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Nutritional composition and health related functional properties of *Eleusine coracana* (Finger Millet)

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Abstract

Nutritional composition, antioxidant activity, alpha amylase inhibitory activity and fermentation ability of Rawana and Oshada FM varieties were measured against Basmati and BG-300 rice varieties. The results showed that both soluble and insoluble dietary fiber (DF) contents were higher ($P < 0.05$) in Rawana and Oshada than Basmati and BG-300. Moreover, soluble and insoluble DF contents of Oshada were higher ($P < 0.05$) than Rawana. Total flavonoid content (TFC) of Rawana was similar to Basmati and BG-300. However, Oshada had the highest TFC. Total phenolic contents (TPC) of both FM varieties were higher ($P < 0.05$) than both rice varieties. Oshada had a higher ($P < 0.05$) TPC than Rawana. Both FM varieties showed a higher ($P < 0.05$) 2, 2-diphenyl-1-picrylhydrazyl (DPPH) scavenging activity than BG-300 and Basmati. Similarly, 2, 2'-azino-bis-3-ethylbenzothiazoline-6-sulphonic acid (ABTS) scavenging activity was higher ($P < 0.05$) in both FM varieties than Basmati and BG-300. Furthermore, ABTS scavenging activity was higher ($P < 0.05$) in Oshada than Rawana. Alpha amylase inhibitory activity of Rawana and Oshada were higher ($P < 0.05$) than Basmati and BG-300. However, the IC_{50} values of both FM varieties were greater ($P < 0.05$) than acarbose which is a drug used to treat type II diabetes. The results of the microbial fermentation study revealed that Rawana and Oshada produced a higher amount of hydrogen and carbon dioxide than rice varieties during the incubation at 39°C with unadapted caecal microflora. Therefore, these results indicate that both FM varieties, particularly Oshada variety has more beneficial nutritional and health related protective effects than Basmati and BG-300 rice varieties *in vitro*.

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Keywords: *Eleusinecoracana*; *Oryza sativa*; Functional properties; Nutritional composition; *in vitro*

1. Introduction

Cereals are important sources of dietary fiber, minerals and phytochemicals. Rice is the staple food in most Asian countries while finger millet is widely consumed by poor communities. However, finger millet has been known as a therapeutic food since ancient times for diabetes.

Cardiovascular diseases, cancers, chronic respiratory diseases and diabetes are the major non-communicable diseases (NCD) which cause 63% of global deaths annually. In Sri Lanka, deaths due to NCDs account for 75% in year 2014.

It is well known that nutrition plays a vital role in the physical and mental wellbeing of human. Phytochemicals such as polyphenolic compounds in foods possess antioxidant effects which lead to reduce the risk of cancer and cardiovascular diseases. Moreover, phytochemicals act as carbohydrate hydrolyzing enzyme inhibitors¹. Dietary fibers are partially or completely fermented by the microorganisms in the colon. Fermentation of soluble DF produces short chain fatty acids. Propionate acts as an inhibitor of cholesterol synthesis. Butyrate is the most important short chain fatty acid which provides energy to the colonic epithelium².

Therefore, the scope of present study was to determine the nutritional composition, antioxidant activity, alpha amylase inhibitory activity and fermentation ability of FM compared to rice in order to encourage its future applications in food industry as a functional food.

2. Materials and Methods

Dried seeds of pure Oshada and Rawana varieties of FM were obtained from field crop research and development institute, Mahailuppallama. Basmati and BG-300 varieties of rice were acquired from local market and rice research institute, Bathalagoda respectively. Dried whole grains of Rawana, Oshada, Basmati and BG-300 were cleaned, ground and sieved to obtain whole meal flour.

Proximate composition, insoluble and soluble dietary fiber contents were determined³.

Total phenolic content and total flavonoid content were determined. 2,2-Diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging assay and 2,2-Azinobis 3 ethyl benzothiazoline 6 sulfonic acid (ABTS) cation radical scavenging assay were conducted.

Alpha amylase inhibitory assays were conducted for all the four samples³. Microbial fermentation activity was determined by incubating the samples with unadapted caecal microflora. The bacteria for the fermentation were harvested from caecal contents of swine. 0.5 g from each sample was taken into 15 mL vacutainer tubes and 8 mL of bacteria suspension was inoculated and allowed to incubate at 39 °C. Hydrogen and carbon dioxide production at 0, 2, 4, 8, 18, 20 and 24 hours were analyzed using GC-9 AM Shimadzu Gas Chromatograph with a capillary column at 130°C temperature.

The experimental design of the study was a complete randomized design (CRD). Treatment means were separated using General Linear Model procedure and means were separated by Least Significant Difference method at $\alpha=0.05$. Data were Analyzed using SAS software package (SAS Institution Inc., 2003, Cary, USA).

3. Results, Discussion, Conclusion and Recommendations

Table 1. Nutritional composition, DF, Antioxidant constituents, Antioxidant activity, Alpha amylase inhibition and Gas production of Oshada, Rawana, BG-300 and Basmati.

		Oshada	Rawana	BG-300	Basmati
Nutritional composition	Dry matter (%)	97.68±0.54 ^a	98.18±0.63 ^a	95.75±0.34 ^b	95.97±0.24 ^b
	Ash (%)	2.01±0.22 ^a	1.61±0.14 ^b	2.31±0.44 ^a	0.40±0.14 ^c

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