



Comparative pharmacognostical and phytochemical evaluation of *Eucalyptus tereticornis* and *Mentha arvensis*

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ABSTRACT

The macroscopy, microscopy, quantitative microscopy, powder microscopy, physical constants, preliminary phytochemical analysis and TLC were carried out for *Eucalyptus tereticornis* and *Mentha arvensis* and a comparative study was done. Microscopically *Eucalyptus tereticornis* showed anamocytic stomata, large oval schizogenous oil glands, rosette and prismatic crystals of calcium oxalate and fibro vascular bundles distributed throughout the parenchyma. Chemical analysis showed the presence of sterols, tannins and volatile oils. Quantitative microscopy showed the presence of stomatal number in upper epidermis as 11.2/mm². Determination of total ash, acid-insoluble ash, water soluble ash, extractive values of *mentha arvensis* and *eucalyptus tereticornis* were carried out by using standard procedure. Microscopically *Mentha arvensis* showed the presence of crescent shaped collateral vascular bundle and diacytic type of stomata with covering and glandular trichomes. Quantitative microscopy showed the presence of stomatal number in lower epidermis as 15/mm². Stomatal index was found to be 12.8. Determination of total ash, acid-insoluble ash, water soluble ash, extractive values of *mentha arvensis* and *eucalyptus tereticornis* were carried out by using standard procedure. Therefore these characters can be used as an evaluation or identification of the plant. © 2007 Trade Science Inc. - INDIA

KEYWORDS

Polymer blends;
Miscibility;
Viscosity;
Ultrasonic velocity;
Refractive index.

INTRODUCTION

Eucalyptus tereticornis belongs to the family Myrtaceae and is commonly called as 'thaila maram'. It is a tall handsome tree and most successful species at low elevations and done well in Nilgiris, Bombay, Uttar Pradesh and Punjab of India. The commercial importance of *Eucalyptus tereticornis* is as natural perfume, spice and flavoring agent. *Mentha arvensis* belongs to the family Labiateae and commonly called as 'pudhina', a perennial herb. It is found wild in western Himalayas

including Kashmir. Both *Eucalyptus* and *Mentha* apart from their commercial importance as natural perfume, spice, flavoring agent they are used for its good therapeutic value such as anti-septic, anti-bacterial, anti-fungal, anti-viral and blood purifier. It can be administered internally or externally.

EXPERIMENTAL

Plant material was collected from Thiruvallur District. Care was taken to select healthy plants. Required

samples of different organs were cut and removed from plant and fixed in FAA (Formalin-5ml+Acetic acid-5ml+70% Ethyl alcohol-90ml) and after 24 hours of fixing, the specimen was dehydrated with graded series of tertiary butyl alcohol as per schedule given by SASS 1940. Infiltration of specimen was carried by gradual addition of paraffin wax and they were stained with toluidine blue as per O'Brien et al 1964. For studying stomatal morphology, venation pattern and trichome distribution, paradermal section was done by Jeffreys maceration fluid (SASS 1940).

(a) Macroscopical studies

Eucalyptus tereticornis^[1,2] is a tall handsome tree with the smooth, more or less deciduous, grayish bark. Stem is smooth, wide and climbs with patches. Leaves are opposite, alternate, broad lanceolate to ovate/elliptic, 5 to 12.5×1.5 to 6cm. Leaves are bluish green, oblique at the base, margin entire, apex acuminate and petiole companulate, rugose, operculum conical and horn shaped with acute apex. Fruits are pedicellate, globular, and aromatic in odour and taste.

Mentha arvensis^[3,4] is commonly called as 'pudina'. It is an erect, predominantly annual or perennial herb, sometimes shrubs and rarely trees. Stem is short branched with short hairs, flowers are distinct whorls none at the top. Leaves are narrowed below stalked, ovate, oblong, lanceolate and toothed. Leaves are opposite, simple to pinnate and compound, estipulate. Flowers are axillary, bi sexual and lilac in color and commonly cymose.

(b) Microscopical studies of *Eucalyptus tereticornis*^[5] (Figure 1)

Leaf is isobilateral. Transverse Section of lamina shows epidermis consisting of straight, anticlinal walls and thick cuticle. Numerous anomocytic or renunculaceus, stomata (figure 2) are present. Each epidermis consists of four layers of palisade cells, large oval; schizolysogenous oil glands (figure 3) are embedded in mesophyll. Between the palisade regions three layers of spongy parenchyma occurs and some of its cells contain rosette and prismatic crystals of calcium oxalate (figure 4). Fibro vascular bundle is distributed throughout the parenchyma. Midrib region shows nearly interrupted slightly lignified, pericyclic fibres. Vascular



