WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 7.523
Volume 6, Issue 8, 54-60. Research Article ISSN 2277–7105

FATTY ACID PROFILE OF AERIAL ROOTS OF *FICUS ELASTIC*

Afifa Saeed[1], Zafar Iqbal*[2,] Hafiza Iqra Khalil[1], Zhang Hai[3], Mohammad Akram[4], Lubna Liaqat[2], Zaheen Tara[1], Marvi Mansha[1] and Zubia Gulzar[1]

[1]Islamia Colleage for Women Cooper Road Lahore-Pakistan.

[2]Applied Chemistry Research Centre, PCSIR Laboratories Complex, Ferozpur Road, Lahore-54000-Pakistan.

[3]School of Chemistry and Chemical Engineering, Qianbei Featured Resources Applied Research Key Laboratory, Zunyi Normal College, Guizhou Zunyi 563002, China.

[4]Medicinal Botanic Centre, PCSIR Labs Complex, Jumrud Road, Peshawar-Pakistan.

Article Received on
26 May 2017,

Revised on 15 June 2017,
Accepted on 06 July 2017

DOI: 10.20959/wjpr20178-8948

***Corresponding Author**
Zafar Iqbal
Applied Chemistry Research Centre, PCSIR Laboratories Complex, Ferozpur Road, Lahore-54000-Pakistan.

ABSTRACT

The oil was extracted from the aerial roots of *ficus elastica* through soxhlet extractor by using *n*-hexane for five hours. The yellow coloured oil with sweet fragrance in 1.61% yield was obtained. Physicochemical properties were studied by standard reported procedures while fatty acid profile was measured by gas chromatograph coupled with flame ionized detector. Esterification of the oil was carried out with methanol by using boron triflouride as catalyst. Results revealed that free fatty acid value, 4.27; saponification number, 49.9 mg KOH/g; and acid number, 8.50 were respectively. The GC-FID study showed the isobutyric, 6.4%; butyric, 3.3%; isovalenic, 25.5%; valenic, 6.9%; caprylic, 29.2%; capruic, 5.2%; capric, 20.3% and lauric acid, 2.9%, respectively. The oil mainly contains low molecular weight fatty acids which are well suitable for application in soap, detergents and cosmetic industries.

KEYWORDS: *Ficus elastica*, Oil, Saponification, Esterification, GC-FID, Fatty acids.

INTRODUCTION

Ficus elastica is a popular ornamental tree grown around the world. It is listed as an "environmental weed, garden thug" in the Global Compendium of Weeds.[1] Often called the

mulberry family, *moraceae* consists of about 40 genera and 800 species of trees, shrubs, lianes, or rarely herbs, nearly all with milky sap and mainly of tropical or subtropical origin.[2,3]

The milky sap of various *Moraceae* species contains 'heart poison' that are used as dart poisons in some cultures; other plant parts such as leaves and fruit juices have also been reported to cause allergic and toxic reactions in humans and livestock.[4] Ficus is a large genus of about 800-1000 tree and shrub species native to the tropics and subtropics that are often cultivated beyond their native range for their fig fruit or as ornamentals. Member of this genus are difficult to distinguished by their flowers, but can be differentiated by leaf shape and by their fruits.[2]

Often seen as an interior container plant, rubber tree has large, 5-20 inches long, thick, glossy evergreen leaves, multiple trunks, and a spreading, irregular canopy. Able to reach 100 feet in height in its native habitat in the forest but most often seen at about 25-40 feet in the landscape.[5]

Large trees up to 20 m tall; young branches glabrous, with yellowish brown to gray exfoliating epidermis. Elliptic to oblong leaves 12-30 cm (5-12 inches) long and 5-15 cm wide, acuminate at apex, rounded at base, glabrous, smooth, leathery, gray to brown when dry.[6] *Ficus elastica* is native to tropical Asia, India and Malaysia and has been introduced to the West indies.[7]

F. elastica possesses antimicrobial activity and the leaves extract was used for treatment of skin allergies, skin infection, anemia, neurodegenerative disorders and hepatic problems, it is also used as diuretic agent. In addition several chemical constituents from *F. elastica* leaves have been investigated.[8]

There are many studies on the leaves of *ficus elastica* but from the best of our knowledge this is the first study on the fatty acid profile of aerial roots of *ficus elastica*. In this study the oil was extracted from the aerial roots of *ficus elastica* and their fatty acid profile was determined by GC-FID. Their physicochemical properties were also measured by using standard procedures.

