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Determination of Antimicrobial Activity of Some Medicinal Plants

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Abstract:

In the ayurveda, many plants were noted to have antimicrobial activities. These plants are highly used as natural sources for protection against many microbial infections. Among many plants Neem (*Azadirachta indica*), Amla (*Phyllanthus embelica*), and Ginger (*Zingiber officinale*) are most common plants. Various primary and secondary metabolites produced by these plants are efficient in controlling the growth of microorganisms. Here a primary study was carried out to determine the effect of the plant extract on two most common microorganisms namely Escherichia coli and Serratia marcescens. Plant extract was prepared in sterile distilled water and use immediately. Most common agar cup method was used for determination of antimicrobial activity. Based on the results of the study, it was found that Amla extract has antimicrobial activity against both the microorganisms. Neem extract and ginger extract can only control the growth of E. coli.

Keywords – **Medicinal plants, Antimicrobial activity, *Azadirachta indica* , *Phyllanthus embelica, Zingiber officinale***

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I. INTRODUCTION

It is known that certain plants have natural antimicrobial activity. [1-4] These plants are known to have natural ability to protect against various microbial diseases. These plants are known to produce sterols, flavonoids, terpenoids, phenolics, saponins, terpenes and alkaloids as secondary metabolites. Many of these compounds are having antimicrobial activity. [5-7] Few of them are water soluble whereas others are only soluble in solvents. Here we have used on water as a medium to extract water soluble compounds only and used for analysis. Among the various plants three plants namely *Neem (Azadirachta indica*) , Amla*(Phyllanthus embelica*), and Ginger(*Zingiber officinale*) were selected. These plants are among the most common and highly consumed plants by the people in various ways. [3, 8-11] Ginger is member of *the zingiberacea* family of plant. Studies have shown that, ginger has the capacity to eliminate harmful bacteria responsible for diarrhoea, headaches, nausea, rheumatism and colds. Bioactive compounds which are present in the ginger are gingerols , shogaols , paradols and terpens. Amla (*Phyllanthus embelica*) is member of *phyllanthaceae* family of plant. [9, 12] Amla role is two folds in the development of new drugs .They are used as the base for the development of new medicines, and also as a phytomedicine for the treatment of diseases. It was used for many years as and amoebicidal drugs and also used for the treatment of abscesses spreading of E. coli infections. [10, 13-15] Neem *(Azadirachta indica)* is a member of the *Meliaceae* family of plant. Neem is a traditional plant that grows in the Indian subcontinent and has been reported with various clinical applications for antibacterial, antiviral, anticancer and antidiabetic properties. Studies have also shown that the neem oil offers good antibacterial activity against pathogenic bacterial spp. [3, 10, 11, 14] It is also noted that most of the

herbs and spices are safe and effective against certain aliments. [12, 13, 15] Here in the study, water extract was prepared from three plants and antimicrobial activity was determined using agar cup method. Based on the zone of inhibition effect of antimicrobial activity was determined.

II. Material and Methods

2.1 Preparation of Water Extract

For preparation of water extract 5 gm of each plant was taken in mixed in 100 mL of sterile distilled water. Mixture was agitated for 1 hour on orbital shaker. After 1 hours, it was filtered though sterile filters and used for antimicrobial activity. [2, 7]

2.2 Antimicrobial activity using agar cup method

Sterile nutrient agar plates were prepared as per standard procedure and also made sure they are contamination free before use. Cultures of *E. coli* and *S. marsescens* were activated in nutrient broth by incubating for 24 hrs at 37ºC at 120 rpm. For agar cup method, 0.2 ml of active cultures was mixed with 5 ml of molten nutrient agar cooled at 50 ºC, mixed well and poured over the base agar plate. With the help of sterile cup borer one cup was made at the center of the plate under aseptic condition. 1000 µl of each extract was poured in the cup and incubated in refrigerator at 5ºC for 5 minutes for faster diffusion. After 5 minutes, plates were incubated at 37ºC for 24 hours. After 24 hours, zone of clearance was measured in mm for determination of antimicrobial activity. All the experiments were carried out in triplicate and mean results with standard deviation were considered for interpretation. [1, 7]

III. Result and Discussion

Based on the results of agar cup method following results were obtained. (Table 1 and Figure 1 to 4)

Table 1. Zone of inhibition obtained for various plant extracts

No.	Substances	Zone of inhibition (*E. coli*)	Zone of inhibition (*S. marcescens*)
1	Amla (*Phyllanthus embelica*)	18 ± 2 mm	20 ± 3 cm
2	Ginger (*Zingiber officinale*)	24 ± 3mm	Not Detected
3	Neem (*Azadirachta indica*)	20 ± 3mm	Not Detected

From the results, it was observed that Amla has antimicrobial activity against both the microorganisms. Amla was found more potential against *S. marcescens* as compare to *E. coli*. Ginger and Neem both were found having antimicrobial activity against *E.coli* only. They didn't show any antimicrobial activity against *S. marcescens*. Among the three extracts, ginger has the highest antimicrobial effect against *E. coli* with zone of inhibition of 24 ± 3mm.

