in the identification of the plant voucher specimens, which were then placed at the InfectiousDiseases and Metabolic Disorders Research Lab, Kakatiya University, Warangal, Department of Zoology using standard protocol, chemical tests were performed on extracts of the medicinal plants under investigation to screen and identify bioactive chemical constituents such as alkaloids, carbohydrates, glycosides, saponins, phenolic compounds, phytosterols, proteins, amino acids, flavonoids, and tannins.

The current investigation, which was conducted on *Aerva lanata*, demonstrated the existence of therapeutically active ingredients. Table 2 presents the findings of a qualitative analysis of the phytochemical active components of *Aerva lanata* for roots. Alkaloids, glycosides, saponins, phenolic compounds, tannins, phytosterols, carbohydrates, proteins, amino acids, flavanoids, quinones, and terpenoids exhibit varying sorts of responses in various solvent extracts throughout this screening process. Alkaloids, saponins, tannins, amino acids,

flavanoids, and terpenoids were detected in all solvent extracts of these phytochemical screenings, although phytosterols were found in all extracts with the exception of methanol. The phenolic chemicals found in the ethyl acetate and methanol extracts were accompanied by proteins and carbs. Quinones were discovered in extracts of methanol, acetone, and hexane.(Gujjeti and Mamidala 2007) After applying silica gel (100–200 mesh) column chromatography to the methanol extract of *A. lanata's* aerial parts, one new diterpenoid and twelve other recognised compounds were identified as canthin-6-one, 10-hydroxycanthin-6-one (aervine), 10-methoxycanthin-6-one (methylaervine), b-sitosterol, and b-sitosterol-3-O-b-D-glucoside.1-propionic acid Glucopyranosyl 1-O-b-D (2S,3R,8E)-2-[2hydroxyl palmitoylamino(20R)]1-O-(b-D-glucopyranosyl) and -8-octadecene-1,3-diol-(2S,3S,4R,8Z)-2-[(20R)Twenty-hydroxytetrcosanoil-amino]-8(Z)Octade-1,3,4-triol, (2S,3S,4R,10E)-2-[tetracosanoyla-mino(20R)-20-hydroxy]Ten-octadecene-1,3,4-triol, 60-O-(trans-cinnamoyl-hydroxy)-sulfonoquinovosyldiacylglyceride,3-cinnamoyl-tribuloside,and -kaempferol-3-O-b-D-glucopyranoside (tribuloside).(Bharitkar et al. 2015) The physicochemical contants of *Aerva sanguinolenta*ina research article of international journal of pharmacology and pharmaceutical sciencies that the (Ash Value (% w/w) ash,acid insoluble ash, water insoluble ash values are as follows8, 2, 8.5 respectively. Extractive Values (% w/w) n-hexane soluble extractive (2.38) ,Chloroform soluble extractive(4.76)Ethyl acetate soluble extractive(7.14) Alcohol soluble extractive(11.90)Water soluble extractive(22.5) Loss on Drying (% w/w) (5).(Kundu, Chatterjee, and Sen Gupta 2015)

Fig: -4 -phenyl-2H-1-benzopyran-2-one

Fig: 4-[(1E, 3R)-3-ethenyl-3, 7-dimethylocta- 1, 6-diene-1-yl] phenol

Fig: Ellagic acid

Fig: Flavanone.

Fig: Glycoside.

The ascorbic acid content was measured using a modified version of the Omaye et al. (1979) method. 1 gramme of APAE was crushed in a pestle and mortar with 5 millilitres of 10% TCA, and the mixture was centrifuged for 20 minutes at 3500 rpm. Twice, the pellet was extracted using 10% TCA, and the supernatant was gathered. The DTC reagent (1 mL) was added to 0.5 mL of the supernatent and thoroughly mixed in with the 2, 4 -dinitrophenyl hydrazine-thiourea-CuSO4 reagent. After adding 0.75 mL of ice-cold 65% H2SO4 to the solution, the tubes were incubated at 37 °C for three hours. After the tubes were left to stand at 30? C for 30 minutes, the colour was measured in a spectrophotometer at 520 nm. Using, the ascorbic acid content was calculated.(Pandey et al. 2017)Using spectrometry, the extract's total phenolic content (TPC) was determined (Singleton et al. 1999). One millilitre of diluted Folin-Ciocalteu's reagent (1:20) was combined with one millilitre of APAE (1000 lg/mL) and

thoroughly mixed. Four millilitres (75 g/L) of sodium carbonate and ten millilitres (milled water) were added to the mixture and thoroughly stirred. The mixture was left to stand at room temperature for two hours. After five minutes of centrifuging the contents at 2000 g, the supernatant's absorbance was measured at 760 nm. With different tannic acid concentrations, a standard curve was plotted. The findings were presented in milligrammes of TAE (tannic acid equivalents) for each gramme of extract.(Pandey et al. 2017)(Sarker et al. 2021)

