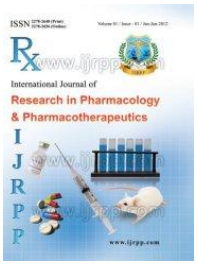
International Journal of Research in Pharmacology & Pharmacotherapeutics



ISSN Print: 2278 - 2648
ISSN Online: 2278-2656

IJRPP | Vol 3 | Issue 2 | April - June - 2014
Journal Home page: www.ijrpp.com

Research article Open Access

GC-MS evaluation of Fatty acid constituents from various tissues of *Macrobrachium scabriculum*

***R.Athiyaman and K.Rajendran.**

Department of Zoology and Biotechnology, A.V.V.M. Sri Pushpam College (Autonomous), Poondi - 613 503, Thanjavur District., Tamilnadu, India.

*** Corresponding author: R.Athiyaman,**
E-mail id: athiyamannet@gmail.com

ABSTRACT

Macrobrachium scabriculum is a tastiest freshwater prawn belongs to the family Palaemonidae available throughout the year in the river Cauvery. The present study deals with the extraction and GC-MS analysis of fatty acid constituents from various tissues of prawn, such as haemolymph, muscle tissue, gonad and hepatopancreas. The result of the present study reveals that there were 14 types of bioactive components have been identified in GC-MSanalysis based on retention time, molecular formula, molecular weight and peak area. The major components such as 9-Octadecenal (5.78%), 7,11-hexa decadienal (3.77%), Methylsalicylate (3.66%), Oxirane tetradecyl (2.14%), 3,5-methyl-5-hexane-3-1 (1.02%) and heptanoic acid 9-decen-1 olester (1.01%) and some minor components were also identified. Among the total fatty acid content polyunsaturated fatty acids and saturated fatty acids showed variations among the tissue.

Keywords: *Macrobrachium scabriculum*, Haemolymph, Hepato pancreas.

INTRODUCTION

The prawn and shrimps are an excellent sources of both polyunsaturated and monounsaturated fatty acids that can regulate prostaglandin synthesis and induce wound healing which are important to human health (Christensen et al., 2001). Total lipid content and fatty acid constituents of prawn have been reported by many investigators (Bottino et al., 1979; Nicholas et al., 1989; Watanabe et al., 1989; Amer et al., 1991, 1993; Saravan Bavan, 1999; Bragagnola, 2001; Chanmugam et al., 2006; Ehigiator and Oterai, 2012 and Arumugam et al., 2012).

The hepatopancreas act as a storage organ, triglycerides and phospholipids being its major components, while the muscle contains mainly phospholipids in the prawn P. japonicus (Muriana et al., 1993) and Macrobrachium rosenbergii (Chanmugam et al., 2006). The percentage of saturated and unsaturated fatty acid content in the tissues of wild prawn M. rosenbergii significantly varied during reproductive cycle (Cavalli et al., 2001). Generally, the muscle of prawn contained lower quality of lipid (Saravana Bhavan et al., 2008, 2009). Polyunsaturated fatty acid (PUFA), Saturated fatty acid (SFA), decosahexanoic acid (DHA)

showed significant difference between M. rosenbergii and P.semisulcatus. Though informations are available on fatty acids composition of some prawns. No reasercher pertaining to fatty acid composition of M. scabriculum, hence the present study is aimed to obseerved the fatty acid composition of fresh water prawn M scabriculum from river Cauvery .

MATERIALS AND METHOD

For the present study, M. scabriculum were collected from river Cauvery (10°48' N and 79°30E), Thanjavur, Tamil Nadu, India. GC-MS analysis of the ethanol extract of various tissue of M. scabriculum was performed using a thermo GC-Trace ultra ver.5.0 thermo MS DSQII and a Gas chromatograph interfaced to a mass spectrometer (GC-MS) equipped with a Elite-ITR-5 MS Capillary standard non-polar column (30 mts, 1Dx 0.25 mm 0.25 mm). For GC-MS detection on electron ionization energy of 70 eV. Helium (99.999%) was used as a carrier gas at a constant flow rate of 1.0 ml/min and an injection volume of 2 ml was employed (Split ratio of 10:1). The injector temperature was maintained at 250°C, the ion source temperature at 200°C. The oven temperature was programmed from 110°C (isothermal for 2 min) with an increase of 10°C/min to 200°C than 5°C/min to 280°C ending with 9 min isothermal at 280°C. Mass spectra were taken at 70 eV, a scan interval of 0.5 seconds and fragments from 45-450 Da. The solvent delay was 0 to 2 min and the total GC-MS running time was 36 min. The relative percentage amount of each component was calculated by comparing its average peak area of the total area.

