ORIGINAL ARTICLE

Antifungal Activity of Ginger Extract on Candida Albicans: An In-vitro Study

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ABSTRACT

Plant derived products have been used for medicinal purposes for centuries. In traditional Indian medicine or Ayurveda, Zingiber officinale and many other herbs have been used as medicine. Traditional uses of plants have led to investigating their bioactive compounds, which have resulted in the detection of a significant number of therapeutic properties. Aim of the study: The present study was carried out to assess the effect of ethanolic extract of ginger on candida albicans in vitro. The shunti Choorna (ginger powder) was procured from commercial source (S.N.Pandit and sons, Mysore). The antifungal activity of the agent was tested in the following dilution range- 1g, 2g, 4g of shunti choorna in 99.9% ethanol. Ginger paste at room temperature showed inhibition zone better than ethanol alone, but cold ethanolic ginger extract showed the maximum inhibition zone at 24 hrs. The present study showed that the ethanolic extract of ginger powder has pronounced inhibitory activities against Candida albicans. From the obtained results it can be concluded that although ethanol in itself has antifungal activity, ethanolic extract of ginger has a synergistic activity.

Keywords: Ginger Extract, Antifungal, Candida Albicans.

INTRODUCTION

Medicinal plants are finding use as pharmaceuticals, nutraceuticals, cosmetics and food supplements[1]. Plant derived products have been used for medicinal purposes for centuries. In traditional Indian medicine or Ayurveda, Zingiber officinale and many other herbs have been used as medicine[2].

With an increase in the antibiotic-resistant strains of microorganisms, traditional plants are being investigated for their antibacterial and medicinal values. Traditional uses of plants have led to investigating their bioactive compounds, which have resulted in the detection of a significant number of therapeutic properties[1]. In 1998, the WHO estimated that 80% of the people living in developing countries almost exclusively use traditional medicine[3].

Ginger has been used as medicine from Vedic period and is called 'maha- aushadhi' which means the great medicine[2]. Ginger is easily available, universally acceptable and relatively inexpensive and well tolerated by most of the people. The ginger has been listed in 'Generally Recognised as Safe' (GRAS) document of the US FDA[2]. Ginger (Zingiber officinale) belongs to Zingiberaceae family[1]. The Zingiberaceous plants are characterized by their tuberous or non-tuberous rhizomes, which have strong aromatic and medicinal properties[4].

In the past few decades, a worldwide increase in the incidence of fungal infections has been observed. The majority of clinically used anti-fungals have various drawbacks in terms of toxicity, efficacy and cost, and their frequent use has led to the emergence of resistant strains. The challenge has been to develop effective strategies for the treatment of candidiasis and other fungal diseases, considering the increase in opportunistic fungal infections in human immunodeficiency virus-positive patients and in others who are immunocompromised due to cancer chemotherapy and the indiscriminate use of antibiotics[5].

Candida is a normal commensal of the oral cavity. However, in immunocompromised individuals, candidiasis is the earliest infection to manifest. For millions of people traditional medicine serves as the only opportunity for health care. Safety and lower side effects of many herbal extracts have also suggested them as sources of new pharmaceuticals[6]. Recently, many plant extracts have shown to have therapeutic values with respect to oral diseases[7,8,9,10,11].

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Due to the development of resistance in known fungal pathogens and the emergence of fungal pathogens intrinsically resistant to the currently available antibiotics, it is important that novel antifungal agents be identified and developed[9]. To this end, the present study was carried out to assess the effect of ethanolic extract of ginger on candida albicans in vitro.

MATERIALS AND METHOD

Antifungal Agent

The shunti Choorna (ginger powder) was procured from commercial source (S.N.Pandit and sons, Mysore). This agent was dissolved in 99.9% ethanol. The antifungal activity of the agent was tested in the following dilution range- 1g, 2g, 4g of shunti choorna in 99.9% ethanol,

Preparation of the Ginger Extract

1g, 2g and 4g of the shunti Choorna was added to 99.9% ethanol. The tubes were kept refrigerated (4-8°C) undisturbed for four hours. The drug concentration was prepared freshly when it was tested against standard strain each time.

