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A Review of The Traditional Applications, Phytochemical, and Pharmacological Research Of Euphorbia Milii (Crown of Thorns)

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Abstract:
Euphorbia milii is an ornamental plant that has several medicinal uses. This plant has advantageous antibacterial, molluscicide, antioxidant, antinociceptive, muscle relaxant, sedative, hepatoprotective, antiviral, and anticancer qualities. Numerous chemical constituents, including β-amyrin acetate, β-sitosterol, cycloartenol, lupeol, euphol, alkaloids, phenolic compounds, proteins, amino acids, cardiac glycosides, steroids, anthraquinone, tannins, phlorotannins, reducing sugar, saponins, coumarin, triterpenes, and flavonoids, are responsible for these activities. This review concluded that a quick search of the pharmacological activities of Euphorbia milii is made easier by the variety of literature on pharmacological activity.

Keywords: *Euphorbia milii*, ornamental plants, pharmacological activity, chemical constituents.

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INTRODUCTION
Natural substances originating from prebiotic, microbial, plant, and animal sources have long captivated humanity. Primitive man began to distinguish between plants with decisive pharmacological action and those that were unsuitable for medical uses to find sustenance and successfully manage human misery. Many plants have been utilized as medicines, and the interaction between humans and plants has evolved. The science of identifying the therapeutic or medical properties of herbs or herbal products is known as herbal medicine or herbalism. Although they can be made from any part of the plant, the most common components are the roots, leaves, flowers, bark, and seeds. They can be administered directly to the skin, swallowed, eaten, or breathed. Because herbal remedies are used so widely over the world, public health issues and concerns regarding their safety are gradually coming to light. Ayurveda, Yoga, Unani, Siddha, Homeopathy, and Naturopathy are among the legally recognized alternative health systems in India that have a long, safe, and continuous history of using a range of herbal remedies. The Indian states that produce the most medicinal herbal plants are Gujarat, Rajasthan, Haryana, Tamil Nadu, Andhra Pradesh, and Uttarakhand. China produces more than 40% of the world's medicinal plants, making it the second-largest producer behind India. (1)

PLANT PROFILE


COMMON NAME: Crown Of Thorns, The Christ Plant. (2)

SYNONYMS *Euphorbia splendens bojer, Euphorbia splendens bojer, Euphorbia bojeri, Euphorbia breonii mucronulata, Euphorbia milii milii.* (2)

SCIENTIFIC CLASSIFICATION

Domain: Eukaryota
Kingdom: Plantae
Phylum: Spermatophyta
Subphylum: Angiospermae
Class: Dicotyledonae
Order: Euphorbiales
Family: Euphorbiaceae
Genus: *Euphorbia*
Species: *milii* (2)

DESCRIPTION

A hardy perennial, crown of thorns has oval leaves that fall off as it ages and robust gray thorns. Although potted plants are much smaller, the sprawling, branching, vine-like branches can grow to a length of over two meters (seven feet). Two dazzling bright crimson bracts (leaf-like structures connected slightly below flowers) encircle the little, unremarkable flowers, which are carried in paired clusters. There are several varieties with deep crimson or yellow bracts. The deadly white milky sap can irritate skin and eyes. (3)

DISTRIBUTION

Despite being native to Madagascar, the plant is mostly found in South Asia. (2)

TRADTIONAL USES

Folk medicine frequently uses Euphorbia mil to treat warts, hepatitis, cancer, and trichiasis. The entire plant paste is used to repair broken animal bones, the leaves are used to cure snake bites and ringworms, and the seeds are used as a laxative for children. (2)

PHYTOCHEMISTRY

The most common phytochemicals present are anthocyanin, cyanin, alkaloids, phenolic compounds, carbohydrates, amino acids, cardiac glycosides, steroids, anthraquinone, tannins, phenolotannins, reducing sugar, saponins, coumarin, triterpenes, and flavonoids. (2)

