UNIVERSITI PUTRA MALAYSIA

TEXTURE STUDIES ON CHINESE WET NOODLES (HOKKIEN - STYLE NOODLES)

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FSMB 1990 3

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Master of Science
Universiti Pertanian Malaysia

1990

TEXTURE STUDIES ON CHINESE WET NOODLES (HOKKIEN - STYLE NOODLES)

By

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Thesis Submitted in Fulfilment of the Requirements
for the Degree of Master of Science
in the Faculty of Food Science and Biotechnology
Universiti Pertanian Malaysia

January 1990

Dedicated to my beloved husband,

Abdul Rahim bin Abdullah

ACKNOWLEDGEMENTS

All praise due to Allah, the Cherisher and Sustainer of the World, the Most Gracious and Merciful, who had given me the strength and will to complete my studies and research.

My sincere appreciation to Dr. Mohd Nasir Azudin for his advice, supervision, constructive criticism and guidance throughout the studies and during the preparation of this thesis. I am grateful to the Australian Wheat Board for their financial support and the Federal Flour Mills Bhd. especially to Mr. Jimmy Chang and Ms. Alice Wong for their helpful guidance, discussion and suggestions given during my studies. Thanks is also extended to Mr. Abdul Hadi Ismail for his assistance in editing and preparation of graphical presentations of the thesis.

I also wish to convey my thanks to other members of the Faculty of Food Science and Biotechnology, Agriculture University of Malaysia, especially to Dr. Suhaila Mohamed and Prof. Madya Dr. Zaliha Christine Alang who have helped me in various ways throughout this project.

To my loving husband, I owe him every bit of my success. He had been most understanding and accomodating through times of stress in the course of my studies.

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LIST OF ABBREVIATIONS

α-	alpha-
ASW	Australian Standard White
A.U.	Amylograph Units
B.U.	Brabender Units
cm	centimetre (s)
°C	degree Celcius
FFMB	Federal Flour Mills Berhad
g	gramme (s)
hr	hour (s)
IMR	Institute of Medical Research
kV	kiloVolt
K_2CO_3	potassium carbonate
max.	maximum
mg	milligramme (s)
μ	micron
max	maximum
min	minute (s)
ml	millilitre (s)
mm	millimetre (s)
Na_2CO_3	sodium carbonate
NaCl	sodium chloride
NaOH	sodium hydroxide
%	percentage
PH	Prime Hard
ppm	parts per million
rpm	revolutions per minute
s	second (s)
S.D.	standard deviation

Abstract of Thesis Submitted to the Senate of
Universiti Pertanian Malaysia in Fulfilment of the
Requirements for the Degree of Master of Science

**TEXTURE STUDIES ON CHINESE WET NOODLES
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By

ROSELINA BT. KARIM

January 1990

Supervisor : Mohd Nasir Azudin, Ph.D.

Faculty : Faculty of Food Science and Biotechnology

This study reports the textural evaluation of Chinese wet noodles made from Australian Standard White (ASW) flour, using the Instron Universal Food Tester (Model 1140). Procedures for conducting the instrumental test were set up in the preliminary part of the study. Maximum cutting stress (MCS), percentage of residual force (RF) and tensile stress which denote the internal firmness, elasticity and tensile strength of noodles obtained using cutting blade, compression and tensile attachments respectively, were reliable measures of the textural properties of Chinese wet noodles. These variables were highly correlated to sensory evaluation of firmness,

chewiness and tensile strength of noodles ($r = 0.93 - 0.99$; $P<0.01 - P<0.1$).

The study on the function of various components and conditions in noodlemaking showed that the texture of Chinese wet noodles were affected by the types and amount of water in the formulation, types and pH of the cooking water, levels of sodium chloride (NaCl), sodium carbonate (Na_2CO_3), potassium carbonate (K_2CO_3) and sodium hydroxide (NaOH) in the formulation and the level of protein in flours.

Results obtained from the cutting test alone demonstrated that Chinese wet noodles with maximum internal firmness could be made from ASW flour using a water absorption of 32 - 34% and a dough pH of 10.0. Slightly hard water containing 36 ppm Ca^{2+} should be used in the formulation. Types and pH of cooking water recommended were hard water (64 ppm Ca^{2+}) and pH 9.0 - 10.0 respectively. The amount of NaOH needed is 0.40% based on the weight of flour.

