

## ANTI-BACTERIAL ACTIVITY OF THREE MORPHOLOGICAL TRAITS OF *AEGLE MARMELLOS* (LINN.) CORR.-‘VILVAM’

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### ABSTRACT

*Aegle marmelos* is an important medicinal plant used to treat many common ailments in Indian traditional systems of medicine. The present study was undertaken to find out a scientific validation for the efficacy of *Aegle marmelos* leaves as a natural antibiotic. Aqueous extract of *Aegle marmelos* leaves of the three morphological traits were prepared and screened for their antibacterial activity against some human pathogenic bacteria.

**Keywords:** *Aegle marmelos*, Vilvam, Antibacterial, ilakam, Antibiotic.

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### INTRODUCTION

*Aegle marmelos* is commonly called as Bael in Hindi, Vilvam in Tamil and Bilva in Sanskrit. It belongs to the family Rutaceae<sup>1</sup>. It is indigenous to India and is used in folk medicines. The Ayurvedic practitioners were used almost all of their parts but the greatest medicinal value ascribed to its Leaves<sup>2</sup>. Vilvam is a perennial tree found wild in the sub Himalaya tract, Central and South India. *Aegle marmelos* is a medium sized armed deciduous tree grows up to height of 9-10 meters with straight, sharp, axillary thorns and yellowish brown shallowly furrowed corky bark. The leaves are trifoliate alternate, leaflets are ovate to lanceolate with pellucid – punctuate aromatic oil glands<sup>3,4</sup>. The lateral leaves are subsessile and the terminal one is long petioled. The flowers are greenish white sweet scented presenting the axillary panicles. The fruits are Globus woody berry with yellowish ring, seeds numerous embedded in orange brown sweet gummy pulp. The leaves are used as astringent, laxative, febrifuge and expectorant. The leaves are useful in ophthalmia, inflammations, catarrh, diabetic and asthmatic complaints<sup>5</sup>. The leaves are used for the heart and brain disorders. The confection called ilakam is made of fruit is used to treat tuberculosis and loss of appetite<sup>6</sup>. The increasing global interest in the medicinal potential of plants during the last few decades is therefore quite logical. Antibiotics since their introduction are one of the most important weapons in fighting against bacterial infections and have largely benefited human beings<sup>7,8</sup>. Many pathogenic organisms are developing plasmid-mediated resistance to the prevailing drugs. Hence, there is a need for novel natural compounds that can be obtained from the plants or microorganisms. Plants, in particular, have been a source of inspiration for novel drug compounds since days immemorable. Plants serve as a reservoir of effective chemotherapeutics and provide valuable sources of natural products in the control of several bacterial diseases.<sup>9,10</sup> Many studies indicate that plants contain bio-active compounds such as peptides, glycosides, alkaloids, saponins, terpenoids, flavonoids etc., with antimicrobial activity against bacterial, fungal and viral infections.<sup>11</sup>

### EXPERIMENTAL

#### Plant material

The authors have identified 5 different traits of different morphological traits in *Aegle marmelos*. In this 3 traits leaf samples were collected and subjected for antimicrobial studies. *A. marmelos* leaves were collected from Kadayam Vilva Vananthar temple with 3 small Leaves (Trait I) and 7 leaves (Trait II) and

Sastha Temple Ariyankavu 3leaves with big size (Trait III). The leaves were extracted with water for 24 hours using Soxhlet apparatus and subjected for the antibacterial evaluation.

### Microorganisms used for Antimicrobial Activity

The target strains used for screening antibacterial activity were procured from PCBS, Pondicherry. The bacterial strains are Staphylococcus aureus, Bacillus subtilis, Vibrio cholerae, Escherichia coli, Enterococcus faecalis and Pseudomonas aeruginosa.