REPORTED ACTIVITIES

The phytochemical profile of *Euphorbia milii* ethanol extract (EMEE) and its anti-inflammatory potential was studied using a carrageenan-induced paw edema model in rats. It was found that the average paw edoema weight substantially declined by treatment with EMEE (100 mg/kg and 200 mg/kg). Also, it was noticed the immunostaining with cyclooxygenase-2 and tumor necrosis factor-alpha antibodies decreased to a mild positive (score 1) after treatment with EMEE (200 mg/kg). This coincides with an improvement in the histology results following hematoxylin and eosin analysis of the paw tissues, which showed a reduction in inflammation. Additionally, proinflammatory mediators (granulocyte–macrophage colony-stimulating factor, monocyte chemoattractant protein-1, inducible nitric oxide synthase, and interleukin-5) were significantly reduced in response to EMEE (200 mg/kg). Surprisingly, it caused the levels of the anti-inflammatory interleukins (IL-10 and IL-12) to rise significantly. The Swiss Target Prediction database was used to link 127 genes to the metabolites found in EMEE. The DisGeNET database showed that 55 of these target genes were linked to 11 inflammatory illnesses. Through the analysis of annotated genes, the primary signaling pathways were determined to be the PI3K-Akt, MAPK, and Ras signaling pathways. As a result, more clinical research on EMEE as an anti-inflammatory drug is necessary. (4)

The present research is the foremost effort to investigate and compare the biological activities and chemical composition of dichloromethane (DCM) and methanol (MeOH) solvent extracts of *Euphorbia milli* aerial and root parts. Antioxidant potential was determined using six different (FRAP, CUPRAC, Phosphomolybdenum, DPPH, ABTS, and ferrous chelation) methods. The enzyme inhibition effects of the tested extracts were evaluated against acetylcholinesterase

(AChE), butyrylcholinesterase (BChE), α-glucosidase, α-amylase, and tyrosinase. Similarly, the amount of total phenolic and flavonoid contents was assessed *via* spectrophotometric methods and individual secondary metabolites were also determined using UHPLC-MS analysis. The largest concentrations of phenolic and flavonoids were found in methanolic extracts from both aerial and root sections. This is generally consistent with their notable DPPH, ABTS (radical scavenging), FRAP, CUPRAC (reducing power), and α-glucosidase inhibitory potentials. Cholinesterase and tyrosinase inhibition, as well as the phosphomolybdenum test, showed the highest levels of activity in both DCM extracts with the lowest bioactive contents. (5)

The goal of the current study is to identify the phytoconstituents and biological characteristics of Euphorbia milii leaves in methanol extract. The antioxidant activity was examined using the DPPH free radical scavenging assay; the anticancer properties were examined using the MTT in vitro cell proliferation assay; the antidiabetic studies employed the Alpha-amylase inhibitory assay; and phytoconstituents were screened in the methanolic extract of Euphorbia milii leaves. In vitro proliferation, MTT experiment utilizing A375 human melanoma cell lines revealed strong anticancer activity with an IC_{50} value of 199.45µg/ml in comparison to Cisplatin. Anti-diabetic research using the α-amylase inhibitory assay revealed a potent IC50 value of 171.28 µg/ml, whereas DPPH evaluation of antioxidant activity revealed a potent IC50 value of 63.06 µg/ml. Rich phytochemicals in the methanolic extract that tested positive for glycosides, alkaloids, steroids, flavonoids, phenols, and saponins were responsible for these biological characteristics. (6)

The goal of the current study is to assess the anti-diabetic potential of Euphorbia milii methanolic aerial extract (MAEEM) in a streptozotocin–nicotinamide-induced type 2 diabetes paradigm in Albino Wistar rats. Acute toxicity research, phytochemical screening, and an oral glucose tolerance test were conducted. Rats with diabetes were given graded doses of MAEEM (100 mg/kg, 200 mg/kg, and 400 mg/kg) for 21 days. Blood glucose levels, serum lipid profiles, liver profile markers (AST, ALP, ALT), and renal profile markers (serum creatinine, blood urea) were among the biochemical indicators used to assess the activity. These parameters were dramatically changed by type-2 diabetes, but they were greatly improved by oral MAEEM treatment. (7)