MATERIALS AND METHODS

Sample collection and oil extraction

Aerial roots of ficus elastica were collected from the Garden of PCSIR near mosque. These roots were cut into small pieces and oil was extracted through soxhlet apparatus by using n-hexane for five hours. The solvent was separated by rotary evaporator under reduced pressure and yellow colored oil was obtained which was stored in the fridge for further studies.

Determination of fatty acid profile.

The fatty acids were then esterified with methanol in the presence of boron trifluoride. Esterifies fatty acids were extracted with n-hexane and then evaporated on low heat. Then the analysis was performed on gas chromatograph (GC-14A) coupled with flame ionizer detector and data processing. A PEG capillary column (25m × 0.2 mm id) was used for fatty acid. The column was operated with temperature programming from 150 to 200 ^{0}C. The injection and detector temperature were maintained at 250 to 300 ^{0}C respectively. Flow gas of carrier gas (Nitrogen) was 20 mL/min at split ratio of 1:50. Identification of the component was based on their retention time as compared with those obtained from methyl esters of known fatty acids, analyzed under similar conditions.

RESULTS AND DISCUSSIONS

The oil from the aerial roots of ficus elastica was extracted through soxhlet apparatus by using n- hexane for five hours. The yellow colored oil with 1.61% yield was obtained. Their physicochemical parameters are reported in the table 1.

Table No. 1: Physiochemical properties of aerial roots of *Ficus elastica.*

Sr. No.	Properties	Results
1.	Acid value	8.50
2.	Free fatty acid value	4.27
3.	Saponification number	49.9
4.	Refractive index	1.4085
5.	% Age yield	1.61

The fatty acid profile of the oil obtained from the aerial roots of ficus elastica was determined by GC-FID. The choromatogram is shown in the fig.1. The fatty acid obtained from the oil are reported in the table 2.

