Comparative account of pharmaco-chemical characterization of *Euphorbia neriifolia* (L) and *Polycarpaea corymbosa* Lam

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Abstract

This study presents a comprehensive comparative analysis of the pharmaco-chemical profiles of two medicinal plants, *Euphorbia neriifolia* (L.) and *Polycarpaea corymbosa* Lam. The research investigates the phytochemical composition, pharmacological properties, and potential therapeutic applications of these plants. Through a systematic review of existing literature and experimental analysis, key constituents and bioactive compounds are identified and compared between the two species. Additionally, the pharmacological activities, including phytochemical screening, physicochemical parameters and antimicrobial are assessed to elucidate the potential medicinal value of *E. neriifolia* and *P. corymbosa*. This comparative account aims to provide valuable insights into the pharmacological diversity and therapeutic potential of these plants, contributing to their utilization in traditional medicine and pharmaceutical development.

Keywords: *Euphorbia neriifolia*, *Polycarpaea corymbosa*, Phytochemical composition, Pharmacological properties and antibacterial activity.

Introduction

Natural products derived from medicinal plants have long been recognized as valuable sources of therapeutic agents due to their diverse chemical composition and pharmacological activities. Among the vast array of medicinal plants, *Euphorbia neriifolia* (L.) and *Polycarpaea corymbosa* Lam stand out for their traditional uses in folk medicine across various cultures Nasim *et al.,* (2022). *E. neriifolia*, commonly known as "Indian spurge tree," has been traditionally employed for the treatment of various ailments, including gastrointestinal disorders, skin diseases, and respiratory ailments Sultana *et al.,* (2022). Similarly, *P. corymbosa*, or "Puliyarai," is renowned in traditional medicine for its purported medicinal properties, such as anti-inflammatory and wound-healing effects. Despite their traditional uses, there is a paucity of comprehensive studies comparing the pharmaco-chemical profiles of *E. neriifolia* and *P. corymbosa*. Understanding the chemical constituents and pharmacological activities of these plants is crucial for validating their traditional uses and exploring their potential therapeutic applications in modern medicine. Therefore, this comparative study aims to bridge this gap by providing a detailed analysis of the phytochemical composition, pharmacological properties, and therapeutic potential of *E. neriifolia* and *P. corymbosa*. By elucidating the similarities and differences in their pharmaco-chemical profiles, this research seeks to highlight the pharmacological diversity of these plants and stimulate further investigation into their medicinal value.

Materials and Methods:

Collection and Extraction of Plant Material:

The fresh plant materials sourced from the pristine Sirumalai hills of Tamil Nadu's Dindigul district underwent meticulous processing for extraction. Leaves were methodically fragmented and subjected to gentle shade drying until achieving a uniform, smooth texture. Following this, the dried plant material underwent granulation or pulverization using a blender, ensuring consistency. Subsequent sieving with a No. 60 mesh sieve yielded uniform particles, free from irregularities. This finely ground powder served as the ideal substrate for extracting the plant's active constituents, ensuring optimal potency and quality.

Physicochemical analysis

Physico-chemical analysis values were determined by ash and extractive values, including parameters followed by standard protocols and WHO (1992) preferred on quality and purity on the medicinal plant material. The values were triplicate to mention the Mean ± SE.

Total ash value of powder

The total ash value was assessed using 1 gram of precisely weighed dried powder obtained from the leaves. The powder was incinerated in a porcelain crucible at a controlled temperature not exceeding 450°C until it achieved a uniform white appearance. After cooling, the crucible was reweighed periodically until a constant weight was obtained. The total ash content was then calculated as milligrams per gram of the dried material and expressed as a percentage.

Acid insoluble ash

The total ash obtained from the previous step was treated with 50 mL of hydrochloric acid (HCl) and boiled for 5 minutes. The resulting insoluble matter was transferred to an ash less filter paper and rinsed with water to obtain a neutral filtrate. This filtrate was then returned to the original crucible and ignited until a constant weight was achieved. The acid-insoluble ash was calculated as milligrams per gram of dried material and expressed as a percentage.

Water soluble ash

The crucible containing the total ash was supplemented with the required volume of water and subsequently boiled. After cooling, the solution was filtered using an ash less filter paper to separate the insoluble matter. The insoluble matter was then ignited periodically until a constant weight was achieved. The water-soluble ash was determined by subtracting the weight of the residue in milligrams from the weight of the total ash and expressed as a percentage. For the loss on drying determination, 1 gram of the sample was weighed in a tarred petri dish and dried at 105°C for approximately 5 hours. The drying process was repeated at 1-hour intervals until a constant weight was obtained. The result was calculated as the percentage of weight loss.

