The use of plants for treating diseases is as old as the human civilization. The low cost and safe quality makes herbal medicine superior than synthetic drugs. In the process of evolution, plants and humans are co-evolved and therefore these phytochemicals have significant positive effect on human systems. The ethanobotanical and phytochemical research has led to the foundation to build a relationship between plants and humans. There is always a need for isolation and identification of phytochemicals from different plant sources. Euphorbiaceae is known for its rich medicinal plant resource. Their wide distribution, habitat, adaptation and succulent nature have showed this family to produce defensive phytochemicals and hence Euphorbiaceae justify its selection for phytochemical investigation in the present study.

The perusal of literature has revealed that the medicinal properties of *Baliospermum montanum, Drypetes roxburghii* and *Codiaeum variegatum* were known but there is no sufficient information available on their phytochemical compounds and their antimicrobial activity. In the present investigation, the phytochemical and antimicrobial activity of *B. montanum, D. roxburghii* and *C. variegatum* has been shown.

In the current investigation, the phytochemical qualitative and quantitative tests; phytochemical fingerprinting, isolation of flavonoid fractions; their antimicrobial, antioxidant and antiinflammatory activities, quercetin quantification by HPLC and phytochemical profiling through GC-MS; acceleration of flavonoid
Summary

synthesis in callus culture and nanoparticles synthesis of three important members of Euphorbiaceae family

Major findings are summarized below:

- It was found that collected Euphorbiaceae members’ viz. *B. montanum*, *D. roxburghii* and *C. variegatum* thrive well at 25 ± 2°C and require proper sunlight for their luxuriant growth, even though they were collected from different agro-climatic conditions.

ESTIMATION OF PHYTOCHEMICALS QUALITATIVELY

- It was found that alkaloids are present in root, stem, leaf and flower of ethanol and petroleum ether extracts of *B. montanum*, *D. roxburghii* and *C. variegatum*.
- It was found that anthraquinone is present in chloroform, hexane, petroleum ether and ethanol extract of leaf, stem, flower and roots of *C. variegatum* and *D. roxburghii*, where as it was absent in *B. montanum*.
- It was found that carbohydrates, monosaccharide and reducing sugars are present in water, acetone, ethanol and methanol extracts of leaf, stem, flower and roots of *B. montanum*, *D. roxburghii* and *C. variegatum*.
- In the present investigation, it was found that cardiac glycosides are present in water, acetone, ethanol and methanol extracts of leaf, stem, flower and roots of *B. montanum*, *D. roxburghii* and *C. variegatum*.
- It was found that coumarins are present in traces in leaf, stem, flower and roots of *B. montanum*, *D. roxburghii* and *C. variegatum*.
- In the present investigation it was found that fatty acids are absent in *B. montanum*, *D. roxburghii* and *C. variegatum*.
- It was found that flavonoids are present in leaf, stem, flower and roots of *B. montanum*, *D. roxburghii* and *Codiaeum variegatum*.
- It was found that gum and mucilage is present in aqueous flower extract of *B. montanum* and acetone leaf extract of *Drypetes roxburghii* leaf, where as it is absent in *Codiaeum variegatum*. 
Summary

- In the present investigation, it was found that proteins and amino acids are present in aqueous leaf, stem, flower and roots of *B. montanum*, *D. roxburghii* and *Codiaeum variegatum*.
- It was found that phenol are present in acetone, ethanol and methanol extract of leaf, stem, flower and roots of *B. montanum*, *D. roxburghii* and *C. variegatum*.
- It was found that saponins are present in leaf, stem, flower and roots extract of water, methanol and ethanol of *B. montanum*, *D. roxburghii* and *C. variegatum*.
- It was found that steroids are present in traces in leaf, stem, flower and roots extract of chloroform, water, hexane, methanol and petroleum ether *B. montanum*, *D. roxburghii* and *C. variegatum*.
- It was found that tannins are present in leaf, stem, flower and roots extract of methanol and ethanol of *B. montanum*, *D. roxburghii* and *C. variegatum*.
- It was found that terpenoids are present in water, ethanol, methanol and chloroform in the leaf, stem, flower and roots of *B. montanum*, *D. roxburghii*.

ESTIMATION OF PHYTOCHEMICALS QUANTITATIVELY:

- In the present study, the leaf, stem, root and flower and latex of medicinally important plants viz. *B. montanum*, *D. roxburghii* and *C. variegatum* were chosen for quantitative analysis of secondary metabolites like alkaloids, flavonoids, saponins, phenol, tannins and terpenoids.
- The analysis of results revealed *D. roxburghii* leaf, stem and root contains highest alkaloid content when compared to *B. montanum* and *Codiaeum variegatum*. However, the roots of *C. variegatum* contain more alkaloids.
- It was found that least and highest content are in *D. roxburghii* and *B. montanum* respectively contains highest content of flavonoids. However, *C. variegatum* roots showed more flavonoid content as compared to other parts.
- In the present study, highest content of saponin was present in *D. roxburghii* as compared to *B. montanum* and *C. variegatum*. Among leaf, stem, flower and roots of *D. roxburghii*, stem showed maximum content.
- In the current study, the tannin content was high in *B. montanum* as compared to *D. roxburghii* and *C. variegatum*. However the stem of *C. variegatum* showed highest tannin content.
**Summary**

- In the present study the phenol content was predominant in leaf, stem, flower and roots of *B. montanum*, *D. roxburghii* and *C. variegatum*. However the leaf of *B. montanum* showed highest phenol content as compared to other plant parts.

