RESEARCH PAPER

A Systematic Review on Euphorbia prostrata: Traditional Uses, Bioactive Compounds and Therapeutic Applications

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ABSTRACT
Euphorbia prostrata Aiton is a periodic herb belongs to the euphorbiacae family which are mostly beneficial for treating various disease like asthma, haemorrhoids, analgesics, diabetes, and diarrhoea. It has been observed that this plant also utilized by peoples to treat snake bites. This plant is traditionally used by the medical practioners to treat fever, in purification of blood, and inflammation, gastric issues, and native to tropical and subtropical regions. The chemical composition present in *Euphorbia prostrata* is anthraquinone glycosides, phenols, polysaccharides, flavonoids, phlobotannins, tannins, saponins, and terpenoids. The plant extract is prepared by utilizing various methods such as soxhlet extraction, decoction, microwave assisted extraction and some advanced methods like enzyme assisted, ultrasonication and super critical fluid. Euphorbia prostrata powder is prepared by pulverizing the entire plant after shade-drying it before going for extraction. There are various solvents like methanol, ethanol, or hydro-alcoholic mixtures utilized for extraction purpose and the chemical composition was found to be like tannins, flavonoids, phenolic compounds and other water-soluble components. For effective fractionation of phytochemicals, a novel method such as ultrasound-assisted and microwave-assisted extraction used, which improve the efficiency and less extraction time and solvent required. For structure elucidation different techniques are used like UV–visible spectroscopy, FT-IR, NMR, and mass spectrometry. The current study gathers and evaluates the literature on Euphorbia prostrata botanical traits, ethnomedical applications, phytochemical components, pharmacological actions, and safety considerations.

Keywords: Herbal remedies, bioactive substances, ethnomedicine, Pharmacological activities and therapeutic uses.

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INTRODUCTION

The herbs and aromatic plants have been utilized for therapeutic activities for peoples and animals. Traditional and official medicine mostly uses medicinal herbs, whereas aromatic plants are employed for their flavour and scent (Inoue, *et.al*., 2014). There is evidence which told that almost every ancient civilization was aware to the therapeutic benefits of plants. Indigenous people employed fragrant plants and herbs to treat mental and physical illnesses. (Voliotis, *et.al*., 1998). *Euphorbia prostrata* having many therapeutic potentials and belongs to euphorbiacae family. This is a flowering plant comprises more than 300 genera and 8000 species, making it a very diverse group (Bijekar, *et.al*., 2014). The genus of euphorbia, comprises more than 2000-3000 species, and one of the largest in this family (Aleksandrov, *et.al*., 2019). These species can resemble with succulents or cacti and can be herbs, shrubs, or trees. Their primary habitats are tropical and subtropical areas of America and Africa (Adedapo, *et.al*., 2004). They are mostly distributed globally and utilized as antihaemorrhoidal, anti-inflammatory, pain killer, antidiabetic, anti-diarrheal, anti-asthmatic and for many topical problems. The morphology of Euphorbia prostrata is determined by using electron microscope and structure found such as differentiated cork cells, cortex, endodermis, phloem, phelloderm, medullary rays, and xylem. Scanning electron microscope (SEM) and Transmission electron microscope (TEM) technique are utilized for identification purpose (Sharma, *et.al*., 2012).

Traditionally Euphorbia prostrata have been utilized to manage a range of ailments in Africa, Asia, South America, and some regions of India. The formulation of the plant has been used to treat haemorrhoids and anorectal discomfort, reflecting its strong anti-inflammatory and astringent characteristics that help reduce pain and swelling (Yadav, *et.al*., 2024). Decoctions made from the leaves and entire plant are used in many African cultures to treat urinary issues, diarrhea, and digestive diseases; in Brazil and Ethiopia, they are used to treat malaria and heal wounds (Mavundzaa, et.al., 2022). E. prostrata has long been used in regions of Asia and India to treat skin ailments, asthma, metabolic diseases like diabetes, and even as an anthelmintic and snake bite cure (Yadav, *et.al*., 2024). This review article focuses on the ethanobotanical applications, including its phytoconstituent, extraction process and material, commercial formulation, and clinical trials.

Significance

The *Euphorbia prostrata Aiton* is a yearly green herb having tiny, prostrate, and occasionally a purple tint. They are enormously available around the world, used to treat a various of skin conditions as well as hypolipidemic, antidiabetic, anti- haemorrhoidal, anti-inflammatory, analgesic, antidiarrheal, and anti-asthmatic conditions (Akhtar, *et.al*., 1984). The root part consists of cork cells, a phelloderm, a cortex, an endodermis, a phloem, a medullary ray, and a xylem. The stem consists of multicellular trichome, epidermis, cortex, e cuticle, endodermis, pericycle, phloem, latex canal, xylem, and pith are visible; in the leaf, multicellular, multiseriate glandular hairs, an epidermis, a vascular bundle, and anomocytic and anisocytic stomata are visible (Bakhshi, *et.al*., 2008). Additionally, the vein's islet and termination numbers have been identified. According to the powder study, there are trichomes, parenchymatous cells, pollen grains, capillaries, fibers, stomata, and epidermal cells present (Manadhar, *et.al*., 1985). The extraction values of petroleum ether, alcohol, and water were ascertained. The preliminary test for extract is the total ash, a sulphated ash, an acid insoluble ash, and water-soluble ash (Khandelwal, *et.al*., 2001). The alcoholic extract of plant contained flavonoids, tannins, glycosides, and saponins, according to preliminary phytochemical analyses (Sharma, *et.al*., 2012).

2.1 Geographical indication: Euphorbia prostrata Ait. is little periodic herb present all over India especially in the hills of Himalayan mountains. It is native to the West Indies and certain parts of South America and also widely found in different countries. other parts of the world. The two varieties found are red and green (Singla, et.al., 1989). They are mostly branched prostrate with many stems spreading from the roots, slender up to 18-20 cm long, leaves green but in some season purplish red (API India, Vol. 5(1). It is a beneficial drug in the Indian system of medicine and used in treatment of various ailments (Lin, *et.al*., 1983) and (Eberle, et.al., 1999), digestive system (Rene, et.al., 2007), anti-asthmatic (Sharma, et.al., 1984), antidiabetic (Akhtar, *et.al*., 1984), haemorrhoids (Bakshi, *et.al*., 2008) etc.

2.2 Ethnobotanical Use: Euphorbia prostrata ethnobotanical relevance is demonstrated by the centuries-long usage of this plant in traditional medicine across numerous civilizations (Amtaghri, *et.al*., 2022). It is most well-known for its application in the treatment of hemorrhoidal disorders (piles), where the plant's preparations assist lessen bleeding, inflammation, pain, and discomfort brought on by enlarged blood vessels in the rectal region (Dhiman, *et.al*., 2023). Based on traditional practice, this application has been incorporated into contemporary herbal compositions.