Sulphated ash

The plant material was precisely weighed and placed into a pre-weighed crucible, followed by gentle ignition to obtain a charred residue. After cooling, the residue was moistened with 1 mL of sulfuric acid (H_2SO_4) and then ignited at high temperature.

Preparation of extracts for Phytochemical screening:

Extraction:

Freshly collected plant material were dried in shade, and then coarsely powdered in a blender. The coarse powder (100g) was extracted successively with benzene, chloroform and

methanol, each 250 ml in a Soxhlet apparatus for 24 hrs. All the extracts were filtered through Whatman No.41 filter paper. All the extracts (Chloroform, Ethanol and Petroleum ether) were subjected to qualitative tests for the identification of various phytochemical constituents as per standard procedures (Brinda *et al*., 1981). All the three extracts of the plant samples were used for Antimicrobial activity studies.

3.7.1. Qualitative analysis

i) *Test for Alkaloids*

E. neriifolia and *P. corymbosa* extracts with added 1 mL Con. HCL and one or two drops of dragon reagent to change the orange red or brick red color the presence of alkaloids.

ii) *Test for flavonoids*

A few drops of conc. H_2SO_4 were added to 1mL of *E. neriifolia* and *P. corymbosa* extracts. Formation of yellow to orange color indicates the presence of flavonoids

iii) *Test for steroids*

E. neriifolia and *P. corymbosa* extract were dissolved with $CHCL_3$ with two drops of acetic anhydride and added few drops of conc. H_2SO_4 to formed brown ring to presence of steroids

iv) *Test for phenols and tannins*

1 mL of *E. neriifolia* and *P. corymbosa* extract with added H_2O heated and filtered. One drops of 1% of lead acetate to form white precipitate the presence of phenols. One drops of $Fecl_3$ added with above sample to formation of dark green color the presence of tannins

v) Test for proteins

To 2 mL of *E. neriifolia* and *P. corymbosa* extract with added few drops of Millons regeant formation at white precipitate the presence of proteins

Antimicrobial activity

Collection of microorganisms

Stock cultures of bacteria such as *Staphylococus aureus, Bacillus subtilis, Pseudomonas aeruginosa* and *Escherichia coli* were obtained from Research Laboratory, Department of Microbiology, Periyar University, Salem, Tamil Nadu.

Preparation of media

The growth media employed in the present study included Nutrient agar and Nutrient broth. The medium was adjusted to pH 7.4 and sterilized by autoclaving at 15 lbs pressure for 15 minutes.

Sub culturing of microorganisms

The pure culture of microorganism was maintained on nutrient agar slants by frequent sub culturing. The culture was stored at 40°C.

Preparation of inoculum

Each organism was recovered for testing by sub culturing on fresh media. A loopful inoculum of each bacterium was suspended in 5ml of nutrient broth and incubated overnight at 370C. These overnight cultures were used as inoculum. Antimicrobial activity was demonstrated by modification of the method described by Barry and Thornsberry, (1985). 0.1 ml of the diluted microbial culture was spread on sterile nutrient agar plate. The pre-soaked and dried discs of 6mm diameter of What man No.1 filter paper were then placed on the seeded plates and gently pressed down to ensure contact. At the same time standard antibiotic of Tetracycline (30µg/ disc) was used as reference or positive control. Respective solvents without plant extracts served as negative control. The plates were incubated at 37°C for 24 hours. After the incubation period, the diameter of the inhibition zone around the plant extract saturated discs were measured and also

compared with the diameter of inhibition zone of commercial standard antibiotic discs. The inhibition zone around the discs were measured and recorded as the difference in diameter between the disc (6mm) and growth free zone.

Results and Discussion

The current work investigated the comparative account of pharmaco-chemical characterization of the medicinal plant *Euphorbia neriifolia* and *Polycarpaea corymbosa* was determined. (Table.1) show the several parameters as well as physicochemical parameters were evaluated.

Table 1. Physicochemical parameters of whole plant of *Euphorbia neriifolia* and *Polycarpaea corymbosa*

Physicochemical parameters	***Euphorbia neriifolia***	***Polycarpaea corymbosa***
Total ash value of powder	8.13 ± 0.02	7.14 ± 0.11
Water soluble ash	1.97 ± 0.07	2.41 ± 0.22
Acid insoluble ash	2.31 ± 0.03	2.91 ± 0.06
Sulphated ash	9.76 ± 0.26	10.22 ± 0.25

The values are triplicate as expressed by Mean±SE (Standard error)

The physicochemical properties determine the total ash value of powder, water soluble ash, acid insoluble ash and sulphated ash. The results of the phytochemical assay conducted on the three plant extracts are summarized below (Table. 2) show that Alkaloid, Phenol and Protein, Steroid are present in *Euphorbia neriifolia* and Flavonoid and Protein, Steroid are present in *Polycarpaea corymbosa.*

