

Study of Antioxidant Properties and Fatty acid profile of Breadfruit seed oil from Khandesh area

Khushbu Sharma¹, Hema Hemnani², Dr. A. R. Lokhande³

¹Shram Sadhana Bombay Trust College Of Engineering & Technology, North Maharashtra University

²Shram Sadhana Bombay Trust College Of Engineering & Technology, North Maharashtra University

³Shram Sadhana Bombay Trust College Of Engineering & Technology, North Maharashtra University

Abstract: Breadfruit (*Artocarpus heterophyllus* Lam.) is one of the most popular tropical fruits grown in India. Bread fruit seeds make-up around 10 to 15% of the total fruit weight and have high carbohydrate and protein contents, minerals and phytonutrients. In the present work, we have investigated fatty acid content of oil, yield and acid value of oil. Oil extracted from seed of breadfruit was analyzed for physicochemical properties, free fatty acids profiles and antioxidant properties. Physicochemical characteristics showed that the light yellow breadfruit oil had a density of 0.89 ± 0.01 g/cm³, moisture content $9.44\pm 1.50\%$, and percentage yield of $7.50\pm 3.01\%$. The iodine value was 52.64 ± 3.56 mg/g, acid value was 77.7 ± 6.67 mg/g, saponification value was 246.09 ± 50 mg of KOH/g and unsaponifiable matter was 29.67 ± 3.12 g/kg. The component neutral lipid of a breadfruit is a fatty acid. Overall results suggest that the oil will be a good candidate for conventional oil and good raw material for soap, paint and food industries.

Keywords: Breadfruit, fatty acid, antioxidant properties.

1. Introduction

The breadfruit (*Artocarpus heterophyllus* Lam.), believed to have originated from India, is largely cultivated throughout many countries in the Middle East such as India, Burma, Ceylon, Malaya and Southern China. This fruit also grows in African countries such as Uganda and Kenya as well as in Brazil, Jamaica and the Bahamas. breadfruit is available in the Indian market in the spring, till summer. The fruit contains large fleshy banana flavoured sweet bulbs which may be crispy or soft and yellow to brownish when ripe. Jackfruit also has been reported to contain antioxidant prenyl avones. Recently, antioxidant capacity of fruit pulp has been evaluated. However, jackfruit seeds are eaten as boiled or roasted but less popular as vegetable. The seeds are also rich source of carbohydrates and proteins and good source of vitamins. They are light brown in colour. [6]

The seeds of breadfruit are edible and are of high nutritional value. Its seed contains oil of about 20.83% when extracted. [2] Seed oils are important sources of nutritional oils, industrial raw materials and nutraceuticals. The characteristics of oils from different sources depend mainly on their compositions; no oil from a single source can be suitable for all purposes thus the study of their constituents is important. Many consumers are looking for variety in their diets and aware of the health benefits of fresh fruits and vegetables and of special interest are food sources rich in antioxidants. [7]

Fatty acids are essential for normal growth and development and may play an important role in the prevention and treatment of coronary artery disease, hypertension, diabetics, arthritis, other inflammatory and autoimmune disorders and cancer. Little work has been done on the physicochemical of the seed oil. Fatty acids profiles and antioxidant properties have not been done till 2013. The aim of the studies is to ascertain its physicochemical properties, fatty acids profiles and antioxidant properties for their nutritional and economic significance. [6]

2. Material and Method

Material Required

The materials required for the extraction method are listed as follows:

- _ Breadfruit seeds flour.
- _ Commercial hexane as a solvent for oil extraction.
- _ sohxlet extractor apparatus.

3. Method

Breadfruit seeds were dried in sunlight for 4-5 days small pieces were made. The powdered form was obtained using electronic blender and stored in airtight box. The oil was extracted with sohxlet apparatus to extract with commercial hexane of boiling point 68.5 to 69.1 ° c. The powdered sample then inserted into the thimble and Close the extraction thimble with a fat free cotton wad . The thimble was inserted into the sohxlet apparatus and commercial hexane was used as the extracting solvent for 4 hours. at the end of the process the solvent is recovered and the oil sample is transferred to a dessicator and allowed to cool before weighed. the oil sample was sealed in glass bottle and kept for analytical test .

3.1 Operation of Soxhlet Extractor

The solvent was heated to reflux. The solvent vapour travels up a distillation arm and floods into the chamber housing the thimble of solid. The condenser ensures that any solvent vapour cools, and drips back down into the chamber housing the solid material. The chamber containing the solid material slowly fills with warm solvent. Some of the desired compound dissolves in the warm solvent. When the Soxhlet chamber was almost full, the chamber is emptied by the siphon. The solvent is returned to the distillation flask. The thimble ensures that the rapid motion of the solvent does not transport any solid material to the still pot. This cycle may be allowed to repeat many times, over hours or days. During each cycle, a portion of the non-volatile compound dissolves in the solvent. After cycles the desired compound is concentrated in the distillation flask. The advantage of this system was that instead of many portions of warm solvent being passed through the sample, just one batch of solvent is recycled. After extraction the solvent is removed, typically by means of a rotary evaporator, yielding the extracted compound. The non-soluble portion of the extracted solid remains in the thimble, and is usually discarded.