In India and Africa E. prostrata traditionally, having anti-inflammatory and astringent property which relieve the buccal mucosal irritation and reduce the bowel irregularity such as dysentery, mild diarrhea, and indigestion (Sen, *et.al*., 2017). This plant also utilized for treatment of minor infections, wounds, cuts, and skin disorders. The leaves extract is utilized in topical applications such as in wound healing and prevent the extent of microbial contamination (Albahri, *et.al*., 2023). Euphorbia prostrata having some potential in treatment of liver detoxification, and general inflammatory symptoms. This herb has been used ethnomedical in many cultures, where healers have used various plant parts particularly the leaves and aerial portions to make decoctions, poultices, and topical treatments that correspond with its tissue-soothing, anti-inflammatory, and antioxidant properties reported in traditional healing systems (Feng, *et.al*., 2019). In table 1. There are some ethnobotanical uses, its parts and mode of utilization are listed below.

Table 1. The ethnobotanical aspects of plant Euphorbia prostrata.

Sr. No	**Plant Part Used**	**Ethnobotanical utilization**	**Mode of utilization**	**Reference**
1.	Whole plant	Treatment of inflammatory diseases, diarrhea, dysentery, and haemorrhoids	Utilized in standardized herbal compositions, the dried whole plant can be powdered or made into a decoction.	Burkill, *et.al*., 2000
2.	Aerial parts	Anti-inflammatory, astringent, and digestive aid	Oral decoction or infusion; extract utilized in contemporary formulations	Sharma, *et.al*., 2012
3.	Leaves	Skin conditions, wound healing, and gastrointestinal issues	Topically applied leaf pastes or poultice; internally consumed decoction	Jain, *et.al*., 1991
4.	Stem	Supporting and reducing inflammation in piles	Incorporated with aerial components in extracts and decoctions	Burkill, *et.al*., 2000
5.	Latex	Management of small wounds, warts, and localized swellings	Due to its irritating properties, fresh latex should only be administered externally in very small amounts.	Sharma, *et.al*., 2012

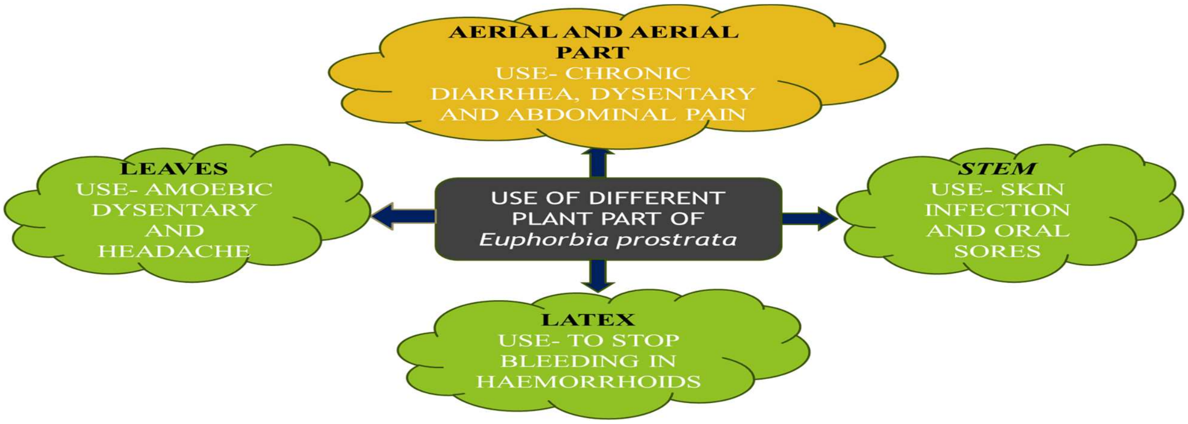


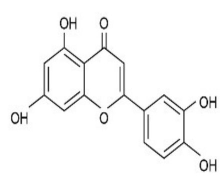
Figure 1. Different plant parts with their uses

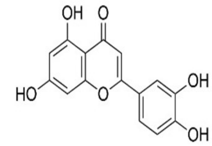
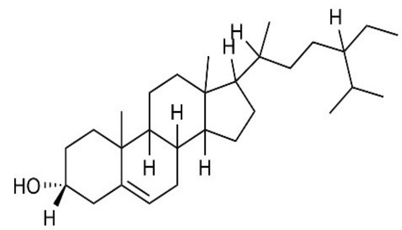
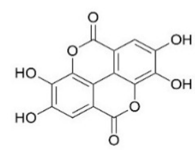
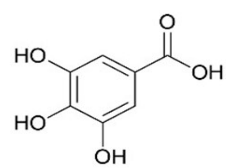
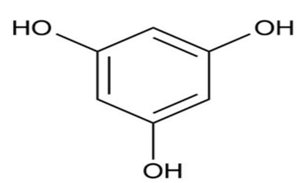
Phytochemical composition

The phytochemical makeup of the extracts showed that alkaloids, flavonoids, leucoanthocyanins, coumarins, and reducing agents were present in all of the extracts (Kengi, *et.al*., 2013). Phytochemical analysis revealed that Euphorbia's hydroethanolic and aqueous extracts Benin-adapted prostrates are abundant in alkaloids.

It could be explained by environmental and biological factors that affect secondary metabolite synthesis and genetic variability (Kamagang, *et.al*., 2007). The therapeutic properties of Euphorbia prostrata are mostly attributed to its abundance of polyphenolic chemicals (Chen, *et al*., 1992, Yadav, *et.al*., 2024). The plant extract found to having various chemical constituents including hydrosable tannins like geranin, rugosins, and corilagin. A derivative of galloyl glucose is also present in this plant (Chen, *et al*., 1992 and Sharma, *et al*., 2012). It has been concluded that tannins are responsible for antioxidant, astringent and anti-inflammatory effects and also having many other medicinal use (Yadav, *et.al*., 2024, Gupta, *et.al*., 2009). On further studies, it shows that the plant extract contained flavonoids such as luteolin, apigenin, quercitrin, kaempferol, quercetin, and apigenin-7-O-glucoside having free radical scavenging and vascular properties (Sharma, *et al*., 2012 and Aslam, *et.al*., 2024). Some phenolic constituents are present such as gallic acid and ellagic acid which is responsible for plant's antioxidant potential (Chen, *et al*., 1992 and Mahy, *et.al*., 2004). The Euphorbia prostrata also contains tiny components such as saponins, terpenoids, and glycosides, as well as phytosterols like β-sitosterol and stigmasterol. (Singh, *et.al*., 2018). In table 2. The structure and chemical structure of observed constituent are listed in this table.

Table 2. The Bioactive Constituent and Structure of *Euphorbia prostrata.*

Sr. No.	**Name of Phytoconstituents**	**Plant part**	**Structure with IUPAC Name**	**References**
1	Quercetin	Whole Plant	 2-(3,4-Dihydroxyphenyl)-5,7-dihydroxy-4H-1-Benzopyran-4-o	Chen, *et.al*., 1992

2	Luteolin	Leaves and stem	 2-(3,4-dihydroxyphenyl)-5,7-dihydroxy-4H-chromen-4-one	Yadav, *et.al*., 2004
3	β-Sitosterol (Sterol)	Aerial Part		Sharma, *et.al*., 2012
4	Ellagic acid	Leaves and whole plant	 Benzopyrano[5,4,3-cde][1] benzopyran-5,10-dione, 2,3,7,8-tetrahydroxy	Aslam, *et.al*., 2024
5.	Gallic acid	Leaves	 3,4,5-trihydroxybenzoic acid	Gupta, *et.al*., 2009
6.	Phloroglucinol	Aerial part	 1,3,5-Benzenetriol	Singh, *et.al*., 2018
7.	Salicin	Whole part		El-Mahy, *et.al*., 2004