Figure 1: T.S of *Eucalyptus tereticornis*

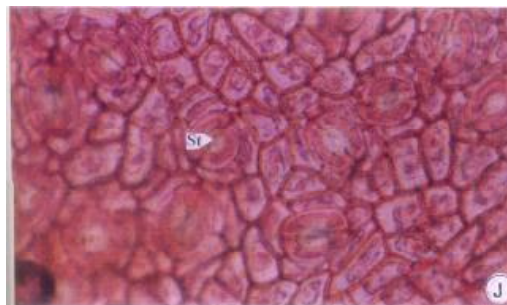


Figure 2: Anomocytic or renunculaceus stomat

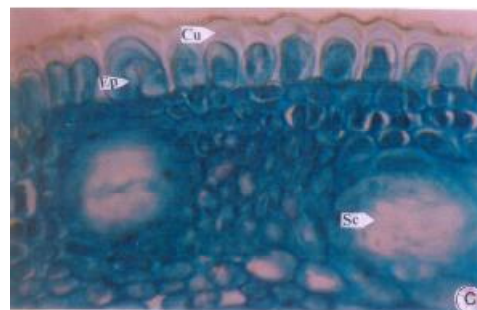


Figure 3: Schizolysogenous oil glands (Cu-cuticle Ep-Epidermis Sc- secretory cavities)

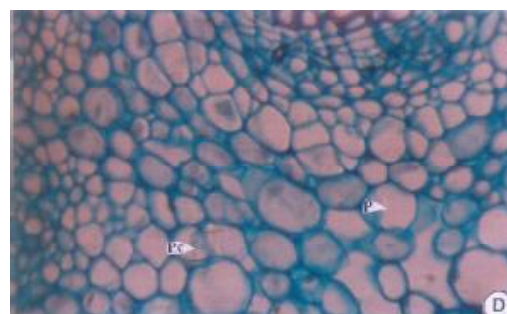


Figure 4: Prismatic crystals of calcium oxalate (Pc- prismatic crystal P- parenchyma)

bundle is arc shaped, ground tissue is parenchymatous. Secretory cavities are present below the epidermis. Lower epidermis shows slight wavy anticlinal contour and presence of numerous renunculaceus stomata.

(c) Microscopical studies of *Mentha arvensis*^[5] (Figure 5)

Leaf is dorsiventral. Upper epidermis have a thin

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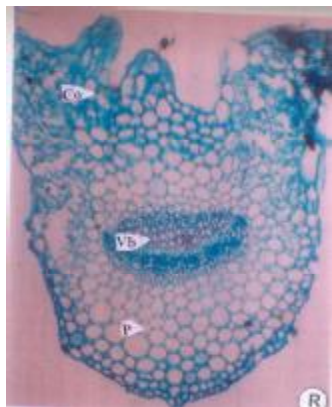


Figure 5: T.S of *Mentha arvensis* (Co- collenchyma P- palisade Vb- vascular bundle)

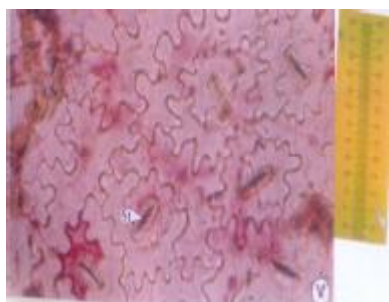


Figure 6: Diacytic and caryophyllaceous stomata (St-stomata)

TABLE 1

Observation	<i>Eucalyptus tereticornis</i>	<i>Mentha arvensis</i>
Stomatal number (lower epidermis)	10/mm ²	15/mm ²
Stomatal number(upper epidermis)	11.2/mm ²	-
Stomatal index	18.4	12.8
Vein-islet number	12/mm ²	10.2/mm ²
Palisade ratio(lower epidermis)	4.8	4.7
Palisade ratio (upper epidermis)	5.5	-

layer of cuticle, no stomata is seen on the upper epidermis. Below the epidermis, is a single row of palisade cells and spongy parenchyma of 3 to 4 layers are present. Midrib region shows a small projection on the upper side and big convexity on the lower side. A crescent shaped mass of collateral vascular bundle is present in the centre. The upper hump and the lower hypodermal region consist of collenchyma cells and other region is made up of closely arranged spherical parenchyma cells. Lower epidermis is smaller than the upper epidermis with strong wavy walls and shows large number of stomata and glands. It consists of diacytic and caryophyllaceous type of stomata (figure 6). Two types of trichomes occurs and they are covering and glandu-

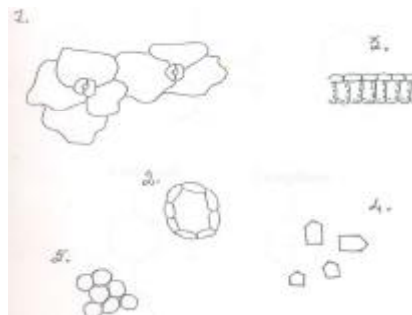


Figure 7 Powdered drug of *Eucalyptus tereticornis* (Anomocytic stomata, 2. Oil glands, 3. Palisade cells, 4. Prismatic crystals, 5. Parenchyma)