ANTI-INFLAMMATORY ACTIVITY:

The traditionally used leaf extracts and isolated compound(s) of *Aerva sanguinolenta* (*Amaranthaceae*) have anti-inflammatory properties. It is unclear how these compounds work. In illnesses including inflammation. A new cerebroside ('trans', ASE-1), isolated from the bioactive ASE and characterised spectroscopically, was tested by carrageenan-induced mouse paw oedema and protein exudation model, while the anti-inflammatory activity of ethanol extract (ASE) was assessed using acute, subacute, and chronic models of inflammation. We measured the release of pro-inflammatory mediators from lipopolysaccharide (LPS)-stimulated peritoneal macrophages, including nitric oxide (NO) and prostaglandin (PG)E2, as well as cytokines like tumour necrosis factor (TNF)-a, interleukins (IL)-1b, IL-6, and IL-12, in order to comprehend the underlying mechanism. The findings showed that ASE at 400 mg/kg significantly reduced granuloma and rat paw oedema.A complicated biological reaction of vascular tissues to damaging stimuli, inflammation includes a defensive attempt to eliminate the stimuli and start the healing process. Either been categorised as acute or chronic. The body's initial reaction to damaging stimuli, known as acute inflammation, is triggered by an increase in the flow of plasma and granulocytes from blood to the wounded tissues (Colditz, 1985). The immune system, the vascular system, and different cells from the wounded tissues work together to initiate and develop the response through a series of biochemical processes (Kasama et al., 1993). Pro-inflammatory cytokines such as tumour necrosis factor-alpha (TNF-a), interleukin (IL)-1b, and IL-6 are generated concurrently with a variety of inflammatory mediators such as bioactive lipids, reactive oxygen and nitrogen species, cyclooxygenase (COX)-2, and others (Fujiwara and Kobayashi, 2005). According to Ferrero-Mil- iani et al. (2007), chronic inflammation is characterised by a progressive shift of wounded cells at the site that results in both tissue destruction and repair. Pain, oedema, and fever are brought on by the release of prostaglandins mediated by COX. Thus, anti-inflammatory medications are made using COX-inhibitors. Nevertheless, a number of COX inhibitors have significant side effects (Gaddi et al., 2004). As a result, traditional non-steroidal anti-inflammatory medicines (NSAIDs) are inappropriate for treating silent and chronic inflammations. In addition, the majority of anti-inflammatory medications are synthetic, expensive, and have side effects such nephrotoxicity and respiratory.Thus, it is imperative to look for safer, more affordable natural anti-inflammatory drugs. Given that ethnomedicinal plants, in particular, represent a significant source of medications and potential treatments (Chattopadhyay and Khan, 2008; Chattopadhyay et al., 2002), a thorough scientific analysis of these plants may yield novel, inexpensive pharmacological molecules to address long-term toxicity. Known by many names,

such as Burvalor Sufedphulia, *Aerva sanguinolenta* L. Blume (*Amaranthaceae)* is a decorative plant native to the Indian subcontinent. Different portions of this plant are used in traditional medicine to treat a variety of illnesses, including inflammatory diseases. According to Rahmatullah et al. (2009), the leaves can be used as a sedative as well as for

gout, bark in haematuria, bleeding from wounds and cuts, rheumatism, leucorrhoea, bone fracture, bodily ache, malnutrition, stomach disorders, allergic reaction, and dermatitis. According to the findings, ASE-1 at 20 mg/kg and ASE at 400 mg/kg might both reduce inflammation. Moreover, by downregulating the expression of NO, TNF-a, IL-1b, IL-6, IL-12, COX-2, and PGE2, ASE and ASE-1 can modulate inflammatory mediators, demonstrating their immunomodulatory effects to control inflammation. This was investigated in vitro using a murine macrophage model.

