Introduction
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India has well developed indigenous system of medicine practiced by both the poor and affluent society. The remedies codified therein are vastly used either as crude drug or as a part of traditional medicine in a value added form in the modern health care systems. Plant material both in crude form and / or their metabolites through incorporation in value added formulations contribute a major portion to the traditional health care systems, aromatherapy, perfume and flavor industry. The secondary metabolites from medicinal plants like Bacopa monnieri (Brahmi), Andrographis paniculata (Kal-megh), Mentha spp. (Pudina - mints) and Cymbopogon spp. (aromatic grasses) are the important contributors in this respect.

As the biomass constitute the main source of economic product in these species, efforts to enhance the plant biomass would be beneficial from economic point of view. This could be achieved through breeding
strategies and biotechnological and tissue culture techniques, but a quick means of getting better genotypes would be through induced polyploidy and bud sport variations.

Genomic multiplication giving rise to generation of polyploids generally enhances the vigor of determinate plant parts and concentration of secondary metabolites. Such acquired features may be favored from commercial angle where plant biomass is the source of economic product. Also, an increased gene activity and enzyme diversity, lower transpiration but higher photosynthetic rate, chromatin shedding / nucleotypic adjustments, that are generally associated with polyploids are expected to provide novel prospects for realizing qualitative change for commercially useful metabolites (Timco et al 1980, Dhawan and Lavania 1986). However, Raina et al (1994) suggested that genomic doubling is often associated with some loss of chromatin material. It is easier to maintain induced polyploidy in vegetatively propagating plants as any genetic change (including chromosomal / genomic) introduced to improve the given genotype
could be easily sustained and commercially exploited. Ploidy level also affects the stomatal frequency, guard cell length and stomatal plastid number (Bingham 1968, Krishnaswami and Andal 1978) and also the size of secretary organs. This could be used as useful marker to identify associated biological changes.

*Mentha* spp. (family: Lamiaceae) constituting group of mints, although propagating vegetatively, are also endowed with inherent tendency of *de novo* generation of somatic variation, some of which may differentiate into vegetative shoots leading to bud sport formation. It is likely that such an inherent tendency of *de novo* variation is enhanced under polyploid pressure and / or colchicine induced cytochimerism, leading to increased realization of bud-sport mutations. In fact, Derman (1948) has reported that terminal buds of Cranberry plant if treated with colchicine, they displayed persistent cytochimerism. However, such tendency of incidence of bud sport-variation in *Mentha* spp. appears to be due to very high chromosome number / ploidy status in natural evolution cycle. It has also been suggested by Klekowski (1988)
that clonal populations are genetic mosaics carrying a significant mutational load, which may be one of the probable sources of bud sport variation. Genetic mosaicism is a condition of occurrence of cells of different genotype in a single plant that increases with increasing cell numbers and increasing numbers of cell division (Klekowski 1988, Marcotrigiano et al 1987). The location of chimeric cell is also very important. Any chimeric cell occurring in the apical meristematic layer has higher chances to enter into axillary bud and as such better chances to subsequently develop into new branch differing genetically from the mother plant (Tilney-Baddett 1963). The most stable type of genetic chimeras are the "periclinal chimeras" where one or more apical layer(s) is genetically distinct from the remaining layers. The number of possible chimeral genotypes depend on the number of stable tunica layers and could be calculated by $2^n$, where $n=$number of stable apical layer. These cell layers remain independent of other layers and the axillary buds have direct lineage with the terminal apex. The chimeral shoot bears chimeral branches that maintain the
hierarchy of the terminal apex, derivatives of the apical layers must have maintained their position in the region of leaf initiation and axillary bud development (Marcotrigiano and Gradziel 1997). The generated "Bud sports" are thus somatic variants that arise on mother shoot during vegetative development. These bud sports are the natural source of variation and speciation in the species that reproduces obligatorily vegetatively. In *Mentha*, the *de novo* mechanism to generate bud sport mutations help to realize fixable genetic variability, although, the very incidence of such bud sports is quite low in nature.

