

Pharmacognostic Characterisation of *E. thymifolia* L. (Euphorbiaceae) a Unani Medicinal Herb

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ABSTRACT: Government of India recognized the traditional systems of medicine and practices like Siddha, Yoga, Homeopathy, Unani and Ayurveda. Unani system of medicine is followed and adopted in many countries. Minerals and plants are used as a source of medicine in this system. In spite of many merits and sustainable effects, Unani folk medicine is losing its charm in this modern world of synthetic medicine which offers instant relief but has many side effects. However, in case of traditional/folk medicine, proper characterization of the plant concerned remains the goal for effective therapy. The present study was aimed to characterize *Euphorbia thymifolia* L. (Euphorbiaceae) used in folk medicinal system and tradition. It is known as Dudhi locally and Dudhi Khurd in unani. The plant is used by hakims to treat diseases like kidney stone, leprosy, menorrhagia, leucorrhoea and whitlow in Amravati district, Maharashtra. Here pharmacognostic studies of the herb has been done. To know the presence of various bioactive molecules, free amino acid composition and minerals, phytochemical analysis were made. Anatomy of all the plant parts is studied as it is necessary to authenticate the drug. Use and information of internet was not common during my research as it is today and so searching for the related paper was hectic. Different libraries were visited, searched journals and books for the information. The major work done was on anatomy and so many plants were like no information was available about the anatomical studies and that too of the whole plant. Still don't saw any paper on anatomical studies of whole plant. Leaf morphology was done only by some. So I did the anatomical study of whole plant and can say that its done for the first time.

Keywords: *Euphorbia thymifolia* L., Folk Medicinal herb, Pharmacognosy, Morphology, Anatomy, Phytochemistry.

INTRODUCTION

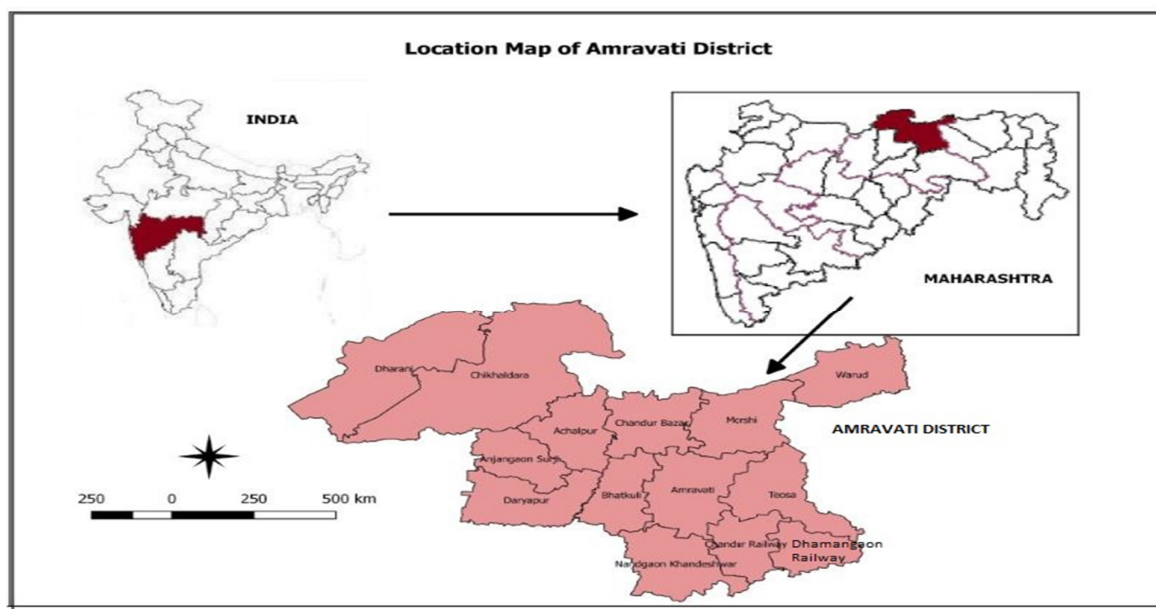
Unani medicine, also called Tibb, is built upon the ancient Greek medical concept of Hippocrates and Galen. It originated and developed with the help of the contributions made by the eminent physicians of different religions such as Christians, Muslims, Jews and Hindus in different regions such as Persia, Syria, Mesopotamia, Arabia and India (Jaggi, 1976). Unani system is based on five principles, viz. elements (Arkan), temperament (Mizaj), humours (akhlat), pneuma (ruh) and governing power of body (tabiat) (Azmi, 1995). Central Council for Research in Unani Medicine, 1978 found by Ministry of Health and Family Welfare with the objective of undertaking multifaceted research activities in unani medicine. Different forest regions of the country are continuously surveyed for collection of Unani Medicinal plants. Southern area was explored by Nayar and Khaleefathullah during 1984 to 1988. A monograph of about 79 taxa of medicinally important plants of the area was published (Nayar and Khaleefathullah 1992). Medico – botanical exploration of the flora of Aligarh resulted in about 100 taxa with their medicinal uses. Survey carried out in Gwalior Forest Division brought