Extraction Methods

Extraction is an important procedure in isolating the chemical constituent present in it. There is various method of extraction employed for extraction process. Traditionally, decoction, maceration, cold maceration and soxhlet techniques are used. The use of extraction methods is on basis of medicinal plants, desired components and solvent system used. (Azwanida, *et.al*., 2015). The conventional methods having some limitation like heat sensitive constituent are destroyed due to heat fluctuation and they required a greater number of solvent systems. (Pandey, *et.al*., 2014). For thermostable substances, a soxhlet extraction is the best techniques and organic solvent are required. Traditionally, for aqueous components such as flavonoids and tannins the preferred mode of extraction is decoction and infusion (Handa, *et.al*., 2008). To overcomes, these limitation advanced and novel methods are employed for extraction purpose such as ultrasound-assisted extraction (UAE), enzymes assisted extraction, supercritical fluid and microwave-assisted extraction (MAE) which enhanced the extraction efficiency, limit the use of solvent, and speed up processing (Azmir, *et al*., 2013). For high purity and obtained no solvent residue in extract a Supercritical fluid extraction (SFE), particularly with CO_2, is regarded as an environmentally beneficial method (Chemat, *et.al*., 2012).

Decoction

In this method, a water-soluble phytoconstituents are extracted from Euphorbia prostrata, which is a conventional aqueous extraction method. The plant sample are prepared firstly by shade-drying and coarsely powder is used for extraction. There are various dried aerial parts like leaves and stems are used for extraction purpose in distilled water for about 15 to 30 minutes (Farooq, *et.al*., 2017). The solvent is used in ratio water: organic solvent usually a 1:10 (w/v) ratio. The polar substance such as hydrozable tannins flavonoid, glycosides, phenolic acids like gallic and ellagic acids are extracted more efficiently. To get the desired extract, boiling is followed by cooling then filtering is done (Yoshida, *et.al*., 1994). The filtrate is then dried or concentrated at lower pressure to get a solid extract. The decoction method is well used method for extraction of works well for tannins because heat promote the release of bound phenolic compounds. This method is not employed for non-polar or thermolabile constituents like sterols (Meghana, *et.al*., 2022).

Cold maceration

This method is a popular and very easy extraction method for separating bioactive components from Euphorbia prostrata (Harborne, *et.al*., 1998). The plant sample are prepared by coarsely ground plant material which is soaked for mostly for 24 hrs to some days at 25 ℃ in desired solvent like water, ethanol, or hydroalcoholic mixture (Trease, *et.al*., 2009 and (Kokate, *et.al*., 2010). Cold maceration method is mostly used for isolating thermolabile bioactive components such as flavonoids, glycosides, and dome phenolics to avoid direct exposure to high temperatures (Harborne, *et.al*., 1998). After some hours of soaking the extract is filtered to remove any solid residues present in the solution of extract and the filtrate is concentrated at a lower pressure (Trease, *et.al*., 2009). The advantages of this method are it is affordable, simple to use, and suitable for small-scale laboratory (Houghton, *et.al*., 1998).

Soxhlet extraction

Soxhlet extraction is a continuous hot solvent extraction technique that is widely used in phytochemical research to isolate bioactive compounds from plant sources (Mondal, *et.al*., 2024). This method entails heating a suitable solvent in a flask beneath a porous thimble that holds powdered and dried plant material inside the soxhlet apparatus (Okoduwa, *et.al*., 2016). As the solvent vapor rises, condenses, and repeatedly washes over the plant sample, soluble components dissolve (Alara, *et.al*., 2021). When the chamber reaches a predefined level, the extract mechanically syphons back into the flask, and the cycle repeats. This repeated reflux process aggressively extracts a variety of compounds, including flavonoids, alkaloids, tannins, and sterols (Nortjie, *et.al*., 2011). Although the technique works well and is simple to employ in the lab, prolonged heat exposure and excessive solvent use may damage thermolabile compounds and pose environmental problems (Pathan, *et.al*., 2025).

Maceration

Maceration is a traditional extraction method that dissolves bioactive components by soaking coarsely ground plant material in an appropriate solvent at ambient temperature (Abubakar, *et.al*., 2020). The technique is widely utilized in medicinal plant research since it is simple to use in lab settings and requires little equipment (Jan, *et.al*., 2019). The plant material is kept in a closed container with the selected solvent for a set period of time, often several days, with occasional shaking to enhance solvent penetration and diffusion (Smith, et.al., 2023). The primary extraction technique is passive diffusion, which allows soluble phytochemicals including flavonoids, alkaloids, and tannins to enter the solvent (Mbaveng, *et.al*., 2021). Because maceration doesn't involve heating, it is particularly suitable for thermolabile materials that could degrade at high temperatures (Ncube, *et.al*., 2008). After the extraction procedure is complete, the mixture is filtered to eliminate the marc from the liquid extract. After that, the liquid extract can be condensed for further pharmacological or phytochemical examination (Sultana, *et.al*., 2009).

Percolation:

Percolation is a continuous extraction method that dissolves soluble components by letting a suitable solvent progressively pass through a column of coarsely powdered plant material (Wang, *et.al*., 2023). The powdered drug is first moistened with solvent and left to allow for adequate swelling and uniform penetration before being added to the percolator (Martins, *et.al*., 2014). In order to generate a saturated layer that permits gravity to pull the material downward under control, additional solvent is then injected over the packed material (Rosas et al., 2019). As the solvent moves through the plant matrix, it extracts bioactive compounds and carries them to the collecting vessel (Gouveia, *et.al*., 2018). Continually changing the solvent improves extraction efficiency as compared to simple soaking methods. The collected percolate is then condensed if needed to provide the extract required for further formulation or analysis (Gracia, *et.al*., 2018).

Successive soxhlet extraction:

In soxhlet extraction, where solvent system is used in successive manner in extraction process. Here, the solvent is added on the basis of polarity to get a distinctive extract (Khoddami, *et.al*., 2013). The non-polar solvent such as petroleum ether, is utilized to isolate the hydrophobic substances such as waxes and lipid. For such extraction, the dried and powdered plant sample are utilized (Kumar, *et.al*., 2010). For moderately polar compounds such alkaloids, glycosides, and flavonoids a more polar solvent like ethanol, chloroform, or methanol are utilized (Li, *et.al*., 2017). For to get maximum compounds for a single plant a sequence type algorithm is employed that prevents the cross-contamination across various compound classes (Wiabowska, *et.al*., 2013). The obtained chemical constituent is utilized for further studied to check its pharmacological activities (Azwanida, *et.al*., 2015). The successive soxhlet extraction is particularly useful techniques for obtaining fractionated extracts depending on its polarity, which enhances the effectiveness of bioactivity investigations (Trease, *et.al*., 2009).

Microwave assisted extraction:

In microwave assisted extraction, a microwave radiation is used to make it easier for analytes to separate into the solvent from the sample matrix (Kaufmann, *et.al*., 2002). These radiations fall on the solvent and analyte causing heating near the material surface. Conduction transfers heat from the material's surface. Microwave electromagnetic dipole rotation of the molecules breaks hydrogen bonds, increasing the movement of dissolved ions and facilitating solvent penetration into the matrix (Kaufmann, *et.al*., 2002). Poor heating happens in non-polar liquids because energy is only transmitted by dielectric absorption. Polar molecules and solvents with a high dielectric constant are preferred by MAE, which may be regarded as a selective technique. If we compared the traditional procedure (maceration and Soxhlet extraction), this methodology decreased the extraction time and solvent volume. Analyte recoveries and repeatability were improved utilizing the MAE approach, although care must be taken to use the right conditions to prevent heat deterioration (Trusheva, *et.al*., 2007).