### Antimicrobial activity by disc diffusion method

Test pathogens were spread on the test plates- Mueller Hinton Agar (MHA) .Sterile antibiotic disc in 6 mm diameter)-impregnated and the Medicament was loaded in the disc in a concentration of 10mg/ml. The test plates were incubated for 24h. The zone of inhibition (mm in diameter) were read and taken as the activity against the test pathogen. The standard antibiotic used in this evaluation is Kanamycin obtained from Glaxo Company

## RESULTS AND DISCUSSION

*Aegle marmelos* leaf extracts of three different traits were evaluated the antibacterial activity and the results were tabulated. . The antibacterial activity of three traits of *Aegle marmelos* in water were tabulated in table 1, 2 and 3 respectively. Inhibition zone of antibacterial activity of Bacillus subtilis, Enterococcus faecalis, Staphylococcus aureus, Escherichia coli, Vibrio cholerae, Pseudomonas aeruginosa were shown in plate-1.

Table-1: Antibacterial activity of Trait I leaf of *Aegle marmelos* water extract

Organism	Trait I	Standard Kanamycin	Percentage of Inhibition
Bacillus subtilis	10	18	55.5
Enterococcus faecalis	11	21	52.3
Staphylococcus aureus	9	28	32.14
Escherichia coli	15	16	93.75
Vibrio cholerae	14	15	93.3
Pseudomonas aeruginosa	12	18	66.6

Table-2: Antibacterial activity of Trait II leaf of *Aegle marmelos* water extract

Organism	Trait II	Standard Kanamycin	Percentage of Inhibition
Bacillus subtilis	-	18	0
Enterococcus faecalis	8	21	38
Staphylococcus aureus	15	28	53.5
Escherichia coli	13	16	81.25
Vibrio cholerae	-	15	0
Pseudomonas aeruginosa	12	18	66.6

Table-3: Antibacterial activity of Trait III leaf of *Aegle marmelos* water extract

Organism	Trait III	Standard Kanamycin	Percentage of Inhibition
Bacillus subtilis	7	18	38.8
Enterococcus faecalis	10	21	47
Staphylococcus aureus	-	28	0
Escherichia coli	16	16	100
Vibrio cholerae	7	15	46.6
Pseudomonas aeruginosa	-	18	0