to light 462 plants used in Unani system of the region. Central Research Institute of Unani Medicine, Hyderabad conducted surveys to collect the information on Unani medicinal plants from Andhra Pradesh (<http://www.unanimedicine.org>). *Euphorbia thymifolia* L. found everywhere as weed especially on waste lands. In Ayurveda known as Chhotidudhi, laghu Dudhika, chicken weed, red caustic creeper, asthma plant in English and in unani Dudhikhurd (Gupta and Srivastava 2007). *E. thymifolia* is found in tropical regions, but not found in North Australia (Prabha and Singh 2005). In China, *E. thymifolia* is used for the treatment of coughing blood out (hemoptysis), hematuria, formation of new blood cells (hemafecia), blood vomiting (hematemesis), nose bleeding (epistaxis), menstruation (vaginal bleeding) and for the treatment of wounds and pus filled boils (carbuncles) (Hoang *et al.*, 2008; Gaioni, 2002). Traditionally *E. thymifolia* is one such medicinal plants which shows properties like laxative, aromatic, sedative, blood purification, anti-viral, anti-helminthic, anti-inflammatory, anti-spasmodic, anti-fungal, anti-bacterial, anti-microbial, diuretic and many more (Muthumani *et al.*, 2016). The leaves, seeds and fresh juice of whole plant are used in worm infections,

as stimulant, astringent. It is also used in bowel complaints and in many more diseases therapeutically (Mali and Panchal 2013). The excellent anti-aging properties displayed by the *E. thymifolia* extract highlighted its potential as a natural source of anti-aging agent for cosmetic (Yang and Lee 2022). *Euphorbia thymifolia* total phytosterol showed marked CNS depressant and sub-maximal, muscle relaxant activity and anxiolytic effect (Sirohi *et al.*, 2019). Advanced research helped in finding the various useful properties of the plant which is helpful to cure the various ailment. *E. thymifolia* includes various phytoconstituents such as carotene, vitamin C, chlorophyll a and b, phenols, tannins, carbohydrates, minerals, cinnamic acid derivatives, glycosides, sterols, isomallotinic acid and anti-oxidants (Nadkarni and Nadkarni 2007). They are grouped into nine categories as sterols, minerals, anti-oxidants, nutrients, cinnamic acid derivatives, glycoside, miscellaneous constituents, essential oil and hydrolysable tannin. The underground part i.e. root and the aerial parts like stem and leaves consist of these compounds; proteins, alkaloids and amino acids were found to be absent (Mamatha *et al.* 2014). GC-MS was used to study entire chemical composition of *E. thymifolia*. It showed the presence of different nutritive mineral like sodium (Na), potassium (K), phosphorous (P), calcium (Ca), iron (Fe), sulfur (S), copper (Cu), zinc (Zn) and manganese (Mn) (Prasad and Bisht 2011). These minerals are essential for proper functioning of various organs of our body. The presence of alkaloids in *E. thymifolia* shows anti-microbial activity (Khare, 2004). A crystalline alkaloidal principal allied to quercetin, 5, 7, 4-trihydroxy flavones 7-glucoside and essential oil found in whole plant. Medicines like fluconazole and ciprofloxacin has extracts of *E. thymifolia* to control the microbes (Killedar *et al.*, 2011). The growth of these microbes *E. coli*, *K. pneumoniae*, *S. typhi*, *Proteus*