The realized bud-sports need to be examined for morphological / biological changes in plant type, and tested for their stability in the vegetative progenies. The economic product specific organs in such plants and their morphological variants need to be further studied with respect to botanical descriptors/ histomorphological parameters of micro-taxonomic values with respect to cellular development, histological and epidermal features including glandular characteristics.
India stands at top with respect to production of menthol (obtained from *Mentha arvensis*) followed by countries like China, Brazil and USA. Consistent efforts are needed to sustain this position by further qualitative and quantitative improvement in the existing varieties of mints.

Cultivation and processing of menthol mint has acquired important position in essential oil industry playing role in Indian economy. Until 1996 China was the major producer of Menthol but today India is being looked upon as the only viable source for mint oils in near future with only USA as prime competitor (Varshney 2003). In India menthol mint is cultivated in an area of 1,50,000 hectares which yields about 15,000 tones of menthol per year in contrast to the total world production of 19,000 tones. Export data shows that in 1998-1999 there was an export of Menthol mint oil and its derivatives worth around Rs. 267 crores, which rose to Rs.456.6 crores in year 2002-2003. This reveals the importance of Mint cultivation and its significance in Indian economy and need for improvement of quality of Menthol mint in India.
The peppermint oil production in India covers around 3,000 hectares of land that produces around 250 tones/year of peppermint oil. This figure lags far behind the world production of 2000 tones/year. USA is the leading producer of peppermint oil followed by France, Brazil and India.

As far as bergamot mint cultivation is concerned India covers 1,200 hectare area and produces 150 tones of bergamot mint oil per year. USA is again the leading producer of Bergamot mint oil followed by Brazil.

The genus Mentha is a commercially important medicinal plant valuable due to Monoterpenes present in the essential oil in the form of Menthol, limonene, menthone, pulegone etc. It is an important herbal medicine that finds its usage in various Ayurvedic preparations. Japanese mint / menthol mint (Mentha arvensis) has a bitter cooling taste in its essential oil and it is the main source of menthol in world. It is used in prescriptions for cold remedies, cough drops, dentifrices, mouth-washes, cosmetics, scenting
cigarettes, flavoring tobacco, chewing pan etc. The peppermint (*Mentha piperita*) oil, on the other hand, has a fine odor that influences behavior and induces alertness in patients. The oil of spearmint (*Mentha spicata*) is rich in carvone, which is a digestive and gastro stimulant compound. It has large demand in confectionary, chewing gum and toothpaste industries. The oil of bergamot mint (*Mentha citrata*) is rich in linalyl acetate uses in cosmetics.

Most of the cultivated varieties in the genus have been developed through clonal selection. Owing to its importance in world market and increasing demand in pharmaceutical industries this plant needs extra attention for the improvement of the genus through various breeding approaches. In order to realize further improvement in the existing clone there is a need to induce variation to facilitate selection. One of the easy recourse to induce variation in such clones could be through realization of artificial polyploids and / or elicitation / scoring of bud-sport mutations. Further, study of such variants (ploidy based / bud-sports) vis-à-vis
histomorphological markers would have value in aiding genetic improvement programme.

Although *Mentha* species have major role in Indian economy, but in order to have meaningful understanding of the micromorphological features vis-a-vis secondary metabolite productivity, it is desirable to study other medicinal and aromatic plants that differ in plant topography than mints. The genus *Cymbopogon* is a large group of odoriferous grasses (family Poaceae), having presence of aromatic essential oil in all parts except roots. This group of species is characterized with profuse tillering and perennial growth habit. *Bacopa monnieri* (family: Scrophulariaceae) is a prostrate herb. Entire plant is a source of active principles, and the plant biomass as such constitutes an important drug of the Indian Materia Medica called "Brahmi*. *Andrographis paniculata* (family: Acanthaceae) is a woody herb occurring wild throughout Indian subcontinent. The plant biomass is a source of crude drug ‘Kalmegh’ highly valued for its diverse medicinal uses as a bitter.
Therefore, the present study was aimed along the following objectives:

1. Elucidation of anatomical characteristics associated with ploidy change in target species,

2. Study of micro-morphological characters, such as leaf epidermal features, secondary metabolite producing micro-organs.

3. Elucidation of relationship between histomorphological features and secondary metabolite productivity.