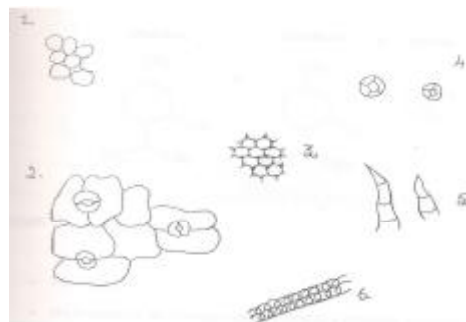


Figure 8: Powdered drug of *Mentha arvensis* (1. Parenchyma cells, 2. Diacytic stomata, 3. Collenchyma cells, 4. Covering trichome, 5. Glandular Trichome, 6. Spiral vessels)

lar trichomes. Covering trichome are uniseriate, 3-4 cells long, tapering to the pointed open. Glandular trichomes consist of unicellular stalk and glandular head composed of 8 cells.

Powder microscopy

The powdered drug of *Eucalyptus tereticornis* (figure 7) was characterized by its green color and characteristic odour. Under microscope it shows anomocytic stomata, schizogenous oil glands, rosette and prismatic crystals, palisade cells, spiral, pitted and annular vessels.

The powdered drug of *Mentha arvensis* (figure 8) was characterized by its green color, aromatic odour and it shows both covering and glandular trichomes, spiral and annular xylem vessels, diacytic type of stomata.

Quantitative microscopy^[6]

The stomatal number, stomatal index, vein-islet number, palisade ratio were determined on fresh leaves us-

TABLE 2

S.no	Ash value	<i>Mentha arvensis</i>	<i>Eucalyptus tereticornis</i>
1	Total ash	Not more than 15.175%	Not more than 6.21%
2	Acid insoluble ash	Not more than 73.42%	Not more than 1.26%
3	Water soluble ash	Not more than 14.93%	Not more than 67.36%
4	Sulphated ash	Not more than 14.205%	Not more than 5.02%
Extractive value			
1	Water soluble extractive	Not less than 1.2%	Not less than 1%
2	Alcohol soluble extractive	Not less than 2%	Not less than 0.9%

TABLE 3

S.NO	Chemical test	<i>Eucalyptus tereticornis</i>	<i>Mentha arvensis</i>
1	Alkaloids	-	-
2	Sterol	+	+
3	Carbohydrates	+	+
4	Glycosides	-	-
5	Tannins	+	-
6	Proteins and amino acids	-	-
7	Saponins	-	-
8	Gums and mucilage	-	-
9	Volatile oils	+	+

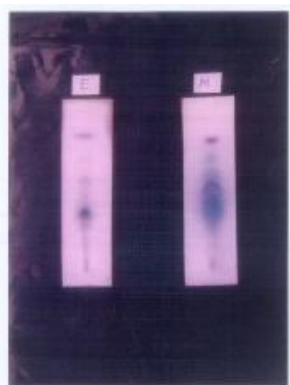


Figure 9: Thin layer chromatography

ing standard procedure for eucalyptus and mentha and the results were tabulated in TABLE 1

(f) Physical characters^[7]

Determination of total ash, acid-insoluble ash, water soluble ash, extractive values of *mentha arvensis* and *eucalyptus tereticornis* were carried out by using standard procedure and the results were tabulated in TABLE 2

(g) Chemical analysis

TABLE 4

S.no	Botanical source	Solvent system	Detecting agent	Color of the spot	R _f value
1.	<i>Mentha arvensis</i>	Toluene & ethyl acetate (9:1)	Vanillin sulphuric acid reagent	Dark blue color spots	May be due to menthol (0.46)
				Blue violet color spots	May be due to menthone (0.61)
1.	<i>Eucalyptus tereticornis</i>	Toluene & ethyl acetate (9:1)	Vanillin sulphuric acid reagent	Purple color spots	May be due to alcoholic compounds (0.71)
				Reddish violet color spots	May be due to menthol (0.97)
				Pink color spots	May be due to piperitone (0.88)
1.	<i>Eucalyptus tereticornis</i>	Toluene & ethyl acetate (9:1)	Vanillin sulphuric acid reagent	Blue color spots	May be due to cineole (0.33)
				Brown red color spots	May be due to eugenol (0.43)
				Pink to violet color spots	May be due to thymol (0.55)
				Orange color spots	May be due to piperitone (0.67)
1.	<i>Eucalyptus tereticornis</i>	Toluene & ethyl acetate (9:1)	Vanillin sulphuric acid reagent	Purple color spots	May be due to carvone (0.8)

Preliminary chemical analysis of *Mentha* and *Eucalyptus* shows the presence of volatile oils, sterols, carbohydrates, tannins. Volatile oils mainly consists of menthone, alpha-pinene, perfurol, l-limonene, camphene, caryophylenes and the results are tabulated in TABLE 3.

