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Screening of pharmacological and biological properties of a euphorbious plant, *Euphorbia pulcherima*: A review

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Abstract
Euphorbiaceae is one of the largest flowering plant families, with a diverse range of vegetative forms, some of which are important plants. Its classification and chemistry have recently piqued interest, likely as a result of the broad range of chemical composition among its members, many of which are poisonous but beneficial**.**
Euphorbia pulcherima, the poinsettia, is a commercially important plant species belonging to the Euphorbiaceae family of spurges. It's a non-food, non-feed ornamental plant propagated by vegetative propagation. Despite its reputation for being highly toxic, the poinsettia is not harmful to pets or infants. It reveals the existence of various chemical constituents such as alkaloids, terpenoids, saponins, steroids, glycosides, reducing sugar and amino acid. The review is an effort to compile all information regarding the pharmacological and biological activities of *Euphorbia pulcherima*, as this information may prove beneficial in scientific research of the plant and formulation development.

Keywords: *Euphorbia pulcherima*, pharmacology, biological activity, alkaloids

Introduction

At present a large number of plants belonging to different families possess, a range of interesting toxicological and pharmacological properties. Researches with area of plant origin pesticides (botanical) are going on in different parts of world to explore the toxicological properties of plants found in endemic areas because plants and their products are most convenient due to their (i) Easy availability (ii) Easy biodegradability (iii) Easy to handle (iv) Low cost (v) Safe for mankind and environment both (vi) Greater acceptance amongst the users (vii) Minimum side effect.

But before commercial use of these botanicals with pharmacological importance, their strict scientific tests, besides clinical ones, on different vital systems is necessary to check for some potentially harmful ingredients in them like secondary metabolites, which may have dangerous mutagenic side effects. It is therefore desirable to evaluate the physiological and biochemical effects, if any, of materials of plant origin before considering them for medicinal and any other purposes.

As per the present scenario the use of medicinal plants as natural alternatives to synthetic compounds has gain importance due to the presence of various phytochemicals in them. Extracts of plants are used for the treatment of various diseases which forms the basis for all traditional systems of medicine [1].

Medicinal herbs are gaining global importance because of the vast array of their uses and also as they are the local heritage. They are used to treat several diseases of humans and animals. We have the Euphorbia spurges species among these herbs. Euphorbiaceae ethnomedicine is extremely complex. This diversity is due to the existence of a broad variety of rare secondary metabolites, which renders the majority of the members poisonous [2].

Many Euphorbiaceae have been used as common medicinal herbs since time immemorial. The genus Euphorbia, as well as the family Euphorbiaceae, is named after King Juba II of Mauritania's Greek physician, Euphorbus, who is said to have used *Euphorbia resinifera* latex to treat ailments such as the King's swollen belly [3, 4]. Euphorbiaceae are found in almost all environments and tolerate a wide variety of climatic and soil conditions. Different habitat conditions, such as soils, pH, temperatures, and moisture, are reported to influence plant physiological processes, resulting in the manufacture and accumulation of various chemical substances [5, 6].

The poinsettia is found in Central America, from Mexico to southern Guatemala. It has a range of around 2,000 km (1,200 mi), encompassing tropical dry forests at mid-elevation. The majority of wild species live in steep canyons with a Pacific view. Many populations used to be found in rolling hill areas, but many have since vanished. The canyons' inaccessibility can protect wild populations from human disturbance, according to one theory.

Wild poinsettias exist in the northern Mexican states of Guerrero and Oaxaca, which are far further inland in humid, seasonally dry forests than the rest of the species' range. Wild populations in northern Guerrero were found to be the possible ancestors of most cultivated poinsettias, according to genetic analysis. The plant is used by the Aztecs to make red dye and as an antipyretic medicine [7].

Because of an extensive marketing campaign by the Ecke family, which started by sending free poinsettias to television stations for use on air, poinsettias are now common Christmas decorations in homes, churches, workplaces, and other locations throughout North America. The 12th of December is National Poinsettia Day in the United States, commemorating Joel Roberts Poinsett's death. Plant-based products are commonly used in the pharmaceutical industry. Many pharmaceutical companies in the Western world depend on many plants for their medicinal properties [8]. The leaves are used as a poultice

and as an emeto cathartic, which causes vomiting and bowel movement.

