International Journal of Trend in Research and Development, Volume 9(2), ISSN: 2394-9333
www.ijtrd.com

Extraction of Edible Oil from Carica Papaya Seeds and to Study the Physicochemical Properties of Edible Oil

[1]Milan Maniya and [2]Anushka Singh,
[1]M.Sc. Student, Assistant Professor,
[1,2]Department of Food Technology, Parul Institute of Applied Sciences, Parul University, Limda, Gujarat, India

Abstract: Extraction of edible oil from Defatted and undefatted seeds of Papaya (Carica papaya) and check or analyzed the physical – chemical properties of the edible oil. Seeds were collected and dried. Extract the oil from seeds by using Soxhlet Method. Petroleum ether are used as extraction solvent (have a pure alcohol and have a low boiling range (30-60 ℃) and to shorten extraction time). This study was to check the physicochemical properties of the Papaya (Carica papaya) seed and oil. The seeds are highly rich in nutrition. Papaya seed are major source of the protein (27.6%).Papaya seeds have crude fiber (22.4%). They have moisture content (7.0%) and the ash content (3.5%) with the including of minerals (K, Na, Mg, P, Ca). Energy value of the papaya seed was (375.90 Kcal). They have carbohydrate and fat content (30.9% and 26.5%). pH of oil is 5.4. Saponification matter and iodine value of oil was following 282.5 and 83.8.

Keywords: *Papaya (Carica papaya) seeds, Extraction of oil, Soxhlet apparatus, Physicochemical analysis.*

I. INTRODUCTION

Papaya (Carica papaya L.) is Associate in Nursing edible tropical fruit extensively cultivated for its exportation and family uses. This is often a vital crop in tropical and semitropic regions, with Brazil, Mexico, and African country being the most producers of papaya (Saeed et al., 2014). The papaya tissues like roots, stems, leaves, seeds, and ripe and unripe fruit have necessary medicative properties (Pandey et al., 2016; Pinnamaneni, 2017; Vij and Prashar, 2015; Yogiraj et al., 2014).

Among others there are antiinflammatory, contraceptive, hypoglycaemic, abortifacient, hepatoprotective, wound healing, medicine, and antitumour effects (Yogiraj et al., 2014). Such human health connected effects are attributed to the biological compounds gift in papaya tissues, like alkaloids, latex, saponins, group chemical irritant (BITC), group glucosinolate, tannins, anthraquinones, carotenoids, synthetic resin compounds, and flavonoids (Roshan et al., 2014).

These biological compounds build papaya fruit Associate in Nursing totally different tissues not solely an garden truck, however additionally a useful food that is alimentary and helps to enhance our health(Ali et al., 2012).

Generally, the medicative effects of papaya are attributed to the alkaloids, like carpaine, papain, and BITC (Adebiyi et al., 2003; Amazu et al., 2010; Julianti et al., 2014; Pandey et al., 2016).

Papaya seeds area unit the ovules shaped within the cavity of papaya fruit. They need ovoid form and brown color, and their size is around 4-6 millimeter, that indicates they're little seeds, To boot, papaya seeds have AN orange-colored, juicy and fleshy cowl (sarcotesta), whereas within this cowl, the seed appearance dark, rough, and laborious (Gil and Miranda, 2005).

Ayala-Zavalanet al. (2010) mention papaya seeds represent around 6%-8% of the entire fruit. Despite papaya seeds composition, these don't seem to be employed by developed countries like the Unites States, Australia, or EEC (Ikram et al., 2015). Not with standing, developing countries use papaya seeds within the treatment of high blood pressure, diabetes, and symptom, among others.

The elements of papaya seeds related to the advantages obtained from this tissue square measure largely alkaloids, glucosinolates, chemical irritant, synthetic resin acids, and flavonoids (Amazu et al., 2010; Gogna et al., 2015). Among those edges, Bose et al. (1961) reported that the organic compound fraction of papaya seeds bated the viscus activity, cardiac muscle, force per unit area, and didn't show any result on earthworms (Pharetima posthuma); whereas oil seed was effective against earthworms.

