Nutritional Composition and Palatability Evaluation of Some Selected Commercially Available Local Brown Rice in Kelantan Prepared By Different Types of Cooking Methods

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ABSTRAK

Kini, sebanyak 2.2 juta ton nasi putih diambil oleh rakyat Malaysia setiap tahun. Pengambilan nasi putih yang tinggi adalah berkaitan dengan penyakit kencing manis (T2DM), dislipidemia, strok ischemik dan penyakit kardiovaskular. Beras perang merupakan makanan bijirin yang mengandungi nilai nutrisi yang tinggi. Kajian mendapati penggantian nasi putih dengan makanan bijirin penuh termasuk nasi perang dikaitkan dengan pengurangan risiko T2DM, tahap insulin dan tahap glukosa. Walau bagaimanapun, pengambilan nasi perang adalah rendah di Malaysia kerana sifat-sifat sensori dan tekstur yang tidak disukai. Kajian ini telah dijalankan untuk menentukan komposisi pemakanan dan tahap kesedapan bagi 3 jenis beras perang yang disediakan dengan 3 kaedah masak berbeza. Sampel beras dimasak dengan kaedah mendidih, mereneh atau mengukus. Sampel-sampel ini kemudiannya dianalisis untuk menentukan nilai kelembapan, abu, lemak kasar, protein kasar, dan karbohidrat. Penilaian deria dan analisis profil tekstur telah dijalankan untuk menilai tahap kesedapan nasi perang. Nasi perang mengandungi sebanyak 72.82% -78.38% kelembapan, 1.42% -2.65% lemak, 0.47% -1.44% abu, 8.05% -9.31% protein, dan 2.67% -4.79% jumlah serat (kaedah mengukus). Nilai pemakanan nasi perang adalah lebih tinggi daripada nasi putih (0.03% -0.08% lemak, 0.11% -0.15% abu, 6.63% -6.75% protein, 0.15% jumlah serat) ($p < 0.05$) kecuali nilai karbohidrat (10.04% -14.94 %) adalah lebih rendah daripada nasi putih (17.75% -28.2%) ($p < 0.05$). Berbanding dengan nasi perang yang dididih (75.37% -78.38% kelembapan, 0.82% -1.21% abu, 8.61% -9.31% protein, 1.42% -2.15% lemak, 10.04% -12.69% karbohidrat), nasi perang yang dikukus mengandungi nilai kelembapan (72.82% -73.68%) yang lebih rendah, kandungan abu (1.11% -1.36%) dan protein (8.05% -

8.92%) yang setanding, tetapi kandungan lemak (2.34% -2.65%) dan karbohidrat (13.47% -14.94%) yang lebih tinggi. Kaedah memasak seperti tempoh memasak, suhu memasak, nisbah air dengan beras (W/R) serta komposisi kimia beras seperti kanji, nilai kelembapan dan protein menyumbang kepada kepelbagaian tekstur nasi. Berbanding dengan kaedah mendidih, kaedah mengukus menghasilkan tekstur nasi perang R3 (10.77kg vs 4.22kg) dan R4 (11.53kg vs 4.62kg) yang lebih keras, R2 dan R3 (1.18kg/s vs-0.56kg/s) yang kurang melekit (1.16kg/s vs-0.71kg/s), R2 yang lebih kohesif (5.27kg vs 4.64kg) manakala R4 yang kurang kohesif (3.77kg vs 5.0kg). Kekerasan yang optimum, tahap kohesif dan kelekitan yang rendah serta nilai jelikitan yang tinggi membolehkan R2 dan R3 yang dikukus mencapai skor tekstur yang lebih tinggi (4.02 dan 3.86) daripada nasi yang dididih ($p < 0.05$). Sampel R3 dan R4 yang dikukus lebih keras dan kurang melekit mendapat skor tinggi dan ketara dalam atribut rupa ($p < 0.05$) berbanding dengan sampel beras yang dididih. Walau bagaimanapun, hanya R3 yang dikukus (4.28) mempunyai tahap penerimaan yang lebih tinggi daripada R3 yang dididih (3.28) ($p < 0.05$). Tahap penerimaan panel terhadap R4 yang direneh, R3 dan R4 yang dikukus adalah setanding dengan nasi putih ($p > 0.05$). Secara ringkasnya, jenis kaedah memasak, komposisi kimia dan jenis beras memberi kesan terhadap sifat tekstur dan sensori nasi perang. Kaedah mengukus dan mereneh disarankan untuk memasak beras perang. Beras perang yang sederhana keras dan tinggi serat (R3) diikuti beras perang yang keras dan tinggi serat (R4) disaran sebagai makanan ruji alternatif untuk menggantikan beras putih kerana mengandungi komposisi makanan yang tinggi dan setanding enak dengan beras putih.