RESULT AND DISCUSSION

The essential information and regarding the fatty acid components in the tissues of haemolymph, muscle tissue, gonad and hepatopancreas of M. scabriculum is depicted in table 1.and fig.1-4. The results indicates that totally 14 (fourteen) fatty acid components were identified in various tissues of M. scabriculum based on RT, MW and peak area. The major components identified in the various tissues were 9-octadeconol (5.78%), 7,11-hexadecadienal (3.77%), methyl salicylate (3.66%) 9-12 octadecadienoic acid (Z,Z) (362%), oxirane, tertradecyl (2.14%, 3,5- Dimethy 1-5-Hexane-3ol (1.02%) and Heptanoic acid, 9-Decen-1-ol ester (1.01%). The presence of polyunsaturated fatty acids/PUFAs and monounsaturated fatty acid (MUFA) are common in all the tissues. However, the nature of fatty acids slightly vary among the tissues. Similar observations reported the earlier workers. According to Bottino et al. (1979) in P. azlecus, the values of 30, 29, 41, fatty acid MUFA, PUSFAs were 30, 29, 41 per cent respectively. The hepatopancreas act as a storage organ, triglycerides and phospholipids being its major components, while the muscle contain mainly phospholipids in the prawn P. japonicas (Muriana et al., 1993).

Ession (1995) estimated 54 per cent of fatty acids and 43 per cent of unsaturated fatty acids in some palaemonid prawn species. In M. rosenbergii monounsaturated fatty acids is the major fatty acid in early stage, whereas polyunsaturated fatty acid, palmitic, stearic, oleic/raclenic, linolenic, eicosapentaenoic acid are common in adult prawn M. rosenbergii (Roustaian, 1999). Bragagnola and Rodriguez (2001) observed high level of polyunsaturated fatty acids in farm reared. M. rosenbergii than penaeid species. The polyunsaturated fatty acids (PUFAs) are the major fatty acid in Penaeus vannamei (Lin et al., 2003). There were 18 fatty acid components such as monosaturated and monoester polysaturated fatty acid (PUFAs) extract fed from shrimp Aristeus alcocki waste (Sindhu and Sherief, 2011). The identified inorganic components of M.scabriculum by GC-MS analysis was shown in Figures 1-4.

Similar in Merican and Shim (1996) identified four components. Yamar and Celik (2005) reported that palmitic acid (18.0), stearic acid (18:0), DHA and EPA were the most abundantly fatty acid in P. semisulcatus and Metapenaeus monoceros. In the present study 14 fathy acids compounds were identified form various tissues of M.scabriculum indicates that this fresh water prawn is good sources of fatty acids compounds which are essential for human health.

Table 1. Fatty acid composition of freshwater prawn M. scabriculum

No	RT	Name of the compound	Molecular formula	Molecular weight	Peak area (%)
1.	2.12	Butane 1, 1 Diethoxy -3 Methyl	$C_9 H_{20} O_2$	160	0.13%
2.	3.32	Tetra Decanoric Acid	$C_{14} H_{28} O_2$	228	0.32%
3.	6.05	Methyl Salicylate	$C_8 H_8 O_3$	152	3.66%
4.	7.03	3, 5-Dimethyl-5-Hexan -3-01	$C_{18} H_6 O$	128	1.02%
5.	9.14	2. Decanol – 5, 9- Dimethyl	$C_{12} H_{24} O$	184	0.09%
6.	9.22	4. Deodecanol	$C_{12} H_{26} O$	186	0.89%
7.	9.76	Diethyl phthalate	$C_{12} H_{14} O_4$	222	0.78%
8.	11.04	9-Dodecanoic Acid methylester, (E)	$C_{13} H_{24} O_2$	212	0.48%
9.	17.11	7, 11-Hexadecadienal	$C_{16} H_{28} O$	236	3.77%
10.	13.04	9-Octadecenal	$C_{18} H_{34} O$	266	5.78%
11.	16.07	9-12 Octadecadienoic Acid (Z, Z)	$C_{18} H_{32} O_2$	280	3.62%
12.	16.24	Oxirane, Tehadecyl	$C_{16} H_{32} O$	240	2.14%
13.	16.41	Heptanoic Acid, 9-Decen-1 Olester	$C_{17} H_{32} O_2$	268	1.01%
14.	18.99	Pytol	$C_{20} H_{40} O$	296	0.19%

