Inhibition of Pathogenic Strain of Candida Famata Using Indigenous Fermented Rice Water And Garlic Extract

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Abstract- *In this study, an attempt was made to determine the activity of various fermented rice water extracts as well as ethanolic garlic extracts against a human pathogen fungus Candida famata(Picture 2). The urine sample was collected from the patient and the specific microbe was identified as Candida famata by Vitek 2 system.Candida famatawas isolated and this isolate is studied for antifungal susceptibility pattern using Kirby-Bauer method. Among three different types of diluted fermented rice water and garlic extract samples impregnated discs were used for the activity studies. The antifungal potency of fermented rice water and garlic extract can be maximized by increasing the concentration of the extract. Fermented rice water combined with garlic extract of 100% concentration showed a maximum zone of inhibition against Candida famata.*

Keywords- Isolation, Fermented rice water, Garlic extract, Candida famata, Antifungal susceptibility test.

I. INTRODUCTION

Fermentation is one of the major methods of adding nutritional values to food. The fermented rice also possesses "probiotics" activity. The lactic acid bacteria present in fermented rice breakdown the anti-nutritional factors in the rice resulting in an improved bioavailability of micro-nutrients and minerals iron, potassium and calcium. These activities are enhanced by the phenolic compound which are p-hydroxybenzoic acid derivative , syringic acids and hydroxycinnamics derivatives present in fermented rice. Rice-containing foods are fermented by a mixed culture of microorganisms by spontaneous fermentation and, in the case of beverages, by adding a starter culture. These are prepared in the households or in cottage industries using relatively simple techniques and equipment. In the recent past, there were no verified data on the nutritional, technical, and quality control implications of indigenous rice -based fermented food products in India, the second most populated rice production country in the world (T. Kumaran , 2021)[(1)].

Garlic (*Allium sativum*) the land of which is said as middle and West Asia steps has a place among eldest crop plants. This plant, which is of great medical importance takes place inside many foods especially, meat ones due to its sharp odour, appetizer property and bitter taste and gives flavour to them. Garlic, its calorie value is 140, has 63.8 g water, 28.2 g carbohydrate, 5.3 g protein, 0.2 g oil and 11 g cellulose in its 100 g. Garlic can be consumed as fresh and has also its pills, capsules and extracts. While, it is safe, when taken in careful amounts, it can lacerate stomach, when consumed in excessive amounts (GulsenGoncagul , 2010)[(2)]. Garlic has been used as a medicinal herb for centuries and Louis Pasteur was reputed to be the first to demonstrate the antibacterial effects of garlic and onion extracts. Garlic extract's reported activities include reducing cholesterol, tumor suppressing, and acting as an antifungal, antibacterial, antiviral and anti-parasitic agent. Garlic is widely consumed and is known to be safe. It has been reported that a human would need to eat 20grams of garlic per kilogram body weight to reach toxic levels (Toye J. Ekunsanmi , 2005)[(3)].

In this studies evaluating antifungal effect of fermented rice and Garlic extract have been reported. Antifungal activity of fermented rice water and Garlic extract against *Candida famata* is carried out in this work.

Case report

In this case a 45 years old woman, with a history of CKD (Chronic Kidney Disease),the treatment ContinuousAmbulatory Peritoneal Dialysis (CAPD) has been carried out since two year review of this time she was associated with fever, abdomen pain and bowel irritation. During the hospital visit urine sample was collected and cultured as well as sensitivity was performed and Diagnosed as Urinary tract infection (UTI).

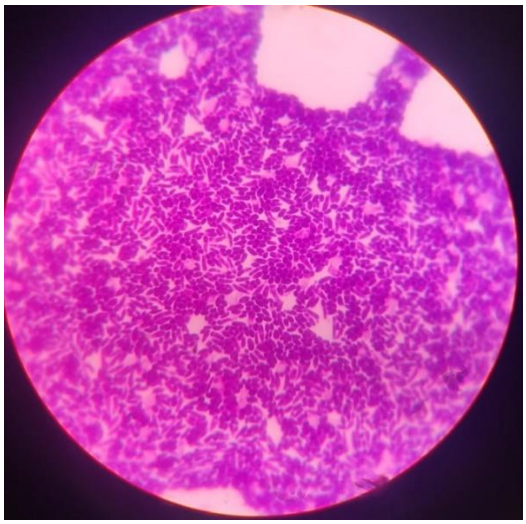
Selection of rice

Three types of rice including White (Ponni rice), Black *(Oryza sativa L.indica)* and Red rice (*Oryza punctata*) (Picture 1) was selected which are having varieties of health promoting macro and micro nutrients, phytochemicals and other functional components during fermentation.

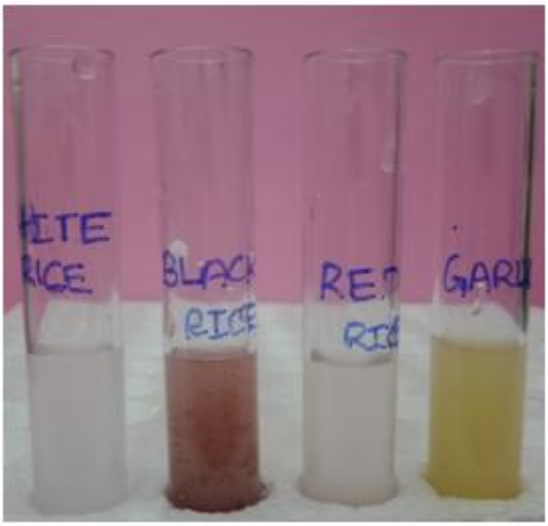
Picture 1: Red Rice White Rice Black Rice

Preparation of fermented rice water

The raw White, Black, Red rice (150gm) was cooked with water for 30 minutes, excess water was drained and allowed to cool at room temperature. The cooked rice (100gm) was soaked in 500 ml of sterile distilled water [rice: water (1:5)] separately and stored in a container. Overnight fermentation was carried out at room temperature. After 24 hours the fermented rice water samples was collected and pipetted out separately into a clean glass beakers.