Based on the results obtained from the compression test, Chinese wet noodles with maximum elastic property could be processed from ASW flour using 38% water absorption level and a dough pH of 9.0. Distilled or soft water (0 ppm Ca^{2+}) should be used in the formulation and noodles should be cooked in slightly hard water (36 ppm Ca^{2+}) and pH of cooking water

suggested was pH 6.0. The amount of Na_2CO_3 or K_2CO_3 needed is 0.25 - 0.50%, whereas if NaOH was used the amount recommended is 0.20% based on the weight of flour.

Fortification of ASW flour using wheat gluten and blending of Prime Hard (PH) to ASW flour increase the level of protein in noodle doughs and hence, improved the textural characteristics of Chinese wet noodles. A strong correlation was observed between protein content of flours and MCS and RF (%) with $r=0.99$ ($P<0.0001$) and $r=0.90$ ($P<0.01$) respectively. No significant differences were seen between MCS of Chinese wet noodles processed from ASW and PH flour blends in the ratio of 55:45, 60:40 and 65:35 ($P<0.01$). Stability of dough obtained from farinograph can be used to predict the internal firmness of Chinese wet noodles.

This study suggested that to produce the required or desirable textural characteristics of Chinese wet noodles several interrelated factors have to be considered and optimised.

Abstrak Tesis Yang Dikemukakan Kepada Senat
Universiti Pertanian Malaysia Sebagai Memenuhi Syarat
Keperluan Untuk Ijazah Master Sains

KAJIAN TEKSTUR KE ATAS MI
(MI HOKKIEN)

Oleh

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Januari 1990

Penyelia : Mohd Nasir Azudin, Ph.D.

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Kajian ini melaporkan penilaian ke atas tekstur mi yang dibuat daripada tepung "Australian Standard White" menggunakan alat "Instron Universal Food Tester" (Model 1140). Tatacara-tatacara untuk menjalankan ujian instrumentasi telah direkabentuk di peringkat awal kajian. Tegasan memotong maksimum (TMM), peratus daya sisa (DS) dan tegasan tegangan yang menggambarkan kepejalan, kekenyalan dan kekuatan tegangan bagi mi yang diperoleh masing-masing dari perkakas yang dipasang seperti pisau pemotong, alat penekan dan alat penegang, adalah pengukuran ciri-ciri tekstur mi yang boleh di percayai. Angkubah-angkubah ini mempunyai korelasi yang tinggi

dengan penilaian deria terhadap kepejalan, kekunyahan dan kekuatan tegangan mi ($r=0.93 - 0.99$; $P<0.01 - P<0.1$).

Kajian ke atas fungsi berbagai-bagai komponen dan keadaan memproses mi menunjukkan bahawa tekstur mi dipengaruhi oleh jenis-jenis air dan amaun air yang ditambah ke dalam formulasi, jenis-jenis air dan pH air yang digunakan untuk memasak, aras-aras natrium klorida (NaCl), natrium karbonat (Na_2CO_3), kalium karbonat (K_2CO_3) dan natrium hidroksida (NaOH) dalam formulasi dan aras-aras protein di dalam tepung.

Keputusan yang diperolehi daripada ujian memotong sahaja, menunjukkan bahawa mi yang mempunyai kepejalan dalaman yang maksimum boleh dibuat daripada tepung ASW menggunakan amaun air sebanyak 32 - 34% dan doh yang mempunyai pH 10.0. Air sederhana keras yang mengandungi 34 ppm Ca^{2+} patut digunakan dalam formulasi. Jenis dan pH air yang dicadangkan adalah air keras (64 ppm Ca^{2+}) dan pH 9.0 - 10.0. Amaun NaOH yang diperlukan adalah 0.40% berdasarkan berat tepung.

Berdasarkan keputusan-keputusan yang diperolehi daripada ujian menekan, mi yang mempunyai kekenyalan yang maksimum boleh diproses daripada tepung ASW pada penyerapan air sebanyak 38% dan doh yang mempunyai pH 9.0. Air yang sepatutnya digunakan dalam formulasi adalah air suling atau air lembut (0 ppm) dan untuk memasak mi adalah air sederhana keras (36 ppm Ca^{2+}) dan

pada pH 6.0. Amaun Na_2CO_3 atau K_2CO_3 yang diperlukan adalah 0.25 - 0.50%, jika NaOH digunakan amaun yang dicadangkan adalah 0.20% berdasarkan berat tepung.