The study examined the in vitro antioxidant, antidiabetic, and Insilco docking characteristics of two phytocompounds: Stigmasta-5,22-dien-3β-ol (Stigmasterol) and 3,3′,4′,5,7-Pentahydroxyflavone (Quercetin). These substances were separated from the E. milli methanol extract of the stem and ethanol extract of the flower. These phytocompounds antioxidant qualities were investigated using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) technique. The antioxidant activities of stigma sterol, quercetin, and the common medication ascorbic acid were compared. The findings suggested quercetin's potential as a powerful antioxidant by demonstrating a notable level of antioxidant activity. Moreover, α-amylase and α-glucosidase inhibition tests were used to examine in vitro antidiabetic activity. Comparing the screened compounds to the reference medication, acarbose revealed high percentages of inhibition against two enzymes that hydrolyze carbohydrates, α-amylase and α-glucosidase. Additionally, the compounds' interactions with PTP1B I (PDB ID: 1T49) and α-d-glucose (PDB ID: 3A4A) as target molecules were examined using molecular docking studies. The biological results of the chemicals extracted from the aerial portions of E. milii were further supported by these docking investigations. (8)

The purpose of the study was to evaluate the developmental toxicity of synthetic molluscicidal chemicals and Euphorbia milii latex (LAT). Egg masses of Biomphalaria glabrata (0–15 hours post-spawning) were treated to molluscicides for 96 hours and then monitored till the fourteenth day post-spawning. Recorded were the day of hatching, aberrant embryo development (malformations), and embryo deaths. At doses ⩾1000 µg L–1, LAT significantly hampered the development of snail

embryos, while having a modest ovicidal impact. It also caused anomalies (EC50 = 2040 µg L−1), including deformed shells, hydropic embryos, and cephalic and non-specific deformities. Embryolethal potencies of molluscicides were as follows: triphenyltin hydroxide (TPTH; LC_{50} = 0.30 µg L^{-1}) > niclosamide (NCL; LC_{50} = 70 µg L^{-1}) > copper sulphate ($CuSO_4$; LC_{50} = 2190 µg L^{-1}) ⋙ LAT (LC_{50} = 34 030 µg L^{-1}). A few malformations were recorded in embryos exposed to concentrations of TPTH within the range of lethal concentrations, while almost no anomalies were noted among those treated with NCL or $CuSO_4$. A hatching delay (hatching on day 10 after spawning or later) was observed among LAT-exposed embryos. The effects of NCL, TPTH and CuSO4 on hatching were to some extent masked by their marked embryolethality. The no-observed effect concentrations (NOEC) for embryotoxicity were as follows: TPTH, 0.1 µg L^{-1}; NCL, 25.0 µg L^{-1}; $CuSO_4$, 500.0 µg L^{-1} and LAT, 500.0 µg L^{-1}. (9)

The study objective was to assess the anticancer and antioxidant qualities of Euphorbia milii floral ethyl acetate extract (EAEEMF) against mice's colon cancer caused by the CACO-2 cell line and breast cancer MCF-7 cell line. Euphorbia milii flower ethyl acetate extract was administered to the animals for 30 days at doses of 200 mg/kg and 400 mg/kg p.o., respectively. Mice were slaughtered on the 31st day after the animal's weight and circumference were recorded. Hematological, antioxidant, and serum biochemical parameters were evaluated in order to determine the ethyl acetate extract of Euphorbia milii flower's antioxidant and anticancer properties. Euphorbia milii floral ethyl acetate extracts reduced body weight and circumference. Groups of mice treated with ethyl acetate extract of Euphorbia milii flowers showed a return to normal hematological profiles, including RBC, hemoglobin, hematocrit, and WBC count. The extract raised GSH, GPx, and catalase levels while dramatically lowering lipid peroxidation levels. In the groups treated with ethyl acetate extract of Euphorbia milii flowers, serum biochemical parameters such as lactate dehydrogenase (LDH), alkaline phosphatase (ALP), γ-glutamyl transpeptidase (GGT), alanine transaminase (ALT), and glucose returned to normal levels. Ferritin and carcinoembryonic antigen (CEA), two markers specific to cancer, also dramatically dropped in the extract-treated animals. The histopathology report supported these findings. (10)

