



Shubham R. Babbhulkar¹, Shubham B.Wankar², Sahil R. Pakhale³, Dr. Prashant R. Tayade⁴

¹Student, Department of chemical engineering, JDIET, Yavatmal, Maharashtra, India, shubhambabhulkar1234@gmail.com

²Student, Department of chemical engineering, JDIET, Yavatmal, Maharashtra, India, shubhamwankar123@gmail.com

³Student, Department of chemical engineering, JDIET, Yavatmal, Maharashtra, India, srpakhale1597@gmail.com

⁴Doctor, Department of chemical engineering, JDIET, Yavatmal, Maharashtra, India, prashanttayade1@gmail.com

Abstract

Essential oils are extremely focused substances. A large no. of herb materials contains essential oils like flowers, leaves, stems, roots, seeds, barks, resins or fruit. There are several processes for extraction of oil from seeds. during this project we have a tendency to used solvent extraction from soxhlet equipment to extract the oil from palash seeds and flax seeds. this can be the foremost economical methodology to recover oil from oil seeds. Solvent extraction is far associated with soxhlet extraction soxhlet extractor was fancied in 1879 by Franx Von Soxhlet. In our project we have a tendency to used alcohol and Water as solvent Analysis of volatile oil which provides valuates volatile oil qualitatively and quantitatively volume of Essential oil obtained was ever-changing with regard to temperature time of hating. The oil content was found to be 9ml and 11ml in first run and 12ml and 15ml in ordinal run followed by the temperature 500C and also the volume of alcohol as 150ml in palash seeds and flax seeds severally.

Index Terms: palash seed, flax seed etc.

1. INTRODUCTION

1.1 Introduction to volatile oil

An essential oil is a concentrated hydrophobic liquid containing volatile (defined as "the tendency of a substance to vaporize") aroma compounds from plants. Essential oils are called volatile oils, ethereal oils, antherolea, or just because the oil of the plant from that they were extracted, like oil of clove. Associate in Nursing oil is "essential" within the sense that it contains the "essence of" the plant's fragrance—the characteristic fragrance of the plant from that it's derived. The term essential used here doesn't mean indispensable like the terms essential organic compound or essential carboxylic acid that area unit thus referred to as since they're nutritionally needed by a given living organism. In distinction to fatty oils, essential oils evaporate fully while not feat a stain (residue) once dabbed onto paper.

Essential oils area unit usually extracted by distillation, usually by exploitation steam. alternative processes embrace expression, solvent extraction, absolute oil extraction, organic compound sound, and cold pressing. They are employed in perfumes, cosmetics, soaps and alternative merchandise, for flavour food and

drink, and for adding scents to incense and manege improvement merchandise.

1.2 Introduction to essential carboxylic acid

Essential fatty acids, or EFAs, area unit fatty acids that humans and alternative animals should ingest as a result of the body needs them permanently health however cannot synthesize them. The term "essential fatty acid" refers to fatty acids needed for biological processes however doesn't embrace the fats that solely act as fuel. Essential fatty acids mustn't be confused with essential oils, that area unit "essential" within the sense of being a targeted essence. Only 2 fatty acids area unit well-known to be essential for humans: omega-3 (an polyunsaturated fatty acid fatty acid) and polyunsaturated fatty acid (an omega-6 fatty acid fatty acid). another fatty acids area unit typically classified as "conditionally essential," which means that they will become essential underneath some biological process or illness conditions; examples embrace omega-3 (an polyunsaturated fatty acid fatty acid) and gamma-linolenic acid (an omega-6 fatty acid fatty acid).

1.3 Components of essential carboxylic acid Omega-3 fatty acids

Omega-3 fatty acids, additionally known as ω -3 fatty acids or n-3 fatty acids, are unit unsaturated fatty acids (PUFAs). The fatty acids have 2 ends, the acid (-COOH) finish, that is taken into account the start of the chain, so "alpha", and therefore the methyl group (-CH₃) finish, that is taken into account the "tail" of the chain, so "omega". A technique within which a carboxylic acid is called is decided by the placement of the primary covalent bond, counted from the tail, that is, the omega (ω -) or the n- finish. Thus, in omega-3 fatty acid fatty acids the primary covalent bond is between the third and fourth carbon atoms from the tail finish. However, the quality (IUPAC) chemical word system starts from the carboxyl finish.