mirabilis, *Shigella dysenteriae* found to show decreased when treated with the extract of *E. thymifolia* (Durai *et al.*, 2013). The ethanol extract used to study anti-spasmodic activity showed inhibition of growth of *Plasmodium falciparum* (Mon *et al.*, 2013). In females due to stress reproductive dysfunction seen; using the ethanol root extract hormone levels of luteinizing hormone, follicle-stimulating hormone, estradiol, progesterone and prolactin changes and so does the dysfunction (Sivaprasad *et al.*, 2015). It also showed to have hepatoprotective activity when CCl₄ is administered (Syed *et al.*, 2011); in bronchial asthma (Sharma and Tripathi 1984); anti-arthritis activity (Gairola *et al.*, 2013); reducing the dysentery and diarrhea of people suffering with it (Mamatha *et al.*, 2014), anti-helminthic activity (Kane *et al.*, 2009). Locally it is known as Dudhi or Choti Dudhi. During the survey interviews with local hakims revealed that whole plant is used on kidney stone, leprosy and plant juice is given to women for menorrhagia and also for leucorrhoea (Ahmad, 2003).

Study Area. Right in the center of the northern edge of Maharashtra state Amravati District is located. It lies among 20°30' to 21°50' north latitudes and 76°35' to 78°27' east longitudes. North is bounded by Madhya Pradesh State, and east by Nagpur and Wardha Districts, Yavatmal in south and in the west by Washim, Akola and Buldana Districts. Amravati is the District headquarters, a town with a population of 6,47,057 persons. It has been acknowledged as the principal cotton market. The District has an area of 12,210.0 sq. km. and a population of 2,888,445 persons as per Census, 2011. While the region of the District reports for 3.97 % of the total area of the State; its population is 237 persons per sq. km. Amravati district ranks 7th in terms of area, and 14th in terms of population among the 35 districts, (District Census, 2011).



MATERIALS AND METHODS

The plant material was collected from the field with the guidance of Hakim. It was taken to the laboratory and described, identified with the help of standard flora (Naik, 1998). Plants were collected and preserved in 70% FAA for further studies. Root, stem, node and leaf were anatomical studied and so hand sections taken. Macerating fluid 5% solution of HNO_3 and 5% Solution $\text{K}_2\text{Cr}_2\text{O}_7$ prepared and thin slices of root and stem treated for 12 to 24 hours. Mature plants were collected shade dried and powdered. This powder used for chemical analysis. Two dimensional chromatography was done to study amino acid profile. The macerate was then thoroughly washed, stained with 1% aqueous safranin and measurements were made by ocular scale lens. Camera lucida sketches were drawn. Classification of Radford et al., 1974 is followed for categorizing the vessel elements. For chemical analysis mature plants were collected, shade dried and powdered. Powder was

preserved in zip lock bags at 4°C and tested qualitatively for various bioactive compounds (Harborne, 1973; Gibbs, 1974; Peach and Tracey 1979; Kokate *et al.*, 1990; Evans, 1996). Free amino acid profile was studied by two dimensional chromatography (Lederer and Lederer 1957.)

RESULTS AND DISCUSSION

Macro Morphology: Prostrate, annual herbs, stems many, spreading, 10-20 cm. long, pubescent, often tinged with red. Leaves opposite, obliquely oblong, 3-6 \times 2-4 mm. rounded and base very unequal sided, entire or crenulate, rounded at apex, glabrous and green or reddish, glaucous above and pubescent beneath; petioles very short; stipules fimbriate. Cyathia axillary, 1-3 in short cymes; involucre, campanulate, 1 mm long, gland minute or absent, without petaloid appendages. Fruits ovoid – globose, 3 lobed, lobes obtusely angled densely hairy (Fig. 1-6).