Fig 1: Mass spectrum of Octadecanoic acid, hexadecadienal, 9- Octadecenal of haemolymph

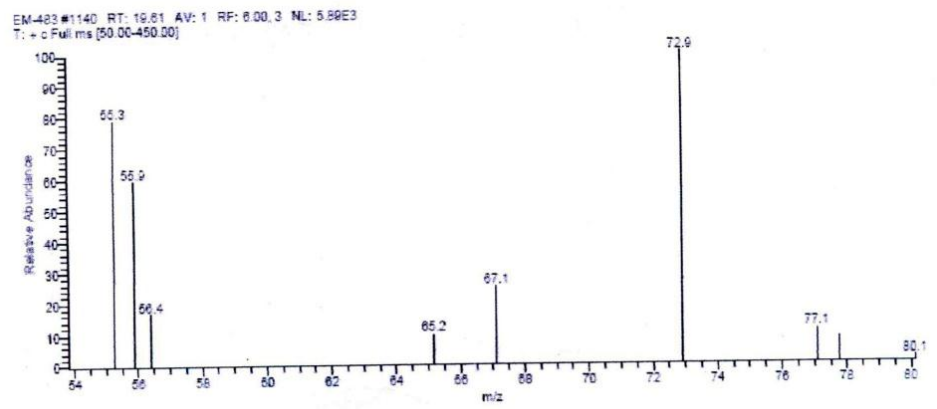


Fig 2: Mass spectrum of methyl salicylate, Octadecanoic acid, 7,11 Hexadecadienal, 9, Octadecenal of muscel tissue

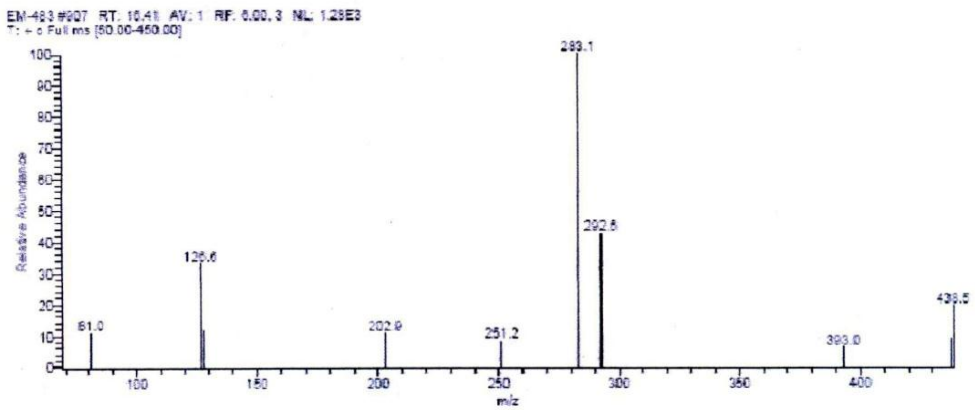


Fig 3: Mass spectrum of 4 – Deocleanol, Oxirane Tetradecyl, 12 – octadecnoic acid, 7,4 – Hexa decadienal and 9- Octadecenal of gonad

