Research Article

Antibacterial activity of ayurvedic preparations on selected human pathogens

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ABSTRACT

Background: The use of herbal medicine is increasing with the increase in the development of drug resistance among bacterial population. Herbal medicines are safe with no side effects and have significant action against bacteria and other microorganisms. **Materials and Methods:** Bacterial strains used are multidrug-resistant *Pseudomonas,* Enterococci, and Staphylococci and they are obtained from the Department of Microbiology, Saveetha Dental College and maintained in nutrient agar slope at 4°C. Moreover, extracts are taken from plant leaf powder. **Results:** The investigation of the antibacterial activity of ayurvedic preparations on *Pseudomonas*, Enterococci, and Staphylococci was done by agar well diffusion method. Mean zones of inhibition of different concentrations were measured and compared with the control. **Conclusion:** Based on the results recorded in the present findings, it concluded that ayurvedic extracts have potential antimicrobial agent on human oral pathogenic microorganisms, and hence, the herbal drug may serve as one of the potential antimicrobial agents. Further studies on isolation of active principles from the plant are needed.

KEY WORDS: Antibacterial activity, Ayurveda, Human pathogens

INTRODUCTION

In ayurvedic medicine, many medicinal plants are useful in strengthening human health-care system and the formulations based on such medicinal plants play an important role in modern medicine.[1] The primary benefits of using plant-derived medicine are relatively safer than synthetic drugs and offer profound therapeutic benefits.[2] Single and polyherbal preparations have diverse range of bioactive molecules and play a dominant role in the maintenance of human health since ancient times. The most frequently used type of herbal preparations is churnas.[3] Churnas are preparations comprising fine powders of medicinal plants and may be single or in combination.[4] Combinations of medicinal plants may increase the antimicrobial spectrum and potency of the preparations. Enteric or diarrheal infections are major public health problems in developing countries and contribute to the death of 3.3–6.0 million children annually. Recently, it has been demonstrated that many human pathogenic bacteria have developed resistance against several synthetic drugs.[5-7] There are several reports on antimicrobial activity of crude extracts prepared from plants that inhibit various bacterial pathogens, but a limited number of *in vitro* studies on herbal preparations have been published. It is need of the hour to identify antibacterial potential of herbal products based on diseases for which no medicine or only palliative therapy is available.[8,9] Hence, the present study is to screen the antibacterial potential of ayurvedic preparations in preventing enteric bacterial infection. In these findings, drugs Ajmodadi and Hareetaki were used to study the antibacterial potentials and to identify the antibacterial activity of ayurvedic preparations on selected human pathogens such as *Pseudomonas*, Enterococci, and Staphylococci.

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MATERIALS AND METHODS

Bacterial strains used are multidrug-resistant *Pseudomonas,* Enterococci, and Staphylococci and they are obtained from the Department of Microbiology, Saveetha Dental College and maintained in nutrient agar slope at 4°C.

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Extraction Procedure and Antibacterial Activity of Plant Extracts

The powder of plants was processed for cold and hot water extraction. For cold water, 10 g dried powder of each plant was soaked in 100 ml distilled water and rotated on shaker at 150 rpm for 24 h. For hot water, 10 g of dried powder was soaked in 100 ml distilled water and then heated at 60°C in incubator for 24 h. The extracts were sieved through a muslin cloth and then centrifuged at 4400 rpm for 7 min. The supernatant was collected and then filtered. Centrifugation and filtration process were repeated 3 times. The drug was mixed with DMSO to gel 1 mg/ml concentration. Then, 10, 20, 30, 40, and 50 ml volume of drug was loaded on agar well diffusion method onto a sterile die with respective organisms of human pathogens. Then, the antibacterial activity will be studied separately. After 24 h incubation period, the plates were observed and inhibition zone was recorded as minimal inhibitory concentration.

Data Analysis

All the experiments were independently repeated 3 times, and average zone of inhibition of test extracts relative to negative control was calculated using Microsoft Excel 2007 software.

RESULTS

Efficacy of Antibacterial Activity of Ayurvedic Preparations on Human Pathogenic Microorganisms

The investigation of the antibacterial activity of ayurvedic preparations on *Pseudomonas*, Enterococci, and Staphylococci was done by agar well diffusion method. Mean zones of inhibition of different concentrations were measured and compared with the control. In this study, ayurvedic extract dose-dependently increased the bacterial growth inhibition. However, 100% inhibition was observed against *Enterococcus faecalis* than the standard drug ciprofloxacin. Finally, the extract showed potential antibacterial activity [Figure 1 and Table 1].

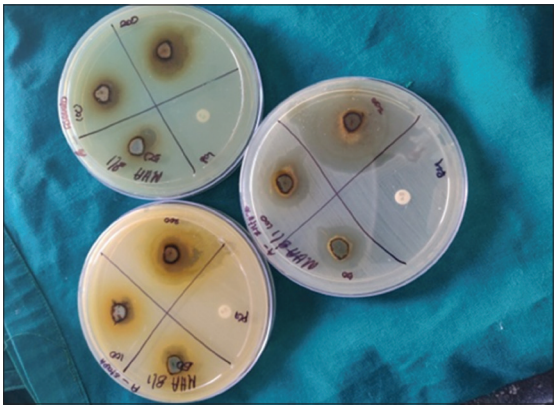

Figure 1: Culture of *Pseudomonas*, Enterococci, and Staphylococci

DISCUSSION

Global burden of infectious diseases caused by bacterial agents is a serious threat to public health.[10] Antibiotic treatment is a preferred choice to treat bacterial infections; however, emergence of antimicrobial resistance and toxicity issues subsides the use of antibacterial agents.[11,12] Safety- and efficacy-related limitations to antibiotics augment biological research on the antimicrobial role of plants due to comparable toxicity and efficacy.[13] In the present study, the samples were tested for their antibacterial properties against the various bacterial human pathogens and this may be due to the presence of active principles present in the polyherbal preparations recorded in the present investigations. In this regards, Tambekar and Dahikar[14] reported in a study on the antibacterial activity of some Indian ayurvedic preparations against enteric bacterial pathogens and they have reported that support the use of the ayurvedic drugs preparations can be used as agents to prevent or control enteric bacterial infections.

CONCLUSION

The use of herbal medicine is increasing with the increase in the development of drug resistance among bacterial population. Herbal medicines are safe with no side effects and have significant action against bacteria and other microorganisms. Based on the results recorded in the present findings, it concluded that ayurvedic extracts have potential antimicrobial agent on human oral pathogenic microorganisms, and hence, the herbal drug may serve as one of the potential antimicrobial agents. Further studies on isolation of active principles from the plant are needed.

Table 1: Efficacy of the antibacterial activity of ayurvedic preparations on human pathogenic microorganisms

Concentration of extracts	Zone of inhibition (mm in diameter)			Percentage of zone inhibition (%)		
	Pseudomonas (mm)	Enterococci (mm)	Staphylococci (mm)	*Pseudomonas*	Enterococci	Staphylococci
50 µg/ml	11 mm	21 mm	16 mm	57.89	46.66	53.33
100 µg/ml	15 mm	23 mm	17 mm	73.33	51.11	56.66
200 µg/ml	19 mm	45 mm	30 mm	100	100	100
Control	No zone	No zone	No zone			

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