ISSN 2348-313X (Print)
International Journal of Life Sciences Research ISSN 2348-3148 (online)
Vol. 7, Issue 1, pp: (331-333), Month: January - March 2019, Available at: www.researchpublish.com

Antimicrobial activity of ginger root extracts against human pathogenic bacteria

Dr. Swamy CT[1], Vinay Kumar PG[2], Dr. Varunakumara JB*[3]

[1]Teaching Assistant, Department of Biotechnology, Davangere University, Shivagangothri, Davangere-577007.
[2]Research Scholar, Department of Microbiology, Davangere University, Shivagangothri, Davangere-577007.
[3*]Assistant Professor, Department of Biochemistry, Sahyadri Science college, A constituent college of Kuvempu University, Shivamogga- 577203.

Abstract: **Plant and their derived products have been used as a medicine for several centuries. In ancient Indian medicine system, Ginger (*Zingiber officinale*) and many other plants also used as medicine. In this study the antimicrobial activity of the ethanol extract of ginger root was tested against six standard bacteria: *Klebsiella pneumoniae, Staphylococcus aureus, Proteus vulgaris, Pseudomonas aeruginosa, Salmonella enterica ser. Typhi* and *Escherichia coli* by agar well method. In agar well method ethanol ginger extract showed maximum zone of inhibition against *Pseudomonas aeruginosa* and minimum zone inhibition observed in *K. pneumoniae*. From these results we can conclude that ethanolic extract of ginger showed potential antibacterial activity against pathogenic bacteria, it can be used as a conventional medicine against these bacteria after proper validation.**

Keyword: **Ginger (*Zingiber officinale*), ethanol extract, Zone of inhibition (ZOI), and agar well method.**

I. INTRODUCTION

A medicinal plant Ginger (*Zingiber officinale*) belongs to the family Zingiberaceae, it has been widely used as a spice in the diet in many of Asian countries [1]. Since long back Ginger has been used for medicinal and dietary purpose in India and China [2, 3, 4]. United States FDA agency listed ginger in GRAS (Generally recognised as safe) consumables document [5]. Ginger commonly used to control wide range of problems like arthritis, cramps, rheumatism, sprains, sore throats, muscular aches, pains, constipation, vomiting, hypertension, indigestion, dementia, fever and infectious diseases [6].

Human health has been threatened by the pathogenic microbes and its food poisoning activities. To curb the activity of microbes several antimicrobial agents have been widely used however, some of them are weakened by microbial resistance [7]. A wide range of phytochemicals like alkaloids, cardiac glycoside, tannin, saponin, flavonoids and terpenoids presence has reported from *Z. officinale* root extracts, these are very effective against wide range of pathogenic fungi and bacteria [8]. In the present study, we focused on the antibacterial activity of ginger against selective human pathogenic bacteria.

II. MATERIALS AND METHODS

Collection of Ginger sample:

The rhizomes of ginger (*Z. officinale*) were collected from the local market of Shivamogga city (Karnataka, India). The roots were washed with distilled water repeatedly to remove the adhered soil and dried at room temperature for 15 days.

Solvent extraction of ginger contents:

After wash and dry ginger roots were powdered using cryogenic tissue grinder, 100 grams of the powder was dissolved in 100 ml of ethanol. Further this solution was allowed to stand for 3 days, after settling filtered through sterile muslin cloth followed by Whatman filter paper No.1. The filtrate obtained was evaporated to dryness by placing in the hot air oven at 40 °C for 24 hrs. The precipitate was made into a concentration of 100mg/ml. Then diluted in ethanol solvent and made different concentrations of 5µl, 10µl and 15µl was prepared [9, 10, 8].

ISSN 2348-313X (Print)
International Journal of Life Sciences Research ISSN 2348-3148 (online)
Vol. 7, Issue 1, pp: (331-333), Month: January - March 2019, Available at: www.researchpublish.com

Test Bacteria:

For determining antibacterial activity of ginger extract six (6) bacterial species were used they were *K. pneumoniae, Staphylococcus aureus*, *Proteus vulgaris*, *Pseudomonas aeruginosa*, *Salmonella enterica ser. Typhi* and *Escherichia coli*.

Screening of antibacterial activity:

Antibacterial activity of ginger root extracts was screened by the agar well method. In this method the test pathogenic bacterial inoculum was swabbed on MHA medium and the wells were made using the cork borer and 20 µl of ginger root extracts were added. The plates were incubated at 37^{o}C for 24 hrs. Standard tetracycline (1 mg/ml) antibiotic was used control and respective solvent was used as the negative control. The antibacterial activity was evaluated by measuring the ZOI diameter (mm) and expressed the standard error mean (SEM) values [9].

