

**Modification of rice flour from four
selected traditional paddy varieties for
fortification of bread loaf**

by

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varieties for fortification of bread loaf**

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DECLARATION

The work described in this thesis was carried out by me under the supervision of Prof. K. B. Wijsekara (Department of Science & Technology, Uva Wellassa University) and Prof. S. B. Navarathne (Department of Food Science & Technology, University of Sri Jayewardenepura) and a report on this has not been submitted in whole or in part to any university for any other Degree/Diploma.

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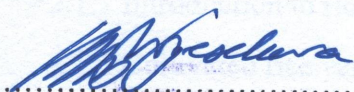
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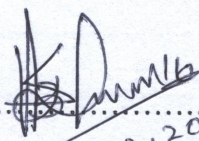

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LIST OF ABBREVIATIONS

| | |
|-----------|----------------------------------|
| GDP | - Gross Domestic Product |
| DP | - Degree of polymerization |
| CD | - Celiac disease |
| HPMC | - Hydroxy propyl methylcellulose |
| CMC | - Carboxymethylcellulose |
| L/B ratio | - Length/ Breadth ratio |
| LS | - Long Slender |
| LM | - Long Medium |
| IB | - Intermediate Bold |
| SB | - Short Round |
| UV | - Ultra Violet |
| GT | - Gelatinization Temperature |
| WAI | - Water Absorption Index |
| WS | - Water Solubility |
| SP | - Swelling Power |
| BD | - Bulk Density |
| NA | - Nutrient Agar |
| PDA | - Potato Dextrose Agar |
| AC | - Amylose Content |
| GS | - Gel Consistency |
| VER | - Volume Expansion Ratio |
| LI | - Leavening Index |

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ABSTRACT

At present traditional rice varieties are gaining recognition in Sri Lanka as a potential raw material for new food products due to their high nutritional value and less dependency on agrochemicals. Hence, traditional rice varieties ideal candidates in promoting bakery industry since it is a potential alternative to substitute wheat flour. However, utilization of rice flour in the bakery industry is limited due to the lack of gluten in flour which is essential for maintaining the desired quality of the products. Therefore, the scope of this study was to modify the rice flour of traditional paddy varieties by adapting different physicochemical treatments with a view to improve functional properties particularly for the sake of bakery products. Polished rice grains of four traditional rice varieties namely *Madatuwalu*, *Kaluhenati*, *Panchaperumal* and *Rathdal* were selected and were subjected to five different dual modification methods. Functional properties of the treated rice flour such as, Water Solubility (WS), Swelling Power (SP), Water Absorption Index (WAI), Bulk Density (BD) and pH of the modified flour were determined. Rice flour of all four varieties without any treatment served as the control. Different proportions of rice flour modified by dual modification methods were combined with different proportions of commercial wheat flour to fabricate most effective composite bread. All modifications showed significant effect ($p < 0.05$) on different functional properties such as WAI, WS and SP, of flour types obtained from selected traditional rice varieties. Out of all modifications, modification 4

(dipping in NaHCO₃ solution followed by dehydration at 100°C) showed the highest functional properties such as WAI, SP and WS for all of the traditional rice flour. Further, treatment T4 in modification 4 (dipping in 1M NaHCO₃ solution for 1 hour followed by dehydration for 2 hours at 100°C) was the best treatment for all the selected traditional rice flour types. *Madathawalu* was the highest performing flour type for all the functional properties (WAI, SP and WS) in treatment T4. Therefore, flour type 1 with treatment T4 was used to fabricate bread. Incorporation of modified rice flour using the selected modification method in bread preparation caused significant influence on bread volume and textural attributes. The results confirmed that the composite bread developed by substituting 40% commercial wheat flour with modified rice flour resulted in the similar sensory attributes to bread developed with 100% commercial wheat flour. Thus, this study demonstrated that rice flour obtained from *Madathuwalu* traditional rice variety could be an ideal candidate for the bakery industry after changing the functional properties of rice flour through simple physiochemical modification methods.

Key words: Traditional rice varieties, flour modification, functional properties, composite flour bread