The latex of *Euphorbia pulcherima* is toxic to livestock. However, in this case, it is used in veterinary medicine to remove maggots in livestock wounds. Just a few studies have looked into the allergic potential of *Euphorbia pulcherima*, such as rhinitis and asthma, but patients were able to tolerate it [9]. There were also a few cases of contact dermatitis caused by *Euphorbia pulcherima* latex [10, 11]. Development retardants/inhibitors, polyamines, and phenolics are some of the compounds that alter the key hormone effects on rooting [12]. Phytohormones have been identified as salicylates, which are found in phenolic compounds [13]. In the medicinal properties the *Euphorbia pulcherima* to cure warts (latex spread on the wart) for the treatment of skin wounds, ulcers or skin diseases, such as labial herpes (latex on the affected part of the skin). To promote breast milk production, as an external remedy for inflammation processes suitable for example in case of arthritis, muscle or bone contusions etc. Latex from poinsettia has been used as a depilatory cream to extract excess hair from the skin. Poinsettia infusions for internal use are used to treat a variety of ailments, including colds, coughs, throat sores, bronchitis, and heart disease.

Morphology

Euphorbia pulcherima is a shrub or small tree that grows to a height of 0.6–4 metres (2–13 feet). The plant produces dark green dentate leaves with a length of 7–16 centimetres (2.8–6.3 in). The coloured bracts, which are usually flaming red with cultivars that are orange, pale green, cream, pink, white, or marbled, are often mistaken for flower petals due to their groupings and colours, but they are actually leaves [14]. The colours of the bracts are created by photoperiodism, which requires that they be exposed to darkness for at least fourteen hours at a time for six to eight weeks in a row. The plants often need a lot of light during the day to achieve the brightest colour.

Poinsettia flowers are unassuming, and pollinators aren't drawn to them. The cyathia, or false flowers, are small yellow structures located in the centre of each leaf bunch. Wasps have been seen visiting the cyathia on occasion, but pollination in wild poinsettias is unknown [15].

Gas liquid chromatography and mass spectrometry were used to analyse the sterol and triterpenoid constituents of *Euphorbia pulcherima* latex and cultured callus tissues. Sitosterol, amyrin, germanicol, cycloartenol, amyrin acetate, and germanicol acetate were found to be present in the latex extracts from various varieties [16].

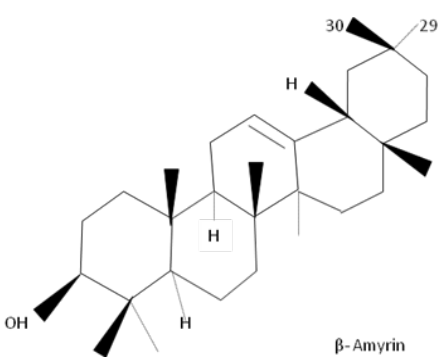

Fig 1

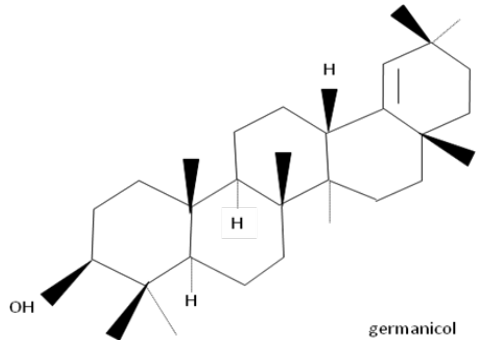

Fig 2

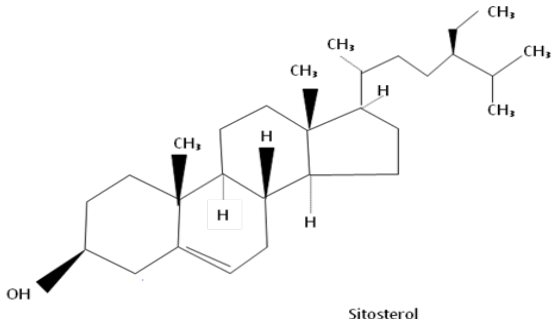

Fig 3

Phytochemicals in *E. pulcherima* n-hexane fraction of ethyl acetate extract during preliminary investigation of bioactive compounds and bio autographic studies of whole plant extract of *Euphorbia pulcherima* on *Escherichia coli*, *Staphylococcus aureus*, *Salmonella typhi*, and *Pseudomonas aeruginosa* showed the presence of 4-Bromophenyl heptyl phthalate (wax), Bis (4-methylheptan -3-yl) phthalate (wax), 4-(Tetrahydrofuran-2-yl) methyl) amino) -1-oxaspiro [4.5] dec-3-en-2-one (alkaloid)2-(tert-Butyl)-6-methyl-4*H*-1,3-dioxin-4-one (flavonoid). Also compounds like 2, 4-Di-*tert*-butylphenol (phenolic) 2, 6-Di-*tert*-butylcyclohexa-2, 5-diene-1, 4-dione (quinone) were found to be present in *Euphorbia pulcherima* hexane: ethyl acetate (9: 1) fraction of ethyl acetate extract [17].

