A STUDY ON THE FUNCTIONAL PROPERTIES OF TARO STARCHES FROM TONGA

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1993

A STUDY ON THE FUNCTIONAL PROPERTIES
OF TARO STARCHES
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A Thesis

presented in partial fulfilment of the

requirements for the Degree of Master of Technology

in Food Technology at Massey University

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ABSTRACT

This study compared the functional properties of three taro starches extracted from selected cultivars, one from each of the three most commonly grown taro genera in Tonga. The selected cultivars were *Alocasia macrorrhiza* var *'Fohenga'*, *Colocasia esculenta* var *'Lau'ila'*, and *Xanthosoma saggitifolium* var *'Mahele'uli'*. Cassava starch, a commercial product from Thailand, was studied together with the taro starches for comparison purposes.

Freshly harvested taro corms/cormels were peeled, washed, ground into pulp. The taro pulp was washed with excess water and filtered with a cheese cloth. The solid pulp was discarded, and the water-starch mixture (starch milk) was collected in a settling tank. The starch was held for 10-24 hours to allow the starch to settle, and then the supernatant liquid was discarded. The *Xanthosoma* starch was successfully isolated using this method. For the *Alocasia* and *Colocasia*, the starch could not be isolated from the starch milk due to the presence of a mucilaginous material, and it was separated using a bowl centrifuge. The starches were dried, in a hot-air drier and then purified to remove trace of protein, fat, and fibre.

All the taro starch granules were similarly polygonal in shape but the granule sizes were different. The *Xanthosoma* starch granule size (5-30μm) was similar to that of cassava starch granules (5-35μm). The granule sizes of *Alocasia* (0.5-3μm) and *Colocasia* (0.5-6μm) were very small, smaller than rice starch granules. The amylose contents, determined using an iodometric blue value colorimetry method, were 12.1, 13.6, 19.8, and 27.4% for *Alocasia, Colocasia*, cassava, and *Xanthosoma* starches respectively.

The gelatinization temperatures for the starches were determined using sensory evaluation, hot stage microscopy, Brabender Amylograph, and Differential Scanning Calorimetry (DSC) methods. The gelatinization temperatures were approximately 69, 70, 75 and 80°C for cassava, *Alocasia, Xanthosoma* and *Colocasia* starches respectively. The gelatinization temperature ranges for *Xanthosoma* and *Colocasia*

were similar to that of cassava starch, but *Alocasia* starch showed relatively wider temperature range. The viscosity of the *Xanthosoma* gelatinized starch paste was much higher than the other starches but showed greater breakdown on heating.

The strengths of the starch gels were determined by measuring the rheological modulus G* of the gels using a Bohlin Rheometer, and the penetration strength test using an Instron. Both tests showed that the *Xanthosoma* starch produced a much stronger and higher viscosity gel than all of the cassava, *Alocasia* and *Colocasia* starches which produced gels with similar strength. The relative order of gel clarity from qualitative sensory evaluation, from highest to poorest clarity, was cassava, *Xanthosoma, Colocasia*, then *Alocasia*.

The storage stability of the starch gels was evaluated by studying the crystallisation using DSC, and measuring the syneresis occurring during storage at 5 and 22°C. The *Xanthosoma* starch gel was extremely susceptible to crystallisation and syneresis during storage, compared with cassava, *Colocasia*, and *Alocasia* gels which had similar stabilities on storage. The freeze-thaw stability of the starch gels was studied by subjecting the starch gels to repeated freeze-thaw cycles. The *Xanthosoma* starch gel was extremely unstable with freeze-thaw treatment. The *Alocasia* and *Colocasia* starch gels were similar to cassava starch gel which was more stable with freeze-thaw treatment.

The *Xanthosoma* starch, because of extremely high viscosity and gel strength, could be use in food products that need high viscous texture but require no further storage. The *Colocasia* and *Alocasia* starches, because of high digestibility due to very small granule sizes can be used in baby food formulations, which are either heat treated or frozen.

Acknowledgements

I wish to thank my supervisors, Dr. Osvaldo Campanella and Professor Mary D. Earle, for all their valuable guidance, time and encouragement provided throughout this research work.

I also wish to thank the staff of the Food Technology Department, Massey University, in particular, thanks to Mr John O'Connor, Mr Hank Van Til, Mr Steve Glasgow, Mr Byron McKillop, and Mr Alistair Young for their assistance in many parts of the laboratory work.

This thesis is dedicated with many thanks to my wife, Sesimani (and Baby), for her patience, encouragement and never ending moral support during the course of this work. Thank you so much for handling most of the hardship of pregnancy by yourself, allowing me to proceed with this research work. Thank you love!

I would like to thank many people who helped during this research work. In particular:

* Many thanks to Samiu and 'Api Taufa for continuously supplying food and daily needs during the busy time of this course.

* Many thanks to my brother Ma'u and family (Lesley, Ma'u Leka, Loleini, Taufa Leka, Mosese Leka, and Palatasa Leka) for their help during the time I spent in Tonga for part of the course.

* Thanks also to Kelepi Mailau, Mosese Taufa, 'Amanaki Paea, Mipa and all the friends who helped in the starch extraction process in Tonga.

* Many thanks also to Mr and Mrs Morgenstern for their hospitality and help during a trip to Christchurch for part of the course.

* Many thanks also to the Naulivou family (Sione, Janice, and Rachel) for their help in preparing this Thesis.

Lastly, I would like to thank the Ministry of Foreign Affairs and Trades, for funding this work.

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