Picture 2 :*Candida famata*



Picture 3 : Samples

Preparation of garlic extract

The selected garlic cloves were air dried at room temperature -(35° C) for 15 days. After which it was grounded to uniform coarse powder. Ethanol was used as the solvent to extract the bioactive compounds from the Garlic.The ethanol extract were prepared by 100gm each of the dry powdered garlic cloves in 500ml of ethanol at room temperature for 120hours. The extract were filtered after 120hours through a Muslin cloth (Picture 3).

Preparation of discs

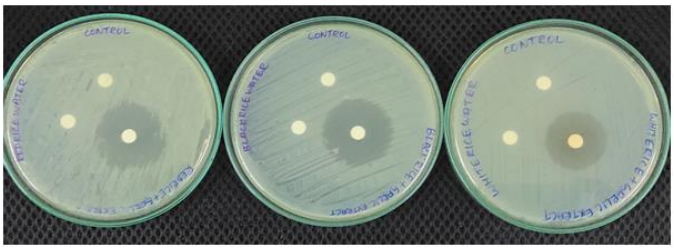
Sterile discs of 6mm diameter (Hi-Media) were loaded with rice water and garlic extracts using pipette (Table 1)

Table 1: Extracts and Concentrations

S.No	Name of Rice	Extracts	Concentration
1	White Rice	Rice Water	20µl
		Rice + Garlic Extracts	10µl + 10µl
		Control	nil
2	Black Rice	Rice Water	20µl
		Rice + Garlic Extracts	10µl + 10µl
		Control	nil
3	Red Rice	Rice Water	20µl
		Rice + Garlic Extracts	10µl + 10µl
		Control	nil

Antifungal susceptibility test

The antifungal activity of fermented rice water and Garlic extract was determined using standard Disc Diffusion Method on Muller Hinton Agar (MHA) plate. Isolated *Candida famata* colonies were mixed with peptone water and incubated at 37ºC for 2 hours. The culture taken with a sterile cotton swab was rolled and rubbed back and forth across the plate. The extracts loaded discs was placed on cultured MHA plate. And the plates were incubated at 37º C for 24 hours. Then the antifungal activity was determined by measuring the diameter of zone of inhibition (Picture 4).



Red Rice Black Rice White Rice

Picture 4 : Antifungal activity results

II. RESULT AND DISCUSSION

Black, White and Red fermented rice extracts, together with ethanolic garlic extract, individually demonstrated antifungal activity against *Candida famata*. The MIC values of fermented rice water extracts and garlic extracts are tabulated below(Table 2)

The present study revealed that fermented rice water along with ethanolic Garlic extract showed good antifungal activity against *Candida famata*. However, the fermented rice water did not show any antifungal effect against*Candida famata*. Antifungal activity of fermented rice water and ethanolic extract of garlic showed that zones of inhibition against *Candida famata* for fermented White rice water + Garlic extract (27mm) , Black rice water + Garlic extract (30mm), Red rice + Garlic extract (28mm) . It is worth mentioning here that fermented black rice water along with Garlic extract showed maximum zone of inhibition.

Table 2: Antifungal activity of fermented rice waters and Garlic extract.

S.No	Name of Rice	Extracts	Zone of Inhibition (mm)
1	White Rice	Rice Water	Nil
		Rice + Garlic Extracts	27 mm
		Control	Nil
		Rice Water	Nil
2	Black Rice	Rice + Garlic Extracts	30 mm
		Control	Nil
3	Red Rice	Rice Water	Nil
		Rice + Garlic Extracts	28 mm
		Control	Nil

The findings of this study show the antifungal activity of fermented extracts of Black, White and Red rice along with garlic extracts against *Candida famata.* The combination of fermented rice water and garlic extract has shown synergistic effects, resulting in increased anti-fungal efficacy. The bioactive components present in fermented rice water extracts and garlic extracts can act in synergy to disrupt fungal growth and cell process, resulting in the observed antifungal effect.

III. CONCLUSION

This study investigated the antifungal activity of fermented rice water extracts along with garlic extract against *Candida famata*. The results demonstrated significant antifungal activity of all three Fermented rice water extracts and Garlic extract suggesting their potential as natural fungal agents.

The findings of this study contribute to the growing body of evidence supporting the therapeutic properties of fermented rice waterand Garlic. The antifungal activity observed may be attributed to the presence of bioactive compounds, such as phenolic compounds, flavonoids, organic acids, and peptides and allicin which are known to possess antimicrobial properties. The use of natural and traditional remedies, such as fermented rice water, could provide alternative options for the treatment of *Candida famata* infections, especially in cases where conventional antifungal drugs are ineffective or unavailable. Moreover, the use of natural products may help mitigate the issue of drug resistance associated with the use of synthetic antifungal agents.From the results, we conclude that fermented rice water extracts and Garlic extract have an effect on*Candida famata.* Further studies can be made on the active molecules of fermented rice water and Garlic extracts responsible for antifungal activity.

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