Anti-Alzheimer's disease bioactivity

Eupulcherol A is a brand-new triterpene. The anti-Alzheimer activity of Eupulcherol A isolated from *E. pulcherima* was tested. Alzheimer's disease is a neurodegenerative condition. The findings revealed that the compound has promising anti-disease Alzheimer's disease properties and can prevent transgenic *Caenorhabditis elegans* from paralyzing. This explains why the species has been used to treat hypermenorrhea, wounds, and traumatic hemorrhage in the past [18].

Antibacterial effect

The antibacterial activity of various solvent fraction of *E. pulcherima* was done using modified agar well diffusion method [19] and the diameters of the zone of inhibition of microbial growth were measured in the plate in millimeters. Against *Klebsiella pneumoniae*, *S. epidermidis*, *B. stearothermophilus*, and *Salmonella Typhimurium*, the n-hexane fraction demonstrated 10, 12, 16, and 10 mm zones of inhibition, respectively. When chloroform was tested against these bacterial strains, it resulted in a zone of inhibition of 18, 16, 14, and 12 mm, respectively. The ethyl acetate fraction had a mild antibacterial effect of 12 mm

against all bacteria studied, while the methanolic fraction had zones of inhibition of 16, 10, 18, and 18 mm against *Klebsiella pneumoniae*, *S. epidermidis*, *B. stearothermophihus*, and *Salmonella typhimurium*, respectively [20].

Antioxidant assay

The hydrogen atom or electron donation abilities of the corresponding extract/fractions and standards were measured from the bleaching of the purple-colored methanol solution of 2, 2-diphenyl-1-picrylhydrazyl. The maximum (90.22%) free radical scavenging effect was observed with methanol extract at higher concentration (500 µg/ml), the antioxidant effect of ethyl acetate was higher (91.31%, at 500 µg/ml); the free radical scavenging effect of chloroform and n-hexane fraction was moderate (60.55 and 48.41%) at tested concentration of 500 µg/ml [21].

Biological activity of ethanolic extracts of *Euphorbia pulcherima* on *Spodoptera frugiperda* *Spodoptera frugiperda* (J.E. Smith) (Lepidoptera: Noctuidae) is a polyphagous species which attacks many economically important crops in several countries. This insect is a major corn pest, and an ethanolic extract of *E. pulcherima* leaves applied during the plant's reproductive process is successful in reducing the population of *S. frugiperda*. Leaves were used to make extracts. *E. pulcherima* leaves were collected at various phenological stages (vegetative and reproductive), oven dried, crushed, and then solubilized in ethanol, yielding an ethanol extract.

The extracts were set aside in 0.5 and 1% concentrations for each phenological stage of the plant, incorporated into an artificial diet and offered to the larvae of *S. frugiperda*. The extract of vegetative and reproductive phase of *E. pulcherima* leaves in concentrations of 0.5 and 1%, has showed that it affected mortality in the larvae, increasing the larval period and reducing the weight of larvae and pupae and viability of the eggs of the caterpillars [22].

Antifungal properties

Effect of different concentrations of Acetone Extract of *E. pulcherima* leaf on growth and morphology of *Aspergillus fumigatus* shows inhibitory action of the extract on growth of *Aspergillus fumigatus*. It was found that the fungi were inhibited by the extract and the inhibition was directly proportional to the increasing concentration of the extract. Also, the effect of alcohol extract of *E. pulcherim*a inflorescence showed same inhibitory effect on growth and morphology of test fungi and that too in directly proportional concentration of the extract [23].

Cytological studies

Using iron-acetocarmine squash technique on *E. pulcherima* reveals, that the chromosome number *E. pulcherima* have 2n=28 [24] Study using the optical and electron microscopy, the distribution and cytological organization of non-articulated branched laticifers in the mature root, stem and leaf tissue of poinsettia, *Euphorbia pulcherima* Wild., has been made and it was found that the laticifers occur in all parts of the plant body being well represented in tissues of parenchyma and the phloem. It is found that the mature region of the laticifer has a living protoplast which exhibits a thin parietal cytoplasm that is bounded with a plasmalemma and a tonoplast, enclosing a large central vacuole that contains the milky latex fluid [25].

Nematocidal Effect

Studies to investigate the usefulness of selective botanical extracts for the suppression of sting (*Belonolaimus longicaudatus* Rau) nematodes has been done keeping in mind the limited utilitarian of synthetic nematicide. Accordingly, it was found that shoot extracts of *E. pulcherima* (with irrigation) provided 70% control compared with the untreated pots while poinsettia (non irrigated) provided 73% control [26].

Fig 4: Photograph of plant *Euphorbia pulcherima*

Conclusions

The current studies, suggest that *E. pulcherima* need extensive studies to be explored as it contains potential secondary metabolites which may be responsible for its use as anti arthritis, anticancer, anticonvulsant, anti eczema, anti-inflammatory, antimicrobial and many more.

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