Results and Discussion

The antimicrobial activity of the ginger root extract varied depending upon extract concentration and different bacterial species used. To investigate the effects of ginger root extract and tetracycline against the study strains, the maximum zone of inhibition showed in 15µl of ginger root extract and 15µl of tetracycline.

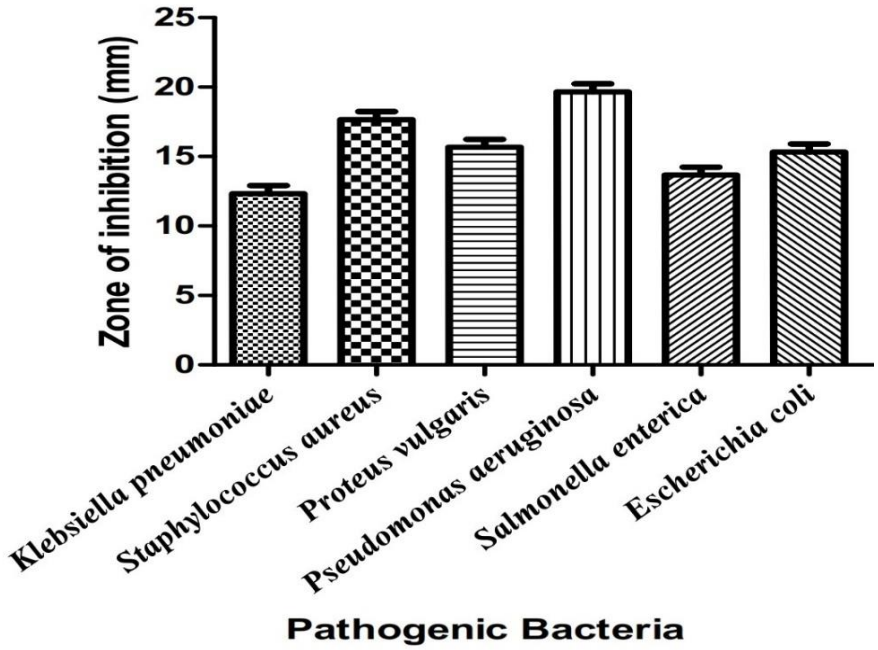

Fig. 1: Antibacterial activity of ginger root extract against pathogenic bacteria.

The minimum zone of inhibition showed in 5 µl of ginger extract. The 5 µl of ginger roots ethanol extract showed zone of inhibition in *K. pneumoniae* (4.6±0.57), *Staphylococcus aureus* (7.6±0.57), *Proteus vulgaris* (6.6±0.57), *Pseudomonas aeruginosa* (7.6±0.57), *Salmonella enterica ser. Typhi* (6.3±0.57) and *Escherichia coli* (6.3±0.57). The 10 µl of ginger roots ethanol extract showed zone of inhibition in *Klebsiella pneumoniae* (8.6±0.57), *Staphylococcus aureus* (13.6±0.57), *Proteus vulgaris* (11.6±0.57), *Pseudomonas aeruginosa* (14.6±0.57), *Salmonella enterica ser. Typhi* (10.3±0.57) and *Escherichia coli* (10.3±0.57). The 15 µl of ginger roots ethanol extract showed maximum zone of inhibition showed in figure 1. Control tetracycline showed around 21±0.57 zone of inhibition against tested bacterial isolates. Previously, ginger root extract showed antibacterial activity against *S. aureus* [11], *P. aeruginosa*, *E. coli*, *S. aureus*, *K. pneumoniae*, *B. cereus*, *A. baumannii*, *C. albicans*, and *C. krusei* [12, 10, 13]. Further, ginger extract also exhibited inhibition against biofilm forming bacteria such as *A. baumannii*, *B. cereus*, *C. krusei*, and *C. albicans*. and MTT assay revealed no significant reduction in cell viability after 24 hours incubation [12].

Ginger root extract also showed inhibition against different fungi such as *C. albicans A. niger*, C. *albicans, C. Krusei, Aspergillus* spp., *Penicillum* spp., *Fusarium* spp., *Trichoderma harzanium, Beauveria bassiana, Mucor mucedo, Saccharomyces cerevisiae* [2, 12,7,11,8, 14].