Table 2. Preliminary phytochemical screening of whole plant of *Euphorbia neriifolia* and *Polycarpaea corymbosa*

Phyto-chemical test	*Euphorbia neriifolia*			*Polycarpaea corymbosa*		
	Chloroform	**Petroleum ether**	**Ethanol**	**Chloroform**	**Petroleum ether**	**Ethanol**
Alkaloid	+	+	+	+	-	+
Flavonoid	-	-	+	+	+	+
Phenol	+	+	+	-	-	-
Protein	+	+	+	+	+	+
Steroid	+	+	+	-	+	+
Tannin	+	+	+	+	+	+

The findings from the antibacterial assay on the three plant extracts such as Chloroform, Petroleum ether and Ethanol are summarized below (Fig.1, 2 and 3) Ethanol *Euphorbia neriifolia* and Chloroform *Polycarpaea corymbosa.*

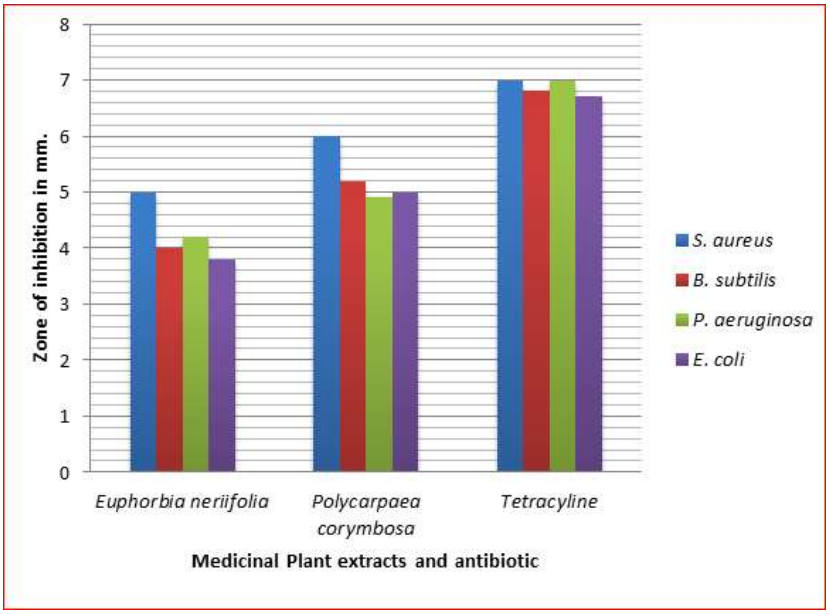

Fig.1. Antibacterial activity on chloroform extracts of *Euphorbia neriifolia* and *Polycarpaea corymbosa*

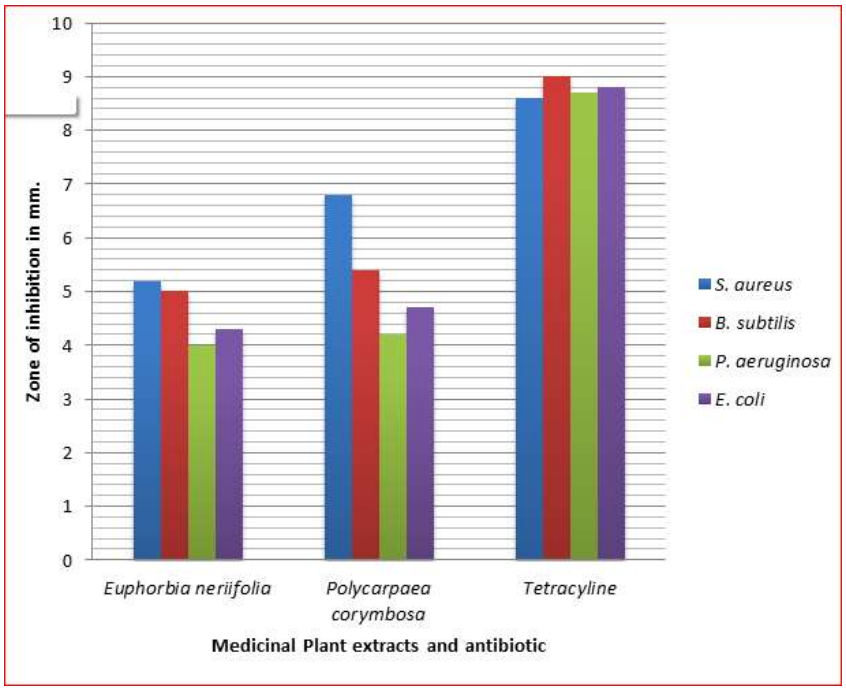

Fig.2. Antibacterial activity on ethanol extracts of *Euphorbia neriifolia* and *Polycarpaea corymbosa*