Alkaloids, anthraquinone, anthocyanin, betacyanin, glycosides, flavonoids, phlobatannins, saponin, steroids, tannins, terpenoids, reducing sugars, and amino acids were all considered secondary metabolites of Euphorbia milii. Ethanol was found to have the highest extraction efficiency of phytoconstituents (91.66%). The greatest free radical scavenging activity (IC50) of the hot water was 6.12 µg/ml. 74.37% was determined to be the hot water extract's percentage scavenging activity (PSA). The antiviral potency of E. milii extracts was gauged by the quantity of plaques in the titer plate. Of the studied solvent extracts of E. milii, the ethanol extract shown the strongest antiviral activity, forming 22 plaques in the titer plate. One of the main bioactive components of E. milii that was identified from the literature was cyclobarbital. Subsequent evaluation of cyclobarbital's ZINC and Swiss-ADME profiles revealed satisfactory druggability. The current study demonstrated significant therapeutic uses of E. milii extract as an antiviral drug, which will be expanded to molecular characterization and in silico antiviral action modeling to gain a more detailed understanding. Dealing with a viral mutation that is directly connected to target protein or receptor molecules is the main obstacle to the antiviral potential of bioactive medicines. Therefore, to remediate target-based bioactive compounds, ongoing research and development of medication modification is needed. (11)

Rats given a high-fat diet (HFD) were split into three groups: K0 (receiving standard feed), KN (receiving HFD of 2 g/200 g body weight (BW) per day), and P (receiving HFD of 2 g/200 g BW per day and EMP of tea 40 mg/100 g BW per day) to demonstrate the impact of Euphorbia milii and propolis (EMP) tea on preventing fatty liver and

hepatocyte apoptosis. To collect and analyze liver tissue, the 30-day interventions were terminated on day 31. Using hematoxylin-eosin (HE) staining, we were able to calculate the hepatic steatosis. Terminal deoxynucleotidyl transferase dUTP nick end labeling (TUNEL) staining was also used to identify hepatocyte apoptosis. The hepatic steatosis percentage was lower in the K0 group (17.87 ± 1.81) than in the KN group (63.75 ± 15.88). Additionally, we observed a significant hepatocyte apoptosis index in the KN (3.98 ± 0.29), but no hepatocyte apoptosis in the K0. Hepatic steatosis and apoptotic percentages in HFD-induced rats were considerably decreased by the combination of EMP tea (25.33 ± 1.17 and 0.91 ± 0.61, respectively). (12)

The anti-convulsive properties of the ethanolic extract of Euphorbia milii leaves (EEEM) were the main focus of the current investigation. At different dosages (200 mg/kg, 400 mg/kg), pentylenetetrazole-induced convulsions and in-vivo maximal electroshock models were studied for EEEM. The outcomes were contrasted with the effectiveness of the common drug phenytoin (25 mg/kg). At 400 mg/kg, EEEM decreased seizures. This study could serve as a useful starting point for upcoming investigations into Euphorbia milii anti-convulsive qualities. (13)

Euphorbia milii methanolic extract (Au-EM) gold nanoparticles were created, described, and tested for sedative, muscle relaxant, and antinociceptive properties. Atomic force microscopy, scanning electron microscopy, UV-visible spectroscopy, and infrared spectrophotometry were used to characterize the gold nanoparticles, and their stability was assessed in varied pH values and sodium chloride (NaCl) volumes. Au-EM's ability to detect metals, including cobalt, copper, lead, mercury, and nickel, was evaluated. When compared to the crude E. milii methanolic extract, Au-EM's antinociceptive, muscle relaxant, and sedative properties were assessed in BALB/c mice at doses of 10 and 20 mg/kg. In a variety of pH and NaCl solutions, Au-EM demonstrated exceptional stability. When compared to the crude E. milii methanolic extract, Au-EM demonstrated a substantial ($P < 0.01$) antinociceptive effect at doses of 10 and 20 mg/kg. After 30, 60, and 90 minutes, Au-EM had a substantial muscular relaxant effect at 10 mg/kg ($P < 0.05$) and 20 mg/kg ($P < 0.01$) in the rotarod test. Au-EM at 10 and 20 mg/kg showed a substantial sedative effect ($P < 0.05$) in an open-field test. Significant detection sensitivity was also shown for each of the heavy metals that were tested. (14)

The Vero cell line and MTT assay were used to evaluate the methanol extract, n-hexane, chloroform, ethyl acetate, and n-butanol fractions of E. milii leaves for cytotoxic and antiviral properties against PPRV. Cell survival rate (CSP) at non-cytotoxic concentrations was regarded as virucidal. Significant effects were seen against PPRV at all test doses for methanol extract and fractions. For the extract and fractions, the 50% cytotoxic concentration (CC50) was determined to be ≤ 25 µg/mL. The ethyl acetate, n-hexane, and n-butanol fractions in the antiviral assay were non-virucidal at all test concentrations between 1.56 and 800 µg/mL; even at their non-cytotoxic concentrations, these fractions lacked antiviral properties. Nonetheless, the methanol extract and its chloroform fractions had virucidal potential that was considerable. (15)

