6. DISCUSSION

Plants have been an integral part of traditional systems of medicine across the continents since time immemorial. These medicinal systems have played a crucial role in curing ailments and offering health care on easily accessible basis (Parashar, 2014).

Although India’s traditional medicinal system (Ayurveda, Siddha, and Unani) are deeply seated in the Indian psyche today, we find that these systems of medicine do not have foremost position in therapeutics. Proper utilization of traditional plant drugs needs unearthing traditional herbal medicines in the context of modern science.

In Ayurvedic medicines various problems like different geographical sources, vernacular names and possibility of substitution or adulteration are encountered in the commercial markets. Besides this, nomenclature ambiguity exists in case of larger number of Ayurvedic plants used. Since, Ayurveda refers the plants used by their Sanskrit names and there are instances where the same name stands for more than one plants or different names applied to one plant. This has put many plants in the controversial position and their identity becomes doubtful. Due to ambiguity of plant names, overlapping of data may occur in chemical or pharmacological information, where the botanical identity of market sample of crude drug taken up for research or commercial use is not ascertained (Viswanathan et al., 2003).

The polynomial nomenclature is one of the major issues which make a lot of confusion too many of the authors and readers. One such example, parpata, is an important drug of Ayurveda. It is a cooling medicine. It has stomachic, anthelmintic, febrifuge and blood purifying properties. Parpata is valuable remedy used for fever, jaundice, skin disease, burning of body, wandering of mind etc (Sivranjan, 1994; Chunekar and Pandey, 1999). There are number of plants available under one common name parpata like Oldenlandia corymbosa, Rungia repens, Mollugo oppositifolia, Fumaria parviflora and Polycarpaea corymbosa (Vaidya, 1982).

The present study was an attempt to develop quality parameters for parpata through a systematic study of above mentioned five plant materials. Hence, the plants were
evaluated for complete pharmacognostic parameters such as macroscopy, microscopy, physical and phytochemical parameters.

*O. corymbosa* is an erect or prostrate annual herb with slender stem, lanceolate leaf and white coloured flowers.

Microscopically root can be distinguished by wide lignified xylem that occupies major area of section, narrow phloem traversed by uniseriate medullary rays.

Stem shows an epidermis composed of drum shaped cells, a narrow cortex and stellar region occupying 1/3rd area.

Leaf can be identified by collateral meristele, bilayered palisade cells below upper epidermis and spongy parenchyma embedded with raphides.

Powder of the plant shows raphides of calcium oxalate, epicarp in surface view, pollen grains, spermoderm, papillose epidermis of corolla and fragments of epidermis of leaf.

Phytochemical screening revealed that flavanoids, phenolics, steroids and triterpenoids, tannins, carbohydrate, coumarins and anthraquinone glycosides are present in plant. Content of flavanoids and phenolics in plant was found to be 2.93±0.28%w/w and 6.47±0.30%w/w respectively.

TLC analysis demonstrated presence of stigmasterol, lupeol, ursolic acid and oleanolic acid, which were considered as chemical markers and HPTLC methods were developed to estimate their content in *O. corymbosa*. The quantity of stigmasterol and lupeol in hydrolyzed methanolic extract of entire herb were estimated to be 1.19±0.04%w/w and 0.026±0.008%w/w on dry basis respectively, while ursolic acid and oleanolic acid were observed to be 0.053±0.009%w/w and 0.012±0.006%w/w on dry basis.

*R. repens* is an erect or diffuse branching herb with subterete stem, subsessile oblong lanceolate leaf and pinkish violet colored spikes.
Root shows wide lignified radiating xylem surrounded by wide phloem and pericycle.

Microscopically stem can be characterized by a thick walled epidermis with multicellular simple and sessile glandular trichomes, collenchymatous hypodermis below wing, endodermis and stellar region occupying 1/3rd area.

Leaf shows collateral meristele, isobilateral lamina bearing simple uniseriate covering and glandular trichomes and presence of cystolith.

Characteristic diagnostic features of powdered plant material included are cystoliths of calcium carbonate, cork in surface view, pollen grains and trichomes.

Flavanoids, phenolics, tannins and carbohydrate are found present in plant. Content of flavanoids and phenolics are 2.96±0.14%w/w and 7.87±1.61%w/w respectively.

Kaempferol, identified in plant by TLC analysis, was taken as chemical marker for HPTLC study. Its quantity in ethyl acetate fraction of hydrolyzed extract of entire herb was found to be 0.15±0.06%w/w on dry basis.