ABSTRACT

Presently, about 2.2 million tons of white rice is consumed by Malaysians every year. Such high white rice intake is associated with type-2 diabetes mellitus (T2DM), dyslipidemia, ischemic stroke and cardiovascular diseases. Brown rice is high nutritional value whole grain. Substituting whole grains including brown rice to white rice is associated with decrease in the risk of T2DM, lowered insulin level and postprandial glucose level. However, brown rice intake is low in Malaysia due to undesirable sensory and texture properties. The present study were conducted to determine nutritional composition and palatability levels of 3 types of brown rice varieties prepared with 3 different cooking methods. Rice samples were either cooked by boiling, simmering or steaming methods and analyzed for moisture, ash, crude fat, crude protein, and carbohydrate content. Sensory evaluation and texture profile analyses were also conducted to assess palatability level of cooked brown rice. Cooked brown rice had 72.82%-78.38% of moisture, 1.42%-2.65% of fat, 0.47%-1.44% of ash, 8.05%-9.31% of protein, and 2.67%-4.79% of total dietary fiber (steaming method). These nutritional values were higher than cooked white rice (0.03%-0.08% of fat, 0.11%-0.15% of ash, 6.63%-6.75% of protein, 0.15% of total dietary fiber) ($p<0.05$) except carbohydrate (10.04%-14.94%) which was lower than cooked white rice (17.75%-28.2%). As compared to boiled brown rice (75.37%-78.38% of moisture, 0.82%-1.21% of ash, 8.61%-9.31% of protein, 1.42%-2.15% of fat, 10.04%-12.69% of carbohydrate), steamed brown rice contained lower water level (72.82%-73.68%), comparable concentration of ash (1.11%-1.36%) and protein (8.05%-8.92%) but higher fat (2.34%-2.65%) and carbohydrate (13.47%-14.94%) content. Recent studies reported rice variety, cooking properties such as

cooking duration, cooking temperature, water uptake (W/R) ratio as well as chemical composition of rice like starch, water level and protein contributed to diversity of cooked rice texture. As compared to boiling method, steam cooking produced firmer gelatinized rice of R3 (10.77kg vs 4.22kg) and R4 (11.53kg vs 4.62kg), less sticky R2 (-1.16kg/s vs -0.71kg/s) and R3 (-1.18kg/s vs -0.56kg/s), more cohesive R2 (5.27kg vs 4.64kg) but less cohesive R4 (3.77kg vs 5.0kg). Optimum hard, less cohesive, less sticky and gummier properties of steamed R2 and R3 achieved significantly higher texture score (4.02 and 3.86) than the boiled one in sensory test ($p<0.05$). Firmer and less sticky steamed R3 and R4 obtained significant high score in appearance attribute ($p<0.05$) compared with boiled one. However, only steamed R3 (4.28) was appeared to be overall preferred than boiled R3 (3.28) ($p<0.05$). In sensory evaluation, simmered R4, steamed R3 and R4 were comparable to white rice ($p>0.05$) in which white rice was highly accepted by panelists. In summary, different types of cooking methods, chemical composition of rice and rice varieties affected texture and sensory properties of cooked brown rice. Steaming and simmering techniques are recommended methods in cooking brown rice. Medium hard and high fiber brown rice (R3) followed by hard and high fiber brown rice (R4) are recommended as an alternative staple food to replace white rice as they contain higher nutritional composition and comparably palatable as white rice.