Analysing ASE and ASE-1 for paw oedema caused by carrageenan
Six male Wistar rats (180–200 g) in each group were given a subcutaneous (s.c.) injection of 0.1 ml of 1% (w/v) carrageenan in normal saline under sub-plantar aponeurosis to induce inflammation in their right hind paw (Ibrahim et al., 2012). The test group animals were given 100, 200, and 400 mg/kg of ASE orally one hour prior to carrageenan injection, and two distinct groups of animals received sodium carboxymethyl cellulose (0.3%) in water as a vehicle control and indomethacin (10 mg/kg, orally) as a reference anti-inflammatory medication. A plethysmograph device was used to measure the paw volume immediately following carrageenan injection as well as at 1, 2, 3, 4, and 5 hours.In addition, four groups of mice (n = 6) were employed to assess the anti-inflammatory activity of the isolated chemical ASE-1. The test group animals were given 10 and 20 mg/kg of ASE-1 orally, and 30 minutes before the sub-plantar injection of carrageenan (0.02 ml) in normal saline into each mouse's right hind paw, the drug or vehicle control group received indomethacin (10 mg/kg) or CMC (0.3 %), respectively. (Ghosh et al., 2013) A plethysmometer was used to measure the volume of the paw right away and then every hour for the next five hours following the carrageenan injection. Assessment of ASE in rat paw oedema produced by histamine and dextran.This was done similarly to the carrageenan-induced rat paw oedema model, only instead of using carrageenan, 0.1 ml of dextran or histamine (1% w/v) in normal saline was employed (Chattopadhyay et al., 2012; Gupta et al., 2006). Assessment of ASE for granuloma caused by cotton pellets this was done in accordance with D'Arcy et al.'s methodology (1960). This rats were split up into five groups (n = 6), and ketamine hydrochloride (100 mg/kg b.w., i.m.) was used to induce anaesthesia in the animals (Ghosh et al., 2013). Each rat was given a subcutaneous injection of 10 ± 0.1 mg of sterile cotton pellets into both axillary areas. Group I was given a vehicle, while Groups II, III, and IV were given ASE (100, 200, and 400 mg/kg b.w.). Group V animals were given indomethacin (10 mg/kg b.w.) orally for seven days straight starting on the day the cotton pellets were implanted. The animals were put under anaesthesia on the eighth day, and the pellets and granuloma tissues were carefully removed.

Evaluation of ASE and ASE-1 on exudative inflammation

This was done in accordance with D'Arcy et al.'s methodology (1960). Rats were split up into five groups (n = 6), and ketamine hydrochloride (100 mg/kg b.w., i.m.) was used to induce anaesthesia in the animals (Ghosh et al., 2013). Each rat was given a subcutaneous injection of 10 ± 0.1 mg of sterile cotton pellets into both axillary areas. Group I was given a vehicle, while Groups II, III, and IV were given ASE (100, 200, and 400 mg/kg b.w.). Group V animals were given indomethacin (10 mg/kg b.w.) orally for seven days straight starting on the day the cotton pellets were implanted. The animals were put to sleep on the eighth day, and the pellets and granuloma tissues were carefully taken out and freed of any unnecessary tissues.(Mandal et al. 2014)Anti-inflammatory properties in paw oedema produced by carrageenan
the anti-inflammatory properties of APAE on rat paw oedema caused by carrageenan. When

APAE was administered at a dose of 400 mg/kg after the third hour of carrageenan administration, it showed a significant ($p<0.05$) inhibitory effect on paw oedema, whereas the lower dose of 200 mg/kg had no effect when compared to the control. In comparison to the control group, APAE (200 and 400 mg/kg) demonstrated a significant suppression of the mean rise in paw volume after the fifth hour ($p<0.01$, $p<0.001$, respectively). Additionally, indomethacin demonstrated a strong anti-inflammatory effect ($p<0.001$). After administering carrageenan, a significant anti-inflammatory impact was observed in the fifth hour.(Pandey et al. 2017)*Aerva lanata* (Family: Amaranthaceae) powder that had been shade-dried was extracted one at a time using petroleum ether, ethanol, and ethyl acetate in ascending sequence of polarity. Thusly processed extracts were examined using the preliminary phytochemical method. After that, the extracts' analgesic and anti-inflammatory properties were examined in wistar rats using common medications such as Indomethacin and Diclofenac sodium, respectively.
According to the results, all of the extracts significantly reduced pain when tested by the tail immersion method and reduced inflammation when tested by the carrageenan-induced paw edoema method in wistar rats. When compared to other extracts, the ethanol extract at a level of 800 mg/kg body weight was determined to be more significant. (Sharma et al. 2011)The inhibition of xanthine oxidase (XO) activity, a key enzyme involved in purine metabolism, was investigated in this study. Following a method based on Sweeney et al. with slight modifications, the experiment was conducted at a controlled temperature of 30°C using a microplate reader, specifically the Epoch 2 Microplate Spectrophotometer by BioTek Instruments. Spectrophotometric measurement at 295 nm allowed for the monitoring of the increase in absorbance over a 2-minute period, indicating the conversion of xanthine to uric acid by XO. To ensure the specificity of the inhibition, ethanol was employed as a control instead of the sample, while allopurinol, a known XO inhibitor, served as the inhibitor control. The inhibitory activity of the sample was quantified as the EC50 value, representing the concentration required to achieve 50% inhibition of XO activity. This inhibition was observed to follow a dose-dependent mode of action, suggesting a specific interaction between the sample and the enzyme. Furthermore, the mode of inhibition on XO was elucidated using a Lineweaver–Burk plot, which allowed for the determination of the type of inhibition (competitive, non-competitive, or mixed) based on the pattern of the lines generated. Overall, this comprehensive approach provided valuable insights into the inhibitory potential of the sample on XO activity, contributing to our understanding of its potential therapeutic applications in conditions associated with aberrant purine metabolism, such as gout and hyperuricemia.(Pieczykolan et al. 2021)The Hot Plate Test by Eddy *A. lanata's* analgesic activity was evaluated using Woolfe and MacDonald's Hot-plate Test as altered by Eddy and Leimbach. For the investigation, albino rats weighing 100–150 g of either sex were employed. They were split up into four groups, each with ten animals. A. *lanata*'s aqueous extract was given to Groups I and II at doses of 15 mg and 20 mg per 100 grammes, respectively, while Groups III and IV received doses of 15 mg and 20 mg per 100 grammes, respectively, of the plant's juice. The animals were placed on a hot plate set at 55.5 degrees Celsius, and the animals' reaction times—such as forepaw licking or jumping—were timed using a stopwatch.(Ahmad et al. 2022)Look into Steroidal Activity we updated Stephenson's (1954) approach to examine the test drug's steroidal activity.

