



**BUSITEMA
UNIVERSITY**
Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF CHEMICAL AND PROCESS ENGINEERING

FINAL YEAR PROJECT

DEVELOPMENT OF A VALUE CHAIN FOR AMARANTHUS DUBIUS' DODO

BY

NANTONGO MARIAM

BU/UP/2014/204

Email: nantongomariam@gmail.com

Contact: +256754482764



SUPERVISOR: MR SSERUMAGA PAUL

A final year project report submitted to the department of chemical and process engineering in partial fulfillment of the requirement for the award of a Bachelor of Science in Agro-Processing Engineering of Busitema University.

ABSTRACT

This study highlights the process of extraction of amaranthus dubius oil using soxhlet extraction method, its benefits and other products from amaranthus grains. Although some benefits derived from amaranthus seeds are known, seeds are less utilized among many producing communities. The oil was extracted from milled amaranthus flour using hexane solvent at 300°C. The extraction method had an oil recovery rate of 10%. The results of my study will encourage the farming communities to increase their expertise and love for growing amaranthus dubius crop. This will increase on their income and improve on their standards of living.

DECLARATION

I **Nantongo Mariam** hereby declare that, this report is a true work of my hands and has never been presented by any person or institution for an academic award.

Signature: 

Date: 25/04/2019



APPROVAL

This final year research project proposal for the programme of Agro-Processing Engineering has been submitted to the Department of Chemical and Process Engineering for examination with approval from the following supervisor:

MR. SSERUMAGA PAUL

Signature:

Date:

LIST OF FIGURES

Figure 1: Figure of a bar graph representation of the m/z of the ions and their abundances.	12
Figure 2: A schematic view of accelerated solvent extraction system.....	17
Figure 3: A value Chain for Amaranthus Seeds.	28

LIST OF TABLES

Table 1: Nutritional Values of Amaranthus seeds,	6
Table 2: The Physiochemical Characteristics of Amaranthus oil.	10
Table 3: Advantages and Disadvantages of Supercritical Extraction Methods.	13
Table 4: List of Bioactive Compounds present in plant-derived cold-pressed oils.	15
Table 5: Advantages and Disadvantages of ASE.....	17
Table 6: Showing the proximate analysis.	19
Table 7: Proximate composition of amaranthus dubius grains	29
Table 8: Chemical properties of amaranthus oil	29
Table 9: Physical properties of amaranthus oil.....	30
Table 10: Physiochemical properties of amaranthus cake	30

CHAPTER ONE

1.0 Back ground.

Amaranthus is a dicotyledonous pseudo cereal which has been identified as a new crop with potential for increased commercial application. The current food application include breakfast cereals, bakery products and extruded foods. Currently, amaranth is being reevaluated due to the high protein (15-18%), lysine, vitamins, and calcium content of its grains (Tucker, 1986; Pedersen et al., 1987; Petr et al., 2003) Amaranthus is composed of, proteins, mineral content and fatty acid composition (Cereal foods world et al., 1989). It belongs to amaranthaceae family and grows to a size of 80-120cm. It has both the green and red varieties, as well as some with mixed colors. It can flower throughout the year in subtropical conditions.

The seeds are lenticular in shape with a diameter of 1.0-1.5mm and 1000 seeds weigh 0.9kg (Jain and Hauptli, 1980, Saunders and Becker, 1984). It is usually found in waste places with examples of cruentus in Guatemala, hypochondriacus in Mexico, and caudatus in Peru and other countries are the main species cultivated for their seeds (Bressani et al., 2003). It has high nutritional quality seeds for both food and animal feed. It may also be cultivated for production of ornaments (Mlakardd et al., 2009). Amaranthus is cultivated in several countries of the world including South America, Africa, India, China and the United States (Dhelliott et al., 2006) . Amaranth is one of the few plants whose leaves are eaten as a vegetable while the seeds are used in the same way as cereals due to its high concentration of protein, minerals, and vitamins. ('13 Amazing Benefits Of Amaranth', May 03, 2018 by OrganicFacts). The essential oil content of plant tissue also varies with developmental stage (Burbott and Loomis et al., 1967), and can vary by extraction methods (Guenther et al., 1972).

In Uganda, grain amaranthus was introduced by Volunteer Efforts for Development Concerns (VEDCO), a local NGO under the program called Sustainable Rural Livelihood (SRL). Extension workers were trained on aspects of grain amaranthus production, nutritional value, preparation and processing methods. The trained extension workers were then tasked with introducing amaranthus to communities and Kamuli district pioneered in 2005. It was aimed at promoting the growth of amaranthus for household food and nutrition security among the small and medium farmers and groups of disadvantaged people. Two varieties of the seeds are now widely grown and these are

REFERENCES

'13 Amazing Benefits Of Amaranth' (no date).

Chauhan, A., Saxena, D. C. and Singh, S. (2016) 'Physical , textural , and sensory characteristics of wheat and amaranth flour blend cookies', *Cogent Food & Agriculture*. Cogent, 21(1), pp. 1–8. doi: 10.1080/23311932.2015.1125773.

Chauhan, A. and Singh, S. (2013) 'Influence of Germination on Physico – chemical Properties of Amaranth (*Amaranthus Spp .*) Flour', (January).

Clement, R. E. and Taguchi, V. Y. (1991) 'Techniques for the Gas Chromatography - Mass Spectrometry Identification of Organic Compounds in Effluents', *Laboratory Services Branch*, (June), pp. 1–45. doi: 0-7729-59834.

Dhellot, R. *et al.* (2006) 'Extraction , chemical composition and nutritional characterization of vegetable oils : Case of *Amaranthus hybridus* (var 1 and 2) of Congo Brazzaville', 5(June), pp. 1095–1101.

Giergielewicz-możajska, H. *et al.* (2016) 'Accelerated Solvent Extraction (ASE) in the Analysis of Environmental Solid Samples — Some Aspects of Theory and Practice Accelerated Solvent Extraction (ASE) in the Analysis of Environmental Solid Samples — Some Aspects of Theory and Practice', 8347(June). doi: 10.1080/20014091076712.

Gunstone, F. D. (no date) *VEGETABLE OILS IN*.

Lang, Q. and Wai, C. M. (2001) 'Supercritical fluid extraction in herbal and natural product studies — a practical review', 53, pp. 771–782.

Leaves, A. (1990) 'Chapter-3 MATERIALS AND METHODS 3.1', (1995), pp. 30–51.

Nakimbugwe, D. (no date) 'GRAIN AMARANTH IN UGANDA History, progress and prospects'.

'NUTRITIONAL CHARACTERIZATION OF GRAIN AMARANTH GROWN IN NIGERIA FOR' (2017), (2), pp. 1–10.

Products, C. (2015) 'MANUAL OF METHODS OF ANALYSIS OF FOODS'.

'Soxhlet extractor' (1879), pp. 1–5.

'Sub- and supercritical fluid extraction of functional ingredients from different natural sources: plants, food-by- products, algae and microalgae.' (no date), 5622900, pp. 1-34.