In the current work, zinc oxide nanoparticles made with Euphorbia milii aqueous extract (ZnO NPs-EM) were created, identified, and tested for sedative, muscle relaxant, and antinociceptive properties. At dosages of 10 and 20 mg/kg, ZnO NPs demonstrated an antinociceptive effect when compared to the aqueous extract of E. milii. During the rota-rod experiment, ZnO NPs-EM had a significant muscle-relaxing effect at concentrations of 20 and 10 mg/kg after 90, 60, and 30 minutes. In an open-field experiment, ZnO NPs-EM at 20 and 10 mg/kg showed a significant sedative effect. These results implied that the ZnO NPs improved the efficacy of the E. milii aqueous sample and showed significant analgesic, sedative, and muscle-relaxing properties. (16)

The purpose of this study was to assess the nematoidal potential of the proteases found in Euphorbia milii latex and to describe them.

According to the results, the proteases milin and miliin are found in the latex concentrate samples of E. milii. The quantity of Panagrellus redivivus larvae in the various groups varied ($p<0.01$), with reductions of 65.59% and 96.46% after 24 and 48 hours, respectively. (16)

This study aimed to observe the molluscicidal activities of Euphorbia milli against Indoplanorbis exustus. Mortality rates were recorded after Indoplanorbis exustus were exposed to the latex for 24 and 48 hours at different concentrations ranging from 6 to 25 ppm. Of the hybrids, eight were found to be effective, with the six most effective hybrids being E. milii Dang-udom, E. milii Arunroong, E. milii Raweechotchuong, E. milii Srisompote, E. milii Sri-umporn, and E. milii Tongnopakun. Under the same conditions, the latex of E. milii Dowpraket and E. milii Promsatid killed 50% of the snails. These results suggest that these six hybrids are promising as natural molluscicidal agents. (17)

The purpose of the study was to assess the nematoidal potential of the proteases found in Euphorbia milii latex and to describe them. According to the results, the proteases milin and miliin are found in the latex concentrate samples of E. milii. The quantity of Panagrellus redivivus larvae in the various groups varied with reductions of 65.59% and 96.46% after 24 and 48 hours, respectively. (18)

The study was carried out to evaluate the impact of interactions between plant-native endophytic bacteria and various airborne contaminants on the levels of ethylene, indole-3-acetic acid (IAA), and hormonal balance of Euphorbia milii. Endophytic isolates increased IAA levels and elimination of airborne formaldehyde. However, one isolate, identified as root endophyte 4, which produced the highest amounts of IAA on its own, refused to remove gaseous formaldehyde from the plant because it upset the hormonal balance of E. milii, causing IAA levels to exceed physiological concentrations. This, in turn, stimulated ethylene biosynthesis and stomatal closure in the presence of light. But because benzene was more phytotoxic and the plant required more IAA to guard against it, interactions between plant and root endophyte 4 promoted the removal of benzene through the air. Trimethylamine (TMA) had no effect on plant-endophyte interactions since it was not poisonous. Consequently, there was no discernible difference in the IAA levels of E. milii infected with root endophyte 4 compared to that of a noninoculated one. Since benzene was the most phytotoxic pollutant with the largest molecular mass, root endophyte 4-inoculated E. milii eliminated it at the slowest rate under mixed-pollutant stress (formaldehyde, benzene, and TMA). However, because formaldehyde is more phytotoxic, TMA (which has a larger molecular mass) was eliminated more quickly than formaldehyde. distinct airborne contaminants had distinct effects on plant-endophyte interactions. (19)

The leaves of the chloroform extract taken from the plant Euphorbia milii were subjected to epicuticular wax analysis. GC-MS analysis and polarity-based column chromatographic separations produced the identification. of the hydrocarbons, acetates, and pentacyclic triterpenoids that are discovered in epicuticular wax. According to the study, the plant wax contains Friedelan-3-ol, D: AF, Lupenone, Glutinol, Lupeol acetate, and Glutinyl acetate.portion 1's riedooleanan-28-acetate 3beta hydroxyl. Friedooleanan-3-ol, Friedooleanan-3-aceteate, and hydrocarbons with carbon chain lengths ranging from C23 to C33 were discovered to be present in the second portion. The third portion of the leaf extracts was discovered to contain mostly hydrocarbons in the form of alkanes and alkenes, which ranged from carbon chains C18 to C34. Triterpenoids were discovered to predominate in the first two fractions of cutaneous wax. Hydrocarbons are the main component of the final percent. The FTIR-HATR study's functional group analysis shows that waxes have distinctive peaks. According to the findings, Euphorbia milii plant biomass may be a significant source of hydrocarbons. (20)