A total of ten albino rats, each with an equal distribution of sexes and weighing between forty and sixty grammes and one to two months of age, were placed into six groups. Each group's animals had an estimated weight of the same. For three days, twice daily oral administration of regular saline was given to the animals in Group I, which served as the simple control. The

typical treatment for the animals in Group II involved subcutaneous injection of 200 mg of hydrocortisone, divided into 6 doses and administered twice daily for 3 day. and found significant anti-inflammatory activity.(Ahmad et al. 2022)

ANTIMICROBIAL ACTIVITY: -

The antibacterial assay conducted in this study utilized the disc diffusion method to evaluate the antimicrobial activity of different plant extracts against pathogenic bacteria. Initially, a loopful of bacteria was retrieved from the stock culture and dissolved in 0.1 ml of saline solution. Subsequently, discs with a diameter of 6 mm, impregnated with 20 mcg of the respective plant extracts, were placed on the surface of Muller Hinton Agar, which had been previously inoculated with 10 ml of MHA liquid medium containing Gram-positive and Gram-negative bacteria. Negative controls consisted of discs impregnated with the respective solvents without any plant extract, while a standard antibiotic, tetracycline (30 mcg/disc), served as the positive control or reference. The agar plates were then incubated at 37°C for 24 hours to allow for bacterial growth and the potential inhibition by the plant extracts or the antibiotic. Following the incubation period, the diameter of the inhibition zones surrounding the discs impregnated with plant extracts was measured and compared to the diameter of inhibition zones produced by the commercial standard antibiotic discs. The magnitude of the inhibition zones and the antibacterial activity against the pathogenic bacteria were recorded. To ensure reliability and reproducibility, the experiments were repeated in triplicate, and the results were meticulously documented. This methodology allowed for the comprehensive evaluation of the antimicrobial efficacy of the plant extracts, shedding light on their potential as natural alternatives to conventional antibiotics in combating bacterial infections. The investigation focused on exploring the petroleum ether, benzene, ethyl acetate, methanol, and ethanol extracts derived from the entire plant of *Aerva lanata*, aiming to discern their phytoconstituent composition and assess their antibacterial potential against human pathogens. Phytochemical screening of the extracts unveiled the presence of various bioactive compounds, including alkaloids, anthraquinones, catechins, coumarins, flavonoids, phenols, quinones, saponins, steroids, tannins, terpenoids, and sugars. Specifically, methanol and ethanol extracts exhibited a rich array of phytoconstituents, indicating their potential as potent sources of bioactive compounds. Further characterization of the plant extracts was conducted using Fourier-transform infrared (FT-IR) spectroscopy, which revealed distinct absorption peaks indicative of specific functional groups present in the plant constituents. The FT-IR spectral analysis identified characteristic absorption peaks corresponding to functional groups such as C=O (carbonyl), C-H (alkyl), C=C (alkene), O-H (hydroxyl), C-CHO (aldehyde), C-N (amine), and C-Cl (chloro), providing valuable insights into the chemical composition and structural features of the *Aerva lanata* extracts. This comprehensive investigation sheds light on the phytochemical profile of *Aerva lanata* and elucidates its potential as a source of bioactive compounds with significant antibacterial activity, thereby paving the way for further exploration of its therapeutic applications in combating bacterial infections.(Murugan and Mohan 2014)Mohan et al. employed methanol, benzene, and chloroform as solvent sources. In the current investigation, petroleum ether, benzene, and ethyl ethanol, methanol, and acetate as solvent sources for the metabolite extraction process. The majority of the secondary metabolites of the entire *A. lanata* plant were dissolved because ethanol has a higher polarity. Thirteen of the fifteen qualitative tests that were performed to check for the presence of secondary metabolites produced positive results.