Fig-1: α -Linolenic acid

Table-1.1: Chemical properties of omega 3

Properties	
<u>Chemical formula</u>	C ₁₈ H ₃₀ O ₂
<u>Molar mass</u>	278.44 g·mol ⁻¹
<u>Density</u>	0.9164 g/cm ³

Omega-6 fatty acids

Omega-6 fatty acids (also spoken as ω -6 fatty acids or n-6 fatty acids) are a family of unsaturated fatty acids that have in common a final carbon-carbon covalent bond within the n-6 position, that is, the sixth bond, investigation from the methyl group finish. Members of the family will have pro-inflammatory or medicament effects.

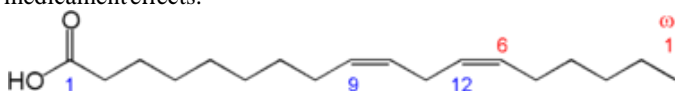


Fig-2: omega-6 fatty acid fatty acids

Table-1.2: Chemical properties of omega 6

Properties	
<u>Chemical formula</u>	C ₁₈ H ₃₂ O ₂
<u>Molar mass</u>	280.45 g·mol ⁻¹
<u>Appearance</u>	Colorless oil
<u>Density</u>	0.9 g/cm ³

1.4 History oil

Although omega-3 fatty acids are referred to as essential to traditional growth and health since the Thirties, awareness of their health advantages has dramatically increased since the Nineteen Eighties.

On September eight, 2004, the U.S. Food and Drug Administration gave "qualified health claim" standing to independent agency and DHA omega-3 fatty acids, stating, "Supportive however not conclusive analysis shows that consumption of independent agency and DHA [omega-3] fatty acids might cut back the danger of coronary heart disease". This updated and changed their health risk recommendation letter of 2001.

The Canadian Food scrutiny Agency has recognized the importance of DHA omega-3 and permits the subsequent claim for DHA: "DHA, associate omega-3 carboxylic acid, supports the traditional physical development of the brain, eyes and nerves primarily in kids underneath 2 years old-time.

"Historically, whole food diets contained sufficient amounts of omega-3, however as a result of omega-3 is quickly oxidised, the trend to shelf-stable, processed foods has LED to a deficiency in omega-3 in factory-made foods.

Food sources

Some of the food sources of ω -3 and ω -6 fatty acids are unit fish and shell fish, linseed (linseed) and linseed oil, hemp seed, olive oil, soya oil, canola (rapeseed) oil, chia seeds, pumpkin seeds, helianthus seeds, ivy-covered vegetables, and walnuts.

Palash seeds

Palash (*Butea frondosa*) is substitutable with palas or flame of the forest. The tree is native to the Indian landmass, Burma, Ceylon and South Asian solid ground. It's a slow growing tree that reaches a height of forty to fifty feet. Every part of the palash tree is being used each medicinally and commercially. The tree provides wood, gum and dye. Wood is employed to create well curbs and water scoops. The pulp is helpful in newspaper producing. Gums area unit employed in animal skin business, drugs and in some food preparations. All elements of the trees like flowers, bark, seed, gum, leaves and root possess anti-inflammatory, antimicrobial, antifungal, bactericide, anti-diabetic and anti-estrogenic properties. The tree is just about seventieth of all the oil made worldwide is destined for technical applications and half-hour is for food production.

Flaxseed

Flaxseed (*Linum usitatissimum*) additionally referred to as oilseed, is believed to be one among the world's oldest cultivated crops with proof of cultivation qualitative analysis back thousands of years. The crop is prized for its fibre and oil. The fibre, obtained from the stocks of the plant, is employed to create fine linen and paper. The oil is used primarily for industrial functions. The oil is perhaps best celebrated for its operate within the production of paints and floor cover (linoleum). The by-product remaining once oil extraction – linseed meal or oilseed meal – may be a supply of supermolecule employed in eutherian feeds, particularly within the rations of ruminant animals. The seed is additionally employed in eutherian production for its medicative properties, especially for its functions as a laxative also as for up skin and hair quality.

Consumption of flax (*Linum usitatissimum*) seeds is beneficial for human health. Flax seeds, containing about 36-40 to grease at the richest (among crop plants) supply of unsaturated fatty acids (PUFA) essential within the human diet. PUFA are highly vulnerable to chemical reaction. Flax (*Linum usitatissimum* L.) may be a multi-purpose crop. Its' seeds containing regarding thirty six to forty you look after oil, have long been used in human and animal diets and in business as a source of oil. Recently there has been a growing interest within the probiotic properties of flax and in its beneficial effects on coronary cardiovascular disease, some kinds of cancer and medical specialty and secretion disorders. Flaxseed is abundant in several nutrients, such as polyunsaturated carboxylic acid, protein, and lignans. In comparison with different vegetable oils, flaxseed oil is distinguished by the very best content of α -linolenic acid, i.e. $26\pm 60\%$, that since recently has been found as particularly necessary for human organism.

