

STUDY ON AVOCADO OIL QUALITY, ITS CHARACTERISTICS AND COMPOSITION

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**AFFECTIONATE DEDICATION TO
MY PARENTS AND TEACHERS**

Declaration

The work described in this thesis was carried out by me as the partial fulfillment requirement for the degree of Master of Science in Food Science & Technology under the supervision of Professor A. Bamunuarachchi, Department of Food Science & Technology, Faculty of Applied Sciences, University of Sri Jayardenepura. No similar report has been submitted to any other university for another degree.

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ABSTRACT

Avocado is one of the most important crops grown in tropical and subtropical countries in the world and it is consumed mostly as a fresh fruit. Oil extracted from the fresh avocado pear has been a valuable product due its high stability. Avocado oil contains lots of nutritionally beneficial compounds. It has heart healthy monounsaturated fats, high level of pigments and vitamins (α and β carotene, vitamin E) which protect against heart diseases and cancers, minerals and valuable omega-3 fatty acids which help to lower blood cholesterol. Phytosterols and β -sterols inhibit intestinal cholesterol absorption in the human. Lutein is a natural antioxidant that may help to maintain eye health as we get older.

In this study, the oil content of different avocado varieties at different maturity stages was determined and the chemical and fatty acid composition of the extracted oil too was analyzed. The varieties selected for the experiment were Booth 7, Choquote, Fuerte, Purple Hybrid, Reed, Simmonds, Tower II, and Waldin. The physical characteristics of each variety were observed and measured. The oil extracted from these varieties by soxhlet extraction method was analyzed for chemical characteristics and the fatty acid composition by gas chromatography. The proximate analysis of the residue remaining after the oil extraction was also carried out.

Fruit shape, size, colour, and skin were found to the most prominent physical characteristics useful in identifying the avocado varieties. According to the results, the oil content of the avocado fruit of each variety increases with its maturity level. The rates of increasing oil content decreases as the fruits become mature.

The highest oil contents were found in Fuerte, Tower II and Reed varieties, hybrids of Mexican and Gautemalan cultivars. Booth 7 variety a hybrid of Gautemalan x West Indian cultivars had medium oil content. All low oil content varieties belong to West Indian Cultivar. Avocado oil has a similar composition to edible oils when compared with the chemical composition of other edible oils and it is similar to olive oil in many respects.

The study showed that avocado oil is composed of Palmitic Acid (C16:0), Palmitoleic Acid (C16:1), Stearic Acid (C:18:0), Oleic Acid (C18:1), Linoleic Acid (C18:2), and Linolenic Acid (C 18:3). Fuerte variety has the higher percentage of unsaturated fatty acid that is 77.2%. Tower II variety has 66.9% and Waldin variety has 66.7%. The Oleic Acid is the most abundant unsaturated fatty acid in all three varieties i.e Fuerte – 56.14%, Tower II – 39.02% and Waldin – 40.10%.

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ABBREVIATIONS

GC – Gas Chromatography

e.g. – Example

i.e. – That is

Sp.Gr. – Specific Gravity

NaOH – Sodium Hydroxide

HCl – Hydrochloric Acid

KOH – Potassium Hydroxide

BF₃ – Boron Trifluoride

NaCl – Sodium Chloride

Na₂SO₄ – Sodium Sulfate

H₂SO₄ – Sulfuric Acid

ppm – parts per million

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Avocado (*Persea Americana*) is an edible fruit, belongs to the Family Lauraceae. It is native to the tropical and subtropical regions of North and South America and has been spread to all tropical countries in the world (Condit, 1915). Avocado tree is an evergreen tree that attains heights of 20 m and has many branches.

The fruit of avocado is referred to as a berry, consisting of a single carpel and a single seed (Salunkhe *et al*, 1991). The fruit may be round, pear shaped, or oblong, and the skin of the fruit may vary in texture and color. The skin of the fruit may be pliable to woody, smooth to rough, and green-yellow, reddish-purple, purple, or black in color. The flesh of the fruit is greenish yellow to bright yellow when ripe and buttery in consistency, but inferior varieties may be fibrous. The avocado fruit has one large seed which makes up to 10.0% - 25.0% of the fruit weight. Avocado fruits range from 150 g to more than 1.25 kg in weight.

The edible pulp of the avocado, which surrounds the seed, contains from 8.0% - 30.0% of non-drying oil. Oil is separated by dehydrating the pulp, then pressing or extracting with solvents. It has been recognized that there is a close relationship between the oil content and the development of an avocado fruit. Basically, oil content increases as the fruit matures. It also depends on cultivar.