Sonication extraction or Ultrasound-assisted extraction (UAE):

In this technique, ultrasound frequencies are utilized between 20 kHz to 2000 kHz (Handa, *et.al*., 2008). The permeability of cell walls and the surface contact between solvents and samples are both increased by the mechanical action of acoustic cavitation from ultrasound. When materials are exposed to ultrasound, their physical and chemical characteristics change and the plant cell wall is disrupted, allowing for the release of chemicals and improving the mass transport of solvents into the plant cells (Dhani, *et.al*., 2013). It is a straightforward and reasonably priced method that may be applied to phytochemical extraction on a local or big scale. The UAE's advantages are mostly attributable to shorter extraction times and lower solvent usage. However, the production of free radicals may have an impact on the active phytochemicals if ultrasonic radiation is used at frequencies higher than 20 kHz (Kaufmann, *et.al*., 2002 and Handa, *et.al*., 2008).

Accelerated solvent extraction (ASE)

This technique uses less solvent than maceration and soxhlet extraction, making it a most effective method for liquid solvent extraction. To stop sample from gets aggregated an inert material, such as sand is put inside the stainless-steel extraction cell (Rahmalia, *et.al*., 2015). The filter paper made up of sand layers and layers of the sand-sample mixture in a packed in the ASE cell. This automated extraction system takes less than an hour to extract and maintain the temperature as well as pressure for each sample. ASE is highly dependent on the kinds of solvents, much like other solvent techniques. *Bixa orellana* produced the largest amount of bixin with 68.16% purity when heated to 50°C for five minutes in a 6:4 v/v cyclohexane acetone solution

(Rahmalia, et.al., 2015). Using 80% aqueous methanol, ASE showed high recoveries (~94%) of flavonoids from *Rheum palmatun*, indicating the method's appropriateness for quality control assessment (Tan, *et.al*, 2014).

Supercritical fluid extraction (SFE):
This extraction process takes less than an hour with this automated extraction technique, which can maintain temperature as well as pressure for each sample. Like different solvent techniques, ASE heavily stands on the nature of solvents. A 6:4 v/v cyclohexane acetone solution heated to 50°C for five minutes produced the highest bixin from Bixa orellana, with a purity of 68.16% (Rahmalia, et.al., 2015). Using 80% aqueous methanol, high recoveries (~94%) of flavonoids from *Rheum palmatun* were found by ASE, indicating that this approach is suitable for quality control assessment (Tan, *et.al*, 2014). In table 3. The different extraction methods, solvent used and part of plant with procedure are listed in this table.

Table 3. List of different extraction methods with solvent system

Sr. No	Extraction	Part used	Solvent used	Type of Extract	Extraction Procedure	Reference
1.	Decoction	Whole plant	Distilled water	Aqueous	This process involves shade-drying, coarsely powdering, and boiling the plant's dried aerial parts (leaves and stems) in distilled water for 15 to 30 minutes.	Farooq, *et.al*., 2017
2.	Cold maceration	Whole plant	Distilled water	Aqueous	The coarsely ground plant material is soaked for a predetermined amount of time, often 24 hours to several days, at room temperature in an appropriate solvent, most commonly water, ethanol, or hydroalcoholic mixes.	Trease, *et.al*., 2009
3.	Soxhlet extraction	Whole plant	Ethanol	Crude ethanolic extract	This approach involves heating an appropriate solvent in a flask underneath a porous thimble containing dried and powdered plant material inside the Soxhlet device. Soluble components are dissolved as the solvent	Mondal, *et.al*., 2024

					vapor rises, condenses, and repeatedly washes over the plant sample.	
4.	Maceration (72 hrs.)	Whole plant	Methanol	Methanolic extract	Maceration is especially appropriate for thermolabile substances that may breakdown at high temperatures because it is done without heating.	Abukar, *et.al.*, 2020
5.	Percolation	Coarse powder	Aqueous (Distilled water)	Aqueous extract	The continuous extraction process known as percolation dissolves soluble components by allowing a suitable solvent to gradually move through a column of coarsely ground plant material.	Wang, *et.al.*, 2023
6.	Soxhlet extraction (Successive)	Coarse powder	Petroleum ether, Chloroform, Ethyl acetate, Methanol	Fractionation for phytochemical profiling	The process of successive Soxhlet extraction involves extracting plant material in succession using solvents with varying degrees of polarity in order to produce distinct classes of phytochemicals.	Khoddami, *et.al.*, 2013
7.	Microwave assisted extraction	Whole plant	Microwave	Microwave radiation	This methodology decreased the extraction time and solvent volume. Analyte recoveries and repeatability were improved utilizing the MAE approach, although care must be taken to use the right	Trusheva, *et.al.*, 2007

					conditions to prevent heat deterioration.	
8.	Sonication	Whole plant	Ultrasonic wave	Ultrasonic radiation	The production of free radicals may have an impact on the active phytochemicals if ultrasonic radiation is used at frequencies higher than 20 kHz.	Handa, *et.al*., 2008
9.	Accelerated solvent extraction	Whole plant	Aqueous methanol	80% aqueous methanolic extract	Using 80% aqueous methanol, ASE showed highest recoveries (~94%) of flavonoids from *Rheum palmatun*, indicating the method's appropriateness for quality control assessment.	Tan *et.al*., 2014
10.	Supercritical fluid extraction	Whole plant	Aqueous Ethanol	80% aqueous methanolic extract	ASE is heavily dependent on the kinds of solvents. A 6:4 v/v cyclohexane acetone solution heated to 50°C for five minutes	Rahmalia, *et.al*., 2015

Pharmacological activity and Mechanism of Action

Antidiabetic Activity

When methanolic extract was given to alloxanized rabbits, their serum glucose levels significantly decreased. Serum glucose levels were nearly three times higher in each diabetic groups compared to the control group for one week after alloxan administration (Garg, *et.al*., 2025). After delivery, methanolic extract at both dosages had a substantial ($P < 0.05$) hypoglycaemic impact after six hours. However, the dose of 500 mg/kg body weight caused the greatest drop in fasting blood glucose (Akah *et al*., 2011).

Diabetic Neuropathy

The impact of *Euphorbia prostrata* hydroalcoholic extract (EPHAE) on rats with diabetic nephropathy (DN) brought on by NAD-STZ. Increased glucose, water, and food intake, along with decreased insulin and body weight, were the hallmarks of the effectively developed NAD-STZ-induced DN. After taking EPHAE (0.15 g/kg) and glimepiride (0.01 g/kg) for 60 days, these levels returned to normal. When EPHAE and glimepiride were taken in a dose-dependent manner, the levels of HDL increases, while the level of low-density lipoprotein, very low-density lipoprotein, cholesterol, triglycerides, albumin, creatine, urea, and uric acid. Furthermore, following the dose-dependent administration of EPHAE and glimepiride, Enzyme Linked Immunosorbent Assay (ELISA) data show a decrease in the levels of IL-1β, IL-6, TNF-α, TGF-β, and NF-κB (Shamim, *et.al*., 2014).

