ORIGINAL RESEARCH PAPER INTERNATIONAL JOURNAL OF PURE MEDICAL RESEARCH

Dentistry

KEYWORDS:
Phytochemistry, Red rice, Bamboo rice, Candida albicans, Antifungal activity.

EVALUATION OF ANTIFUNGAL ACTIVITY OF ORYZA PUNCTATA AND PHYLLOSTACHYSBAMBUSOIDES EXTRACT AGAINST ORAL CANDIDA ALBICANS: AN IN-VITRO STUDY

Volume - 9, Issue - 7, July- 2024 ISSN (O): 2618-0774 | ISSN (P): 2618-0766

L. Jebisha	Postgraduate
Mahalakshmi	Postgraduate
Sreeja*	Professor*Corresponding Author
Sathish Muthukumar	Head of the Department

INTERNATIONAL JOURNAL OF PURE MEDICAL RESEARCH

Abstract-
Oryza punctata is an annual grass in the rice genus Oryza also known as red rice. Phyllostachysbambusoides (Bamboo Rice) have antifungal properties, primarily due to compounds found in bamboo shoots. Bamboo shoots contain various bioactive compounds, including phenolic compounds and flavonoids, that are known to possess antimicrobial and antifungal properties.

INTRODUCTION

The Oral cavity has one of the most diverse microbiomes in the human body, which is made up of bacteria, viruses, fungi, protozoa, and archaea. Historically, only four types of systemically active antifungal medications—polyenes, azoles, echinocandins, and the pyrimidine analogue 5-flucytosine3—were commonly utilized for therapy. (1) Failure of the treatment is a result of a complex interaction between fungal traits such as different cell morphologies, antifungal tolerance, and resistance, as well as underlying host immunological deficiencies. (8,9) Antifungal therapies have improved over the last 30 years, yet the phenomenon of antifungal resistance remains a key problem in clinical practice. Finding a strong antifungal medication is made more difficult by the fact that humans and fungi have many conserved biological activities. (2) Rice bran layers can be coloured by anthocyanin and genetic factors are responsible for the variations in bran layers between rice genotypes. According to reports, rice bran contains the strongest antioxidants and is effective against malignancies of the breast, cervical, and leukemia. (3) When comparing red and black rice to white or bright rice, rice bran exhibits more antioxidants such as phenolic compounds, tocochromanols, and oryzanol. (4)

MATERIALS AND METHODS:

COLD EXTRACTION

Red rice & Bamboo rice were obtained from the local organic store 10 gm of powder sample was weighed and soaked in 100 ml of methanol. The extract was allowed to stand for 24 hours and filtered using sterile filter paper. The filtrate was collected and incubated at room temperature for evaporation (Figures 4 and 9). The yield was calculated using the formula, (Yield= initial weight - final weight) and the yield was yield for Bamboo rice = 0.15g and yield for red rice = 0.17g.

ESTIMATION OF ANTIFUNGAL ACTIVITY

AGAR DISC DIFFUSION METHOD

PREPARATION OF INOCULUM:

Stock cultures were stored at 4°C on potato dextrose agar slants. To prepare active cultures for experiments, a loopful of cells from the stock cultures was transferred to test tubes containing nutrient broth for bacteria. These test tubes were then incubated for 24 hours at room temperature. The assay was conducted using the agar Kirby- Bauer disk diffusion method

ANTIFUNGAL ACTIVITY:

The antifungal activity of the sample was determined by the well diffusion method on the Potato Dextrose agar (PDA) medium. The Potato Dextrose Agar medium was weighed 4.4 gms dissolved in 100 ml of distilled water and add 1 gm of agar. Then the medium is kept for sterilization. After sterilization, the media was poured into sterile petriplates and were allowed to solidify for 1hr. After the medium was solidified, the inoculums were spread on the solid plates with sterile swabs moistened with the fungal suspension. Wells were made using a cork borer. The samples were placed in wells on the medium with varying concentrations, alongside a positive control (Ketoconazole 20 µl) and a negative control (DMSO 20 µl) were loaded in their respective wells. These plates were then incubated for 24 to 48 hrs at room temperature. Finally, the efficacy of antifungal activity of each sample at different concentrations (20 µl, 15 µl, 10 µl and 5 µl) was determined by measuring the diameter of the zone of inhibition.