Unfortunately, a high content of α -linolenic acid induces a poor aerobic stability of flaxseed oil. Flax is associate degree annual plant happiness to the genus *Linum* and also the family *Linaceae*. totally different varieties of *Linum* are developed for production of fibre seed. forms of *Linum* bred for fibre use are known as flax, whereas the seed varieties are called flax seed, seed flax or simply flax. Linseed contains 26-45% oil. some twenty second of the oil is

found within the testa and four-dimensional within the embryo.

The oil is gift primarily as triacylglycerols in oil bodies having a mean diameter. Approximately seventieth of all the flaxseed oil made worldwide is destined for technical applications and 30% is for food production

History

Essential oils are utilized in people medication throughout history. The earliest recorded mention of the techniques and ways accustomed manufacture essential oils is believed to be that of Ibn al-Baitar (1188–1248), AN Al-Andalusian (Muslim-controlled Spain) medico, health professional and chemist. Rather than check with essential oils themselves, trendy works generally discuss specific chemical compounds of that the essential oils area unit composed. For example: salicylate instead of "oil of wintergreen".

Interest in essential oils has revived in recent decades with the recognition of aromatherapy, a branch different of different medication that uses essential oils and other aromatic compounds. Oils area unit volatilised, diluted in a very carrier oil and utilized in massage, subtle within the air by a nebulizer, heated over a candlelight, or burned as incense.

Medical applications projected by people who sell medicative oils vary from skin treatments to remedies for cancer and sometimes area unit primarily based entirely on historical accounts of use of essential oils for these functions. Claims for the effectualness of medical treatments, and treatment of cancers particularly, area unit currently subject to regulation in most countries.

Human effects of flax oil

facilitate cut back neo-plastic cell Growth

Although this analysis is restricted to test-tube and animal studies, there's some proof that oil could facilitate cut back the expansion of cancer cells.

facilitate Treat Constipation and symptom

Flaxseed oil could also be effective at treating each constipation and symptom. A recent animal study showed that oil acted as a laxative to market regularity

Improve Skin Health

Flaxseed oil may additionally facilitate enhance skin health. enhancements in skin smoothness and association, whereas skin sensitivity to irritation and roughness had attenuated..

Reduce Inflammation

Due to omega-3 fatty acid carboxylic acid content, some analysis shows that oil could facilitate reduce inflammation in sure populations.

Brain and visual functions

Brain operate and vision trust dietary intake of DHA to support a broad vary of cyto-membrane properties, notably in nervous tissue, that is wealthy in membranes. a significant structural element of the class brain, DHA is that the most torrential omega-3 carboxylic acid with in the brain.

Human effects of Palash oil

Infection of abdomen

It is use for abdomen issues like internal wounds, ulcers etc.

Treat urinary organ stones

It is use for Treat urinary organ stones and alternative urinary grievance.

Help Treat polygenic disease

It is use for polygenic disease patients

Blood purification

It is accustomed take away body toxins.

Solvent extraction

Nurhan Dunford, AN Agricultural Engineering Associate Professor claimed in his writing that solvent extraction refers to discriminatory dissolution of oil by contacting oilseeds with a liquid solvent. this is often the foremost efficient technique to recover oil from oilseeds, so solvent extraction mistreatment dissolvent has been commercialised as a standard apply in today's business. This technique has been used by variety of alternative studies on RSO and is chosen for the high share oil (99.5%) extracted from the seeds . Solvent extraction is way associated with Soxhlet extraction. Most of this kind of extractions is completed within the Soxhlet extractor (Figure 1) that was fancied in 1879 by Franz von Soxhlet.