Anti-inflammatory activity

Rats were used to test the anti-inflammatory properties of an ethanol extract of the entire plant Euphorbia prostrata. At an oral dose of 0.2 g/kg, the ethyl acetate fraction prevented 76% of the acute paw edema caused by carrageenan. At a dose of 0.008 g/kg, a fraction known as KSE-23 that was separated from the ethyl acetate fraction prevented 57% of pedal edema. Histamine-induced edema was selectively inhibited in acute inflammatory investigations of fractions employing bradykinin-induced pedal edema, indicating reduction of the initial phase of the acute inflammatory response (Singla, *et.al*., 1989).

The purpose of the study was to ascertain how Euphorbia prostrata hydroalcoholic leaf extract affected joint destruction, paw edema, and the production of cytokines that cause inflammation in animal models of rheumatoid arthritis. According to the research given here, Euphorbia prostrata hydroalcoholic extract may be used to treat and manage rheumatoid arthritis since it decreases inflammatory symptoms, suppresses macrophage activity, and regulates IL-1, IL-6, and NF-κB (Hariyadi, *et.al*., 2020).

Anti-malarial activity

The plant extract showed no signs of toxicity or mortality 0.2 g/kg. In comparison to the group treated with distilled water, the 4-day chemo-suppressive anti-malarial activity generated by the crude extract were 66.87%, 84.94%, and 93.69% at 0.2, 0.4, and 0.6 g/kg extract, respectively. In comparison to mice treated with 0.2 g/kg extract, mice treated with 400 mg/kg ($P < 0.01$) and 600 mg/kg extract ($P < 0.001$) demonstrated substantial variation in chemo-suppressive anti-malarial efficacy (Muluye, *et.al*., 2014).

Anti-bacterial activity

The E. prostrata having an antibacterial as well as antioxidant activities which protect form bacterial exposure and oxidative stress. The methanolic extract of E. prostrata having 3 different quantities i.e., 0.001, 0.003 and 0.005 g/ml. These 3 doses are given to the exposed patients and after further investigation it founded that at the dose of 0.005 g/ml produced the greatest inhibition and moderate inhibition at 3 mg/ml and minimal inhibition at 1 mg/ml. The methanolic extract of E. prostrata shows a great scavenging activity at different concentration and scavenging properties are related on basis of the percentage of *E. prostrata* extract used. (Ahmad, *et.al*., 2011).

Hepatoprotective activity

According to these studies, the extract of Euphorbia prostrata showed a great significant reduction in alanine aminotransferase (ALT), aspartate aminotransferase (AST) ($p < 0.010$), and alkaline phosphatase (ALP) ($p < 0.0011$) at a dose of 0.25 g/kg in paracetamol-induced intoxication. On comparing them with disease control group, Euphorbia prostrata extract significantly reduced the activities of aspartate aminotransferase (AST) and alanine aminotransferase (ALT) up to ($p < 0.0011$) at 0.5 g/kg. However, at 0.5 g/kg, Euphorbia prostrata extract did not significantly change the levels of alkaline phosphatase (ALP) (Alamgeer, *et.al*., 2025).

Anti-diarrheal activity

Traditionally Euphorbia prostrata is used to various types of ailments such as inflammation, analgesics, amoebicidal, etc., including diarrhea. For determining the acute toxicity of aqueous ethanolic extract *of E. prostrata* in bacillary dysentery in vivo method are utilized for the extent of bacterial growth, and gastrointestinal propulsion. After the toxicity studies it shows that aqueous ethanolic extract of *E. prostrata* was non-toxic. In in vitro studies, the minimal inhibitory (MIC) and minimal bactericidal concentrations (MBC) was found to be 3,500.00 and 12,000.00 µg/ml, respectively. The in vivo study revealed that there is an increase in the bacterial population due to increase in frequency of faces.

On day 3rd was found to be $P < 0.011$, after 3rd day an increase in the bacterial population peaked following infection ($P < 0.011$). Till day 6, the diarrheal control group had a 100% death rate. Similar to norfloxacin, extracts of E. prostrata (20 and 40 mg/kg) decreased bacterial growth ($P < 0.01$), resulting in a Sd1 density of less than 100 by the sixth day and no deaths. The frequency of feces decreased significantly ($P < 0.01$). Intestinal propulsion was significantly ($P < 0.01$) inhibited by the extract (Rene, *et.al*., 2007).

Anti-helminthic activity

The *Euphorbia prostrata Ait's* have antihelmintic activity because the plant's decoction has historically been required for this purpose. *Pheretima posthuma*, an adult Indian earthworm, was used for the anthelminthic assay because of its morphological and physiological similarities to the human intestinal roundworm parasite. (3, 4) Eight groups of six worms each were created from the worms. For the investigation, 50 mL of ethanolic and aqueous extracts at four different concentrations (0.04, 0.05, 0.075, and 0.01 g/ml) were produced in the distilled water. The ethanolic and aqueous extracts exhibit strong, dose-dependent anthelmintic action which is comparable to that of the common medication piperazine citrate (Sharma, *et.al*., 2011).

Gastroprotective activity

The *Euphorbia prostrata* plant protects male adult albino rabbits against aspirin-induced stomach ulcers. While E. prostrata extract dramatically ($P<0.05$) decreased TOS and MDA levels, it significantly ($P<0.05$) increased TAC and CAT activity equal to the synthetic antiulcer medication cimetidine. According to the study's findings, E. prostrata extract at 0.01, 0.02, and 0.04 g/kg demonstrated stomach protection of 33.79%, 53.15%, and 70.66%, respectively. The study found that the synthetic antiulcer medication cimetidine provided 72.85% stomach protection. According to the aforementioned findings, E. prostrata extract exhibited gastroprotective efficacy comparable to cimetidine at a dose rate of 0.04 g/kg (Ahmad, *et.al*., 2019).

Analgesic activity

Various studies witnessing the use of plants as medication to treat pain, haemorrhoid, wound diarrhoea and inflammation. The analgesic properties of crude extract using n-hexane and ethyl acetate of Euphorbia prostrata extract. The phytochemical screening was performed by uuing n-Hexane and ethyl acetate extract are determined. At a dose of 1000 mg/kg, both the ethyl acetate and hexane crude extracts significantly increased pain reaction time (PRT). The t-test value of 24.98 at the $\alpha = 0.004$ level of significance and minimal standard deviations of 0.157 and 0.0567 for diclofenac and ethyl acetate extract, respectively. The results were statistically valid and demonstrated the effectiveness of the ethyl acetate and hexane extracts, which suggested that E. prostrata having analgesic properties and a promising lead for drug development (Biwott, *et.al*., 2015).

Antioxidant activity

The *E. prostrata* having antioxidant and radical scavenging activity. This study uses ethanolic extract of fresh leaves. For performing extraction, 0.5 g of dried fresh leaves were ground by using a tissue grinder and 5.0 mL of 50 mM cooled phosphate buffer (pH 7.8) are used and an ice bath in also used to extract antioxidant enzymes. To obtain homogeneous extract the solution was centrifuge at 4°C for 20 minutes at 15,000 rpm. The supernatant layer is used for its enzymatic activity and the protein content was also determined. (Lowry, *et.al*., 1951).