From the latex of Euphorbia milii, a serine protease known as "Milin" was homogeneously isolated. 51 kDa, pH 8.0, and 60 degrees Celsius were the

enzyme's optimal molecular mass (SDS-PAGE), pH, and temperature, respectively. Using casein and azoalbumin as substrates, Milin maintains complete proteolytic activity over a broad pH range (5.5–12) and temperature range (up to 65 degrees C). Serine protease inhibitors like PMSF, APMSF, and DFP block the activity of milin, but no other protease inhibitors like PCMB and E-64 do. Even at very high concentrations seen naturally in plants, the proteinaceous inhibitor soyabean trypsin inhibitor (SBTI) did not suppress the action of milin, as it did for the other serine proteases from the genus Euphorbia. The enzyme's molar extinction coefficient (a(m)), specific extinction coefficient (epsilon(280 nm)(1%)), and isoelectric point were determined to be 29, 152,500 M(-1) cm(-1) and pH 7.2, respectively. The activity of the enzyme depends on the presence of a detectable carbohydrate moiety (7-8%) in its structure, which is a glycoprotein. According to chemical estimations, the tryptophan, tyrosine, and cysteine residue counts in the milin sequence are 23, 14, and 14, respectively. Two of the 14 cysteine residues are free cysteines, and the remaining 12 formed 6-disulfide bonds. No sequence of known plant serine proteases matches the N-terminal sequence, which consists of the first 12 amino acid residues. The enzyme's remarkable stability, as demonstrated by CD, fluorescence, and proteolytic activity, is further demonstrated by perturbation experiments by temperature, pH, and chaotropes. This serine protease may therefore find use in the food trade. (21)

An aqueous extract of Euphorbia milii leaves is used as a bio-reducing and stabilizing agent in the development of a green approach for the preparation of palladium/sodium borosilicate nanocomposite. X-ray diffraction, transmission electron microscopy, scanning electron microscopy, energy dispersive X-ray spectroscopy, EDS elemental dot maps, and Fourier transform infrared spectroscopy were among the instrumental analyses that demonstrated the immobilization of Pd NPs on the sodium borosilicate glass surface. In the reduction of chromium, nitro compounds such as 2,4-dinitrophenylhydrazine and 4-nitrophenol, as well as some organic dyes that contained Congo red, Methyl orange, and Methylene blue, the green-produced nanocatalyst showed exceptional performance. Without losing its effectiveness, the biosynthesized heterogeneous catalyst was readily retrieved and repurposed in at least five subsequent processes. (22)

A simple one-step hydrothermal treatment of E. milii latexes has produced a green synthetic method for the production of water-soluble Carbon Quantum Dots. This technique uses ultrapure water at no cost as a green solvent; it does not employ strong concentrated acid or post-surface passivating chemicals. Excellent optical characteristics of the as-prepared CQDs included long-term photostability and high QY up to 39.2% that resisted high salt strength. Additionally, the chromogenic substrate 3,3',5,5'-tetramethylbenzidine (TMB) linked to H2O2 was catalyzed by the as-prepared CQDs acting as an intrinsic peroxidase-mimic activity. This produced a blue reaction with a distinctive absorbance peak at 652 nm. The suggested TMB-based oxidation system then serves as a probe for the detection of GSH and provides great selectivity in comparison to other interfering agents and other amino acids that are readily visible to the unaided eye. In a linear range of 0.02 to 0.1 M of GSH concentration, the limit of detection (LOD) was found to be 5.3 nM, which demonstrated superiority under ideal conditions when compared to another probe. The current technique was successfully used on human blood serums with good recovery to show the practical viability of GSH detection. (23)