On the opposite hand, they showed liquid extracts and organic compound of papaya seeds aroused the viscus muscle and unfit earthworms and rat tapeworms in vitro. Organic compound was the foremost effective fraction tested with anthelmintic action. To boot, Amazu et al. (2010) found that methanolic extract of papaya seeds had antiinflammatory activity in Wistar rats. However, this health-related profit must be prove not solely in animals.

Benefits of Papaya(Carica papaya) seeds oil :-

1) The Organic Papaya Seed oil effectively moisturizes, enhances skin physical property, Lowers wrinkles, dryness, and skin lines. The enzyme in Papaya seed Oil aids within the removal of the dead skin cells therefore the application of organic papaya seed oil on the skin exfoliates your skin.

2) The OTI Organic Papaya Seed oil may be a sturdy inhibitor with a considerably high quantity of axerophthol & C. The Papaya seed oil may be a good supply of enzyme that is that the protein in most natural fruits and as well as omega-6 fatty acid and omega-9 fatty acids.

3) The Organic Papaya seed oil will alleviate restless, scaly, or irritated skin conditions like skin condition and skin problem. The organic Papaya seed oil contains a big quantity of vitamin C that relieves wrinkles, patches, pores, acne, dark spots, and different skin challenges.

4) Organic Papaya seed oil improves smooth soft hair, prevents hair wet loss, and adds physical property and suppleness. Papaya seed oil offers a moment sparkle and shine and helps to fix split ends.

5) Fortified with vitamins, minerals, and essential fatty acids, The OTI Organic papaya seed oil may be a good addition to your natural and organic aid routine.

II. MATERIALS & METHOD

Requirement:

Instrument	Glassware	Other requirement
1. Soxhlet apparatus	1. Measuring cylinder	1. Papaya Seeds powder
2. Mixer grinder	2. Table Spoon	2. Plastic cups
3. Weighing Balance	3. Conical flask	3. Distilled Water
4. Autoclave	4. Beaker	
5. Muffle Furnace	5. Petri plate	
6. Incubator	6. Crucible	
7. PH meter	7. Test Tube	
8. Hot air oven	8. Burette	
9. Water bath	9. Pipette	
	10. Dropper	
	11. Glass rod	
	12. Funnle	
	13. Buchner Funnle	
	14.Whatman Filter paper	
	15. Test tube stand	
	16. Forceps	
	17. Cotton swabs	
	18. Muslin cloth	

Chemicals & Reagent:

Staining Reagent	Conc.Solution	Sugars
1. Methyl orange	1. Conc.H2so4	1. Standard glucose
2. Authrone reagent	2. Conc.Cuso4	
3. Phenolphthalein indicator	3. Conc.NaoH	
	4. Hcl	
	5. Iodine solution	
	6. Sulphuric acid solution	
	7. Petroleum ether	
	8. KI solution	
	9.Na2S2O3 solution	
	10. KOH solution	
	11. Chloroform	

Collection of raw Material:

Papaya Seeds are collected from the local super market of Vadodara, Gujarat.

Extraction of oil:-

Methodology: Soxhlet method

1. Collect papaya seed from papaya fruit.
2. Under the sunlight, (type of Drying method) all papaya seeds were dried.
3. Take the dried papaya seeds and grind with the help of the grinder mixer and get papaya seed powder.
4. Take 1gm of papaya seed powder using of weighing balance in Whatman filter No 1.
5. The solvent (250ml of petroleum ether) is added to a spherical bottom flask, Which is connected to a Soxhlet extractor and condenser on isomental.
6. The crush papaya seed powder is loaded into the thimble that is placed Inside the Soxhlet extractor.
7. The solvent is heated exploitation the isomantle and can begin to evaporate, Moving through the equipment to the condenser.
8. The atmospheric phenomenon then drips into the reservoir containing the thimble.
9. Once the extent of solvent reaches the siphon it pours back to the Flask and therefore the cycle begins once more.
10. The method is taking a time of 5-6 hours.
11. Once has the discovered the extraction it will be left to run without direct direction.
12. Once the method has finished, the crude ether ought to be gaseous employing a rotary evaporator, deed a little yield of extracted papaya seed oil within the glass bottom flask.

