Study on the effect of maturity, geographical location, seasonal variation and processing method on fatty acid profile of Tilapia

By

Udumalebbe Abdul Majeed

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Udumalebbe Abdul Majeed

Thesis submitted to the University of Sri Jayawardeneepura for the award of the Degree of Doctor of Philosophy in Food Science and Technology in 2013.
DECLARATION

The work described in this thesis was carried out by me under the supervision of;

Professor Arthur Bamunuarachchi
Emeritus Professor
Professor in Applied Chemistry
Department of Food Science & Technology
Faculty of Applied Sciences
University of Sri Jayawardenepura
Gangodawila, Nugegoda

Professor K. K. D. S. Ranaweera
Professor in Food Science & Technology
Department of Food Science & Technology
Faculty of Applied Sciences
University of Sri Jayawardenepura
Gangodawila, Nugegoda

A report on this has not been in whole or in part submitted to any University or other Institutions for another Degree or Diploma

[Signature]
Udumalebbe Abdul Majeed

[Date]
2014-08-19
Declaration of the Supervisors

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

............................................................
Professor Arthur Bamunuarachchi
Emeritus Professor
Professor of Applied Chemistry
Department of Food Science & Technology
Faculty of Applied Sciences
University of Sri Jayawardenepura
Gangodawila, Nugegoda

............................................................
Professor K. K. D. S. Ranaweera
Professor of Food Science & Technology
Department of Food Science & Technology
Faculty of Applied Sciences
University of Sri Jayawardenepura
Gangodawila, Nugegoda
We certify that the candidate is submitting this thesis with all corrections, additions and amendments attended in accordance with the comments and suggestions by the examiners.

Professor Arthur Bamunuarachchi
Emeritus Professor
Professor of Applied Chemistry
Department of Food Science & Technology
Faculty of Applied Sciences
University of Sri Jayawardenepura
Gangodawila, Nugegoda

Professor K. K. D. S. Ranaweera
Professor of Food Science & Technology
Department of Food Science & Technology
Faculty of Applied Sciences
University of Sri Jayawardenepura
Gangodawila, Nugegoda
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AND
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LIST OF ABBREVIATIONS

AA - Arachidonic Acid
AHA - American Heart Association
AI - Adequate Intake
ALA - Alpha Linolenic Acid
BP - Blood Pressure
CAD - Coronary Artery Disease
CHD - Coronary Heart Disease
COX - Cyclooxygenase
DAG - Diacylglyceride
DHA - Docosahexaenoic Acid
DHGLA - Dihomo Gamma Linolenic Acid
DPA - Docosapentaenoic Acid
DRI - Daily Recommended Intake
DTA - Docosatetraenoic Acid
EDB - Export Development Board
EFA - Essential Fatty Acid
EPA - Eicosapentaenoic Acid
FADS - Fatty Acid Desaturase
FA - Fatty Acid
FAME - Fatty Acid Methyl Ester
FAO - Food and Agriculture Organization
FDA - Food and Drug Administration
GC-MS - Gas Chromatography- Mass Spectrometry
GDP - Gross Domestic Product
GLA - Gamma Linolenic Acid
HDL-C - High Density Lipoprotein-Cholesterol
HEPE - Hydroxyeicosapentaenoic Acid
HETE - Hydroxyeicosatetraenoic Acid
HPEPE-Hydroperoxyeicosapentaenoic Acid
HPETE - Hydroperoxyeicosatetraenoic Acid
HUFA - Highly Unsaturated Fatty Acid
IBD - Inflammatory Bowel Disease
IL - Interleukin
IOM - Institute of Medicine
IQ - Intelligence Quotient
LA - Linoleic Acid
LC - Long Chain
LC-PUFA - Long Chain Polyunsaturated Fatty Acids
LDL-C - Low Density Lipoprotein-Cholesterol
LOX - Lipoxygenase
LT - Leukotriene
MAG - Monoacylglyceride
MFARD - Ministry of Fisheries and Aquatic Resources Development
MI - Myocardial Infarction
NAQDA - National Aquaculture Development Authority
PG - Prostaglandin
PL - Phospholipid
PUFA - Polyunsaturated Fatty Acids
RDA - Recommended Dietary Allowance
SCD - Sudden Cardiac Death
SCFA - Short Chain Fatty Acid
SDA - Stearidonic Acid
SFA - Saturated Fatty Acid
TAG - Triacylglyceride
TX - Thromboxane
UK - United Kingdom
US - United States

VLDL-C - Very Low Density Lipoprotein-Cholesterol

WHO - World Health Organization
Study on the effect of maturity, geographical location, seasonal variation and processing method on fatty acid profile of Tilapia

Udumalebbe Abdul Majeed

ABSTRACT

Tilapia (*Oreochromis niloticus*) is a freshwater fish species that is widely cultured and frequently consumed in Sri Lanka. It is a good source of proteins and health improving fatty acids.

A study was carried out to investigate the impact of maturity stages (six maturity stages, weight ranging from (97.50 ± 2.12 g to 543.00 ± 12.72 g), geographical distribution, seasonal effects and processing methods on proximate composition and fatty acid profiles of Nile tilapia (*O. niloticus*) fillets. For maturity variation, six different sized groups of samples were selected. For assessing the effect of geographical distribution, samples were collected from two different locations, namely, Bandarawela (Wet zone) and Mannar (Dry zone). For studying the seasonal variation, the samples were collected at one month interval over a period of six consecutive months. Smoking, boiling, and frying (in virgin coconut oil) were adopted as processing methods and compared with raw samples.

The proximate composition was assessed as described in the AOAC (1984) and the oil from Tilapia fillets was extracted according to (Bligh and Dyer, 1959). The preparation of fatty acid methyl esters (FAME) and the analysis of GC-MS were done according to (AOCS, 1992).

Proximate values of nutrients namely moisture, ash and fat contents showed a significant variation with maturity stage, geographical location, season and processing.
method. Significant variation (p<0.05) was observed only in n-6 FAs and n-3/n-6 ratio with respect to maturity stage. Significant variations (p<0.05) were observed in PUFAs, n-3 FAs and EPA+DHA content with respect to time (January, February and March, 2013), whereas no significant variation (p>0.1) was observed with respect to geographical locations. Significant variation (p<0.1) was observed in SFAs with respect to geographical locations, while not (p>0.1) with respect to time (January, February and March, 2013). No significant variations (p>0.1) were observed in MUFAs, n-6 FAs and n-3/n-6 ratio with respect to both geographical location and time as well. Significant variation (p<0.05) was observed in SFAs, MUFAs, PUFAs, n-3 FAs, EPA+DHA and n-3/n-6 ratio with respect to season, whereas, no significant variation was observed in n-6 FAs. Significant variations (p<0.05) were observed in PUFAs, n-3 FAs, EPA+DHA and n-3/n-6 ratio, SFAs (p<0.1) and MUFAs (p<0.1) with respect to processing methods, whereas no significant variation (p>0.1) was observed in n-6 FAs. Marginal variations in FAs were observed in smoking and boiling process, whereas, significant variations in FAs were observed in frying process. Frying in coconut oil significantly reduced the health beneficial n-3 FAs such as EPA and DHA.

Since the study showed significant variations with respect to maturity, geographical location and seasonal variation, it is suggested that Tilapia is reared in ponds under controlled conditions so that the highest benefits with respect to protein content and health beneficial fatty acids are obtained.