Thin layer chromatography was individually carried out for eucalyptus and mentha using toluene : ethyl acetate in ratio of 9:1 v/v as a mobile phase and in UV light and the results are tabulated in TABLE 4, figure 9.

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RESULTS

Eucalyptus tereticornis plant is a tall handsome tree with deciduous grayish bark. are opposite, alternate, broad lanceolate to ovate to elliptic of 5 to 12.5×1.5 to 6cm. Leaves are bluish green in color with entire margin and acuminate apex. Petiole is 2.5cm. Flowers are white in color, hypanthium campanulate and horn shaped. Fruits are pedicellate, fruncate, globular. Microscopically, it showed anamocytic stomata, large oval schizogenous oil glands, rosette and prismatic crystals of calcium oxalate and fibro vascular bundles distributed throughout the parenchyma. Chemical analysis shows the presence of sterols, tannins and volatile oils. In TLC, 5 spots came at an RF of 0.33 (blue spots), 0.43 (brown red color spots), 0.55 (pink or violet spots), 0.67 (orange spots) and 0.8 (purple color spots). Quantitative microscopy shows the presence of stomatal number in upper epidermis as 11.2/mm² and lower epidermis as 10/mm² Stomatal index was found to be 18.4, vein-islet number was found to be 12/mm² Palisade ratio was found to be 4.8 and 5.5 in lower epidermis and upper epidermis respectively.

Mentha arvensis is an erect, predominantly annual or perennial herb, sometimes shrubs and rarely trees. Stem is short branched with short hairs. Leaves are narrowed below stalked, ovate, oblong, lanceolate and toothed. Leaves are opposite, simple to pinnate and compound, exstipulate. Flowers are auxillary, bisexual and lilac in color and commonly cymose. Flowers are distinct whorls none at the top. Microscopically, it shows the presence of crescent shaped collateral vascular bundle and diacytic type of stomata with covering and glandular trichomes. The glandular trichome consist of unicellular stalk and a granular head composed of 8 cells. Chemical analysis shows the presence of sterols, carbohydrates and volatile oils. In TLC 5 spots appeared at RF 0.46 (blue), 0.61 (blue violet), 0.71 (purple color spots), 0.97 (reddish violet spots), 0.88 (pink color spots). Quantitative microscopy shows the presence of stomatal number in lower epidermis as 15/mm² Stomatal index was found to be 12.8, vein-islet number was found to be 10.2/mm² Palisade ratio was found to be 4.7 in lower epidermis. The physical parameters were determined and the above mentioned characters can be used for the identification of the plant.

DISCUSSION

The macroscopy, microscopy, quantitative microscopy, powder microscopy, physical constants, preliminary phytochemical analysis and TLC were carried out for *Eucalyptus tereticornis* and *Mentha arvensis* and a comparative study was done. Microscopically *Eucalyptus tereticornis* showed anamocytic stomata, large oval schizogenous oil glands, rosette and prismatic crystals of calcium oxalate and fibro vascular bundles distributed throughout the parenchyma. Chemical analysis showed the presence of sterols, tannins and volatile oils. Quantitative microscopy shows the presence of stomatal number in upper epidermis as 11.2/mm². Determination of total ash, acid-insoluble ash, water soluble ash, extractive values of mentha arvensis and eucalyptus tereticornis were carried out by using standard procedure. The physical parameters were determined and the above mentioned characters can be used for the identification of the plant. In the case of *Mentha arvensis*. Microscopically it showed the presence of crescent shaped collateral vascular bundle and diacytic type of stomata with covering and glandular trichomes. Quantitative microscopy showed the presence of stomatal number in lower epidermis as 15/mm² Stomatal index was found to be 12.8. Determination of total ash, acid-insoluble ash, water soluble ash, extractive values of mentha arvensis and eucalyptus tereticornis were carried out by using standard procedure. The physical parameters were determined and the above mentioned characters can be used for the identification of the plant.

CONCLUSION

The macroscopy, microscopy, quantitative microscopy, powder microscopy, physical constants, preliminary phytochemical analysis and TLC were carried out for *Eucalyptus tereticornis* and *Mentha arvensis* and a comparative study was done. Determination of total ash, acid-insoluble ash, water soluble ash, extractive values of mentha arvensis and eucalyptus tereticornis were carried out by using standard procedure. The physical parameters were determined and the above mentioned characters can be used for the identification of the plant.

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