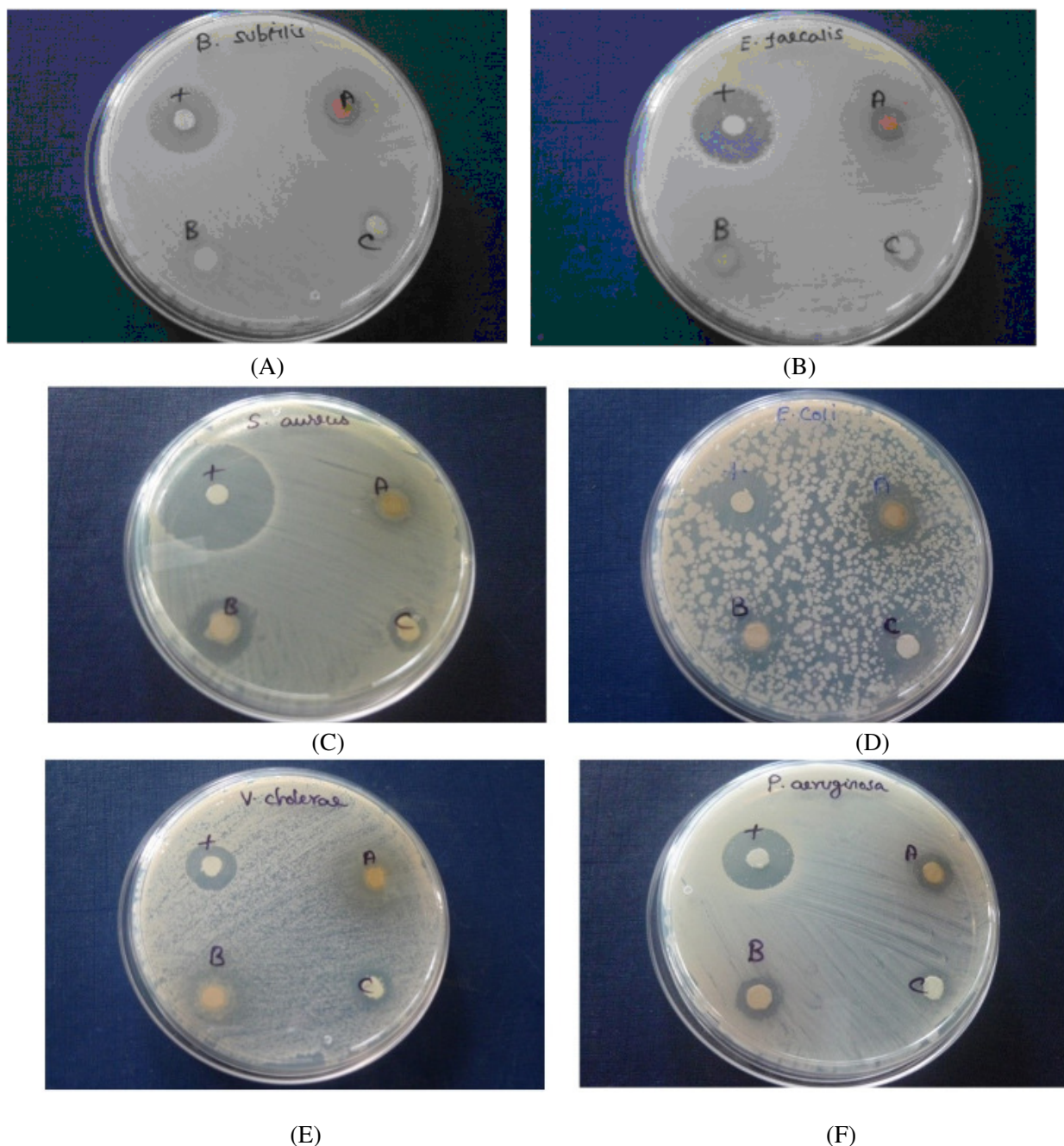


Plate-1: (A)– *B. subtilis*, (B) - *E. faecalis*, (C) - *S. aureus*, (D) - *E. coli*, (E) - *V. cholerae*, (F) - *P. aeruginosa*

The percentage of the inhibition zone of gram positive and gram negative human pathogenic bacteria were evaluated against the three traits of leaves of *Aegle marmelos*. The Gram Negative bacteria showed maximum inhibition zone than that of the gram positive bacteria. Among the gram negative bacteria the *E. coli* showed maximum inhibition. Out of the 3 traits of *Aegle marmelos* leaves were evaluated the trait I ( three leaves with small size) showed maximum inhibitory effect to the all six types of bacteria when compared with the trait II and trait III. But the trait 3 showed maximum inhibition on *E. coli* 100% which is equal to the control. Among the three Phenotypic traits of *Aegle marmelos* evaluated for antibacterial

activity the Trait I (3 leaves with Small Leaves) which is the traditional one from which the other two traits might have (Trait II and trait III) evolved by nature. The trait II and trait III showed inhibitory effect to 4 organisms out of six bacteria studied, that indicates that some of the active principles may be present in less quality. From the above result it is proved that the leaves of *Aegle marmelos* can be used as very good natural antibiotic. The ability of the leaf extracts of *Aegle marmelos* to inhibit growth of bacteria and fungi is an indication of its broad spectrum antimicrobial activity, which may be employed as a source to develop new antimicrobial agents. This data clearly showed that the inhibitory activity of the water extract is due to the presence of the substances like flavones, isoflavones, flavonoids, anthocyanin, coumarinlignans, catechins and isocatechins. The trait I tree is found as StalaVirusha in all the 24 temples where the investigation was carried out. All the three type of traits is also available in the same temple yard. This also indicates that the trait II and III might have evolved from the trait I by nature phenomena. The trait I can be exploited for the future use as natural antibiotic.

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