Chemical analysis of Papaya seed:-

1) Ash content:

Procedure:

1. Note the weight of empty silica crucible.
2. Weight 10 g of sample into the crucible.
3. Flash off the moisture using water bath.
4. Keep the content at 530˚C for 3 hours in muffle furnace.
5. Cool the dishes in desiccators & weigh.Note the difference in weight of content.

The Ash content calculated from the following equation:

$$\textit{percentage of ash content} = \frac{\mathbf{W1 - W2 \ \times 100}}{\boldsymbol{W}}$$

W = Weight of sample
W1 = Initial weight of sample with crucible
W2 = final weight of sample

2) Moisture content:-

Procedure:

1. Weigh 10 g sample accurately and subjected to oven drying at 105° C for 4-5 hour.
2. Oven dried samples is cooled in desiccators and weighed.
3. The drying was repeated until the constant weights were obtained or until the Difference between two successive weighing was not more than 0.002 g.
4. The resultant loss in weight was calculated as percent moisture content.

The Moisture content calculated from the following equation:

$$\textit{percentage of moisture} = \frac{\boldsymbol{W1 - W2\ X\ 100}}{\boldsymbol{W1}}$$

W1 = Initial weight of sample
W2 = final weight of sample

3) Fat content:

Procedure:

1) Weigh 20 g sample accurately and take this sample in petri plate. 2) Keep

this petri plate in hot air oven. 3) Set 105°c temperature of hot air oven and start the oven. 4) Stop heating in hot air oven after complete moisture is removing. 5) Remove sample from oven and cool it.6) Make a thimble of solidify sample after removing moisture. 7) This thimble place in soxhlet apparatus extractor. 8) Weigh empty round bottom flask. 9) Assemble soxhlet apparatus and add 20 cycles of hexane solvent. 10) Start heating at 70° C for 3 h. 11)After 3 hour remove thimble from extractor and recover solvent with the help of heating.12) After recovery weigh round bottom flask and record the readings and calculate it.

The Fat content calculated from the following equation:

$$percentage\ of\ fat = \frac{W2 - W1}{W}\ X\ 100$$

W = Weight of Sample
W1 = Weight of flask prior to extraction
W2 = Weight of flask after extraction

Fat Determination: (Acid Hydrolysis)

Procedure:

1. Take 1 gm of sample add equal amount of water for homogenization.
2. Add 9 ml hydrochloric acid and 0.3 ml of ammonia in that beaker, put that beaker on waterbath for 2 hour.
3. After that add 10 ml absolute alcohol and 50 ml of petroleum ether and 50 ml of diethyl ether and shake it vigorously for minute.
4. Now take out the upper layer in pre weighed beaker.
5. Evaporate it completely on water bath at temperature that does not cause bumping.
6. Dry the fat in oven at 102±2˚c to a constant weight. Weigh that cooled beaker.

Equation:

$$percentage\ of\ fat = \frac{W1 - W2\ X\ 100}{W3}$$

W1= weight in g of contents in the flask or metal dish or glass bowl before removal of fat.
W2= weight in g of contents in the flask or metal dish or glass bowl after removal of fat
W3= weight in g of material taken for the test.

4) Protein content:(K-jeldahl method)

The Kjeldahl method is a method of determining the nitrogen content. The basic principle introduced by John Kjeldahl. The method may be divided into 3 main steps.

1. Digestion.
2. Distillation.
3. Titration.

Procedure

1) Digestion :

1. A general equation for the digestion of an organic sample is shown below as; Weigh accurately 1 gm ground sample into 100 ml digestion flask.
2. Add 2gm K2SO4 as a catalyst and 25 ml conc. H2SO4. Digest until the clear solution is obtained.
3. Initially an organic sample usually blackens the reaction.
4. The heat input with organic decomposition the digestion mixture gradually clears as CO2 is evolved.
5. The acid digestion is usually cooled and diluted with ammonia free water. Conc. NaOH (usually 50% solution) is added slowly down the neck of the flask.
6. Generally for each 5 ml of conc. H2SO4 used in the digestion 20 ml of 50% NaOH is required to make the digest strongly alkaline.
7. The Kjeldahl flask is attached to water condenser and is heated to boil off the NH3 from the digest.