Isolate

The standard strain used for the study is Candida albicans (ATCC 66027). This was grown on Sabourauds dextrose agar (SDA) (Hi Medic Laboratories Pvt. Ltd; Mumbai, India) overnight at 37°c for 24 hours and 48 hours.

Media used for the Study

The Sabouraud's dextrose agar (SDA) (Hi Medic Laboratories Pvt. Ltd; Mumbai, India) was used for the study.

Inoculum Preparation

3-5 colonies of standard strain candida albicans ATCC 66027was suspended in 2ml of sterile normal saline and vortexed. The turbidity of the homogenous suspension was adjusted to approximately 0.5 Me Farland standards. The sterile swab was dipped in suspension and swabbed on dried plates of Sabouraud's dextrose agar to get lawn culture.

METHOD

Disc Diffusion Method

6mm sterile filter paper discs were purchased and sterilized. These were placed and inoculated on dried SDA plates. 10µl of the extraction was placed on the disc. These plates were incubated at 37°c. Zone of inhibition was noted around the disc at 24 and 48 hrs. The positive control used in the study was 99.9% ethanol.

Data were analysed using ANOVA. The level of significance was set at 0.05.

RESULTS

The present study was done to evaluate the antifungal efficacy of ginger against Candida albicans (ATCC 66027).

As shown below in graph1, 1g ethanolic ginger paste at cold temperature showed maximum inhibition at 24 hrs. All the values decreased at 48 hrs. (Fig. 1)

2g ginger paste at room temperature showed inhibition zone better than ethanol alone, but cold ethanolic ginger extract showed the maximum inhibition zone at 24 hrs (Fig. 2).

At 4g concentration it was seen that ethanolic ginger extract showed maximum inhibition zone of 23mm at 24hours and at cold temperature (Fig. 3)

There was a statistically significant difference in the inhibition zones at 24 hours and 48 hours (table 1)

It is evident from the study that, at 24 hrs, the 2g concentration was more effective than 1g in inhibiting the organism growth.

The antifungal activity of ethanolic extract of ginger was pronounced in cold extract than in room temperature extract. Cold method of preparation which was evaluated against room temperature was found to be more effective for extraction of active ingredients of shunti choorna.

DISCUSSION

The various therapeutic effects of ginger has been reported which includes anti-emetic activity, anti- ulcer, antiplatelet, antipyretic, anti-inflammatory and antioxidant activity[12]. The antifungal and antibacterial activity of ginger has been attributed to gingerol and shagelol derived from the ethanolic extracts of ginger [6].

Most of the studies that test the medicinal values of plants are done by taking a methanolic or ethanolic extract of the same. Previous study[6] has shown that ethanolic extract of ginger has antifungal activity. But, these studies have not considered the inherent antifungal activity of ethanol. So, in this study ethanol was used as a positive control. This was done to check for the confounding effect of ethanol, if any. It was seen that the positive control (ethanol) used in the study produced significantly sized inhibition zones with Candida albicans.

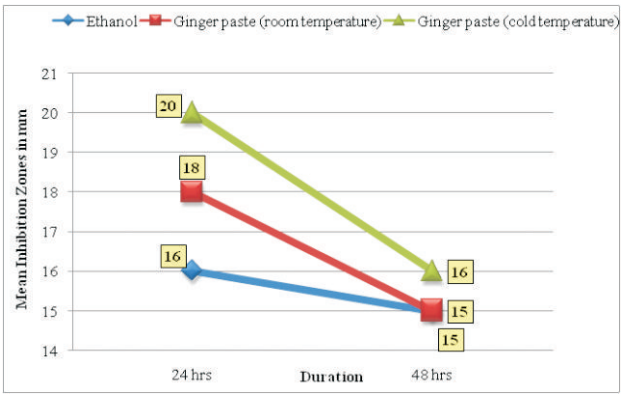

Fig. 1: Mean inhibition zone of candida albicans at 1g concentration and at 24 and 48 hrs