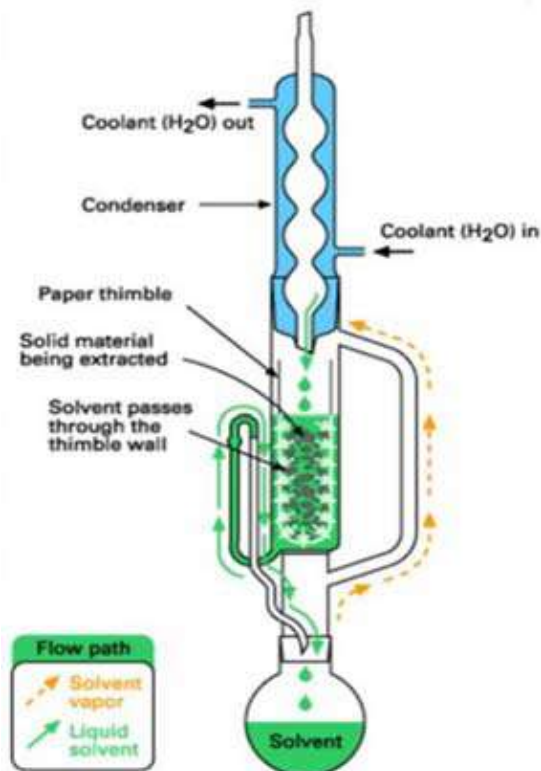


Fig-3: Solvent extractor

The choice of solvent used relies on solvent extraction capability, effects of solvent on oil properties, process safety, solvent volatility and stability, and economic concerns. This is often as a result of most of the common solvent used; light-weight paraffinic fossil fuel fraction such as grain alcohol, pentane, hexane, alkane series and hydrocarbon square measure flammable, studies are developed to use chlorinated hydrocarbons, alcohols, water and etc. as an alternate. According to Devesh et al, liquid grain alcohol are often a better various solvent to n-hexane thanks to its comparable extraction potency between the solvents. On the opposite hand, he reportable that the potency are often more enhanced by the lower particle size of the seeds. According to Johnson et al. [4], there square measure eleven properties of ideal solvents for seed extraction. the foremost important property of an ideal solvent is that it should have a high solvent power for triglycerides at elevated temperature that is exhibited by lower alcohols.

Secondly, the solvent should be non-toxic and safe for the employees, and therefore the meals made mistreatment the solvent should even be non-toxic to humans or animals to feed. The solvent ought to additionally possess property, depending on the specified ending.

Currently, n-hexane is in depth and ideally used for goods edible fat extraction thanks to its extraction efficiency and simple handiness. Conversely, as hexane vapor is thrice heavier than air and a small quantity of hexane mixed with air will initiate explosion mixture, hexane is categorised as ignitable and unsafe air pollutant and is enclosed within the list of nephrotoxic chemicals by the United States of America Environmental Protection Agency. As explicit within the PFA act 1954, the utmost permissible limit for n-hexane in oil and therefore the meal square measure solely 5ppm and 10ppm severally. In real world cases, it's terribly tedious and energy intense to meet the dissolvent most permissible limit. However, despite the torrential disadvantages of mistreatment n-hexane as a solvent extraction, n-hexane continues to be the foremost solvent used because of its high solubility, low corrosion, low evaporation loss and greasy residue. Moreover, the merchandise has a higher odor and flavour. In virtue of the pharmacological medicine and environmental considerations of mistreatment n-hexane as extracting solvent, researchers were terribly impelled in searching new alternatives. There also are alternative celebrated and preferable solvents used, like fossil fuel ether, water, alcohols and lots of additional. As reportable by Johnson et al., there is quite variety of other solvents are often used, each with its own benefits and drawbacks. While water are often the process aid for liquid extraction of oilseeds, halogenated hydrocarbons additionally show tremendous potential in seed process.

2. MATERIALS AND METHODS

2.1. Apparatus

1. One spherical bottom flasks(500ml)
2. Condenser
3. Burette stand
4. Conical flask

5. Beaker
6. Measuring cylinder
7. Separating funnel
8. Heater(500ml)
9. Thimble

2.2. Raw Materials

- 1 Flax seeds
- 2 Palash seeds
- 3 Ethanol

2.3. Procedure

A 50g of seeds powder was transferred into a beaker, and a hundred and fifty metric capacity unit of grain alcohol was poured into it. The suspension of seeds powder and grain alcohol is kept for twenty-four hours. The solid material is separated from mixture with facilitate of paper. The answer is taken in spherical bottom flask for Soxhlet extraction. The temperature of resolution is rises up to 650 C. The grain alcohol vaporise and condensed into Thimble section of Soxhlet equipment. The condensation containing oil was collected in a very cone-shaped flask. The oil obtained, was then measured. The same method was continual for more 2 consecutive runs and also the volume of oil was measured all told the 3 runs.