RESULTS:

The antifungal activity of the Oryza punctata and Phyllostachys bambusoides were compared and evaluated against candida albicans via disk diffusion method. The effect of different concentration zones of inhibition against candida albicans was reported in the case of red rice and Bamboo rice (Figures 1) & (Graph 1). antifungal activity at the concentration of 20 µl for both red rice & bamboo rice. The zone of inhibition was 16mm & 15mm for Bamboo rice and red rice respectively at a concentration of 20 µl. Other concentrations showed the same level of inhibitions in both samples.

DISCUSSION:

Candidiasis is a common infectious condition that affects the oral cavity. It is a significant concern for patients who wear dentures, as it can worsen their already compromised lifestyle. Although there are known treatment methods for candidiasis, some researchers are exploring the potential of herbal supplements as alternatives. Bamboo rice and red rice are two organic substances that have antifungal properties. (5) To the best of our knowledge, there are no studies done to date which has compared the antifungal efficacy of bamboo rice and red rice. Hence, the present study was undertaken to compare their antifungal efficacy against C. albicans.

The antifungal activity of both bamboo rice and red rice is mediated by specific bioactive compounds present in their composition. The primary factors responsible for bamboo rice's anti-fungal activity are gallic acid (also known as gallic acid-2-gallo-2-dioxylamine) p-coumaric acid, caffeic acid, and cirsimaritin. These compounds act

synergistically to inhibit fungal growth. Together, these compounds act to break down the fungal cell membrane, inhibit the activity of fungal enzymes, and act as antioxidants, thereby inhibiting fungal proliferation. (6)

While gamma-oryzanol is the main antifungal component in red rice, the antifungal properties of bamboo rice are attributed to a complex of gallic acid (gallic acid and p-coumaric acid), caffeic acid (Caffeic acid and Cirsimaritin), eriocitrin, alkaloids and flavonoids. Understanding the bioactive components in rice varieties gives insight into their potential uses in fighting fungal infections and improving food safety and security. (7,8)

This study aimed to evaluate the effectiveness of Oryza punctata (Red rice) and Phyllostachys bambusoides (Bamboo rice) in inhibiting fungal growth. The zones of inhibition produced at different concentrations were measured using the disc diffusion method. Results showed that Phyllostachys bambusoides (Bamboo rice) had a higher level of antifungal activity than Oryza punctata (Red rice), with a larger zone of inhibition at 20 µl. It is worth noting that the antifungal activity increases as the zone of inhibition increases. Our study, therefore, concluded that bamboo rice was slightly superior when compared to the antifungal efficacy of red rice.

When compared to the standard drug, ketoconazole (zone of inhibition: 22mm), Bamboo rice showed good antifungal efficacy (zone of inhibition: 16mm) at the highest concentration. The antifungal activity of red rice (zone of inhibition: 15mm) was also comparable with that of the commercial standard used. Our strategy for preventing fungal infections using agricultural products such as red rice and bamboo rice. These types of rice contain natural chemicals such as gamma-oryzanol, gallic acid, p-coumaric acid, caffeic acid, and cirsimaritin, which are known to possess antifungal properties. (9,10)

In future research, through the application of nanotechnology, we can enhance the effectiveness of these chemicals and also combine them with small nanoparticles to create a potent combination that effectively inhibits candida albicans. By acting as a route of administration, these nanoparticles deliver their therapeutic properties exactly where they are needed. As a result, red rice and bamboo rice have been enhanced to a level that surpasses traditional antifungal management.

CLINICAL SIGNIFICANCE:

In recent times, the rise in antifungal resistance and growing awareness of the side effects linked to conventional therapies have led to an increased use of herbal medicine. Herbal remedies offer a wide range of micronutrients and pharmacologically active components, which makes them cost-effective, readily available, and with fewer side effects. This shift towards herbal medicine signifies a recognition of its potential to address oral health issues more effectively. The amalgamation of ancient wisdom regarding medicinal herbs with modern scientific advancements opens up new avenues for combating oral diseases. A recent study highlights the potential of bamboo rice and red rice as effective antifungal agents. Further exploration in this field could lead to the incorporation of bamboo rice and red rice extracts into dental products such as dentifrices, mouthwashes, and various dental materials to combat oral candidal infections effectively. By integrating natural remedies into dental care products, safer and more sustainable solutions for managing oral health issues can be achieved, catering to the growing demand for holistic and natural approaches to healthcare.