Anti-haemorrhoids activity

In this study, dried extract of *Euphorbia Prostrata* is used and 100 mg tablets were prepared and administered to the patients suffering from bleeding for 14 days. The efficacy and safety are measured on taking 1836 patients and they are under care of 476 investigators. The symptoms arise in patient are taking this medication like bleeding, itching, pain, and prolapse, were shown and these observations are compared using baseline values. (Bakshi, *et.al*., 2017). The main active constituent of Euphorbia prostrata include tannins, and phenolic acid. The flavonoids (apigenin-7-glucoside, luteolin-7-glucoside) and most powerful inhibitor of the of the COX-2 and iNOS enzyme. The RAW 264.7 macrophages were stimulated by lipopolysaccharide and this kind of modification of Apigenin's effects the COX-2 and iNOS which have important role in reducing the inflammation and uncontrolled growing cells. (Linang *et al*., 1999).

Anti-fungal activity

After some time, uses of marketed drug leads to resistance, to solve these problems all the drug manufacturer are seeking for alternative medicines. The manufacturer started using the herbal medicinal plant for its antifungal as well as various activities. This study evaluates the effects of ethyl acetate extract of Euphorbia prostrata by using leaf having the haematological effect on fungus-infected rats. The leaves of Euphorbia prostrata were extracted using cold maceration, and the extract was then fractionated into ethyl acetate, chloroform, n-hexane, and methanol by fractions using vacuum liquid chromatography. To get more active fraction of chemical, its effectiveness was evaluated using antimicrobial susceptibility testing (AST).

To test the efficacy and safety of the formulated cream a rar model is used using using fraction of ethyl acetate ranging from 0.05% - 0.4%. (Familusi, *et.al*.,2025).

Anti-microbial activity

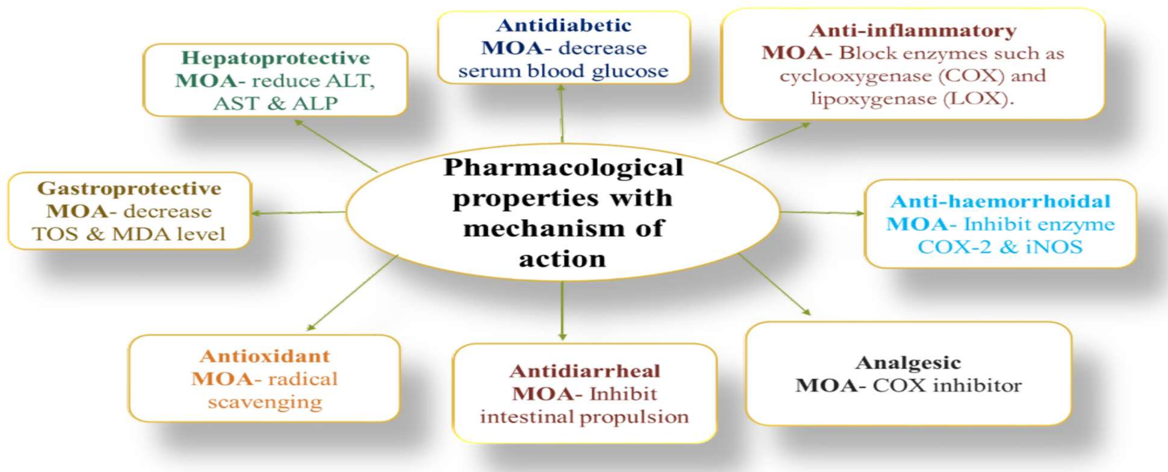
Euphorbia prostrata Ait. is traditionally utilized for its antioxidant and antimicrobial activities. The coarsed powder are prepared firstly shade-dried then pulverised by using mortar and pestle and solvent are choosed according to the chemical extracted. There is different solvent system such as ethanol, methanol, ethyl acetate, chloroform, hexane and acetone-are used. This study founded that the ethanolic leaf extracts have antibacterial and antioxidant properties. Additional research on these chemicals' biological activities may clarify the plant's therapeutic significance. The novel formulation is formulated to combat microbial infections when any antimicrobial drug resistance arises. By the use of modern technique various bioactive constituent are identified from plants which is crucial to medication development (Sundara, *et.al*., 2018). In table 4. The pharmacological activities and the extract responsible are framed in this table.

Table 4. Various activities with different types of extract.

Sr. No	Plant Part Used	Activity	Extract used	Reference
1.	Whole plant	Anti-diabetic	Methanolic extract	Shamim, *et.al.*, 2014
2.	Whole plant	Diabetic neuropathy	Hydroalcoholic extract	Garg, *et.al.*, 2025
3.	Whole plant	Anti-inflammatory	Ethanolic extract	Singla, *et.al.*, 1989
	Leaves	Anti-inflammatory	Hydroalcoholic Extract	Hariyadi, *et.al.*, 2020
4.	Root	Anti-malarial	Crude extract	Muluye, *et.al.*, 2014
5.	Whole plant	Anti-bacterial	Methanolic extract	Ahmad, *et.al.*, 2011
6.	Aerial parts	Hepatoprotective	Aqueous methanolic extract	Alamgeer, *et.al.*, 2017
7.	Whole plant	Anti-diarrheal	Aqueous ethanolic extract	Rene, *et.al.*, 2007
8.	Whole plant	Anti-helminthic	Ethanolic extract	Sharma, *et.al.*, 2011
9.	Whole plant	Gastroprotective	Aqueous extract	Mahboob Ahmad, *et.al.*, 2019
10.	Male Wistar Albino Rat	Analgesic	Hexane and ethyl acetate extract	Biwott, *et.al.*, 2015
11.	Fresh leaves	Anti-oxidant	Enzyme extraction	Lowry, et.al., 1951
12.	Tablet of *Euphorbia prostrata*	Anti-haemorrhoids	Dry extract of 100 mg tablet	Bakshi, et.al., 2017

13.	Leaves	Anti-fungal activity	Ethyl acetate extract	Familusi, *et.al.*, 2025
14.	Leaves	Anti-microbial	Ethanolic extract	Sundara, et.al., 2018

Figure 2. Various pharmacological activities with mechanism of action of E. prostrata



Formulation

Topical cream:

1% topical cream to treat haemorrhoids of Grades 1 and 2. For the past fifteen years, Euphorbia prostrata has been a prescription medication with proven clinical efficacy and safety in haemorrhoids patients. Nevertheless, there is currently no published research assessing its application in haemorrhoids pregnant women. Thus, in order to investigate its application in the unique population of haemorrhoids pregnant women. The topical cream was marketed by name Sitcom (*Euphorbia prostrata*) cream 1% w/w manufacture by Panacea Biotec Ltd., India should be applied locally for 14 days, at least twice a day, and following each act of defecation (Porwal, *et.al*., 2015).