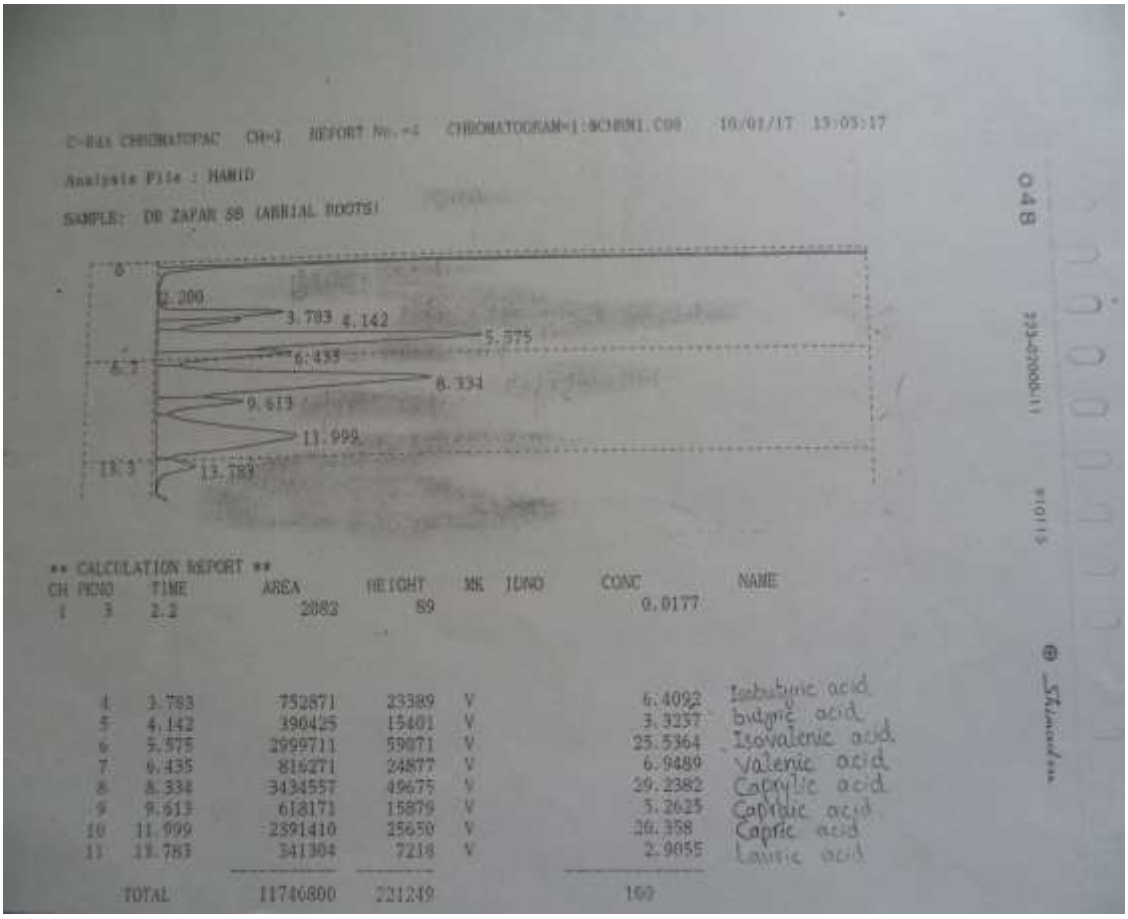

Fig 1: Chromatogram of GC-FID.

Table No. 2: Fatty acid profile of aerial roots of *Ficus elastic*.

Sr. No.	Retention time	Area	Concentration	Name
1.	3.703	752871	6.40%	Isobutyric acid
2.	4.142	390425	3.32%	Butyric acid
3.	5.575	2999711	25.53%	Isovalenic acid
4.	6.435	816271	6.94%	Valenic acid
5.	8.334	3434557	29.23%	Caprylic acid
6.	9.613	618171	5.26%	Capruic acid
7.	11.999	2391410	20.35%	Capric acid
8.	13.783	341304	2.90%	Lauric acid

The main constituents of the ficus elastic aerial root oil were isobutyric acid (6.40%), butyric acid (3.32%), isovaleric acid (25.53%), valeric acid (6.94%), caprylic acid (29.23%), capruic acid (5.26%), capric acid (20.35%) and lauric acid (2.90%). The obtained yield of this yellow colored oil was 1.61%, determined by us. Similarly, the essential oil of *F. elastic* was obtained from the University of Agriculture, Faisalabad, showed 4% amount yield.[9] The variations in the amount yield depends upon the climate, soil, age of the tree, types of the selected roots, maturity of plant part, etc.

Lauric acid is 12 carbon chain fatty acid (C_{12}:0) and its main application in cosmetic product is for the treatment of acne.[10] Myristic acid (C_{14}:0) in the form of ester isopropyl myristate is used in cosmetic and topical medicinal preparations where good absorption through the skin is desired. Butyric acid a four carbon fatty acid is used in the preparation of various butyrate esters. Due to pleasant tastes or aromas it is used used as perfume and food additives. It is also used as an animal feed supplement due to ability to reduce pathogenic bacterial colonization.[11] Due to powerful odor it is used as a fishing bait additive[12] and in anti abortion protesters to disrupt abortion clinics.[13] It is added to imitate the flavor of chocolate produced by Hershey process. Isobutyric acid also known as 2-methylpropanoic acid are used to eliminate calcium in leather industry. Valeric acid (Pentanoic acid) its primary use is in the synthesis of its esters. Volatile esters of valeric acid tend to have pleasant odors and are used in perfumes and cosmetics. Ethyl valerate and pentyl valerate are used as food additives because of their fruity flavors.[12] Isovaleric acid is common name of 3-Methyl butanoic acid it w seen that it was primary cause of flavors which are added to wine caused by Brettsnomyces yeasts.[14] It is anticonvulsant agent in valerian.[15] It uses to synthesize beta-methyl butyric acid by microbial oxidation via fungus. Caprylic acid is 8 carbon chain fatty acid (C8:0) and it is used commercially in the production of esters used in perfumery and also in manufacture of dyes. Caprylic acid is an antimicrobial pesticide used as a food contact surface sanitizer in commercial food handling establishment on dairy equipments breweries, wineries and beverage processing plants and as disinfectants in health care facilities. In addition Caprylic acid is used as an algaecide, bactericide and fungicide in nurseries, greenhouses, gardens centers. The acid chloride of caprylic acid is used in the synthesis of the perfluoroctanoic acid.[16] Capric acid (C10:0) is other name of Decanoic acid it is saturated fatty acid used in the manufacture of esters for artificial fruit flavors and perfumes, as an intermediate in chemical synthesis and industrially in the manufacture of perfumes, lubricants, greases, rubber dyes, plastics, food additives and pharmaceuticals.[17] Caproic acid (C6:0) also known hexanoic acid and is a medium chain triglycerides (MCT) which are widely used for parenteral nutrition in individuals requiring supplemental nutrition and are being more widely used in food drugs and cosmetics. it is fatty acid found naturally in various animals fats and oils, it is also one of the component of vanilla. The primary use of caproic acid is in the manufacture of its esters for artificial flavors and in the manufacture of hexyl derivatives such as hexylphenols.[18] By keeping all this information in view, it can be concluded that aerial roots of ficus elastica contains lower molecular weight fatty acids which are suitable for application in soap, detergents and cosmetic industries.