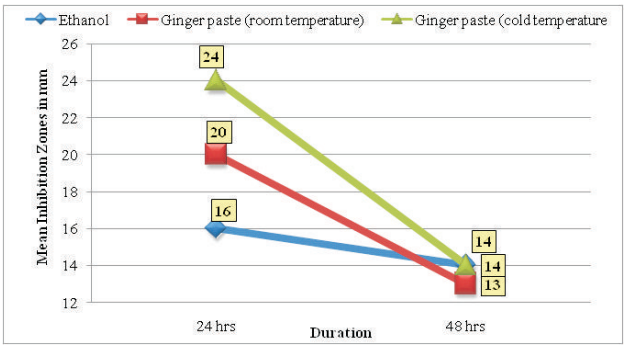

Fig. 2: Mean inhibition zone of candida albicans at 2g concentration and at 24 and 48 hrs

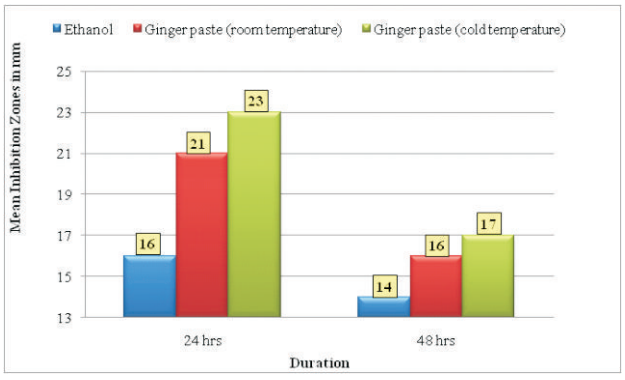

Fig. 3: Mean inhibition zone of candida albicans at 4g concentration and at 24 and 48 hrs

Table 1: Between and within group differences at 24 and 48 hours

Duration	Anova Test	Mean Square	F
24 hours	Between Groups	15.500*	279.00
	Within Groups	.056	
48 hours	Between Groups	2.389*	43.00
	Within Groups	.056	

*Statistically significant at p = 0.000

In the present study ginger extract was effective in inhibiting the growth of Candida albicans. (ATCC 66027). The positive control (ethanol) produced significantly sized inhibition zones with Candida albicans. The inhibitory zone was measured with respect to different concentrations of the extracts which included 1g, 2g and 4g and at both room temperature and cold temperature (4-8°c). The inhibition zones were evaluated at 24 and 48 hrs.

The results of this study revealed that the ethanolic extract of ginger powder has pronounced inhibitory activities against Candida albicans. This result is comparable with other studies which have shown that ginger has broad antibacterial activity[4, 6, 9, 11].

Cold method of preparation which was evaluated against room temperature was found to be more effective for extraction of active ingredients of shunti choorna.

The study results are comparable with other studies suggesting that different antifungal agents are present in the Ginger extract. In the ginger rhizome there are several components which have antibacterial and anti fungal effects. The gingerol and shagelol are identified as more active agents[6]. Park et al showed that crude extract of ginger can inhibit the growth of oral bacteria in vitro which is in good agreement with the present result.

This assay showed that the inhibition zone decreased at 48 hrs compared to 24 hrs. There was a statistically significant difference in the inhibitory zones at 24hrs and 48 hrs with maximum inhibition at 24 hr, irrespective of the concentration. This can be explained by the fact that, Candida albicans will be in log phase during 24 hrs and reaches stationary phase at 48 hrs. Hence, this study showed 24 hrs reading to be better than 48 hrs.

The present study has shown that ethanol itself has antifungal activity against candida albicans. However, there was an increased inhibition zone when ethanolic extract of ginger was used when compared to ethanol alone and this was statistically significant. This clearly indicates that ginger in itself also has antifungal activity.

CONCLUSION

The wide spectrum of activity of ginger extracts has been documented earlier. This study evaluated the inherent antifungal activity of ethanol as well as the antifungal activity of ethanolic extract of ginger. From the obtained results it can be concluded that although ethanol in itself has antifungal activity, ethanolic extract of ginger has a synergistic activity. Since ginger is easily available and well- tolerated, it can be incorporated into medications for topical antifungal therapy. However, further studies for its incorporation into oral preparations, safety and cost- effectiveness has to be conducted.

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