III. CONCLUSION

In this study, ethanol extract of ginger root showed maximum inhibition at higher concentration (15µl) and lesser activity recorded at lower concentration. The ethanol extract of ginger root at the concentration of 5 µl and 10 µl showed average inhibition zone, i.e microorganisms need additional concentration of extract to inhibit effectively. However, maximum zone of inhibition observed at 15µl concentration of tetracycline used. Maximum inhibition recorded at 15µl concentration against *P. aeruginosa* and minimum inhibition recorded against *K. pneumoniae*. These findings confirmed the effectiveness of ginger against selective human pathogenic bacteria, this activity due to the presence of divrse secondary metabolites present in ginger. Overall this study proved the antimicrobial efficiency of ginger.

REFERENCES

[1] Gao, D., & Zhang, Y. (2010). Comparative antibacterial activities of crude polysaccharides and flavonoids from Zingiber officinale and their extraction. Am J Trop Med, *5*(6), 235-238.

[2] Supreetha, S., Mannur, S., Simon, S. P., Jain, J., Tikare, S., & Mahuli, A. (2011). Antifungal activity of ginger extract on Candida albicans: An in-vitro study. *J Dent Sci Res.* 2. 1-5.

[3] Salmon, C. N., Bailey-Shaw, Y. A., Hibbert, S., Green, C., Smith, A. M., & Williams, L. A. (2012). Characterisation of cultivars of Jamaican ginger (Zingiber officinale Roscoe) by HPTLC and HPLC. *Food chemistry*, *131*(4), 1517-1522.

[4] Yeh, H. Y., Chuang, C. H., Chen, H. C., Wan, C. J., Chen, T. L., & Lin, L. Y. (2014). Bioactive components analysis of two various gingers (Zingiber officinale Roscoe) and antioxidant effect of ginger extracts. *LWT-Food Science and Technology*, *55*(1), 329-334.

[5] http://icmr.nic.in/BUJUNEO3nwe.pdf ICMR Bulletin. Ginger: Its Role in Xenobiotic Metabolism. Accessed on 29/08/2010.

[6] Ali, B. H., Blunden, G., Tanira, M. O., & Nemmar, A. (2008). Some phytochemical, pharmacological and toxicological properties of ginger (Zingiber officinale Roscoe): a review of recent research. *Food and chemical Toxicology*, *46*(2), 409-420.

[7] Liu, Q., Meng, X., Li, Y., Zhao, C. N., Tang, G. Y., & Li, H. B. (2017). Antibacterial and antifungal activities of spices. *International journal of molecular sciences*, *18*(6), 1283.

[8] Ayodele, O. A., Akinyosoye, F. A., Arotupin, D. J., Owoyemi, O. O., & Oyindamola, A. B. (2018). Phytochemical Screening and Antifungal Activities of Zingiber officinale (Roscoe) on Mycotoxigenic Fungi Associated with the Deterioration of Pennisetum glaucum Grains. *Journal of Advances in Microbiology*, 1-11.

[9] Swamy, C.T., Gayathri D., & Devaraja T.N. (2016). Antibacterial activity of lichens *Parmotrema tinctorum* and *Pyxine sorediata* and their secondary metabolites. International Journal of Advanced Life Sciences. 3.373-380.

[10] Grace, U. S., Sankari, M., & Gopi. (2017) Antimicrobial Activity of Ethanolic Extract of *Zingiber Officinale* – An *in vitro* Study. *Journal of* Pharmceutical Sciences and Research. 1417-1419.

[11] López, E. I. C., Balcázar, M. F. H., Mendoza, J. M. R., Ortiz, A. D. R., Melo, M. T. O., Parrales, R. S., & Delgado, T. H. (2017). Antimicrobial activity of essential oil of Zingiber officinale Roscoe (Zingiberaceae). *American Journal of Plant Sciences*, *8*(07), 1511.

[12] Aghazadeh, M., Bialvaei, A. Z., Aghazadeh, M., Kabiri, F., Saliani, N., Yousefi, M., Eslami, H., & Kafil H. S. (2016). Survey of the Antibiofilm and Antimicrobial Effects of *Zingiber officinale* (*in Vitro* Study). *Jundishapur J Microbiol.* 9. e30167.

[13] Islam, K., Rowsni, A. A., Khan, M. M., & Kabir M. S., (2014). Antimicrobial activity of ginger (*Zingiber officinale)* extracts against food-borne pathogenic bacteria. *International Journal of Science, Environment.* 3. 867 – 871.

[14] Hassan, A. M., Abutalib, A. A., Almagboul, A. Z., & Kabbashi, A. S., (2017). Antimicrobial activity of the rhizome essential oil of *Zingiber officinale* Roscoe. *Advancement in Medicinal Plant Research*. 5. 5-10.