Nano formulation using plant

The current study aimed to investigate the mechanism of induced cell death and synthesis silver (Ag) and titanium dioxide (TiO2) nanoparticles (NPs) as antileishmanial agents utilizing the aqueous leaf extract of *Euphorbia prostrata*. Alamar Blue® cell viability reagent and propidium iodide uptake assay were used to examine the produced NPs' in vitro antileishmanial efficacy against Leishmania donovani promastigotes. Cell cycle progression, externalized phosphatidylserine, DNA fragmentation assay, reactive oxygen species (ROS) level, intracellular non-protein thiols, and transmission electron microscopy (TEM) of the treated parasites all provided additional evidence of the synthesized Ag NPs' potent leishmanicidal activity. Synthesised Ag NPs were found to strongly inhibit the distinct trypanothione/trypanothione reductase (TR) pathway of Leishmania cells (Zahir, *et.al*., 2014).

Biogenetic & metal-oxide nanoparticle

The use of unicellular and multicellular organisms that function as a pattern for the development, assembly, and organization of nano-scaled materials or the assembly that follows a bottom-up production route is part of the biogenic synthesis of NPs. Various metallic and metal oxide NPs have been produced from biogenic sources by utilizing many process parameters, including solvents, temperature, pressure, and pH. Biosynthesized nanoparticles (NPs) offer numerous pharmaceutical applications, such as tumoricidal, anti-inflammatory, antimicrobials, antiviral, etc. Drug delivery and bio-nanotechnology work together to provide a variety of pharmaceutics with site-specific biological uses (Nikolova, *et.al*., 2023).

Silver nanoparticle of *Euphorbia prostrata* (Anti-malarial)

It has recently been demonstrated that silver nanoparticles (AgNPs) made with Euphorbia prostrata leaf extracts have antimalarial properties. Thus, the parasite clearance activity of the produced AgNPs from Euphorbia prostrata (EcAgNPs) was examined. In the asexual blood stage infection of 3D7 (laboratory strain) P. falciparum, we assessed the antimalarial activity. EcAgNPs showed a considerable suppression of parasite development (EC50 of 0.75 µg/ml) in the standard in vitro culture of *P. falciparum*. Through enhanced formation of reactive oxygen species (ROS) and activation of programmed cell death pathways marked by the activity of caspase-3 and calpain, the produced silver nanoparticles were observed to induce apoptosis in *P. falciparum*. Additionally, increased apoptosis was indicated by changed transcriptional regulation of the Bax/Bcl-2 ratio (Tiwari, *et.al*., 2024).

Silver nanoparticle of *Euphorbia prostrata* (Against Sitophilus oryzae)

The current investigation was based on evaluations of the pesticidal activity to ascertain the effectiveness of produced Ag NPs, silver nitrate ($AgNO_3$) solution (1 mM), and aqueous leaf extracts of E. prostrata against the adult Sitophilus oryzae L. The produced nanoparticles were examined using X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), UV-visible spectroscopy, and scanning electron microscopy (SEM) examination. The rod-shaped nanoparticles had an average size of 52.4 nm and ranged in size from 25 to 80 nm. For 14 days, pesticidal bioassay tests were carried out at different concentrations (Zahir, *et.al*., 2012).

Cream of *Euphorbia prostrata* by using ethyl acetate extract:

The purpose of this study was to evaluate the effects of applying an ethyl acetate fraction of Euphorbia prostrata leaf extract topically on the haematological parameters of fungus-infected rats. By the use of cold maceration method extract of Euphorbia prostrata are prepared by using its leaves and solvent are used for example, ethyl acetate, n-hexane, chloroform, and methanol fractions using vacuum liquid chromatography (VLC). The antimicrobial susceptibility testing (AST), most active fraction was identified using phytochemical and antioxidant assays. For testing of cream formulation rat models were used and ethyl acetate fractions is ranging from 0.05% to 0.4% as antifungal agents (Familusi, *et.al*., 2025).

Plant extract – silver nanoparticle:

In this study a silver nanoparticle is prepared by using aqueous plant extract and silver nano-based material. They are employed to determine the antiplasmodial activity against P. falciparum. The nano-particle based formulation are widely utilized for better therapeutic activity. Ongoing study revealed that use of herbal extract in combination with metal nanoparticle provide great way for formulation. The UV–vis spectrum, scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDX), and X-ray diffraction (XRD) were all used to properly characterize the bio-reduced silver nanoparticles. In table 5. There is various formulation with their observed results are summarized in this table.

Table 5. Marketed formulation with dosage form.

Sr. No	Name of formulation	Uses	Result	Reference
1.	Topical cream	Haemorrhoids	At every follow-up appointment, there was a progressive improvement in the reduction of per-rectal bleeding and exudation from two weeks (86.8% and 72.7%) to four weeks (95.3% and 90.9%) to eight weeks (100.0% each).	Porwal, *et.al.,* 2015

2.	Nano formulation using plant	Leishmaniasis	At room temperature, the extract accelerates the synthesis of nanoparticles (NPs) without the use of hazardous chemicals. In summary, this work confirms that the synthesized Ag NPs were more effective against L. donovani promastigotes when compared to TiO2 NPs, aqueous leaf extracts, and bulk solutions.	Zahir, *et.al*., 2014
3.	Biogenetic & metal-oxide nanoparticle	Cytotoxicity	Along with some recent developments toward improved biocompatibility, bioavailability, and fewer side effects, the toxicity of the biogenic NPs due to their pharmacokinetic behaviour in vitro and in vivo is also examined.	Nikolova, *et.al*., 2023
4.	Silver nanoparticle of *Euphorbia prostrata*	Anti-malarial	According to our research, EcAgNPs are a targeted, non-toxic antimalarial medication that may be a viable therapeutic strategy for treating malaria.	Tiwari, *et.al*., 2024
5.	Silver nanoparticle of *Euphorbia prostrata (Leave extract)*	Against Sitophilus oryzae	Synthesized Ag NPs and E. prostrata leaf aqueous extracts have the potential to be the best environmentally friendly methods for controlling S. oryzae.	Zahir, *et.al*., 2012
6.	Cream of Euphorbia prostrata by using ethyl acetate extract	Anti-fungal	The ethyl acetate fraction's dominance in flavonoid and phenolic content, alongside significant antioxidant activity. Haemoglobin concentrations were markedly increased by treatment with both normal medication and the plant extract, with the 0.2% plant extract	Familusi, *et.al*., 2025

			showing the most noticeable impact.	
7.	Silver nanoparticle using Plant extract	Anti plasmodial	There was a dose-dependent parasite inhibition. Compared to the crude methanol and aqueous leaf extract, the synthesized AgNPs shown significant antiplasmodial action.	Paneerselvam, *et.al*., 2015

Clinical Studies and Therapeutic Potential

In vivo anti-salmonella activity

To study the in vivo anti-salmonella activity and the safety of aqueous extract of *Euphorbia prostratra*, a plant extensively utilized in Cameroon by traditional healers. The study used a rat model infected with *Salmonella typhimurium*. The physiological, biochemical, and histological indicators of this extract's potential adverse effects were investigated using normal procedures. The extract showed a substantial effect on the amount of viable *Salmonella typhimurium* recovered from faces, and could terminate salmonellosis after 8 and 10 days of treatment for male and female rats, respectively, using non-toxic doses. The biochemical and histopathological analyses showed that the extract could cause liver damage at relatively high doses (≥ 73.48 mg/kg for females and ≥ 122.71 mg/kg for males), as demonstrated by an increase in serum transaminase levels and notable inflammation of the parenchyma and portal vein (Tala, *et.al*., 2015).

