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Proximate composition, calorie content and heavy metals (As, Cd, Pb) of selected Sri Lankan traditional rice (*Oryza sativa* L.) varieties

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Abstract

There are over 2000 Sri Lankan traditional rice varieties (STRV) known to have existed in Sri Lanka. But only about 30 varieties have been subjected to scientific research and proven to have high nutritional and medicinal properties. Therefore, uncovering the nutritional values of the rest of the STRV has become very important. Standard methods of AOAC nutritional guidelines were used to obtain the proximate composition of six STRV; Kalu heenati (KH), Pokkali (PK), Gurusinge wee (GW), Kahawanu (KW), Sudu murunga (SM) and Unakola samba (US). Heavy metals (As, Cd and Pb) of these STRV were determined by using an ICP-AES.

The moisture content of selected STRV ranged from 11.2±0.2 % - 11.9± 0.2 %. The results showed that crude protein content of the selected STRV was in the range of 9.7±0.3 % - 11.0±0.4 % KH had the highest crude protein content while SM had the least. In relation to crude fiber content, SM had the highest percentage (1.14±0.04 %), while the lowest (0.92±0.03 %) was recorded for KH. Crude fat content of all the STRV ranged from 2.3±0.0 % - 2.9±0.1 %. US had the highest crude fat content while PK and GW similarly had the least. PK had the highest ash content of 1.9±0.1 % and the least ash content of 1.2±0.0 % was shown by SM. Carbohydrate content of the selected STRV ranged from 72.0±0.1 % - 76.3±0.1 %. Calorie contents of the selected STRV were in the range of 352.3-372.8 Kcal/100 g and the highest value was reported for KH. The study reveals that the levels of As, Cd and Pb were below the limit of quantification (LOQ: Pb-0.04 ppm, As-0.02 ppm and Cd-0.01 ppm). Therefore, consumption of STRV may not cause metal toxicity due to Pb, Cd or As. This reveals that STRV show high nutritional values than those values reported for the improved rice.

Keywords: Sri Lankan traditional rice varieties; Proximate composition; Heavy metals

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1. Introduction

Rice is the main staple food as well as the highest priority crop in Sri Lanka and other parts of the Asia. In ancient times, over 2000 different varieties of rice are said to be grown all over Sri Lanka¹. Sri Lankan traditional rice varieties (STRV) show high nutritional value, different texture, appearance, aroma and taste compared to improved rice varieties. Studies done for twenty five traditional rice varieties showed bioactivities such as antioxidant, anti-amylase, anti-glycation and anti-inflammatory properties and higher nutritional composition compared to improved varieties².

Each STRV has basic nutritional importance that can be assessed by their content of protein, carbohydrates, fats, ash etc. Thus, understanding of the overall composition and nutritional values of these STRV is essential. There is a developing trend in organic farming of SRTV for preserving the nutritional values and sustainability of the environment. Organic farming relies on techniques such as crop rotation, green manure, compost, and biological pest control. Therefore, considering the cost of fertilizer and pesticides as well as their harmful effects to humans and nature, cultivation of traditional rice varieties is definitely worth of having a better look. There are some claims that rice consumed in Sri Lanka is contaminated with some toxic heavy metals including arsenic and cadmium in recent years³. Several cases of human disease including Chronic Kidney Disease of unknown etiology (CKDu), disorders, malfunction and malformation of organs due to metal toxicity have been reported³. Therefore, studying the nutritional values and heavy metal contents of the rest of the STRV has become very important since there are over 2000 different STRV of which their nutritional values are still not known. This paper focuses the determination of nutritional values and heavy metals of Kalu heenati (KH), Pokkali (PK), Gurusinghe wee (GW), Kahawanu (KW), Sudu murunga (SM) and Unakola samba (US) as they are popularizing traditional rice among consumers.

2. Methodology

2.1 Preparation of paddy

Five traditional varieties of long grain rough rice consisting of KH (red), PK (red), GW (red), SM (white) and US (white) and one short grain rough rice variety consisting of KW (white), grown under organic farming (Fertilizers-cow dung, animal bones, hay, plant juices, compost; Biological pest control methods; Soil parameters- pH -5.4, salinity-0.03 dS/cm, soil colour-pale brown, soil moisture-49% , temperature-29 °C) were used for the study. Rough rice samples were packed in polyethylene bags and stored in a refrigerator at 10 °C.

2.2 Preparation of rice

Raw paddy was dehulled (Satake THU 35B), ground and passed through a 60-mesh sieve to obtain a homogeneous fine powder.

2.3 Proximate analysis

Uniform fractions of rice flour were used to analyze moisture, protein (%N x 6.25), fat, ash, fiber and carbohydrate by the methods of AOAC (2002).

2.4 Analysis of Metals

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