Figure 1. Zone of Inhibition of E. coli obtained by Amla (*Phyllanthus embelica*)

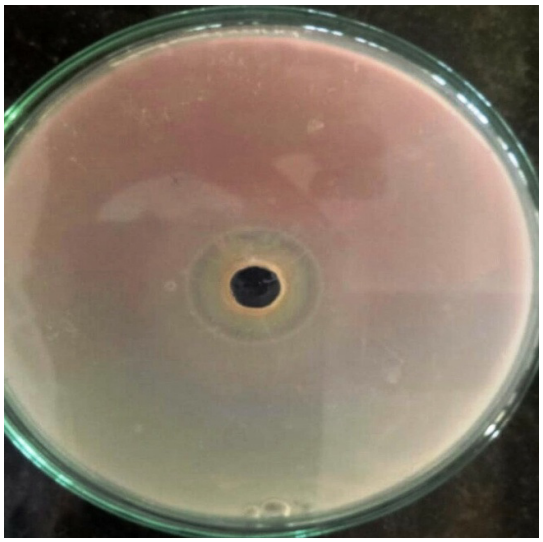

Figure 2. Zone of Inhibition of *S. marcescens* obtained by Amla (*Phyllanthus embelica)*

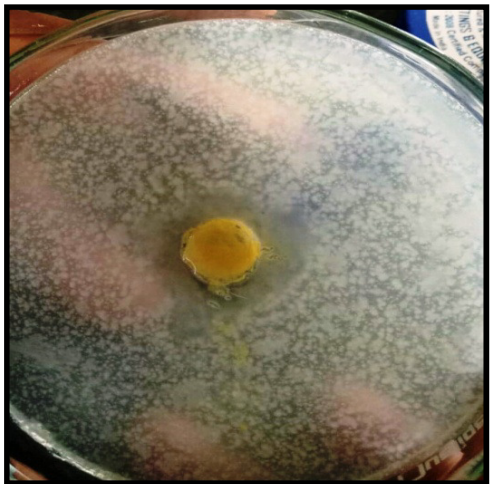

Figure 3. Zone of Inhibition of E. coli obtained by Ginger (*Zingiber officinale)*

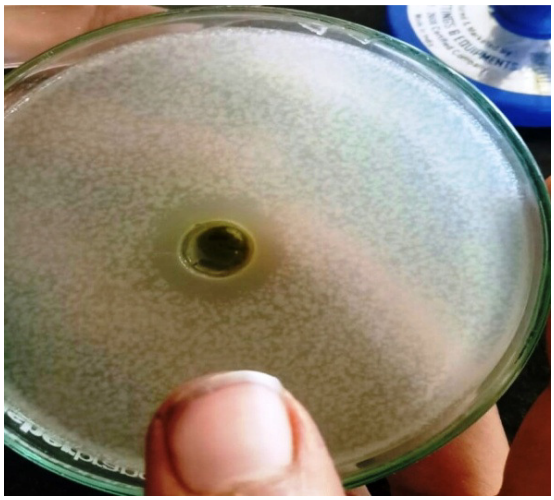

Figure 4. Zone of Inhibition of E. coli obtained by Neem (*Azadirachta indica)*

Here, water was used as a solvent for extraction of metabolites. Generally water is considered as poor solvent for extraction of many phytochemicals which have antimicrobial activity. Instead of water acetone, methanol or hexane are used for extraction of metabolites than there more chances to get better antimicrobial activity. [1, 2, 6-8, 13, 14] Use of these solvent along with heating enable better extraction of all the type of phytochemicals including flavonoids, terpenoids, phenolics, saponins, terpenes and alkaloids. Previous studies have shown that solvent extraction can extract many phytochemicals. Solvent extraction has shown that neem contains β-sitosterol, lupeol, rutin, ellagic acid, ferulic acid and quercetin which have potential antimicrobial activity. [3, 8, 10, 11, 13, 14] Similarly in amla, bioactive compounds like apigenin, gallic acid, ellagic acid, chebulinic acid, quercetin, chebulagic acid, corilagin, isostrictiniin, methyl gallate, luteolin, emblicanin A, emblicanin B, phyllaemblicin B, punigluconin and pedunculagin are present. [10, 13-15] In case of ginger α-gingiberene, β-seiquphellandrene, α-curcumen, Cyclohexane, α-fernesene, Cis-6-shagole, gingerol and gingerol. [9, 12] But here we have restricted with water only to check plants natural ability of antimicrobial activity in water. This can

be correlated directly with its diffusion within the body. However stability of the compounds in the acidic pH is a major concern.

