

Phytochemical, Nutritional and Antioxidant Activity Evaluation of Seeds of Almond (*Terminalia catappa* L.)

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Abstract- In the present work, the almond seeds (*Terminalia catappa* L.) of nutritional, phytochemical content and antioxidant activity were investigated. The antioxidant activity of ethanol extract was evaluated using free radical scavenging, metal chelating, ferric reducing antioxidant power and reducing power assays. Secondary metabolites including alkaloids, saponins, flavanoids, reducing sugar and phenolic content were determined in the almond seeds. Nutritional properties including moisture, ash, carbohydrates, proteins and fats content and metal content in the seeds were also estimated. The antioxidant property of ethanol extract of almond seeds was found to be high results indicated almond seeds to be a good source of nutritional and antioxidant components and hold their potential for value addition and nutraceutical development.

Index Terms- Almond, Nutrients, Antioxidant, Phytochemical

I. INTRODUCTION

All human beings require sufficient food for their growth and development and to lead an active and healthy life and it depends upon the quality and quantity of foodstuffs included in their regular diet. The quality of a food depends upon the presence of relative concentrations of various nutrients such as proteins, fat, carbohydrates, vitamins and minerals. Carbohydrates, fat and proteins are sometimes referred to as proximate principles and form the major portion of the diet while minerals play an important role in the regulation of the metabolic activity in the body. It has been established that antioxidants found in large quantities in the crude extracts of fruits, herbs, vegetables, cereals and other plant materials act as reducing agents and thereby improve the quality and nutritional value of the food. The importance of the antioxidant constituents of plant materials has also been established in the maintenance of health by acting against stress related diseases such as infections, diabetes, cancer and coronary heart disease.

Almonds come in two varieties, sweet and bitter. Sweet almonds are used in many Asian dishes, as well as dessert pastes and garnishes. A popular use for crushed sweet almonds is a European candy base called marzipan. Sweet almonds can also be processed into essential oils or extracts. The almond is very

popular tree nut. Almonds are a very good source of vitamin E, manganese, biotin and copper. Almonds are a good source of magnesium, molybdenum, riboflavin (vitamin B₂), and phosphorus. Almonds are high in healthy monounsaturated fats, fiber, protein and various important nutrients. The main aim of this research is to find out the some nutritional values, minerals and antioxidant activity of Almond (Badan) seeds.

Aim and Objectives

Aim

The aim of this research work is to determine the minerals, nutritional values and antioxidant activity of almond (*Terminalia catappa* L.) seeds.

Objectives:

- To collect almond seeds from Mandalay Township
- To determine physicochemical properties of almond seeds (pH, moisture content, ash content)
- To determine elemental analysis
- To determine the nutritional values of almond seeds (carbohydrate, protein and fat content)
- To determine the antioxidant activity of almond seeds

Botanical Description of Almond



Figure (1) Almond Tree, Fruit and Seeds

- Family name - Combretaceae
Botanical name - *Terminalia catappa* L.
English name - Almond
Myanmar name - Badan

Part used - Seeds

II. MATERIALS AND METHODS

Sample Collection

Almond seeds were collected from Mandalay Township, Mandalay Region. They were cut into small pieces and dried in air. They were stored in well stoppered bottles which were used throughout the experiment.

Preliminary Phytochemical Test of Almond Seed

The phytochemical studies of the almond seed has been tested according the standard procedure. Some of chemical compounds such as tannin, flavonoid, phenolic, alkanoid, spanning and reducing sugar were found in this almond seed

Determination of Some Nutritional Values of *Terminalia catappa* L.

The ash content, moisture content, carbohydrate content, fat content by AOAC method and protein content by macro Kjeldahl method were determined.