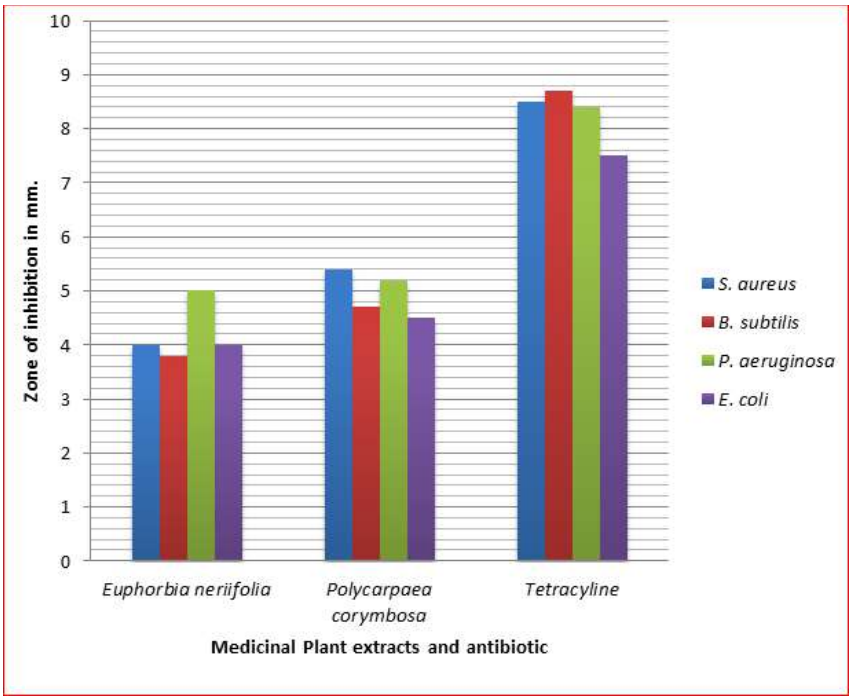

Fig.3. Antibacterial activity on Petroleum ether extracts of *Euphorbia neriifolia* and *Polycarpaea corymbosa*

The ash values are indicating the impurities of drug and then improve the quality and purity. Extractive values are the estimated in this species leaf powder exhibited different constituents from various reagents. Extractive values are primarily useful for the determination of an exhausted or adulterated drug. Similarly, the results the ash and extractive values are perform the leaves of *Clerodendrum infortunatum* (Verma *et al.,* 2021) and stem of *Vitex pinnata* (Thenmozhi *et al*., 2021). Hashmi, (2021) similarly, reported that the n-hexane and ethyl aceyayte extracts were highly presence of alkaloids, terpenoids, flavonoids, tannins. In contrast, Gupta *et al*., (2023) studied that the ethyl acetate extract of *Alpinia nigra* showed alkaloids, flavonoids, phenolics and terpenoids. Compared to the present study, ethyl acetate extract exhibited one compound because the sample contained the essential oil content. Naidoo *et al*., (2023) determined by *Tabernaemontana ventricosa* leaf and stem methanol, ethylacetate extracts

found the alkaloids, steroids, phenols, carbohydrates and aminoacids Kebede *et al.,* 2021 reported the methanolic extract of *C. englerianum, L. adoensis,* and *E. depauperate* showed inhibition zone in diameter values of 28mm, 27mm, and 26mm respectively. Ngom *et al*., (2022) evaluated that the *B. senegalensis* and *T. dodeneifolius* water, methanol, choloform and hexane extracts were kill the pathogens (*E. coli* and *S. typhi*) which highest zone form at 20mm for hexane extract. *Dipoknema butyracea* methanol root extract were potently against the microorganism (*S. aureus, S. epidermidis, K. pneumoniae*) zone of inhibition ranged between 13-17.33mm at the 50mg/mL (Chhetry *et al*., 2022). Bagale *et al*. (2022) summarized *Princepia utilis* inhibition of bacterial strains using various extracts (hexane, ethylacetate, and methanol) on zone formation at 9-12 mm.

Conclusion

In conclusion, this comparative analysis of the pharmaco-chemical profiles of *Euphorbia neriifolia* (L.) and *Polycarpaea corymbosa* Lam. underscores their diverse therapeutic potential and highlights the importance of further exploration in harnessing their medicinal properties. Through a comprehensive examination of their chemical constituents and pharmacological activities, we have gained valuable insights into their traditional uses and potential modern applications in healthcare. As we continue to unravel the complexities of these botanical treasures, it is imperative to conduct additional research, including clinical trials, to validate their efficacy, safety, and potential for pharmaceutical development. Ultimately, this comparative study serves as a stepping stone towards unlocking the full therapeutic potential of these botanical species, paving the way for novel treatments and contributing to the advancement of natural medicine.

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