CONCLUSION

From the study, it was concluded that all extracts of selected medicinal plants have variation in antibacterial properties. It depends on the type of microorganisms and phytochemical extraction methods.

REFERENCES

[1] A. Altemimi, N. Lakhssassi, A. Baharlouei, D. G. Watson, and D. A. Lightfoot, "Phytochemicals: Extraction, Isolation, and Identification of Bioactive Compounds from Plant Extracts," *Plants (Basel),* vol. 6, Sep 22 2017.

[2] M. M. Mashilo and M. Peter, "Phytochemical analysis, antioxidant, antibacterial and combinational effects of medicinal plants used by Bapedi traditional healers to prepare herbal mixtures," *Journal of Medicinal Plants Research,* vol. 12, pp. 563-574, 2018.

[3] S. Susmitha, K. K. Vidyamol, P. Ranganayaki, and R. Vijayaragavan, "Phytochemical Extraction and Antimicrobial Properties of *Azadirachta indica* (Neem)," *Global Journal of Pharmacology,* vol. 7, pp. 316-320, 2013.

[4] A. Wadood, "Phytochemical Analysis of Medicinal Plants Occurring in Local Area of Mardan," *Biochemistry & Analytical Biochemistry,* vol. 02, p. 1000144, 2013.

[5] Y. Vaghasiya, R. Dave, and S. Chanda, "Phytochemical Analysis of Some Medicinal Plants from Western Region of India," *Research Journal of Medicinal Plant,* vol. 5, pp. 567-576, 2011.

[6] S. Keo, Maneenet, Y. Chulikhit, S. Leang, C. Ny, and S. Chea, "Phytochemical Analysis and Antioxidant Property of Selected Medicinal Plants Native to Cambodia," *Drug Designing & Intellectual Properties International Journal,* vol. 1, pp. 64-70, 2018.

[7] J. K. Mensah, R. I. Okoli, A. A. Turay, and E. A. Ogie-Odia, "Phytochemical Analysis of Medicinal Plants Used for the Management of Hypertension by Esan people of Edo State, Nigeria," *Ethnobotanical Leaflets,* vol. 13, pp. 1273-1287, 2009.

[8] B. Joshi, G. P. Sah, B. B. Basnet, M. R. Bhatt, D. Sharma, Krishna Subedi*, et al.*, "Phytochemical extraction and antimicrobial properties of different medicinal plants: Ocimum sanctum (Tulsi), Eugenia caryophyllata (Clove), Achyranthes bidentata (Datiwan) and *Azadirachta indica* (Neem)," *Journal of Microbiology and Antimicrobials,* vol. 3, pp. 1-7, 2011.

[9] J. W. A. Ling, L. S. Chang, R. Mohd Khalid, W. A. Wan Mustapha, N. S. Sofian‐Seng, N. S. Mohd Razali*, et al.*, "Sequential extraction of red button ginger (Costus woodsonii): Phytochemical screening and antioxidative activities," *Journal of Food Processing and Preservation,* vol. 44, 2020.

[10] S. G. Nath and R. Dhivya, "Phytochemical Analysis, Antioxidant and Antibacterial Properties of Phyllanthus emblica Leaf Extracts against Selected Bacterial Isolates," *International Journal of Science and Healthcare Research,* vol. 4, pp. 20-28, 2019.

[11] V.Indhumathi, S.Perundevi, B. N.Vinoja, V. Manivasagan, K.Saranya, and N. G. R. Babu, "Phytochemical Screening and Antimicrobial Activity of Fresh and Shade Dried Leaves of *Azadirachta indica*," *International Journal of Innovations in Engineering and Technology,* vol. 11, pp. 27-32, 2018.

[12] A. kumar, P. Sharma, A. Mahajan, and Z. Begum, "In Vitro Comparative Study of Antioxidant and Antibacterial Activity of Selected Dietary Plants," *Nepal Journal of Biotechnology,* vol. 6, pp. 39-45, 2018.

[13] N. Akhtar, H. Ihsan ul, and B. Mirza, "Phytochemical analysis and comprehensive evaluation of antimicrobial and antioxidant properties of 61 medicinal plant species," *Arabian Journal of Chemistry,* vol. 11, pp. 1223-1235, 2018.

[14] M. R. Hasan, M. N. Islam, and M. R. Islam, "Phytochemistry, pharmacological activities and traditional uses of Emblica officinalis: A review," *International Current Pharmaceutical Journal,* vol. 5, pp. 14-21, 2016.

[15] M. F. Nisar, J. He, A. Ahmed, Y. Yang, M. Li, and C. Wan, "Chemical Components and Biological Activities of the Genus Phyllanthus: A Review of the Recent Literature," *Molecules,* vol. 23, Oct 8 2018.