Distillation

1. The majority of NH3 is distilled and trapped in the receiving acid solution.
2. The receiving acid solution is 4% boric acid collect the condensate in boric acid solution.
3. Almost 150-200 ml condensate should be collected in the receiving flask to ensure complete recovery of nitrogen.
4. The tip of the condenser is submerged in a flask of boric acid solution. Again trap the distilled NH3 in receiving solution.

3. Titration

1. The boric acid captures the ammonia gas forming an ammonium borate complex.
2. Add methyl orange indicator and titrate against 0.1 N H2SO4.

Equation:

$$percentage\ of\ Protein = \frac{1.4\ X\ N\ X\ V}{W}$$

V = Acid used in titration (ml)
N = Normality of standard acid (0.1)
V = weight of sample (g)

5) Carbohydrate content:

1. Weigh 100 mg of the sample into a boiling tube.
2. Hydrolyse by keeping it in a boiling water bath for three hours with 5 mL of 2.5 N HCl and cool to room temperature.
3. Neutralize it with solid sodium carbonate until the effervescence ceases.
4. Make up the volume to 100 mL and centrifuge.
5. Collect the supernatant and take 0.5 and 1 mL aliquots for analysis.
6. Prepare the standards by taking 0, 0.2, 0.4, 0.6, 0.8 and 1 mL of the working standard. '0' serves as blank.
7. Make up the volume to 1 mL in all the tubes including the sample tubes by adding distilled water.
8. Then add 4 mL of anthrone reagent.
9. Heat for eight minutes in a boiling water bath.
10. Cool rapidly and read the green to dark green colour at 630 nm.
11. Draw a standard graph by plotting concentration of the standard on the X-axis versus
12. Absorbance on the Y-axis.
13. From the graph calculate the amount of carbohydrate present in the sample tube.

Equation:

$$carbohydrate\ content = \frac{ODV\ of\ unknown}{ODV\ of\ standard}\ X\ Sc\ X\ DF$$

SC = concentration of standard
DF = dilution factor

6) Ph content:

Procedure:

1. Ensure the temperature of the Liquid being examined to 200-250C.
2. Immerse the glass electrode in the liquid to be examined.
3. Turn off the knobs to pH Checking & note.
4. When measuring the pH above 10, ensure that the electrode is suitable for use under alkaline conditions & apply any correction that is necessary.
5. Record the pH of the solution used to standardize the meter and electrodes at the end of a set of measurements. If the difference between this reading and the original value is greater than 0.05, the set of measurements must be repeated.

8) Determination of Energy value:

Equation:

$$\boldsymbol{Energy\ value}\left(\frac{\boldsymbol{Kcal}}{\boldsymbol{100g}}\right) = (\text{CP\%} \times 4) + (\text{Carb\%} \times 4) + (\text{Fat\%} \times 4)$$

CP = crude protein

Carb = carbohydrate

Chemical analysis of oil:

1) Saponification value:

Procedure:

1. 2g Sample mixed with 25ml of alcoholic solution of KOH in 250ml flask.
2. Placed in water bath for 1h and cool at room temperature.
3. add 2-3 drop of phenolphthalein indicator and mixn it.
4. Titrate against standard 0.5 N Hcl until pink colour observed.

Equation:

$$\boldsymbol{Saponification\ value} = \frac{\textbf{(blank + Titer)} \times \textbf{100}}{\textbf{weight of oil}}$$

2) Iodine value:

Procedure:

1. Weight 0.2 g of oil in 250 ml conical flask.
2. Add 20ml chloroform and dissolve the oil completely.
3. Keep it in dark incubation for 30 min.
4. Add 20 ml of KI solution and mix well.
5. Titrate against 0.1 N Na2S2O3 solution using starch as indicator with vigorous shaking to extract iodine chloroform layer.

