In-vitro Antibacterial Activity of Sri Lankan Traditional Rice (Oryza sativa L.) Extracts against Bacteria Causing Skin and Soft Tissue Infections

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ABSTRACT

The aim of this study was to evaluate the potential antibacterial activity of the extracts of selected parboiled and un-parboiled Sri Lankan traditional rice against bacteria causing skin and soft tissue infections. Methanolic extracts of five Sri Lankan traditional rice including Kalu Heenati, Pokkali, Rathdal, Kahawanu and Sudu Murunga were used for in vitro antibacterial analysis. Antibacterial activity was evaluated in both the parboiled and un-parboiled rice samples. Concentrations of rice extracts used for the assays were 1000 µg/mL and 2000 µg/mL from the each extract. The antibacterial activity was evaluated against common bacteria causing skin and soft tissue infections (Staphylococcus aureus (ATCC 25923), Pseudomonas aeroginosa (ATCC 27853), Escherichia coli (ATCC 25922) and three clinical isolates of Methicillin resistant staphylococcus aureus (MRSA)) by well diffusion method and viable colony count technique. According to the results, methanolic extracts of all the selected Sri Lankan traditional rice varieties exhibited a potent antibacterial activity against Staphylococcus aureus with minimum bactericidal concentrations (MBC) of 200 µg/mL (minimum incubation time (MIT); 30 min) for Rathdal, 200 µg/mL (MIT; 60 min) for Kalu Heenati, Sokkali and Kahawanu, and 2000 µg/mL (MIT; 60 min) for Sudu Murunga. The largest inhibition zones were observed in the extracts of Kalu Heenati and Rathdal. Kalu Heenati, Pokkali and Rathdal showed an efficacious inhibitory effect against MRSA (MBC; 200 µg/mL, MIT; 60 min), whereas the highest inhibitory activity was observed for Rathdal. Only the extract of Kalu Heenati was slightly active against Pseudomonas aeroginosa.

None of the rice extracts studied showed an antibacterial activity against Escherichia coli.

Reduction and loss of antibacterial activity was detected in rice after subjected to parboiling. In conclusion, Sri Lankan traditional rice varieties with red pericarp are good sources of antibacterial compounds mainly against Gram positive bacteria. Methanolic extract of Rathdal and Kalu Heenati showed a high efficacious inhibitory effect against skin and wound pathogens of Staphylococcus aureus and MRSA.

KEY WORDS: Traditional rice; Parboiled; Antibacterial activity; Skin and soft tissue infections

1. INTRODUCTION

Bacterial skin and soft tissue infections (SSTIs) are some of the most common infections which can occur from infants to older adults. Clinical manifestations of SSTIs encompass a wide spectrum of clinical presentations ranging from mild superficial epidermal infections to life threatening rapidly progressive infections. This includes cellulitis, erysipelas, impetigo, ecthyma, erythrasma, bacterial folliculitis, furuncles, carbuncles, and abscesses, hidradenitis suppurativa, surgical site infection, pressure ulcers and venous and arterial ulcers, necrotizing skin and soft tissue infections,ournier gangrene and clostridialmyonecrosis. Bacterial SSTIs involves bacterial invasion of the layers of the skin and underlying soft tissues. Gram positive Staphylococcus aureus and Streptococcus pyogenes and Gram negative Pseudomonas aeruginosa and Escherichia coli are the most commonly identified causes of SSTIs. Multidrug resistant Methicillin resistant staphylococcus aureus (MRSA) strains are being identified more frequently as the causative agents for SSTIs. In recent years, these infections have become more difficult to treat, as pathogens have developed resistance to many different types of antibiotics. Despite drugs being...
ABSTRACT
The study was conducted to evaluate the effects of parboiling treatment on the minerals and heavy metals of six Sri Lankan traditional rice varieties; Kalu heenati, Pokkali, Gurusinghe wee, Kahawanu, Sudu murunga, and Unakola samba. Metals were determined by using ICP-AES and AAS. Parboiling can be considered as a suitable rice processing method for Pokkali and Kahawanu and not for Kalu heenati and Unakola samba in order to furnish the recommended daily intake of the micronutrients. Un-parboiled Kalu heenati and both un-parboiled and parboiled Kahawanu can be considered as the most suitable rice varieties for daily consumption in order to maintain the recommended daily intake of iron. It was identified that Pokkali rice contained the highest iron content of 29.5 mg/100 g. This amount has further increased by 66.7% after parboiling. Therefore both parboiled and un-parboiled Pokkali can be considered as the best dietary supplement among these rice varieties for iron deficiency and for pregnant mothers. Selected heavy metals including As, Cd, Pb and Cu were not detected in the selected Sri Lankan traditional rice varieties.

Key words: Heavy metals, Parboiling, Sri Lanka, Traditional rice varieties

INTRODUCTION
In ancient times, over 2000 different varieties of rice are said to be grown all over the Sri Lanka (Amarasingha et al 2013). With the current trend of global awareness of the benefits of organic food and medicinal properties of Sri Lankan traditional rice varieties (STRV), and nowadays need of traditional rice is becoming very high. Organic farming relies on ecofriendly techniques which preserve the nutritional values and sustainability of the environment. Almost all the STRV were organically farmed, which relies on techniques such as crop rotation, green manure, compost, biological pest control and depends on ancient irrigation systems for a sustained water supply. The trend of organically farmed STRV is becoming popularized as a result of the negative impact of agrochemicals and fertilizers to the environment and human health.

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උපයු ජනපතියට පිළිමි ගේ මොදුමක් කිසියම් නිවේදනය කෙරේ. මේ කාලය දකුණු අත්නමේ ඒක්ක පැහැදිලි ක්‍රේඩියන් මූලික නිර්මාණය කරන ලද අත්තාන්තික නිර්දේශයක් ඉහළ කියන්නේ. එක්සත් කුමක් නිර්දේශ කිරීම මෙය ඔබට නිළියේමකු ඒක්ක පැහැදිලි ක්‍රේඩියන් නිර්මාණය කරන නිපදනයක් නිසා පැහැදිලි නිර්මාණය කරන්නේ. එකක් නිර්දේශ කිරීම ඔබට නිළියේමකු ඒක්ක පැහැදිලි ක්‍රේඩියන් නිර්මාණය කරන නිපදනයක් නිසා පැහැදිලි නිර්මාණය කරන්නේ.

උපයු ජනපතියට පිළිමි කාපායෙකුගේදාගේ මොදුමක් කිසියම් නිවේදනය කෙරේ. මේ කාලය දකුණු අත්නමේ ඒක්ක පැහැදිලි ක්‍රේඩියන් මූලික නිර්මාණය කරන ලද අත්තාන්තික නිර්දේශයක් ඉහළ කියන්නේ. එක්සත් කුමක් නිර්දේශ කිරීම ඔබට නිළියේමකු ඒක්ක පැහැදිලි ක්‍රේඩියන් නිර්මාණය කරන නිපදනයක් නිසා පැහැදිලි නිර්මාණය කරන්නේ. එකක් නිර්දේශ කිරීම ඔබට නිළියේමකු ඒක්ක පැහැදිලි ක්‍රේඩියන් නිර්මාණය කරන නිපදනයක් නිසා පැහැදිලි නිර්මාණය කරන්නේ.