LIMITATION:

The present study has limitations that need to be considered. It only focuses on evaluating the effectiveness of Bamboo rice (Phyllostachys bambusoides) and Red rice (Oryza punctata) against Candida albicans, which is a common cause of oral candidiasis. However, the study does not explore the possible antifungal action of these substrates against other fungal species. It would be necessary to conduct in-vivo investigations on animal models or human clinical trials to confirm the effectiveness of these rice types as antifungal medicines in practical settings.

CONCLUSION:

Our study has shown that Bamboo rice (Phyllostachys bambusoides) and red rice (Oryza punctata) have remarkable antifungal properties against Candida albicans. This highlights their potential as valuable resources in oral health care and suggests promising applications in the development of oral hygiene products, medications, and dental materials. Incorporating Bamboo rice and red rice extracts into denture cleansers and other oral care products could offer effective disinfection of denture surfaces, aiding in the prevention and treatment of oral fungal diseases. It is important to note, however, that further research is needed to fully harness the potential benefits of Bamboo rice and red rice in oral health care. We need additional studies to explore their effectiveness against a broader range of fungal species and to optimize their formulation for practical application. Furthermore, clinical trials involving human subjects would be essential to validate their efficacy and safety in a practical setting. Overall, the antifungal properties exhibited by Bamboo rice and red rice pave the way for innovative solutions in oral health care, offering new avenues for the prevention and management of oral fungal diseases.

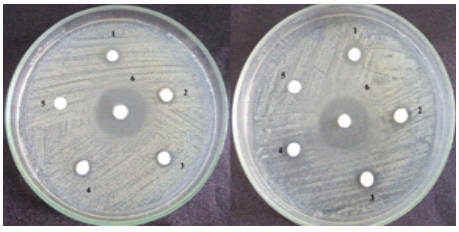
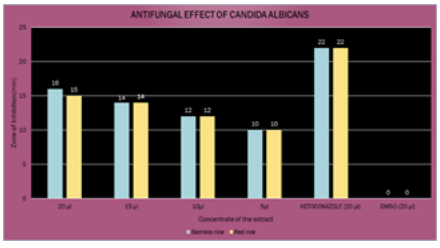


Figure 1: Extent of the zone of inhibition of Bamboo rice (Phyllostachys bambusoides) and red rice (Oryza punctata) and ketoconazole against candida albicans.

Graph 1:



REFERENCES:

1. Wade WG. The oral microbiome in health and disease. Pharmacol Res. 2013 Mar;69(1):137-43. doi: 10.1016/j.phrs.2012.11.006. Epub 2012 Nov 28. PMID: 23201354.
2. Dewhirst, F.E.; Chen, T.; Izard, J.; Paster, B.J.; Tanner, A.C.; Yu, W.H.; Lakshmanan, A.; Wade, W.G. The human oral microbiome. J. Bacteriol. 2010, 192, 5002–5017
3. Baker, J.L.; Bor, B.; Agnello, M.; Shi, W.; He, X. Ecology of the oral microbiome: Beyond bacteria. Trends Microbiol. 2017, 25, 362–374.
4. Suresh Unniachan A, Krishnavilasom Jayakumari N, Sethuraman S. Association between Candida species and periodontal disease: a systematic review. Curr Med Mycol 2020;6(2):63–68. DOI: 10.18502/CMM.6.2.3420.
5. Richardson M, Lass-Florl C. Changing epidemiology of systemic fungal infections. Clinical microbiology and infection. 2008;14(Suppl 4):5–24. doi: 10.1111/j.1469-0691.2008.01978.x.
6. Vandeputte P, Ferrari S, Coste AT. Antifungal resistance and new strategies to control fungal infections. Int J Microbiol. 2012;2012:713687. doi: 10.1155/2012/713687. Epub 2011 Dec 1. PMID: 22187560; PMCID: PMC3236459.
7. Robbins, N., Caplan, T. & Cowen, L. E. Molecular evolution of antifungal drug resistance. Annu. Rev. Microbiol. 71, 753–775 (2017).
8. Fisher, M. C., Hawkins, N. J., Sanglard, D. & Gurr, S. J. Worldwide emergence of resistance to antifungal drugs challenges human health and food security. Science 360, 739–742 (2018).
9. Verweij, P. E. et al. The one health problem of azole resistance in Aspergillus fumigatus: current insights and future research agenda. Fungal Biol. Rev. 34, 202–214 (2020).
10. Rhodes, J. & Fisher, M. C. Global epidemiology of emerging Candida auris. Curr. Opin. Microbiol. 52, 84–89 (2019).