Fortifikasi tepung ASW menggunakan gluten yang diperolehi daripada gandum dan pencampuran tepung Prime Hard (PH) dengan tepung ASW meningkatkan aras protein di dalam doh-doh mi dan dengan ini memperbaiki ciri-ciri tekstur mi. Satu korelasi yang kuat di antara kandungan protein di dalam tepung dengan TMM dan DS (%) masing-masing dengan $r=0.99$ ($P<0.0001$) dan $r=0.90$ ($P<0.01$) telah dicerap. Tidak terdapat perbezaan yang bererti di antara TMM mi yang diproses daripada campuran tepung ASW dan PH pada nisbah 55:45, 60:40 dan 65:35 ($P<0.01$). Kestabilan doh yang diperolehi daripada alat "farinograph" boleh digunakan untuk meramalkan kepejalan dalaman bagi mi.

Daripada kajian ini adalah dicadangkan bahawa untuk mendapatkan ciri-ciri tekstur mi yang dikehendaki atau yang disukai beberapa faktor yang berhubungkait perlu diambilkira dan dioptimumkan.

CHAPTER I

INTRODUCTION

Noodles are thin strips of dough that are cut into a wide variety of lengths, widths and shapes. The dough usually consists of flour, salt and water. Sometimes eggs are added depending on the type of noodles being produced (Oh *et al.*, 1983). The art of noodlemaking was believed to have spread throughout Asia including Japan, Southeast Asia and westward through Burma, India and the Middle East by the Chinese. Some of the common Asian noodles are bean thread noodles, cellophane or vermicilli noodles, potato starch noodles, shrimp noodles, "soba", "somen", "udon" and wheat or egg-and-wheat noodles (Coyle, 1982).

In Malaysia, different types of noodles and pasta are available in the market. They are prepared from wheat, rice, corn and tapioca flours. These include Chinese noodles or yellow noodles, starch vermicilli noodles, "kuay teow", "chee cheong fun", "loh shee fun" and rice noodles. The most common types of noodles manufactured are Chinese noodles. Chinese noodles are wheat noodles in which an alkaline solution is added to the basic ingredients. They come in various forms such as dried raw noodles, raw Cantonese-style, Hokkien-style noodles or Chinese wet noodles which are

partially-boiled, Wantan noodles in which eggs are added as one of the ingredients, the traditional instant noodles which are steamed and dried, and the modern instant noodles which are steamed and fried.

The noodles and related pasta products industry forms one of the major cottage food manufacturing industries in Malaysia. Almost all of the factories produce noodles for local consumption. Most of the processing plants operate on small scale basis and some are performed in the backyard. The production of these product mostly involved batch processing operations but in some cases modern continuous automated processing plants are installed.

Noodles form one of the main dishes in Malaysian diet. They can be served as fried noodles or added to soups and are frequently taken as a replacement for rice during the main meals or in between meals. Noodles are very popular among all races especially the Malaysian Chinese. The amount of noodles consumed is large, ranging from 40 - 45% of the total flour usage in Malaysia. The number of establishments involved in the manufacture of noodles and related pasta products in Peninsular Malaysia increased from 254 in 1973 to 396 in 1981, with gross value output of $30,198 and $116,003 respectively, indicated a tendency towards increasing demand for these product in the future (Malaysia, 1973; 1983).

There is a considerable variation in the quality of noodles produce in this country, depending on the manufacturer, techniques used and the consumers demands. Preference for colour, texture and taste varies with different ethnic groups and the types of dishes for which the noodles will be used. Manufacturers are often required to produce different characteristics of noodles as a result of consumer demand. Generally, the manufacturing of noodles in Malaysia lacks quality control especially with the respect to raw materials, sanitary conditions during noodles preparation and processing variables. No research has been published concerning studies, on the effects of formulation and ingredients on the textural characteristics of Chinese wet noodles or Hokkien-style noodles processed under local conditions and techniques.

Therefore, the objectives of this research are :

(I) to develop test methods or procedures for evaluating locally-manufactured Chinese wet noodles quality and

(II) to study the effects of formulation and types of ingredients on the textural quality of Chinese wet noodles.