Investigation of Antioxidant Activity of Almond Seed

The DPPH radical scavenging activity of ethanol extracts from seed of almond was compared with ascorbic acid. DPPH radical scavenging test is based on the exchange of hydrogen atoms between the antioxidant and the stable DPPH free radical. The reduction capability of DPPH radicals was determined by the decrease in its absorbance at 517 nm, which is induced by antioxidants. The significant decrease in the concentration of the DPPH radical is due to the scavenging ability of ethanolic extract of seed of almond. Determination of radical scavenging by DPPH method based on the change in absorbance of crude extracts solutions in various concentrations. Six kinds of concentrations 2µg / mL, 1 µg/mL, 0.5 µg/ mL, 0.25µg/ mL, 0.125µg/ mL and 0.0625 µg/mL were prepared by dilution with ethanol as solvent. Ascorbic acid was used as standard sample and ethanol was employed as control. These values are used to calculate the percentage inhibition of DPPH radical against the samples. The IC₅₀ values of various extracts were calculated from the percentage inhibition at various concentrations. The results of the free radical scavenging activity of seed of were assessed by DPPH assay was summarized by IC₅₀ using method of linear regression.

Analysis of Semi Quantitative Elements

The semi- quantitative elemental analysis of *Terminalia catappa* L. (almond seed) was performed by EDXRF method.

III. RESULTS AND DISCUSSION

The phytochemical tests revealed that tannin, flavonoid, phenolic compound, alkaloid, saponin and reducing sugar were present in the sample. The observed phytochemical constituents are essential compounds for the metabolism and nutrition of human body.

The nutritional compositions of almond seeds (ash, moisture, carbohydrate, protein and fat contents) were determined and the results were shown in Table 1.

The results of the free radical scavenging activity of seed of almond were assessed by DPPH assay was summarized by IC₅₀ using method of linear regression. The lower the value of IC₅₀ the higher is the antioxidant property. It was observed that the ascorbic acid and ethanol extract of seed of almond have been illustrated in Table 2 and 3.

The elemental compositions of almond seed sample by EDXRF method results were tabulated in Table 4.

Table 1 pH, Ash Content, Moisture Content and Nutritional Compositions of Almond Seeds

No.	Content	Analytical Method	Value
1.	pH	pH meter	7.4
2.	Ash	Loss of weight in ignition	4.16 %
3.	Moisture	Gravimetric method	4.57 %
4.	Carbohydrate	Phenolsulphuric acid Colourimetric method	4.86
5.	Protein	Kjeldahl method	24.18
6.	Fat	Petroleum Ether Extraction method	49.75

From the determination of almond seeds, it was found that the amount of fat content was highest in the samples.

Table 2. Absorbance, DPPH % Radical Scavenging of Various Concentration and IC₅₀ Value of Ascorbic Acid

Tested Sample	Concentration (µg / mL)	Absorbance (517 nm)	DPPH % Radical Scavenging	IC ₅₀ (µg / mL)
Ascorbic acid	0.0625	1.9969	44.3078	0.031
	0.125	1.7828	50.2761	
	0.25	1.6269	54.6268	
	0.5	1.4826	58.6513	
	1	1.2721	64.5220	
	2	1.1242	68.6468	

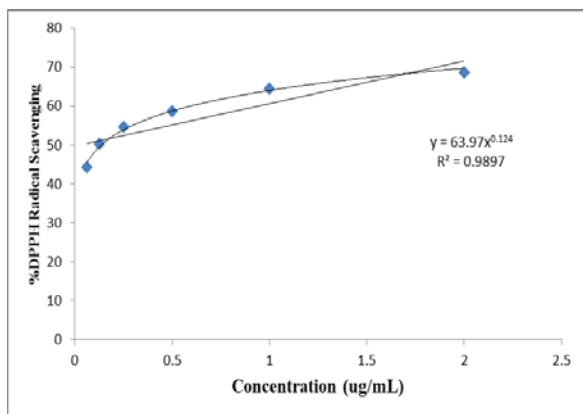


Figure (2) The Plot of DPPH % Radical Scavenging Vs Concentration (µg/mL) of Ascorbic Acid

Table 3. Absorbance, DPPH % Radical Scavenging of Various Concentration And IC₅₀ Value of EtOH Extract of Almond Seeds

Tested Sample	Concentration (µg / mL)	Absorbance (517 nm)	DPPH % Radical Scavenging	IC ₅₀ (µg /mL)
Almond seed	31.25	2.0259	43.5000	35.782
	62.5	1.7982	50.0200	
	125	1.6440	54.1536	
	250	1.3653	61.9227	
	500	1.2756	64.4244	
	1000	0.9252	74.1968	

Figure (4) IC₅₀ Value of Almond Seeds with Ascorbic Acid

According to the results of antioxidant screening, the IC₅₀ value of ethanolic extract was found to be 35.782 µg/mL. IC₅₀ value is inversely related to the free radical scavenging activity. As the almond seed possesses the rich antioxidant properties, it may be consumed for the human health.