CONCLUSION

The oil from the aerial roots of ficus elastica was obtained through soxhlet apparatus by using n-hexane for five hours. The yellow colored oil was 1.61% in yield. Its physicochemical properties were measured by standard procedures. Its fatty acid profile was determined by esterification of oil with methanol in the presence of boron triflouride. The esterified oil was analysed by GC-FID and its constituents were measured. The main constituents of the ficus elastic aerial root oil were isobutyric acid (6.40%), butyric acid (3.32%), isovaleric acid (25.53%), valeric acid (6.94%), caprylic acid (29.23%), capruic acid (5.26%), capric acid (20.35%) and lauric acid (2.90%). The results indicates that it contain lower molecular weight fatty acids which can be used in soap, detergents and cosmetic industry.

REFERENCES

1. Randall RP, 2012. A Global Compendium of Weeds. Perth, Australia: Department of Agriculture and Food Western Australia, 1124.
2. Whistler WA, 2000. Tropical ornamentals. Portland, Oregon, USA: Timber Press.
3. University of Hawaii, 2014. Department of Botany Vascular Plant Family Access Page: Moraceae. Honolulu, USA.
4. Frohne D, Pfander HJ, 2005. Poisonous plant. A handbook for Doctors, Pharmacists, Toxicologists, biologists and veterinarians. 2nd Edition. Portland, OR, USA. Timber Press.
5. Environmental Horticulture, Florida Cooperative Extention Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date; November 1993. Revised, December 2006.
6. Flora of Nicaragua, 2014. Tropicos website. St. Louis, Missouri and Cambridge, Massachusetts, USA: Missouri Botanical Garden and Harvard University Herbaria.
7. Acevedo-Rodriguez P, Strong MT. Catalogue of the seed plants of the West Indies. Smithsonian Contribution to Botany, 2012; 98: 1192. Washington DC, USA: Smithsonian Institution.
8. I. A. Ogunwande, G. Flamini, A.E. Adefuye, N.O. Lawal, S.Moradeyo, N.O. Avoseh, Natural Products Research Unit, Department of Chemistry, Faculty of Science, Lagos State University, Badagry Expressway, P.M.B. 0001, Lasu Post Office, Oju, Lagos, Nigeria.
9. Taxonomist, Dr. Mansoor Hameed. Botanical Garden, Department of Botany, University of Agriculture, Faisalabad, Pakistan, 2014.

10. Almahyl, H. A, Rahmani, M, Sukari, M. A, and Ali, A.M. *Investigation on the Chemical Constituents of the Leaves of Ficus elastica Roxb. and their Antimicrobial activity.* Pertanika J. Sci & Technol, 2003; 11(1): 57–63.
11. Busari, A.O. Compendium of plants Growing in Ogbomoso Area. Bayowa Press, Nigeria, 2001; 102.
12. Burkill, L. H. A Dictionary of the Economic Products of the Malay Peninsula, 1966; 1: 1021. Kuala Lumpur, Malaysia: Ministry of Agriculture and Co-operative.
13. Agarwal VS. Drug plants of India, Vol. I. India: Kalyani Publishers, 1967.
14. Sukhawatana, K. *Exotic plants introduced to Thailand at the time of King Rama V's reign.* Ornamental Plant of Thailand, special, 1981; 95–103.
15. Starr f, Starr K, Loope L, 2003. Ficus elastica: Indian rubber tree. Hawaii, USA: United States Geological survey.
16. Marimuthu M. Chemical analysis of laticiferous plants. Ph. D. thesis. India: Sardar Patel University, Anand, Gujarat, 1988.
17. Kim, J. Chemical constituents of the Ficus elastica leaves and their antioxidant activities. Bull. *Korean Chem. Soc*, 2012; 33, 10 3461.
18. Esuoso. K. O. and Odetokun. S.M. Proximate composition and possible industrial utilization of Blighia sapida seed and seed oil.Riv. Ital. Delle. Sostanze Grasse, 1995; 72: 311-313.