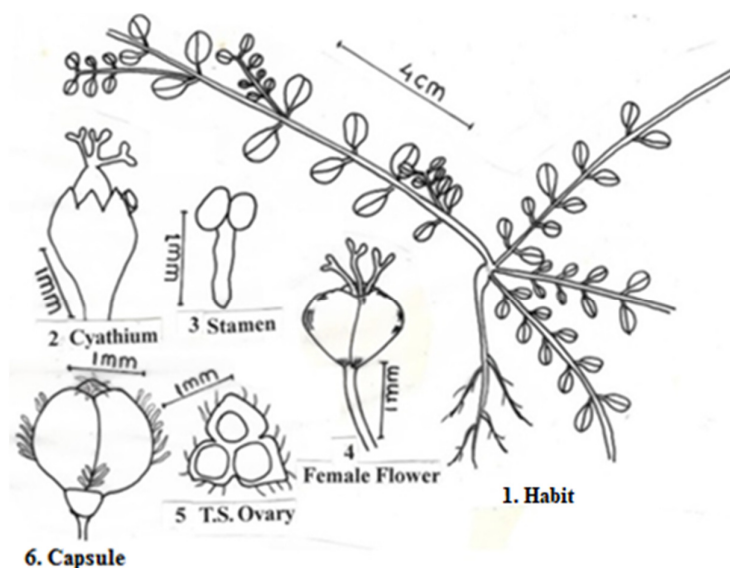


Fig. 1-6.

Flowers and Fruits:- Throughout the year

Occurrence:- Common in crevices of rock, on gravelly soil, along road side, in gardens etc.

Exsiccata:- SAA 109

Anatomy: The plant is anatomically studied for the first time and it is necessary to do so as it is required to confirm the crude drug identification.

Root. triarch. Pith absent. Secondary growth normal. Vessels mostly arranged in uniseriate fashion, separated by broad bands of conjunctive tissue. Rays uniseriate as well as biseriate; uniseriate more frequent than biseriate. Cortex with comparatively large latex cells. Cork superficial, 2-3 layered. Cells of cork also comparatively thin walled (Fig. 7).

Vessels (Fig. 18)

Extremely small (Class A): 165 -173 μm long \times 19-23 μm broad

Very Short (Class B): 208 -246 μm long \times 19-27 μm broad

Moderately short (Class C): 338 μm long \times 15 μm broad.

Stem thin, wiry, cylindrical in t.s. Epidermis with thick cuticle cells containing anthocyanin, cortex parenchymatous; cells containing abundant chloroplasts. Endodermis and pericycle not clearly defined. In innermost cortical layers abutting the vasculature are large laticiferous cells. Pith parenchymatous containing chloroplasts. Secondary growth normal, resulting in a cylinder of xylem and phloem. Latex cells become more larger. Pith cells and cortical cells with abundant chloroplasts. No cork formation noted (Figs. 8-9).

Vessels (Fig. 17).

Extremely small (Class A): 65 -142 μm long \times 19-23 μm broad

Very Short (Class B): 188 -250 μm long \times 19-23 μm broad

Node trilacunar three trace (Fig. 10).

Petiole very short, receives three traces arranged in a shallow C – shaped arc. Epidermis containing anthocyanin. Ground tissue parenchymatous; cells containing chloroplasts and latex cells (Figs. 11-12).

Lamina dorsiventral, amphistomatous. Cells of lower epidermis sinuous; sinuses sharply angled. Stomata surrounded by 2-3 subsidiary cells; paracytic and as well anisocytic. Cells of upper epidermis angular. Stomata More frequent in upper epidermis than lower epidermis. Mesophyll differentiated into single layered palisade and 1-3 spongy parenchyma. Vein bundles surrounded by large parenchymatous sheath; sheath cells containing chloroplasts. Palisade layer only abutting the bundle sheath. If two bundles are widely separated simple non – chlorophyllose parenchyma is present filling the gap in palisade layer between the bundles (Figs. 13-15).

Midrib single vascular bundle present; bundle incompletely surrounded by chlorenchymatous sheath. Sheath open, especially on lower side. Palisade continuous over the sheath cells as in case of minor vein bundles. To the lower side of vascular bundle small amount of parenchymatous ground tissue present (Fig. 15).

Trichomes non glandular, short trichomes consisting of two cells only. Old stems glabrous (Fig. 16).

Phytochemistry: Whole plant was analysed phytochemically since it is used medicinally. Tissue was found to contain iridoids, alkaloids, anthraquinones, phenolics, leucoanthocyanin and steroids/ triterpenoids. Eight Amino acid found to be present in the plant. These are aspergenine, aspartic acid, tyrosine, histidine, DL – alanine, valine, proline, and leucine. Qualitative analysis shows presence of sulphur, calcium magnesium, iron, chlorine, phosphorus and sodium. Dry tissue ash yield was found to be 810 mg/ gm, HCL soluble fraction is 93 mg/gm and insoluble ash is 907 mg/gm. HNO₃ soluble ash 472 mg/gm and insoluble ash 528 mg/gm. Ash was found to be rich in Calcium 127.34 mg/gm while Potassium is 70.55 mg/gm and Sodium is much less in quantity 24.14 mg/gm.