Elemental Compositions of Almond Seed by EDXRF Method

Elemental compositions of almond seeds samples by EDXRF method results were tabulated in Table (4).

Table 4. The Results of Mineral Compositions of Almond Seeds

No	Name of Element	Symbol	Result (%)
1	Potassium	K	0.8907
2	Phosphorus	P	0.7810
3	Calcium	Ca	0.3460
4	Magnesium	Mg	0.3420
5	Sulphur	S	0.2310
6	Chlorine	Cl	0.0743
7	Iron	Fe	0.0089
8	Zinc	Zn	0.0079
9	Manganese	Mn	0.0030
10	Copper	Cu	0.0028
11	Strontium	Sr	0.0010

According to EDXRF method results, the high content of potassium is effective for the persons with hypertension. Calcium helps the teeth and bones to be strong for human.

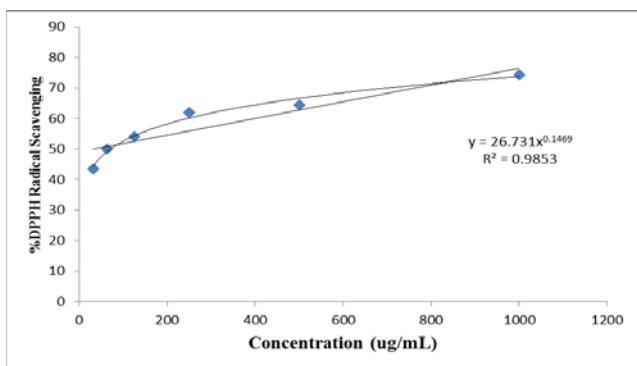
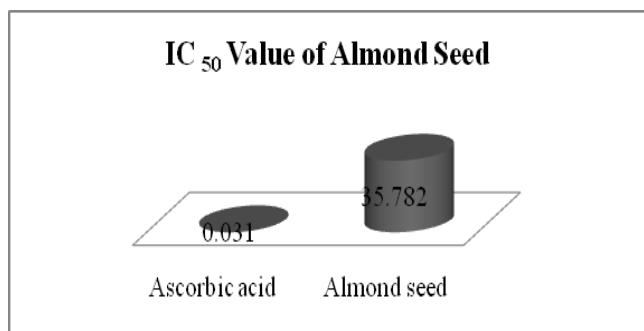


Figure (3) The Plot of DPPH % Radical Scavenging Vs Concentration (µg/mL) Of EtOH Extract of Almond Seeds

V. CONCLUSION

In this research paper, the almond seeds were determined the physicochemical properties, mineral content, nutritional values and antioxidant activity. The values of pH, ash and moisture content were 7.4, 4.16 % and 4.57 % respectively. Carbohydrate, protein and fat contents were 4.86 %, 24.18 % and 49.75 % respectively. In the study of elemental analysis, the high contents of potassium (0.890 %), phosphorus (0.7810 %), calcium (0.3460 %) and magnesium (0.3420 %) were observed.



The high content of potassium is effective for the persons with hypertension. Calcium helps human's teeth and bones to be strong. From the determination of nutritional composition of almond seeds, it was found that the amount of fat and protein were high in the samples. The antioxidant activity of ethanol extract was also screened. IC₅₀ value of ethanol extract was 35.782 µg/mL. According to the results of antioxidant screening, almond seeds possess antioxidant property, it may be used for human health.

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Approximately 33 g of proteins are lost each day by the average adult male and can be replaced in the diet. Also growing children need more protein than adult per unit weight since more protein is needed for growth. The result show that consumption of almond will contribute significantly on healthy benefits. The health benefits of almonds included blood pressure and sugar levels, reduced blood pressure and lower cholesterol levels. In this regard, attention should be drawn to cheap sources of protein like almond seeds proven to be edible, available and affordable, and which contain most of the nutritional requirement in large proportion.

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