3.2 Physicochemical Analysis of oils

The physicochemical analysis of all the four oils were carried out using AOCS official methods, moisture content, acid value, saponification value, iodine value, unsaponifiable matter were determined for the oils used in this study. [8]

4. Results

Physical properties

PARAMETERS	VALUE
Percentage yield (%)	11.6
Colour	Light yellow
Density (gm/cm ³)	0.88
Moisture(%)	10.13

Chemical properties

Parameters	Values
Acid value (mgs of KOH/gm)	74.2
Peroxide value (mEq/1000gm)	102.9
Iodine value (mg/g)	50.84
Free fatty acid (%)	37.1
Saponification value (mg KOH/gm)	239.88
Unsaponifiable matter (gm/kg)	30.12

G.C. ANALYSIS

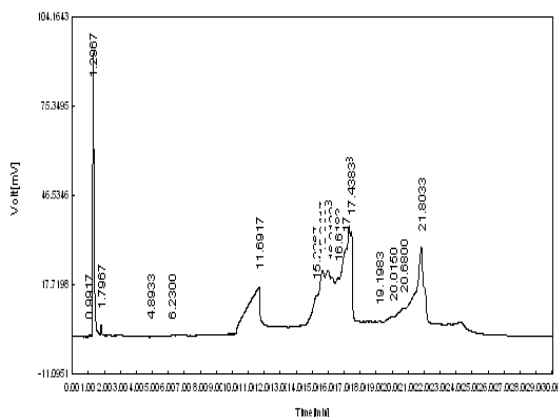


Fig 2 Fatty acid anlysis

4.1 Preparation of Methyl Esters

100 mg of sample was taken in a round bottom flask. Measured amount of boron tri fluoridemethanol solution (BF₃- 125gms /liter of methanol) were added to mixed fatty acid. The mixture was heated and refluxed for 25-30 minutes at steady temperature. A 5 ml of heptanes was added through condenser and the content was boiled for 5 minutes till it dissolved .The content was transferred to a separating funnel. The lower layer formed was decanted. To the upper layer anhydrous sodium sulphate was added and traces of moisture were removed. This dried heptanes solution was subjected to Gas-Chromatography. The ester sample was injected into gas chromatography. The carrier gas was helium at pressure of 116.9kPa. The column oven temperature of 70oC, flow rate 1.80ml/min with split ratio of 20:0 was employed. The fatty acids were identified by comparing their retention times with those of standards. The content of fatty acids was expressed as percentage of total acids.

Index	RT[min]	Area[mV*s]	Area%
1	0.8383	4.8478	0.1709
2	0.9283	1.6711	0.0589
3	0.9917	1.5183	0.0535
4	1.2967	462.4054	16.3047
5	1.7967	11.1740	0.3940
6	4.8933	1.4927	0.0526
7	6.1650	1.0512	0.0371
8	6.2300	1.2329	0.0435
9	11.6917	665.0019	23.4483
10	15.2367	17.4995	0.6170
11	15.6417	116.3099	4.1012
12	15.9633	98.1860	3.4621
13	16.2133	30.3691	1.0708
14	16.6183	7.3476	0.2591
15	17.1017	263.7513	9.3000
16	17.2883	260.6337	9.1901
17	17.4383	210.7779	7.4321
18	19.1983	4.3085	0.1519
19	20.0150	9.8589	0.3476
20	20.6800	10.6461	0.3754
21	21.8033	655.9463	23.1290

5. Conclusion

This study showed that breadfruit seed oil is a good source of edible oil. Its fatty acids composition is comparable to that of some conventional oils. Therefore, the oil will be a good alternative for conventional oil and its applications are useful towards soap, paint, food and even pharmaceutical industries

6. Reference

- [1]. Okaka JC, Okobundu ETN, Okaka ANC. Human nutrition. An integrated approach. 2nd Ed. Enugu state university of science and technology Enugu, Nigeria; 2002:77-85
- [2]. Ajiwe VIE, Okeke CA, Agbo HU. Extraction and utilization of breadfruit seed oil (*Traculia Africana*). Bioresource Technology England. 1995; 53(2):89-90
- [3]. Physicochemical Properties, Fatty Acids Profiles and Antioxidant Properties of Seed Oil of Breadfruit(*Treculia africana*). Bwai MD*, Adedirin O, Akanji FT, Muhammad KJ, Idoko O and Useh MU
- [4]. Mato L, Nzikou JM, Kimbonguila A et al. Composition and Nutritional properties of Seeds and Oil from *Terminalia catappa*. L. Adv. J. Food Sci. Tech:2009; 1(1):72-77.
- [5]. Study of functional properties of raw and blended jackfruit seed flour (a non-conventional source) for food application by A.Roy Chowdhury , A K Bhattacharyya , and P Chattopadhyay “Department Of Food Technology ” Techno India ,E.M. 4/1,sector-5,salt lake,Kolkata-700091,west Bengal ,india.
- [6]. Keay RWJ., Phil D., Biol FT. Trees of Nigeria. Oxford University press, New York, 1989: 204-207.
- [7]. Aberoundmand A; Deokule SS.Determination of elements profile of some wild edible plants. Food Anal. Mthods. 2008 Doi 10, 1007/s12161-008-9038-z.
- [8]. Official Methods and Recommended Practice of the American Oil Chemist’s Society, AOCS (2006); In (ed),4th edition, Champaign, IL Official Method To la- 64, reapproved.