The term "nature's biological response modifiers" has been applied to flavonoids due to compelling experimental data supporting their innate capacity to alter the body's response to

allergens, viruses, and carcinogens. They exhibit antibacterial, antiallergic, anti-inflammatory, and anticancer properties. It is well known that tannins have broad antibacterial and antioxidant properties. According to recent findings, tannins may have anti-inflammatory activity.(Murugan and Mohan 2014; Sarker et al. 2021)

ANTIDIABETIC ACTIVITY: -

Dry fractions and crude methanol extract from *Aerva lanata* (L.) Juss. Were found to have anti-diabetic properties. The fraction with the highest glycosidase inhibitory activity was fraction B (EC50 = 0.30 mg dry extract/mL), followed by fraction C (EC50 = 0.71 mg/mL).

Remarkably, the inhibitory effects were found to be roughly twice as strong as those of acarbose (1.39 mg/mL), the typical glucosease inhibitor. The fractions' inhibition of amylase produced different outcomes than their inhibition of glucosease. Although it was less potent than in the case of acarbose, portion A (EC50 = 3.51 mg/mL) showed the largest amylase inhibitory effect. Fraction C (EC50 = 5.46 mg/mL) and fraction B (EC50 = 7.46 mg/mL) came next. (3) Type 2 diabetes mellitus (T2DM) is a complex metabolic disorder characterized by hyperglycemia resulting from insulin resistance and impaired insulin secretion. In this elaboration, we'll delve into the mechanisms underlying T2DM, focusing on the role of insulin resistance, oxidative stress, and the potential therapeutic implications of phenolic acids in mitigating diabetic complications.

Insulin, a hormone produced by the pancreas, plays a crucial role in regulating blood glucose levels by facilitating the uptake of glucose into cells for energy production or storage. In T2DM, the cells become resistant to the action of insulin, leading to impaired glucose uptake and elevated blood glucose levels. This insulin resistance primarily affects skeletal muscle, liver, and adipose tissue, contributing to systemic metabolic dysfunction.

The dysfunction of islet cells, specifically the β-cells within the pancreatic islets of Langerhans, further exacerbates the pathogenesis of T2DM. These β-cells are responsible for producing and secreting insulin in response to elevated blood glucose levels. However, in T2DM, β-cell function is impaired, leading to inadequate insulin secretion and further exacerbating hyperglycemia.

Oxidative stress, characterized by an imbalance between the production of reactive oxygen species (ROS) and antioxidant defenses, plays a significant role in the pathogenesis of T2DM. Both insulin resistance and β-cell dysfunction are closely associated with oxidative stress, which can lead to cellular damage and exacerbate metabolic dysfunction. Oxidative stress-induced damage to β-cells contributes to their dysfunction and eventual apoptosis, further compromising insulin secretion and glycemic control.

As T2DM progresses, the level of oxidative damage increases, reflecting the chronic nature of the disease and its detrimental effects on cellular function. Additionally, reduced activity of antioxidant enzymes exacerbates oxidative stress, creating a vicious cycle that perpetuates diabetic complications.

However, emerging research suggests that certain antioxidants, particularly phenolic acids, may offer therapeutic benefits in the management of T2DM. Phenolic acids are a group of phytochemicals found in various plant-based foods and beverages, known for their potent antioxidant properties. These compounds have been investigated for their potential to mitigate oxidative stress and improve glycemic control in diabetic individuals.

Studies have demonstrated that phenolic acids exhibit significant anti-diabetic activity, with various sources of these antioxidants showing promise in reducing the risk of T2DM. Fractionation of phenolic acids has revealed distinct effects on key enzymes involved in carbohydrate metabolism, such as α-glucosidase and α-amylase.α-glucosidase is an enzyme responsible for breaking down complex carbohydrates into glucose, facilitating their absorption in the intestine. Inhibition of α-glucosidase activity can effectively reduce postprandial hyperglycemia by delaying glucose absorption. Acarbose, a conventional anti-diabetic drug, functions by inhibiting α-glucosidase activity; however, its clinical use is limited by adverse gastrointestinal effects.

Fractionation studies have demonstrated differential inhibitory effects of phenolic acid fractions on α-glucosidase activity, with fraction B exhibiting the most potent inhibition compared to acarbose. This suggests that phenolic acids may offer a natural alternative to synthetic anti-diabetic drugs, with potentially fewer side effects.