2.4. Analytical technique

Gas Chromatography (GC)



Fig 4: Gas natural action

Gas natural action (GC) is a common variety of natural action employed in analytical chemistry for separating and analyzing compounds which will be volatilised while not decomposition. Typical uses of rate embody testing the purity of a specific substance, or separating the various compounds of a mixture. In some things, rate might facilitate in distinctive a compound. In preparatory natural action, rate is accustomed prepare pure compounds from a mix.

Table-2.1: Physico-chemical properties of palash seed oil

In gas natural action, the mobile section may be a carrier gas, usually associate chemical element like argon or associate unreactive gas like element. Argon remains the foremost usually used carrier gas in regarding ninetieth of instruments though element is most popular for improved separations. The stationary section may be a microscopic layer of liquid or chemical compound on associate inert solid support, within a bit of glass or metal conduit referred to as a column. The instrument accustomed perform gas natural action is named a gas chromatograph.

The volatilised compounds being analysed move with the walls of the column, that is coated with a stationary section. This causes every compound to rinse at a special time, referred to as the retention time of the compound. The comparison of retention times is what offers rate its analytical utility.

2.5 Results Palash seeds oil

Palash seeds were soxhlet extracted exploitation paraffin as solvent. The oil content was found to be 2 hundredth. The free carboxylic acid content of palash seed oil was regarding four.0%. Phosphorous content of palash oil was found to be 557 ppm which accounted for higher content of phospholipids. The 5 physic-chemical properties of palash seed oil is given in Table 1. Palash seed oil contains of thirty two.8% of saturated fatty acids comprising of palmitic, stearic, arachidic, behenic and lignoceric acids. 65.4 you look after unsaturation comprising of oleic, linoleic and linolenic acids. The carboxylic acid composition is tabulated in Table a pair of. The rate recording of palash seed oil is given in Fig one.

Characteristic	Value
Free fatty acids (wt %)	4.0
Iodine value (g/100g)	75.3
Saponification value	171.4
Unsaponifiable matter (wt %)	1.17
Phosphorous content (ppm)	557.0
Density (g/cm ³) at 40°C	0.8978
Viscosity (cSt) at 40° C	42.3
Calorific value (K cal/kg)	8358

2.6 Results

Flax seeds oil

In Table two and Figures one and a pair of representing GC-MS chromatogram and mass spectra, area unit shown the results obtained for samples of fatty acids from linseed oil and conjointly table one have chemistry characteristics of oil and spectrum of methyl palmitate (a), of alkyl stearate (b), of methyl linolenate (c), of alkyl oleate (d), of methyl linoleate (e). It noted that samples of flaxseed oil, area unit major unsaturated fatty acids (88.97%), while saturated fatty acids were at a rate of eleven.01%. Predominantly within the composition of unsaturated fatty acids is omega-6 (53.21%), also the category of unsaturated fatty acids were monounsaturated fatty acid (18.51%) and polyunsaturated fatty acid discovered (17.25%).

Table-2.2: Carboxylic acid composition of palash seed oil

Fatty acid Composition	(Wt %)
Palmitic (16:0)	24.4
Stearic (18:0)	4.7
Oleic (18:1)	23.8
Linoleic (18:2)	40.4
Linolenic (18:3)	0.6
Arachidic (20:0)	0.8
Gondoic (20:1)	0.6
Behenic (22:0)	2.9
Lignoceric (24:0)	1.0

Table-2.3: Chemistry characteristics of oil

Properties	Mean value
Refractive index	1.469
Iodine value (g I ₂ / 100g oil)	177
Saponification value (mg KOH/ g oil)	190
Acid value (mg KOH/ g oil)	0.80
Peroxide value (meqO ₂ / kg oil)	0.95

Table-2.4: Composition in fatty acids (saturated and unsaturated) for oil

Fatty acids	Content (%)
Palmitic acid (C16:0)	6.58
Stearic acid (C18:0)	4.43
Oleic acid (C18:1)	18.51
Linoleic acid (C18:2)	17.25
Linolenic acid (C18:3)	53.21