Method of preparation of drug: Fresh whole plants are crushed and juice is expressed through cloth. Half cup of juice is given for prolonged menstruation on first day of the cycle and also for leucorrhoea. Dried whole plant is crushed to powder form and 5-10 gms. Powder is taken early in the morning and also at bed time with water for kidney stone for about 40 days in early stage and in later stage for 3-4 months. Leaf juice is also useful as refrigerant. If crushed leaf is applied on whitlow in early stage then it dries up quickly; but is not effective in later stage.

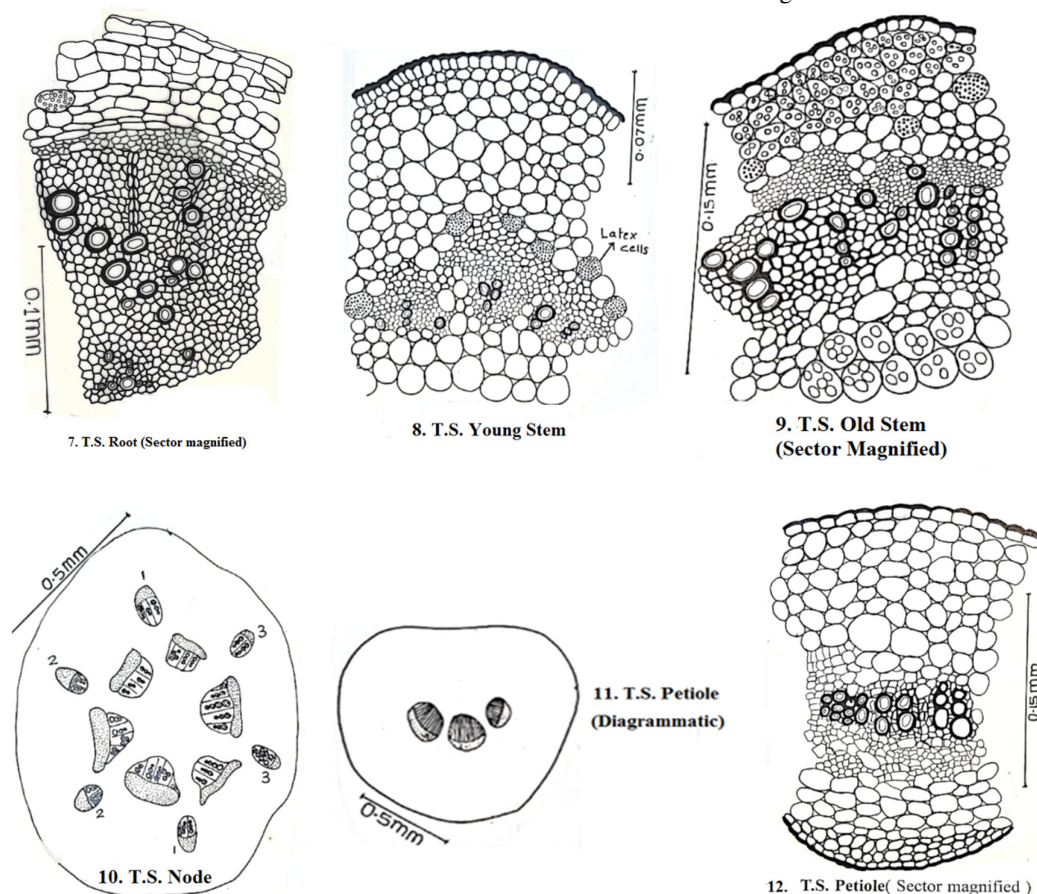


Fig. 7-12.

