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SELECTION OF RICE VARIETIES SUITABLE FOR RICE BASED FOOD PRODUCTS

By

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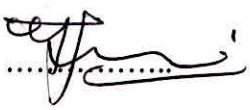
The work described in this thesis was carried out by me under the supervision of Mrs. Damitha Rajapaksa and Prof. K.K.D.S Ranaweera and a report on this has not been submitted in whole or in part to any University or any other institution for another Degree/Diploma.



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We certify that the above statement made by the candidate is true and that this thesis is suitable for submission to the University for the purpose of evaluation.

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ABBREVIATION

°C – Degree Celsius

µm – micro meter

a^* - red-green colour

AACC – American Association of Cereal Chemists

AC – Amylose content

AOAC – Association of Official Analytical Chemists

AP – Amylopectin

At – Ambalantota

b^* - yellow-blue colour

Bg – Bathalagoda

BU – Brabender units

Bw – Bombuwala

CE - Cross-sectional expansion

CIE – International Commission on Illumination

CMC – carboxymethylcellulose

Da – Dalton

DDT - Dough development time

DOM - Degree of milling

DPn – Degree of polymerization

E – Energy

ER (%) – Elastic recovery

F – Resistant to extension

F (%) – Firmness

GC – Gel consistency

GO - glucose oxidase

GT – Gelatinization Temperature

HPMC – Hydroxypropyl methyl cellulose

HRW – Hard red winter

HTST – High temperature short temperature

IRRI – International Rice Research Institute

L – Extensibility

L^* - Brightness

Ld – Labuduwa

LE – Longitudinal expansion

MC – Methylcellulose

OIA – Oil Absorption index

PS 50 – Median particle size

RMS – Raw Material Specification

RVA – Rapid Visco Analyzer

SLSI – Sri Lanka Standards Institution

SLV – Specific loaf volume

Tg – Glass transition temperature

Tm – Enthalpy of glass melting endotherm

WAI – Water absorption index

WSI – Water solubility Index

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ABSTRACT

Rice (*Oryza sativa* L.) is the staple food of Sri Lanka and achieved self sufficiency in rice production. Diversification of rice based product will enable the consumer to have a wide range of products. A wide range of rice varieties are being cultivated under different agro-climatic conditions in Sri Lanka. These different varieties having compositional differences, contribute to the diversity of physicochemical properties. A study was carried out to select the suitable rice varieties for manufacturing rice based food products such as bread, noodles and extrudates.

Popularly grown Sri Lankan rice varieties namely Bg 300, Bg 352, Bg 403, Bg 94-1, Ld 356, Bw 272-6b, At 405 and At 306 were used for the present study. Physicochemical properties of the rice varieties and the quality characteristics of rice noodles, rice bread and rice extrudates were investigated.

Physicochemical properties of rice had shown a wide variation among different rice varieties. Amylose content (AC) was high in polished rice than brown rice irrespective of the variety. AC of polished rice ranged from 21.49±1.468 in At 405 to 36.93±0.346 % in Bg 94-1. Amylograph pasting properties of rice varieties showed a significant ($p<0.05$)

variation for all the pasting parameters. Protein content was ranged from 6.84±0.199 in Bg 94-1 to 11.18±0.219 in Ld 356.

Rice noodles were prepared by pre gelatinizing the dough followed by cold extrusion. Cooking loss of rice noodles was high in At 405 (19.17±3.503 %), but it was low in Bg 403 (9.19±0.327%). Tensile strength of noodles was significantly ($p<0.05$) high in Bg 352 (16.7±3.37 g) whereas it was significantly ($p<0.05$) low in At 405 (8.0±1.72 g). Overall acceptability of rice noodles from At 405 had the significantly ($p<0.05$) lowest score and rice noodles from Bg 300 had significantly ($p<0.05$) higher value. AC had significant correlation with cooking loss, swelling ratio, tensile strength, extensibility and elastic recovery at $p<0.05$.

Incorporation of different rice varieties at 30 % level into wheat flour had a significant ($p<0.05$) variation in physical dough properties, physical bread properties and sensory attributes of bread. Rice variety Bg 352 incorporated bread had the significantly ($p<0.05$) highest specific loaf volume (5.22±0.108 g/ml) and lowest firmness (6.52±0.299 N).

Rice extrudates were prepared in co-rotating, fully intermeshing twin screw extruders. Wide variation in extrudate properties were observed among rice varieties. Rice variety Bg 352 and Bg 300 had greater puffing during extrusion. Rice varieties from Bathalagoda exhibit low WSI and high WAI. AC significantly correlated negatively with density ($r=-0.365$, $p<0.01$), WSI ($r=-0.522$, $p<0.001$) and FAI ($r=-0.352$, $p<0.05$) and positively with

WAI ($r=0.569$, $p<0.001$). Protein content had significant effect on WSI and WAI. Amylograph pasting properties also had a significant effect on rice extrudate properties.

The amylose content was the major factor affecting the quality characteristics of rice based products, even though the Amylograph pasting properties showed significant differences Two wide grown rice varieties, namely Bg 300 and Bg 352 showed overall best performance for making rice noodles, rice bread and rice extrudates. Also other rice varieties, namely Bg 94-1, Bg 403 and At 403 also preferred in making such products.