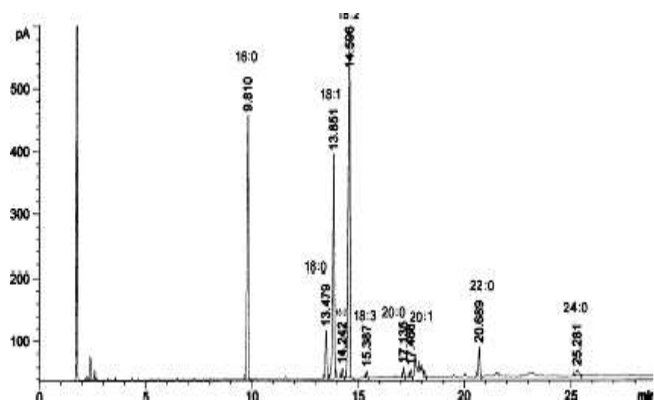


Fig-4: GC Chromatogram of Fatty Acid Composition of Palash oil

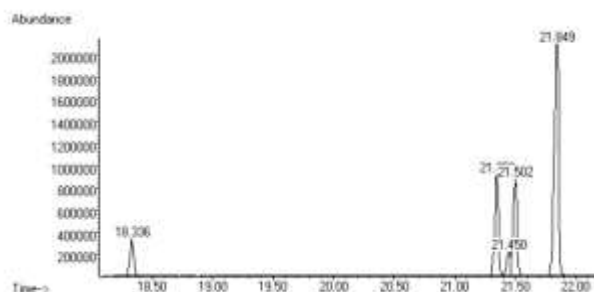


Fig-5: The chromatogram from the GC-MS analysis of the linseed oil

CONCLUSION

This experiment gives complete picture on this topic. Starting from the raw material, it's nature of it's content. We have extracted oil with the solvent extraction method by soxhlet apparatus using ethanol as a solvent. We have analysed composition of essential oil with values of Refractive index, Acid value, iodine value and saponification value of our oils. We observe that the quantity of oil obtain by flax seeds is more than the quantity of oil obtain from palash seeds. The method used by us gives high yield than other methods i.e. cold pressing methods and rendering. Lastly some application and uses are also provided.

ACKNOWLEDGEMENT

We avail this chance to specific our deep sense of feeling and whole hearted because of our honourable guide Dr P.R. Tayde sir for giving his valuable steering inspiration and tender encouragement to embark this project. We additionally acknowledge overwhelming feeling and vast relation to the honourable Principal Dr. R.S. Tatwawadi for providing all facilities required. we have a tendency to additionally greatly acknowledge because of our Head of the Department faculty member. A.P. Pardey for his valuable steering from time to time. Last we'd prefer to convey all non teaching employees and friends UN agency facilitateed U.S. directly or indirectly in our endeavour and infused their help for the successes of this project.

REFERENCES

- [1]. S.H Mohd-Setapar*, Lee Nian-Yian and N.S Mohd-Sharif, "Extraction of rubber (Heveabrsiliensis) seed oil using soxhlet method" ,Malaysian Journal of Fundamental and Applied Sciences, Vol. 2, No1(2014)
- [2]. Viorica-Mirela Delia Dumbrava, Camelia Moldovan, Despina Bordean, Constantin Mateescu. Study on "Fatty acid composition and oil characteristics of linseed (Linum Usitatissimum L.) From Romania Journal of Agroalimentary Processes and Technologies Vol.7, No3(2012)
- [3]. Ch. Bindhu, M.S.L Karuna, P.P. Chkrabarti, Sanjit Kanjilal and R.B.N. Prasad... Study on Palash seed Oil –Potential Feedstock for Biodiesel Preparation" INTERNATIONAL JOURNAL of RENEWABLE ENERGY RESEARCH R.B.N Prasadal., Vol.4, No.3, (2014)
- [4]. S.H Mohd-setapar, Lee Nian Yian and N.S Mohd-Sharif.... Study on "Extraction of rubber (Heveabrsiliensis) Seed oil using soxhlet method" Malaysian Journal of Fundamental and Applied Sciences Vol.10, No1(2014)

[5]. VB Bhise, SB Gaikwad, SM Shende, Dr. YS Sakhare, SG Kalane.... Study on "Extraction of Oil from Medicinal Plant Butea monosperma (Palash) Seeds by electric muffle furnace using locally available materials: Design and Fabrication" International Journal of Applied Research Vol. 6, No 4 (2017)

[6]. Jagannathan.N, Amutha.KandAnand.N...VELS University, Department of Biotechnology, School of Life Sciences, Chennai-600117, Tamilnadu, India...Study on "Production of Omega-3 Fatty Acids in Cymbellasp" ADVANCES IN BIORESEARCH, Vol.1, No 5 (2010)