In vivo anti-candidal activity

The purpose of this study was to assess the safety and therapeutic efficacy of *E. prostrata* extract in rats with systemic candidiasis that was artificially produced. The Organization for Economic Co-operation and Development (OECD) guideline 425 was used to assess the acute oral toxicity of the E. prostrata extract. The broth micro-dilution method was used to evaluate the in vitro antifungal activity against four strains of Candida. By calculating the fungal burden in the kidneys, the in vivo activity was assessed in a rat model of widespread candidiasis caused by Candida albicans. Using commercial kits to measure certain blood biochemical markers, the adverse effects of antifungal medication were identified. The LD50 estimate was higher than 5000 mg/kg because the levels utilized in the acute toxicity research did not result in any mortality or notable behavioral abnormalities. *E. prostrata* extract revealed good anticandidal activity against the tested yeasts with a MIC value equal to 64 µg/mL, obtained against the tested C. albicans strain. When *E. prostrata* extract was given orally to artificially infected rats at doses of 33.2 and 166 mg/kg of body weight (bw), the animals recovered completely after 15 days of treatment, with zero colony forming units per millilitre of C. albicans cells in the kidney. Rats treated with E. prostrata extract showed comparatively negative side effects, according to the evolution of serum biochemical markers (Garg, *et.al*., 2025).

A multifaceted intervention targeting oxidative stress and inflammation

The current study aims to assess the impact of *Euphorbia prostrata* Hydroalcoholic Extract (EPHAE) on diabetic nephropathy (DN) in rats caused by NAD-STZ. In order to induce DN in rats, NAD (230 mg/kg) was given 15 minutes before STZ (65 mg/kg). Body weight, glucose, insulin levels as well as behavioural factors including polydipsia and polyphagia was found. The autoanalyzer was used to measure the levels of HDL, LDL, VLDL, cholesterol, TGs, albumin, BUN, creatine, urea, uric acid, and kidney index in addition to biochemical estimations of AGEs, gluconeogenic enzymes, SOD, GSH, Cat, and TBARS. IL-1β, IL-6, TNF-α, TGF-β, and NF-κB were all measured using ELISA. Increased glucose, water, and food intake as well as decreased insulin and body weight were the hallmarks of the effectively developed NAD-STZ-induced DN. Following 60 days of EPHAE (150 mg/kg) and glimepiride (10 mg/kg) treatment, these levels returned to normal (Garg, *et.al*., 2025).

A histomeric and biochemical study

When male rats were given methanolic extract of *Euphorbia prostrata* orally at a dose level of 400 mg/kg body weight per day for 60 days, their body weights did not significantly decrease; however, the weights of their reproductive organs, such as the testes, epididymides, seminal vesicle, and ventral prostate, significantly decreased in comparison to the controls. Rats treated with E. prostrata showed a 73.04% decrease in round spermatid generation. It was discovered that both the cell counts and the cross-sectional surface area of Sertoli cells had been greatly reduced. Leydig cell nuclear area and the number of mature Leydig cells dropped by 57.47% and 54.42%, respectively. Both sperm density and motility dramatically decreased (Bataineh, *et.al.*, 2012).

Inhibitory effects on HIV-1 protease and replication: We examined 48 plant extracts among those often used in Sudanese traditional medicine, focusing on their inhibitory effects on HIV-1 replication and the HIV-1PR enzyme. The results indicated that the water extracts of 2, 3, and 12 and the methanol extracts of 8 and 13 had inhibitory effects on the viral replication, but they had no effect on the PR enzyme. This could result from suppression of other crucial stages in the viral life cycle or from inhibitory activity on enzymes other than the PR. Regarding the HIV-1PR inhibitory activity of the studied extracts, the methanol extracts of 12 and 17 and the water extract of 17 showed moderate inhibitory activity, whereas the methanol extracts of 1 and 2 showed significant inhibition (Hussein, *et.al.*, 1999). In table 6. There are some herbal drugs are listed which are under clinical trial or in different phases are listed in this table.

Table 6. Different formulation under clinical or non-clinical studies.

Sr. No	Part used	Phases of trial	Therapeutic potential	Reference
1.	I*n vivo* anti-salmonella activity	Phase 3	Overall, the findings suggest that E. prostrata aqueous extract may be a useful treatment for typhoid fever and other forms of salmonellosis. Nevertheless, additional research is required to extend these findings to larger species.	Tala, *et.al.*, 2015
2.	I*n vivo* anti-candidal activity	Pre-clinical	The current investigation supports the traditional usage of E. prostrata extract for the treatment of mycoses by demonstrating its therapeutic efficacy on an experimentally produced systemic candidiasis in rats as well as its relative safety.	Tchuenguem, *et.al.*, 2018
3.	A multifaceted intervention targeting oxidative stress and inflammation.	Preclinical	By controlling inflammation and oxidative stress, EPHAE shows great promise for treating DN.	Garg, *et.al.*, 2025
4.	A histometric and biochemical study	Preclinical	The protein, glycogen, and cholesterol contents of the testes, fructose in the seminal vesicle, and protein in the epididymides considerably decreased.	Bataineh, *et.al.*, 2012
5.	Inhibitory effects on HIV-1 protease and replication	Clinical studies	The activities of the inhibitory principles that were isolated from M. senegalensis were also examined.	Hussein, *et.al.*, 1999

Future Direction

Integrating traditional knowledge with modern scientific studies to enhance its therapeutic effectiveness. The extracts are particularly utilized in many diseases such as haemorrhoids, gastrointestinal disorders, inflammation, and skin ailments. Future studies must prioritize its optimization and standardization of extraction methods using advanced techniques to improve % yield, bioactivity of extracts and reproducibility. The phytochemical screening is done by employing modern analytical tools for isolation, characterization, and quantification of bioactive constituents to establish a clear structure activity relationship. Although, the preliminary pharmacological studies indicate anti-inflammatory, antioxidant, analgesic, and immunomodulatory effects. The further dose-response, mechanistic, and long-term safety studies are essential. The Formulation studies should move beyond crude extracts by utilizing standardized and novel delivery systems that enhance bioavailability, stability, and patient compliance. Finally, well-designed, randomized, controlled clinical trials are required to confirm safety, efficacy, and therapeutic efficacy over existing treatments. This integrated research will strengthen the scientific credibility of Euphorbia prostrata and support its development as an evidence-based herbal therapeutic.

CONCLUSION

There are many medicinal plants founded on the earth having different pharmacological activities. The Euphorbia prostrata which is an important medicinal plant having well-recognized traditional uses as well as by growing scientific support many activities of this plant are founded. Ethnobotanical knowledge highlights its value in managing haemorrhoids, inflammatory conditions, and gastrointestinal disorders, providing a strong basis for pharmacological investigation. Phytochemical studies revealed that the presence of diverse bioactive compounds which used for its antioxidant, anti-inflammatory, and analgesic activities. The formulation of this plant extract can be optimized to get standardized, bioavailable formulations with improve consistency and therapeutic effectiveness. On large scale further studies are going on, a controlled clinical trials and toxicological assessments are performed to ensure its safety, efficacy, and suitable dosage formulation. Ultimately, establishing the Euphorbia prostrata as a dependable, evidence-based herbal remedy which utilizes the traditional knowledge and combines with cutting-edge analytical methods, sophisticated formulations, and thorough clinical research.

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