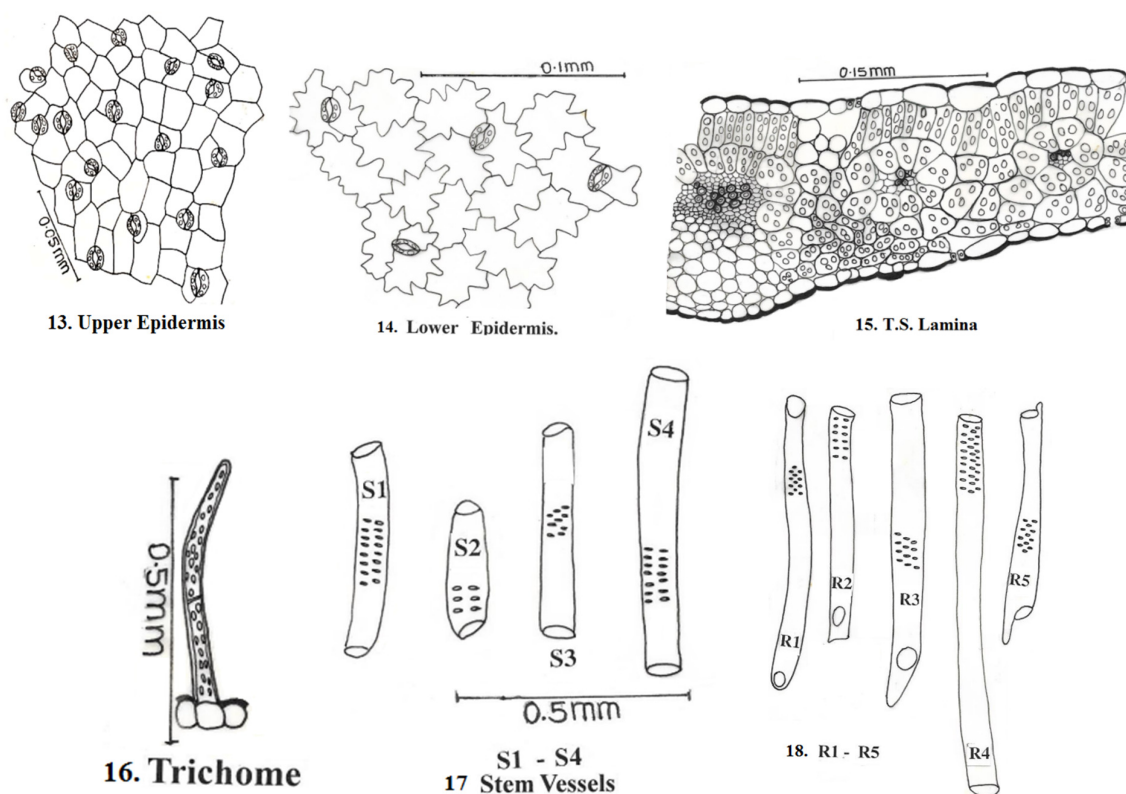


Fig. 13.18.

CONCLUSIONS

As the papers are surveyed it is found that anatomical work is not done of whole plant of *E. thymifolia* L. so it can be considered as the first time work on anatomy of whole plant. A good amount of phytochemical analysis is available about *E. thymifolia*. The detailed survey of literature showed that *E. thymifolia* L. is an important medicinal plant with many pharmacological spectrum. Lots of pharmacological studies have been carried out with extract of the different parts of the plant. The present paper found different references which summarizes about its analgesic, antimalarial, antimicrobial and hypoglycemic activity of *E. thymifolia*, phytochemical investigations and isolated principles from them, which can be investigated further to achieve lead molecules in the search of novel herbal drugs. The presence of medicinal properties makes enormous scope for future. Alkaloids are very important of known bioactive molecules. It also contains triterpenes along with alkaloids. Leucoanthocyanin is found in *E. thymifolia*. Many of the Euphorbia species are woody and therefore it is possible that this species though herbaceous, is also showing presence of leucoanthocyanin which is expected only in woody members. A cubins and iridoids, flavonoids, phenolics, steroids and triterpenoids are present. Protein free amino acid profile shows aspartic acid, tyrosine, apsergenine, dl -alanine, histidine, proline, valine, leucine. Quantitative analysis

shows maximum amount of Calcium and minimum of sodium.

FUTURE SCOPE

Nowadays many new techniques are available So in detail the characterization of amino acids can be done. The new chemical entities can be find out responsible for the traditional claimed activities. There are many unexplored sites which can be done by the young researchers.

Author Contributions: Use this form to specify the contribution of each author of your manuscript. A distinction is made between five types of contributions: conceived and designed the analysis by P.Y. Bhogaonkar; collected the data; contributed data or analysis tools; performed the analysis; wrote the paper by Sameera Ahmad. Both authors participated equally in reviewing and the finalizing manuscript.

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Conflict of Interest. None.

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