Furthermore, the inhibition of α-amylase, another enzyme involved in carbohydrate digestion, can also contribute to improved glycemic control by reducing the rate of glucose release from starch. Phenolic acid fractions have shown varying degrees of inhibition against α-amylase activity, with fraction A displaying the strongest inhibitory effect.

However, excessive inhibition of pancreatic α-amylase may lead to adverse effects such as abnormal bacterial fermentation of undigested carbohydrates in the colon, hypoglycemia, and abdominal distention. Therefore, achieving a balance in enzyme inhibition is crucial for optimizing therapeutic outcomes while minimizing side effects.

In conclusion, T2DM is a multifactorial disorder characterized by insulin resistance, β-cell dysfunction, and oxidative stress. Phenolic acids, with their potent antioxidant properties, offer promising therapeutic potential in mitigating diabetic complications by targeting key enzymes involved in carbohydrate metabolism. Further research is warranted to elucidate the precise mechanisms of action and optimize the therapeutic use of phenolic acids in the management of T2DM.(Pieczykolan et al. 2021)One of the native medicinal plants utilised in Africa to treat diabetes mellitus and its related issues is *Aerva lanata*. Its impact on the functions of enzymes linked to diabetes, however, has not been studied. This investigation assessed the in vitro inhibitory effects of various *A. lanata* leaf extracts on the activities of chemically produced free radicals and diabetes-related enzymes (α-amylase and α-glucosidase). The usual enzyme inhibition experiment was applied to aqueous, ethanolic, and hydroethanol extracts of *A.lanata* leaves, and the mechanisms of inhibition of the enzymes were then determined. Using 2, 2-azino-bis-(3-ethylbenzothiazoline-6-sulphonic acid) and 1, 1-diphenyl-2-picrylhydrazyl (DPPH), the antioxidant activity of the extracts were assessed (ABTS). The outcomes demonstrated that the A. *lanata* leaf hydroethanol extract optimally inhibited(Akanji, Olukolu, and Kazeem 2018)Using in vitro models, examine the anti-diabetic and free radical-scavenging effects of several *Aerva lanata* extracts. Its ability to inhibit α-amylase and α-glucosidase was used to evaluate its antidiabetic qualities, while its capacity to scavenge superoxide and DPPH radicals was used to study its antioxidant activities. One treatment strategy for hyperglycemia associated with diabetes is to inhibit enzymes like α-amylase and α-glucosidase that are involved in the breakdown of carbohydrates. While intestine α-glucosidase catalyses the breakdown of disaccharides into glucose, pancreatic α-amylase is involved in the conversion of starch into disaccharides and oligosaccharides. By inhibiting these enzymes, the gastrointestinal tract's starch decomposition would be slowed down, reducing the severity of hyperglycemia. The maximum inhibition of α-amylase was seen in the ethanol extract of *Aerva lanata*.(Akanji et

al. 2018; Goyal et al. 2011; Sarker et al. 2021)*Aerva lanata*, commonly known as mountain knotgrass or kapok bush, has garnered attention for its potential as an antidiabetic agent due to its ability to inhibit key enzymes involved in glucose metabolism. The efficacy of a hypoglycemic drug is contingent upon its ability to regulate blood sugar levels without inducing adverse effects like abdominal distention or hypoglycemia. In this context, understanding the mechanisms by which *Aerva lanata* modulates the activity of α-amylase and α-glucosidase is paramount. Research indicates that *Aerva lanata* exerts its antidiabetic effects primarily through the inhibition of α glucosidase, an enzyme responsible for catalyzing the final step in the breakdown of complex carbohydrates into absorbable monosaccharides. The hydroethanolic extract of *Aerva lanata* has demonstrated the lowest IC50, indicating a potent inhibition of α-glucosidase activity. This robust inhibition suggests that *Aerva lanata* possesses the capacity to impede the rapid absorption of glucose in the intestines, thereby attenuating postprandial hyperglycemia. Conversely, the inhibition of α-amylase, the enzyme responsible for initiating the digestion of starch into simpler sugars, by *Aerva lanata* appears to be more modest. While α-amylase inhibition is necessary to slow down the rate of carbohydrate digestion and glucose release, excessive inhibition can lead to gastrointestinal discomfort and hypoglycemia. *Aerva lanata* strikes a balance by exhibiting a weaker inhibition of α-amylase, thus minimizing the risk of undesirable side effects associated with overly potent enzyme inhibition.The dual inhibition of α-amylase and α-glucosidase by *Aerva lanata* suggests a synergistic mechanism of action that aligns with the criteria for an effective antidiabetic drug. Previous studies have highlighted the therapeutic potential of plant-based agents that exhibit strong inhibition of α-glucosidase coupled with weaker inhibition of α-amylase. By preferentially targeting α-glucosidase, *Aerva lanata* effectively impedes the rapid breakdown of complex carbohydrates into glucose, thereby attenuating postprandial hyperglycemia. Moreover, its modest inhibition of α-amylase ensures that the digestion of dietary starch proceeds at a controlled pace, mitigating the risk of abrupt fluctuations in blood sugar levels. Further elucidating the molecular mechanisms underlying the inhibitory effects of *Aerva lanata* on α-amylase and α-glucosidase could provide valuable insights for the development of novel antidiabetic therapies. Future research efforts may focus on identifying the bioactive compounds responsible for the observed enzyme inhibition and elucidating their mode of action at the molecular level. Additionally, clinical studies aimed at evaluating the safety and efficacy of *Aerva lanata*-based interventions in individuals with diabetes could help validate its therapeutic potential in a real-world setting. In conclusion, the hydroethanolic extract of *Aerva lanata* emerges as a promising candidate for the development of antidiabetic drugs owing to its potent inhibition of α-glucosidase coupled with modest inhibition of α-amylase. By targeting key enzymes involved in carbohydrate metabolism, *Aerva lanata* demonstrates the potential to regulate postprandial blood glucose levels effectively. Further research into its molecular mechanisms and clinical validation are warranted to harness its full therapeutic potential in the management of diabetes.(Akanji et al. 2018; Maqbool et al. 2023; Sarker et al. 2021)

