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Research article

Comparison of general nutritional composition of wild rice *Oryza rhizomatis* D.A. Vaughan and the commercial variety Bg352

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Abstract: *Oryza rhizomatis* is an endemic wild rice species of Sri Lanka. Numerous studies on nutritional attributes on several wild rice species revealed that some wild rice species contain desirable nutritional qualities than the commercial rice varieties. A preliminary investigation was carried out to compare general nutrition composition of *O. rhizomatis* seeds and the popular commercial variety Bg352 seeds (*Oryza sativa* L.). Carbohydrate, protein, fat, moisture and ash content of the seeds of this wild rice species was estimated by nutrient content analysis according to the standard protocols recommended by the Association of Analytical Communities (AOAC), USA. An unpaired *t*-test indicated that there was a significant difference between nutritional compositions of two samples at 0.05 significant level (*P* value < 0.05). According to the mean values, the mean protein content of 12.300 g/100 g, carbohydrate content of 69.354 g/100 g and the fat content of 2.528 g/100 g was found in *O. rhizomatis*. Whereas the moisture and ash content of *O. rhizomatis* is lower than in cultivated variety Bg352.
Keywords: *Oryza rhizomatis* - Bg352 - Nutritional composition - Protein - Carbohydrate - Fat.

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INTRODUCTION

Rice is the staple food of Sri Lankan. *Oryza rhizomatis* D.A. Vaughan is an endemic perennial wild rice species of Sri Lanka (Liyanage *et al*. 2002) with some desirable characteristic features as resistance to biotic and abiotic stresses. *O. rhizomatis* is adapted to specific areas and highly resistant to drought, temperature, soil type and water quality. *O. rhizomatis* has the best adaptability to survive in the adverse environmental condition (drought) of dry zone because of its thick root system and underground branched rhizome. *O. rhizomatis* is the only species which has the branched underground rhizome and this feature makes it a perennial plant (Tao *et al.* 2001).

Several studies confirmed that most of the wild rice species have higher nutritional value and can be considered as food source comparable to commercial cultivars (Kennedy & Burlingame 2003, Anderson 1976). Even though the yield of *O. rhizomatis* is low, the objective of this study was to evaluate the nutritional value of *O. rhizomatis* grains and compared to cultivated high yielding rice (*Oryza sativa* L.) Bg352 with the aim of incorporating this wild rice species in crop improvement programmes in future.

Bg352 seeds were selected as the control as Bg352 is a popular commercial variety with white intermediate bold grains. It is cultivated in 16.63% of the total extent of rice cultivation of Sri Lanka (Jeyawardena *et al.* 2010).

MATERIAL AND METHODS

Plant materials

O. rhizomatis and Bg352 seeds were collected from Rice Research and Development Institute (RRDI) Sri Lanka. Weight of each sample was recorded, before and after milling the seeds. Four replicates from Bg352 and *O. rhizomatis* were used in this study.

Moisture content

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The moisture content was measured according to the AOAC method 925.10 (AOAC, 1990). An empty dish and the lid were dried in an oven at 105°C for 3 hrs and transferred to desiccators until cool and weight was recorded. Subsequently seed sample was placed in the dish and oven dried at 105°C until a constant weight is reached. After drying, the dish with partially covered lid was transferred to a desiccator for cooling and the weight of the dish was recorded as above.

Ash content

The ash content was calculated according to AOAC method 923.03(AOAC, 1990). Crucible and the lid were placed in the furnace at 550ºC for overnight to ensure that impurities on the surface of crucible are burned off. Crucible was cooled in the desiccator for 30 min and weight was recorded. Weight of sample and crucible was then measured (before ignition) again. Crucible with the sample was heated over low Bunsen flame with half covered lid and placed in a furnace until fumes are no longer produced. Crucible was then heated at 550ºC for overnight, cooled in a desiccator and the weight was recorded.

Crude fat content

Crude fat content was measured according to AOAC method 996.06 (Eromosele & Eromosele, 1994). A flask and the lid were placed in an incubator at 105°C overnight to ensure the weight of the flask is stable. Weighed sample was filled into extraction thimble and transferred into Soxhlet apparatus. Petroleum ether (250 ml) was filled into the flask and heated for about 14 hrs (heat rate was 150 drops/min). Solvent was evaporated by using a vacuum condenser. Flask was incubated at 80-90°C until the solvent is completely evaporated and the flask was completely dried. Then the flasks were transferred to the desiccator for cooling and the residue weight was recorded.

Protein content

Protein content was measured according to AOAC method 984.13, A-D (AOAC, 1990). Weighed sample was placed in a digestion flask. Then Kjedahl catalyst (5 g) and of concentrated H_2SO_4 (200 ml) was added. A separate flask was prepared as the blank by adding above chemicals except the sample. Flask was placed in an inclined position and heated gently until frothing ceases and boiled briskly until the solution was clear. Then flask was allowed to cool and 60 ml of distilled water was added. Flask was connected to digestion bulb with tip of condenser immersed in standard acid (H_2SO_4) and 5–7 drops of mix indicator in the receiver. Condenser was rotated to mix the content thoroughly and heated until all NH_3 was distilled. Then the receiver was removed and titrated with standard NaOH solution.

Carbohydrate content

Carbohydrate content was calculated by the difference after subtracting protein, fat, moisture and ash.

Statistical analysis

Statistical analysis was performed using SPSS version 14 statistical software. An unpaired *t*-test was used to compare the nutrient content of *O. rhizomatis* with Bg352.

RESULTS AND DISCUSSION

Nutritional aspect of endemic rice species *O. rhizomatis* is not reported yet. To consider *O. rhizomatis* as a possible candidate for new rice varietal development, it is essential to understand the nutritional value of the seeds. Therefore investigation was carried out to compare the nutrient content of this wild rice species with cultivated rice (Table 1).

Table 1. Comparison of general nutritional composition between wild rice species and cultivated variety.

Component	Wild species (g/100 g)	Cultivated variety (g/100 g)	*P* value*
Moisture	14.716 (± 0.240)	13.167 (±0.335)	<0.0001
Ash	1.137 (± 0.105	1.610 (± 0.072)	0.001
Fat	2.528 (± 0.064)	3.068 (± 0.094)	<0.0001
Protein	12.300 (±0.123)	6.550 (± (0.087)	<0.0001
Carbohydrate	69.354 (± 0.137)	75.611 (±0.250)	<0.0001

An unpaired *t*-test indicated that there was a significant difference between nutritional compositions of two samples at 0.05 significant level (*P* value < 0.05). According to the mean value, the mean protein content of *O. rhizomatis* was 12.300 g/100 g. It is approximately two times as high as the cultivated variety Bg352 (6.550 g/100 g) whereas Bg352 contained comparatively higher amount of carbohydrate (75.611 g/100 g) than *O. rhizomatis* (69.354 g/100 g). *O. rhizomatis* has relatively low fat content (2.528 g/100 g) than Bg352 (3.068 g/100 g). The moisture and ash content of Bg352 were higher than *O. rhizomatis*.

CONCLUSION

O. rhizomatis possesses some desirable nutritional attributes. Therefore, this species could be considered as a protein rich food source with low fat and carbohydrate content. However, extensive studies on total nutritional content including mineral and vitamin content is suggested to conclude its use as a food source.

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