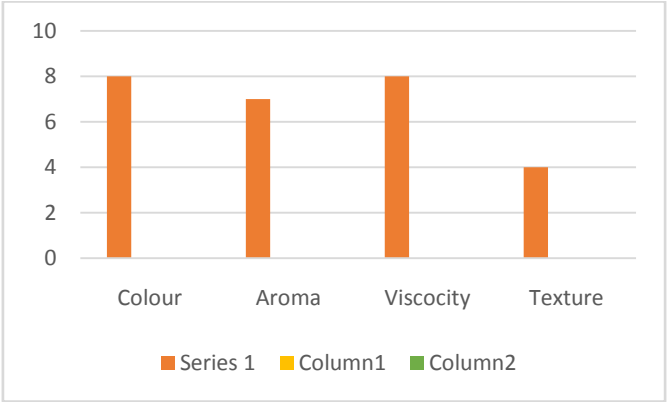
$$\boldsymbol{Iodine\ value} = \frac{A \times N \times 0.1269 \times 100}{Weight\ of\ oil}$$

A = ml of Na2S2O3

N = Normality of Na2S2O3

III. RESULT

1) Sensory evaluation of oil:



Graph of sensory evaluation of papaya seed oil

By performing various chemical test for Papaya seed following result are:

Table: Result of chemical test of papaya seed

Component	Chemical composition per 100gm
Protein content	27.60%
Crude fiber	22.40%
Moisture content	7.00%
Ash content	3.50%
Energy value	375.90Kcal
Carbohydrate content	30.90%
Fat content	26.50%

By performing various chemical test for Papaya seed oil following result are:

Table: Result of chemical test of papaya seed oil.

Test	Result
Ph	5.4±5.8
Iodine value	83.8
Saponification value	282.5

CONCLUSION

Papaya seed are circular, black or brown seeds are encased in a like gelatin substance in the inner cavity of the papaya fruit. Papaya seed are usually discarded or thrown out without treatment or use. papaya seeds have a massive or positive impact on the human health and human body. They have also medicinal properties and also used for skin disease and other allergies.

By performing various physicochemical test of papaya seed and papaya seed oil, the various test of result shown that papaya seed are rich in high nutrition and they are used as antioxidant ,they have anticancer properties, oil used in human kidney function.

References

[1] Adebiyi, A., Adaikan, P.G., Prasad, R., 2003. Tocolytic and toxic activity of papaya seed extract on isolated rat uterus. Life Sci. 74, 581,592.

[2] Ali, A., Devarajan, S., Waly, M.I., Essa, M.M., Rahman, M., 2012. Nutritional and medicinal values of papaya (Carica papaya L.). Natural Products and Their Active Compounds on Disease Prevention. Nova Science Publishers, Inc.

[3] Amazu, L., Azikiwe, C., Njoku, C., Osuala, F., Nwosu, P., Ajugwo, A., et al., 2010. Antiinflammatory activity of the methanolic extract of the seeds of Carica papaya in experimental animals. Asian Pacific J. Tropical Med. 3, 884,886.

[4] Aryal, R., Ming, R., 2014. Sex determination in flowering plants: papaya as a model system. Plant. Sci. 217, 56,62.

[5] Ayala-Zavala, J., Rosas-Domı´nguez, C., Vega-Vega, V., Gonza´lez-Aguilar, G., 2010. Antioxidant enrichment and antimicrobial protection of fresh-cut fruits using their own byproducts: looking for integral exploitation. J. food Sci. 75.

[6] Bamisaye, F., Ajani, E., Minari, J., 2013. Prospects of ethnobotanical uses of pawpaw (Carica papaya). J. Medicinal Plants 1, 171,177.

[7] Bose, B., Saifi, A., Vijayvargiya, R., Bhagwat, A., 1961. Pharmacological study of Carica papaya seeds with special reference to its anthel-mintic action. Preliminary report. Indian. J. Med. Sci. 15, 888,892.

[8] de Oliveira, J.G., Vito´ria, A.P., 2011. Papaya: nutritional and pharmacological characterization, and quality loss due to physiological disorders. An overview, Food Res. Int., 44. pp. 1306,1313.

[9] Ezikanyi, D.N., Nnamani, C.V., Ihejirika, J.N., 2016. Qualitative phytochemical analysis and in vitro fungal activities of Citrus aurantifolia L. and Carica papaya L. leaves extracts on pathogenic fungi. J. Pharm. Biol. Sci. 11, 68,72.

[10] Fuentes, G., Santamarı´a, J.M., 2014. Papaya (Carica papaya L.): origin, domestication, and production. Genetics and Genomics of Papaya. Springer, pp. 3,15.