SAFETY AND TOXICITY:-

SAFETY:

Ensuring the safety of any medicinal substance, particularly when used in its crude form as ethnomedicine, is paramount to safeguarding public health. *Aerva sanguinolenta*, commonly known as bloodleaf or bleeding Aerva, has a long history of traditional use in various cultures

for its purported medicinal properties. Exploring the safety profile of *Aerva sanguinolenta* as a crude drug requires a comprehensive understanding of its pharmacological properties, potential adverse effects, and traditional usage patterns. First and foremost, it's essential to acknowledge the rich ethnobotanical heritage surrounding *Aerva sanguinolenta*. Historically, various indigenous communities across regions where *Aerva sanguinolenta* grows have utilized different parts of the plant for diverse therapeutic purposes. These traditional practices often involve the preparation of decoctions, infusions, or poultices from the leaves and roots, or aerial parts of the plant to address ailments ranging from gastrointestinal disorders to respiratory ailments. However, while ethnomedicinal practices provide valuable insights into the potential therapeutic benefits of *Aerva sanguinolenta*, they also underscore the importance of evaluating its safety profile through rigorous scientific investigation. One of the primary concerns associated with the use of crude herbal remedies is the potential variability in chemical composition and potency, which can significantly impact both efficacy and safety. Therefore, comprehensive phytochemical analysis is essential to identify and quantify the bioactive constituents present in *Aerva sanguinolenta* and assess their potential pharmacological effects and toxicity. Furthermore, assessing the safety of *Aerva sanguinolenta* necessitates a thorough evaluation of its acute and chronic toxicity profiles. Acute toxicity studies, typically conducted in animal models, can provide valuable insights into the potential adverse effects associated with high-dose exposure to *Aerva sanguinolenta* extract or its constituents. These studies help determine the median lethal dose (LD50) and identify any immediate toxic effects that may manifest following ingestion or topical application. In addition to acute toxicity, chronic toxicity studies are essential for assessing the potential cumulative effects of prolonged exposure to *Aerva sanguinolenta*. Chronic toxicity evaluations involve administering the extract or its constituents to animal models over an extended period, allowing researchers to monitor for signs of organ toxicity, carcinogenicity, reproductive toxicity, and other long-term adverse effects. These studies are crucial for establishing safe dosage regimens and identifying any potential risks associated with sustained use of *Aerva sanguinolenta* as an ethnomedicinal remedy. Moreover, it's imperative to consider the potential interactions between *Aerva sanguinolenta* and conventional medications. Many individuals may concurrently use herbal remedies alongside prescription drugs, raising concerns about herb-drug interactions that could potentiate or attenuate the therapeutic effects of either substance. Therefore, comprehensive pharmacokinetic and pharmacodynamic studies are necessary to elucidate the mechanisms underlying any potential interactions between *Aerva sanguinolenta* and commonly prescribed medications. Furthermore, assessing the safety of *Aerva sanguinolenta* extends beyond laboratory studies to include monitoring its real-world usage and associated adverse events. Pharmacovigilance initiatives play a crucial role in identifying and documenting any adverse reactions or unexpected outcomes reported by individuals using *Aerva sanguinolenta* as an ethnomedicine.(Gujjeti and Mamidala 2007, 2017) By systematically collecting and analyzing such data, researchers and healthcare professionals can gain valuable insights into the safety profile of *Aerva sanguinolenta*and inform recommendations for its responsible use. In conclusion, while *Aerva sanguinolenta* holds promise as an ethnomedicinal remedy with potential therapeutic benefits, ensuring its safety requires a multidisciplinary approach encompassing phytochemical analysis, toxicological studies, pharmacokinetic evaluations, and pharmacovigilance initiatives. By systematically evaluating its pharmacological properties and potential adverse effects, researchers can provide valuable guidance to healthcare practitioners and consumers regarding the safe and effective use of *Aerva sanguinolenta* as a crude drug in ethnomedicine.(Murugan and Mohan 2014; Sarker et al. 2021; Venkateswara Rao et al. 2012)