CONCLUSION

The purpose of the review was to thoroughly examine Euphorbia milii pharmacological characteristics. Its phytoconstituents include alkaloids, flavonoids, terpenoids, cardiac glycosides, steroids (phytosterols), protease, anthocyanin, proteins, tannins, and phenolic compounds, according to a variety of literature gathered about this plant's therapeutic effects from PubMed, ScienceDirect, Google, and other

sources. It had anti-cancer, anti-oxidant, hepatoprotective, muscle-relaxing, antinociceptive, sedative, molluscicidal, anti-trypanosomal, proteolytic, lectinic, antileishmanial, ovicidal, catalytic, inhibitory, nematicidal, insecticidal, amoebicidal, anti-gout, wound healing, larvicidal, antiviral, and antimicrobial qualities, according to literature collections. This review concluded that the pharmacological literature should be used in future plant studies.

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REFERENCES

1. **Shivali Sagar, Monika Bish** A Review On Phytopharmacology Of Medicinal Plant: Euphorbia Milii Des Moul **Int. Res. J. Pharm. 2021; 12 (6): 67-74**
2. **Anbarasu Mahendiran, Naveena Gopal, Nivedha Duraisamy, Rajeswari Rajamani** A Comprehensive Literature Review on Pharmacological effects of Euphorbia milii(Crown of Thorns) **Advance Pharmaceutical Journal 2023; 8(4): 94-107**
3. **https://www.britannica.com/plant/cactus RETRIEVED ON 21/11/2024**
4. **Walaa A. Negm, Engy Elekhnawy, Fatma A. Mokhtar, Reem Binsuwaidan, Nashwah G.M. Attallah, Sally Abdallah Mostafa, Ehssan Moglad, Sarah Ibrahim, Omnia Momtaz Al-Fakhrany, Duaa Eliwa** Phytochemical inspection and anti-inflammatory potential of Euphorbia milii Des Moul. integrated with network pharmacology approach **Arabian Journal of Chemistry 2024; 17 (2): 105568**
5. **Hammad Saleem, Gokhan Zengin, Marcello Locatelli, Adriano Mollica, Irshad Ahmad, Fawzi M. Mahomoodally, Syafiq Asnawi Zainal Abidin, Nafees** Ahemad In vitro biological propensities and chemical profiling of Euphorbia milii Des Moul (Euphorbiaceae): A novel source for bioactive agents **Industrial Crops and Products 2019; 130: 9-15**
6. **Sanjeev Kumar Gir, Priyanka S. Jamade, Balaji Pendakur, Sanjotha G., Sudheer Manawadi, Sandeep V. Binorkar, Nagineni Sudarshan Rao, Sharangouda J. Patil** Anticancer, Antidiabetic, Antioxidant Properties and Phytoconstituents of Efficacy of Methanolic Extract of Euphorbia milii Leaves **Afr.J.Bio.Sc. 2024; 6(6): 6561-6572**
7. **Shivali Sagar, Rajeev Sati and Monika Bisht** Antidiabetic Activity Of Methanolic Aerial Extract Of Euphorbia milii Des Moul In Streptozotocin–Nicotinamide Induced Type 2 Diabetic Rats **IJPSR 2023; 14(8): 3978-3984.**
8. **A.Ch, P., Yadam, S., & Umamaheswara Rao, V.** In vitro antioxidant activity, antidiabetic activity and in silico docking studies of 3,3′,4′,5,7-pentahydroxyflavone and stigmasta-5,22-dien-3β-ol isolated from aerial parts of Euphorbia milii. Des moul. **Natural Product Research 2024; 1–8.**
9. **Eduardo C. Oliveira-Filho, Barbara R. Geraldino, Deise R. Coelho, Rosângela R. De-Carvalho, Francisco J.R. Paumgartten** Comparative toxicity of Euphorbia milii latex and synthetic molluscicides to Biomphalaria glabrata embryos **Chemosphere 2010; 81 (2): 218-227**
10. **Sreenika. G, Naga Sravanthi. K, Lakshmi. BVS, Thulja. P, Sudhakar. M.** Antioxidant And Antitumor Activity Of Euphorbia Milii Flower Extract Against In Vivo Breast Cancer And Colon Cancer In Mice. **World Journal Of Pharmacy And Pharmaceutical Sciences 2015; 4 (06): 912-934.**
11. **U. Tiwari, Rashmi Parihar, Sumit Kumar Dubey** Phytochemical, Antioxidant and Antiviral Potential of Euphorbia milii **Biological Forum – An International Journal 2023; 15(2): 123-129**
12. **Linawati, N. M. ., Sundari, L. P. R., Widarta, I. W. R., Arijana, I. G. K. N., Wande, I. N., & Luvianto, J.** Euphorbia milii

and propolis combination tea reduced hepatic steatosis and hepatocyte apoptosis in high-fat diet rat model. **JKKI : Jurnal Kedokteran Dan Kesehatan Indonesia 2024; 221–232**