*M. oppositifolia* is prostrate, annual herb bearing numerous stems with long internodes, linear-lanceolate leaf and white coloured flowers in axillary fascicles.

Root was microscopically characterized by anomalous growth rings showing crescent shaped phloem associated with xylem vessels.

Stem shows thick walled epidermis with multi-cellular simple triseriate and glandular trichomes and, stellar region occupying 1/3rd area.

Leaf can be identified collateral meristele, continuous band of palisade cells below upper epidermis and calcium oxalate crystals.

Powdered plant material shows prisms and rosettes of calcium oxalate, pieces of seeds, trichomes from stem and fragments of epidermis from corolla.
Phytochemical analysis demonstrated presence of saponins, flavanoids, phenolics, alkaloids, steroids and triterpenoids, tannins and carbohydrate. Content of phenolics, alkaloids, flavanoid and saponins were found to be $3.83\pm 0.11\%\text{w/w}$, $5.05\pm 0.18\%\text{w/w}$, $2.66\pm 0.42\%\text{w/w}$ and $833.33\pm 0.21$ respectively.

TLC study showed that oleanolic acid and lupeol are present in plant. They were chosen as chemical markers and HPTLC method was developed to estimate their content in *M. oppositifolia*. The quantity of oleanolic acid and lupeol in hydrolyzed methanolic extract of entire herb were estimated to be $0.028\pm 0.015\%\text{w/w}$ and $0.016\pm 0.002\%\text{w/w}$ on dry basis respectively.

*F. parviflora* is a diffuse, annual herb with thin winged stem; alternate leaf finely divided into small, linear lanceolate segments, small white or pink flowers with purplish tips.

Microscopically root can be characterized by the presence of centrally located diarch primary xylem encircled by wide secondary xylem occupying major area and a narrow cork.

Stem shows collenchymatous hypodermis, vascular bundle capped with lignified pericyclic fibres and hollow pith.

Leaf can be identified by vascular bundles with groups of sclerenchyma underneath the phloem and narrow spongy parenchymatous lamina.

Powder of the plant shows xylem vessels with varied thickening, lignified and thick walled testa and spherical pollen grains.

The plant showed presence of alkaloids, flavanoids, phenolics, steroids and triterpenoids, tannins, and carbohydrate. Content of alkaloids, phenolics and flavanoids are $6.21\pm 0.13\%\text{w/w}$, $6.15\pm 0.28\%\text{w/w}$, and $3.64\pm 0.35\%\text{w/w}$ respectively.
Protopine and β-sitosterol, identified in plant by TLC study, were considered as chemical markers. HPTLC methods were developed to estimate their content in *F. parviflora*. The quantity of protopine and β-sitosterol in methanolic extract of entire herb were estimated to be 0.49±0.03% w/w and 0.25±0.12% w/w on dry basis respectively.

*P. corymbosa* is an erect annual herb having slender stem, linear leaf and terminal cymes.

Root shows continuous or discontinuous concentric rings of xylem and phloem, clefts of medullary rays, cortex and cork microscopically.

Stem can be characterized by hollow pith surrounded by ring of xylem, phloem, sclerenchymatous pericycle, compressed cortex and papillosive epidermis with multicellular branched collapsed and glandular trichomes.

Centric leaf shows collateral meristeles enclosed within parenchymatous sheath arranged in transverse view throughout.

Powdered plant material can be typified by rosettes of calcium oxalate in epidermis of leaf, branched and collapsed trichomes and pollen grains.

Saponins, flavanoids, phenolics, steroids and triterpenoids, tannins and carbohydrate are found to be present in plant. Content of phenolics, flavanoids and saponins observed are 5.69±0.16% w/w, 3.44±0.45% w/w and 250.34±0.13 respectively.

*P. corymbosa* showed presence of lupeol, which was considered as chemical marker for HPTLC study. Its quantity in hydrolyzed methanolic extract of entire herb was estimated to be 0.012±0.007% w/w on dry basis.

Water-soluble ash value was found to be more than acid insoluble ash value in all above mentioned plants indicating presence of some quantity of earthy materials. The plants showed higher water-soluble components than alcohol soluble components. Heavy metal and microbial load were found within permissible limits in all plants.
This is the first report on the Pharmacognostic study supported with HPTLC analysis for all five drugs available under the name of parpata. The ensemble of data on standard parameters is valuable for the approval of quality control and for standardization of these crude drugs.