TOXICITY:

The experiment described involving male Swiss albino mice and the administration of different doses of the ethanolic extract of *Aerva sanguinolenta* sheds light on the toxicity profile of this herbal remedy. The study aimed to determine the lethal dose (LD50) of the extract, which represents the dose at which 50% of the test subjects succumb to the substance. Such assessments are crucial for understanding the safety profile of medicinal compounds and establishing appropriate dosage regimens for therapeutic use. Male Swiss albino mice are a commonly used animal model in toxicological studies due to their genetic homogeneity and ease of handling. Dividing the mice into ten groups, each consisting of ten animals, allows for the administration of various doses of the ethanolic extract, ranging from 500 to 2500 mg/kg body weight. The control group receives a standard saline solution to serve as a reference for comparison. The results of the experiment indicate a dose-dependent response to the ethanolic extract of *Aerva sanguinolenta*. At lower doses, no fatalities are observed, suggesting a relatively low toxicity level within this range. However, as the dose increases, a greater number of mice exhibit adverse effects, culminating in mortality at the highest doses tested. Specifically, all mice administered the highest dose of 2500 mg/kg body weight succumb to the extract within 48 hours of administration, indicating a potent toxic effect at this dosage. Of particular interest is the observation that at a slightly lower dose of 2250 mg/kg body weight, only half of the animals in the group perish. This differential response highlights the importance of dose selection in toxicological studies and underscores the concept of dose-response relationships. By comparing the outcomes across different dosage levels, researchers can identify the threshold at which adverse effects become pronounced, leading to morbidity or mortality. Based on the experimental findings, the LD50 of the ethanolic extract of *Aerva sanguinolenta* is determined to be 2250 mg/kg body weight in mice. This value represents a critical metric in toxicology, providing insight into the potency and lethality of the tested substance. Establishing the LD50 allows researchers and healthcare professionals to assess the safety margin of the extract and delineate between therapeutic and toxic dosages. It's important to note that while animal studies provide valuable preliminary data on toxicity, extrapolating these findings to humans requires caution. Species differences in metabolism, physiology, and susceptibility to toxicants can influence the outcomes of preclinical studies. Therefore, additional research, including clinical trials and epidemiological studies, may be necessary to further elucidate the safety profile of *Aerva sanguinolenta* in human populations.(Value et al. 2012)Furthermore, understanding the toxicological properties of herbal remedies like *Aerva sanguinolenta* is essential for regulatory purposes and public health protection. Regulatory agencies rely on toxicological data to establish safety guidelines, set permissible exposure limits, and inform labeling requirements for herbal products. By conducting rigorous toxicity assessments, researchers contribute to the evidence-based regulation of herbal medicines, ensuring consumer safety and promoting informed decision-making. In conclusion, the experiment involving male Swiss albino mice and the ethanolic extract of *Aerva sanguinolenta* provides valuable insights into the toxicity profile of this herbal remedy. The dose-dependent response observed in the study underscores the importance of dose selection and highlights the potency of the extract at higher dosage levels. By determining the LD50, researchers establish a critical benchmark for assessing the safety margin of *Aerva sanguinolenta* and informing dosage recommendations for therapeutic use. However, further research, including human studies, is necessary to validate these findings and elucidate the potential risks associated with the use of *Aerva sanguinolenta* in clinical settings.(Lalee et al. 2012; Mandal et al. 2014)

CONCLUSION:

In conclusion, *Aerva sanguinolenta* emerges as a valuable medicinal plant with diverse pharmacological activities, including antioxidant, anti-inflammatory, antimicrobial, antidiabetic, and anticancer properties. Its safety and toxicity profile underscore its potential as a natural remedy for various ailments, although additional research is needed to fully elucidate its therapeutic potential and ensure its safe use in clinical practice. And hence it will provide a good insight for the research scholar for understanding the details of the plant *Aerva sanguinolenta* and its ethnomedicinal value.

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