- The highest content of terpenoids was in *B. montanum* as compared to *D. roxburghii* and *C. variegatum*. However, stem shows highest content of terpenoids.

**PHYTOCHEMICAL FINGERPRINTING:**

- For the first time in the present investigation, phytochemical fingerprint was developed by computing all the fourteen phytochemical qualitative data pertaining to compounds such as alkaloids, anthraquinone, carbohydrates, cardiac glycosides, coumarins, fatty acids, flavonoids, gum and mucilage, phenols, protein and amino acids, saponins, steroids, tannins and terpenoids with their presence or absence in leaf, stem, roots and flower of water, acetone, ethanol, methanol, chloroform, hexane and petroleum ether extract of *B. montanum*, *D. roxburghii* and *C. variegatum*.

**ISOLATION OF FLAVONOIDS FRACTIONS:**

- In the present investigation, flavonoid fraction I, II and III from methanol leaf extract of *B. montanum*, *D. roxburghii* and *C. variegatum* was successfully isolated by column chromatography. These three flavonoid fraction I, II and III were further used for anti-microbial, anti-inflammatory and anti-oxidant studies.

**ESTIMATION OF ANTIINFLAMMATORY ACTIVITY OF ISOLATED FLAVONOID FRACTIONS**

- It was found that the flavonoid fractions I, II and III of *B. montanum*, *D. roxburghii* and *C. variegatum* isolated do not exhibit cytotoxic activity against RAW264.7 (Mouse Leukaemic Monocyte Macrophage) cell lines. However, *B. montanum* was least cytotoxic activity against RAW264.7.

- It was found that flavonoid fractions I, II and III of *B. montanum*, *Drypetes roxburghii* and *Codiaeum variegatum* exhibit anti-inflammatory activity against RAW264.7 cell lines. Further it was found that *B. montanum* (35%-
Summary

41%) exhibit remarkable anti-inflammatory activity when compared to D. roxburghii (31-46%) and Codiaeum variegatum (49-54%).

ESTIMATATION OF ANTIOXIDANT ACTIVITY OF ISOLATED FLAVONOID FRACTIONS
- It was found among flavonoid fractions I, II and III of methanol leaf extract of B. montanum, Drypetes roxburghii and Codiaeum variegatum, only fraction I of B. montanum was found to have antioxidant activity.

ESTIMATATION OF ANTIMICROBIAL ACTIVITY OF ISOLATED FLAVONOID FRACTIONS
- It was found that flavonoid fraction isolated from B. montanum Codiaeum variegatum and D. roxburghii have revealed different degree of antibacterial activity against Escherichia Coli, Salmonella typhimurium and Pseudomonas aeruginosa. However, B. montanum showed highest antibacterial activity when compared to, Drypetes roxburghii and Codiaeum variegatum.
- It was revealed that fraction III of B. montanum was found to have best anti-fungal activity against A. fumigates as compared to fraction I and II. Among I, II and III isolated flavonoid fractions in D. roxburghii, fraction III was least effective whereas fraction I and fraction II were equally effective against Aspergillus niger and Aspergillus fumigates. In Codiaeum variegatum, fractions I and fraction II were found to be equally effective than fraction III against A. Niger, A. fumigates and M. gypseum.

ACCELERATION OF FLAVONOID SYNTHESIS IN IN VITRO CULTURE
- Cell viability of 42 days old suspension culture of B. montanum D. roxburghii and Codiaeum variegatum was 88%, 82% and 80% respectively and was found that elicitor treatment accelerates the production of flavonoids. Among three elicitors phenylalanine, copper sulphate and P. aeruginosa, phenylalanine was found to be the best and showed maximum elicitation in B. montanum.
Summary

GC-MS PROFILING

- In the current investigation, GC-MS analysis showed 4 peaks in the methanol leaf extract of *B. montanum*. GC-MS with NIST library analysis revealed the presence of 15 compounds such as 3-methyl-4-methylidenehexan-2-one, 2,4-Pentanedione, 3-diazo-, 1-(2,3-Dimethyl-6-oxabicyclo [3.1.0]hex-1-yl)ethanone, 6-Amino-1,3-dimethyl-2,4(1H,3H)-pyrimidinedione, 1-(2-Methyl-2H-tetrazol-5-yl)vinyl acetate, 2,3-dihydro-2,5-dihydroxy-6-methyl-4H-pyran-4-one, 2,4,5-Trimethyl-1,3-dioxolane, 1,2,4,5-Tetramethyl-1,2,4,5-tetrazinane, (2R,3S)-2,3-Dimethyloxirane, Hydroxymethylfurfural, -Methyl-4-hepten-3-one, Sucrose, 2-(Hydroxymethyl)-2-nitropropan-1,3-diol, Propylene carbonate and Butoxyacetic acid.

QUERCETIN QUANTIFICATION

- In the present study, through HPLC significant amount of quercetin is present in *B. montanum*, *D. roxburghii* and *C. variegatum* and was analyzed with standard quercetin peak and its retention time.

NANOPARTICLES SYNTHESIS:

- It was found that the growth of *E. coli* is inhibited by silver nanoparticles in all the three plants *B. montanum*, *D. roxburghii* and *C. variegatum*.

The present findings confirms that all the three Euphorbiaceae members *B. montanum*, *D. roxburghii* and *C. variegatum* exhibit the presence of phytochemicals, which indicates that they are having potential resource of drugs. Hence they are categorized under medicinal plants. These three plants *B. montanum*, *D. roxburghii* and *C. variegatum* can be utilized for pharmaceutical, cosmetics and food industries for commercial exploitation.