Oil is the most important component of avocado fruit as it is a significant proportion of the dry matter of the mesocarp (60% - 80%). It is responsible for the taste and mouth feel that govern consumer demand for avocados. The oil is mainly composed of oleic acid. The predominant use of the avocado oil to date is mostly because of the high stability of the oil and its vitamin E (α -tocopherol) content.

Avocado oil contains a variety of nutritionally beneficial compounds. It has the highest level of heart healthy monounsaturated fats, high level of pigments (α and β carotene) which protect against heart diseases and cancers, vitamins and minerals (especially vitamin E- a

powerful antioxidant) and valuable omega-3 fatty acids which helps to lower blood cholesterol level.

Avocado oil is used as a food oil, as an ingredient in other dishes, as well as a cooking oil. It can be found frequently in cosmetics where it is valued for its regenerative and moisturizing properties. It also functions well as a carrier oil for other flavors. As a culinary oil, avocado oil compares well with olive oil. Avocado oil is one of the most valuable oils of the unsaturated fatty acids range.

Avocado oil is of high importance to the cosmetic industry. This is mostly due to the high stability of the oil and its vitamin E content. Vitamin A in avocado oil helps to prevent from dry skin and vitamin E and vitamin D are effective against skin wrinkling. Due to the abundance of unsaturated fatty acids and fibrous proteins in avocado oil, it acts as a natural skin moisturizer and makes the skin look soft and young. Avocado oil also has some sun screening properties.

Avocado is a fruit rich in other nutritional factors as well. Therefore the residue of the avocado pulp remaining after the oil extraction has a good nutritive value. Value addition to the residue will increase the demand for the by product.

1.2 Overall Objective

1. To determine the oil content of different avocado varieties and analysis of its fatty acid composition and nutritional composition.

1.3 Specific Objectives

1. To identify the suitable varieties and correct maturity level of the fruit which can be used to extract maximum oil yield.
2. To determine the characteristics of avocado oil.
3. To determine the fatty acid composition of the extracted oil.
4. To determine the nutritional composition of avocado residue and possible value addition.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction to Avocado

Avocado is one of the important crops grown in tropical and subtropical countries in the world. It is consumed mostly as a fresh fruit and has good dietary value. It is a high fat fruit, which contains rare sugars of high carbon numbers and relatively rich in certain vitamins, minerals and nitrogenous substances. Due to its high oil and low sugar content it is recommended as a high energy food for diabetics. Avocado oil is in great demand for the preparation of cosmetics. In Western Europe imports of avocados has increased several fold in the last decades (Salunkhe *et al*, 1995).

2.1.1 Origin and Distribution

The avocado fruit was first described by Martin Fernandez de Encisco Sevilla Spain in 1591 (Human, 1987). It was originated in a broad geographical area stretching from the Eastern and Central highlands of Mexico through Guatemala to the Pacific coast of Central America (Whiley *et al*, 2002). From its native home it has spread to all tropical countries.



Figure 2.1 : Centers of Origin for the Ecological Races of Avocado

Source : Whiley *et al*, 2002

In 1918 the British Imperial Institute in England drew attention to the possibility of using avocado oil as a source of oil being suitable for edible purposes. The first avocado oil was extracted commercially in 1958 at Polittsi, Northern Transvaal (Human, 1987).

The date of introduction of avocado to Sri Lanka is not known. However records at Department of Agriculture indicate that bud grafts of some avocado varieties were established successfully in the Royal Botanical Garden, Peradeniya in May 1927 (Nethsinghe, 1993).

2.1.2 Avocado Production

Avocado is mainly grown in tropical and subtropical climates particularly in America and Asia. Mexico, the United States, the Dominican Republic, Brazil, Colombia and many other countries of South America, Central America, the Caribbean Islands and South Africa are the main avocado producing countries in the world (Salunkhe *et al*, 1995). The world avocado production is about 1, 463, 000 MT (Salunkhe *et al*, 1995) and Mexico and United States are the largest producers supplying over one third of the world's total production.

Table 2.1 : Major Countries Producing Avocado

Country	Production (1000 MT)
Mexico	320
United States	160
Dominical Republic	133
Brazil	115
Colombia	81
Indonesia	72
Haiti	58
Venezuela	49
Zaire	45
Chilie	40
South Africa	35
Spain	35
Gautemala	29
Peru	25
Philippines	22

Source : Salunkhe *et al*, 1995