13. **N. Vedika, M. Sandhya Rani** Anti-Convulsant Activity of Ethanolic Leaf Extract of Euphorbia milii Des moul using rodent models **International Journal of Pharmaceutical Research and Applications 2024; 9 (1): 158-170**
14. **Islam, N.U., Khan, I., Rauf, A. *et al.*** Antinociceptive, muscle relaxant and sedative activities of gold nanoparticles generated by methanolic extract of *Euphorbia milii*. **BMC Complement Altern Med 2015; 15: 160.**
15. **Sadia Chaman, Farrakh Zia Khan, Rabia Khokhar, Husnul Maab, Shaista Qamar, Sahar Zahid, Mobasher Ahmad, Khalid Hussain** Cytotoxic and antiviral potentials of Euphorbia milii var. splendens leaf against Peste des petits ruminant virus **Tropical Journal of Pharmaceutical Research 2019; 18 (7): 1507-1511**
16. **Shen, T., Wang, Q., Liu, C. *et al.*** *Euphorbia milii* extract-mediated zinc oxide nanoparticles and their antinociceptive, muscle relaxant, and sedative activities for pain management in pediatric children. **Appl Nanosci 2020; 10: 1297–1303.**
17. **Bunguorn Sermsart, Somphong Sripochang, Thongdee Suvajeejarun and Rachada Kiatfuengfoo** The Molluscicidal Activities Of Some Euphorbia Milii Hybrids Against The Snail Indoplanorbis Exustus **Southeast Asian J Trop Med Public Health. 2005; 36:192-5.**
18. **Bruna Leite Sufiate, Filippe Elias de Freitas Soares, Álvaro Soares Roberti, José Humberto de Queiroz** Nematicidal activity of proteases from Euphorbia milii **Biocatalysis and Agricultural Biotechnology 2017; 10: 239-241**
19. **Gholamreza Khaksar, Dian Siswanto, Chairat Treesubsuntorn, and Paitip Thiravetyan** Euphorbia milii-Endophytic Bacteria Interactions Affect Hormonal Levels of the Native Host Differently Under Various Airborne Pollutants **Molecular Plant-Microbe Interactions® 2016; 29(9): 663-673**
20. **Fitzerald Hujon, A. Mary Saral** Chemical investigation of epicuticular wax obtained from Euphorbia milii leaves **SN Applied Sciences 2022; 4:122**
21. **Subhash C Yadav, Monu Pande, M V Jagannadham** Highly stable glycosylated serine protease from the medicinal plant Euphorbia milii **Phytochemistry. 2006; 67(14): 1414-26.**
22. **Mahmoud Nasrollahzadeh, Mohaddeseh Sajjadi, Mehdi Maham, S. Mohammad Sajadi, Azeez Abdullah Barzinjy** Biosynthesis of the palladium/sodium borosilicate nanocomposite using Euphorbia milii extract and evaluation of its catalytic activity in the reduction of chromium(VI), nitro compounds and organic dyes **Materials Research Bulletin 2018; 102: 24-35**
23. **Daraksha Bano, Vijay Kumar, Vikas Kumar Singh, Subhash Chandra, Devendra Kumar Singh, Pradeep Kumar Yadav, Mahe Talat, Syed Hadi Hasan**
24. **Daraksha Bano, Vijay Kumar, Vikas Kumar Singh, Subhash Chandra, Devendra Kumar Singh, Pradeep Kumar Yadav, Mahe Talat, Syed Hadi Hasan** A Facile and Simple Strategy for the Synthesis of Label Free Carbon Quantum Dots from the latex of Euphorbia milii and Its Peroxidase-Mimic Activity for the Naked Eye Detection of Glutathione in a Human Blood Serum **ACS Sustainable Chem. Eng. 2019; 7 (2): 1923–1932**