[11] Gayosso-Garcı a-Sancho, L., Yahia, E.M., Martı´nez-Te´llez, M.A., Gonza´lez-Aguilar, G.A., 2010. Effect of maturity stage of papaya maradol on physiological and biochemical parameters. Am. J. Agric. Biol. Sci. 5, 194,203.

[12] Gil, A.I., Miranda, D., 2005. Morfologı´a de la flor y de la semilla de papaya (Carica papaya L.): variedad Maradol e hı´brido Tainung-1. Agronomı´a Colombiana 23

[13] Gogna, N., Hamid, N., Dorai, K., 2015. Metabolomic profiling of the phytomedicinal constituents of Carica papaya L. leaves and seeds by 1H NMR spectroscopy and multivariate statistical analysis. J. Pharm. Biomed. Anal. 115, 74,85.

[14] Goyal, S., Manivannan, B., Ansari, A., Jain, S., Lohiya, N., 2010. Safety evaluation of long term oral treatment of methanol sub-fraction of the seeds of Carica papaya as a male contraceptive in albino rats. J. Ethnopharmacol. 127, 286,291.

[15] Hossain, N., Kumar, P.V., Wei, Y.S., 2016. A comparative study of phytochemical content in air dried and lyophilized Carica papaya leaves. Int. J. Green. Pharm. 10, 220,227.

[16] Ikram, E.H.K., Stanley, R., Netzel, M., Fanning, K., 2015. Phytochemicals of papaya and its traditional health and culinary uses a review. J. Food Compos. Anal. 41, 201,211.

[17] Jime´nez, V.M., Mora-Newcomer, E., Gutie´rrez-Soto, M.V., 2014. Biology of the papaya plant. Genetics and Genomics of Papaya. Springer, pp. 17,33.

[18] Julaeha, E., Permatasari, Y., Mayanti, T., Diantini, A., 2015. Antifertility compound from the seeds of Carica papaya. Proc. Chem. 17, 66,69.

[19] Julianti, T., Oufir, M., Hamburger, M., 2014. Quantification of the antiplasmodial alkaloid carpaine in papaya (Carica papaya) leaves. Planta Med. 80, 1138,1142.

[20] Kermanshai, R., McCarry, B.E., Rosenfeld, J., Summers, P.S., Weretilnyk, E.A., Sorger, G.J., 2001. Benzyl isothiocyanate is the chief or sole anthelmintic in papaya seed extracts. Phytochemistry 57, 427,435.

[21] Marfo, E.K., Oke, O.L., Afolabi, O.A., 1986. Chemical composition of papaya (Carica papaya) seeds. Food Chem. 22, 259,266

[22] Otsuki, N., Dang, N.H., Kumagai, E., Kondo, A., Iwata, S., Morimoto, C., 2010. Aqueous extract of Carica papaya leaves exhibits anti-tumor activity and immunomodulatory effects. J. Ethnopharmacol. 127, 760,767.

[23] Owoyele, B.V., Adebukola, O.M., Funmilayo, A.A., Soladoye, A.O., 2008. Anti-inflammatory activities of ethanolic extract of Carica papaya leaves. Inflammopharmacology 16, 168,173.

[24] Pandey, S., Cabot, P.J., Shaw, P.N., Hewavitharana, A.K., 2016. Anti-inflammatory and immunomodulatory properties of Carica papaya. J.Immunotoxicol. 13, 590,602.

[25] Pinnamaneni, R., 2017. Nutritional and medicinal value of papaya (Carica papaya linn.). World J. Pharm. Pharm. Sci. 6, 2559,2578.

[26] Roshan, A., Verma, N.K., Gupta, A., 2014. A brief study on Carica papaya—a review. Int. J. Curr. Trends Pharm. Res. 2, 541,550.

[27] Saeed, F., Arshad, M.U., Pasha, I., Naz, R., Batool, R., Khan, A.A., et al., 2014. Nutritional and phyto-therapeutic potential of papaya (Carica papaya Linn.): an overview. Int. J. Food Prop. 17, 1637,1653.

[28] Zunjar, V., Dash, R.P., Jivrajani, M., Trivedi, B., Nivsarkar, M., 2016. Antithrombocytopenic activity of carpaine and alkaloidal extract of Carica papaya Linn. leaves in busulfan induced thrombocytopenic Wistar rats. J. Ethnopharmacol. 181, 20,25.