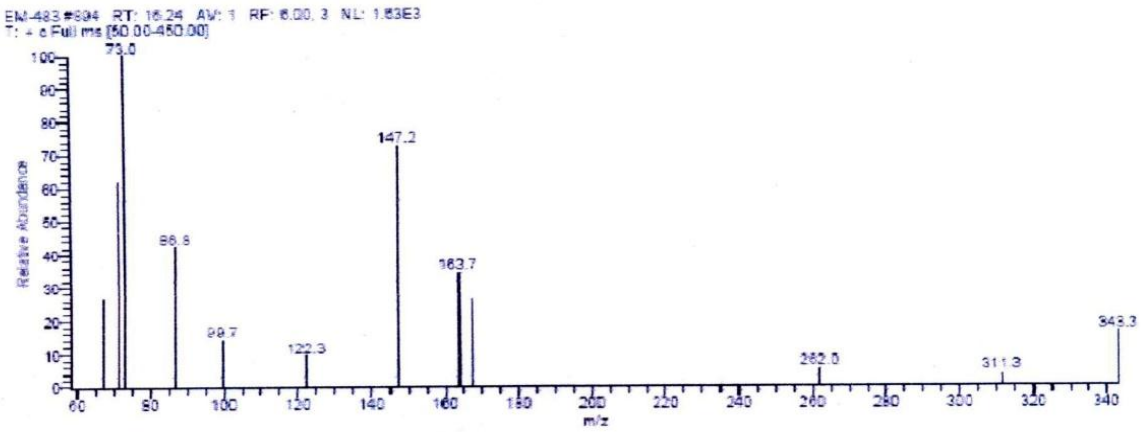
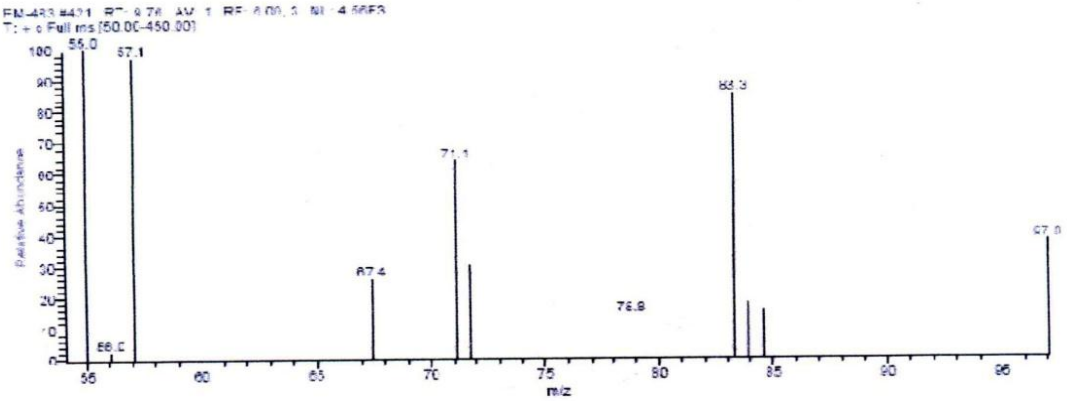


Fig 4: Mass spectrum of 3,5- Dimethyl -5- Hexan -3-ol, N-Hexa decanoic acid and 9- Octadecenal of hepatopancreas



REFERENCES

[1]. Amer, H.A., Sedik, M.F., Khalafalla, F.A., and Abd EI-Ghany and Awar, H., 1991. Results of chemical analysis of prawn muscle as influenced by sex variations. Molec. Nutr. Food Res., **35**: 133-138.

[2]. Arumugam, P., Saravana Bhavan, P., Muralisankar, T., Manickam, N., Srinevasan and Radhakrishnan, S., 2013. Growth of Macrobrachium rosenbergii fed with Mango seed Kernel, Banana peel and Papaya peel incorporated feeds. Intl. J. App. Biol. Pharmacheu. Tech., **4**(2): 12-25.

[3]. Bottino, N.R., Lilly, M.L., and Finne, G., 1979. Fatty acid stalilotof Gulf of Mexico brown shrimp (Penaeus astecus) held on ice and in frozen storage. J. Food. Sci., **44**: 1778-1779.

[4]. Bragagnola, N., and Rodrignez-Amaya, 2001. Total lipid, cholesterol and fatty acid of farmed freshwater prawn (M. rosenbergii) and wild marine shrimp Penaeus brazilensis, P. schimiltis, Xiphopenaeus kroyeri). J. Food Comp. Anal., **14**: 359-367.

[5]. Cavalli, R.O., Tamtin, M., Lavens, P., and Soregeloos, P., 2001. Variation in lipid classes and fatty acid content in tissues of wild Macrobrachium rosenbergii (deMan) females during maturation. Aquacult., **193**: 311-324.

[6]. Chanmugam, P., Donovan, J., Wheeler, C.J., and Hawng, D.H., 2006. Differences in the lipid composition of freshwater prawn (Macrobrachium rosenbergii) and marine shrimp. J. Biol. Chem., **214**: 56-70.

[7]. Christensen, J.H., Skou, H.A., Fog, L., Hansen, V.I., Vesterlund, T., Dyerberg, J., and Toft, E., 2001. Marine n^3 fatty acids, wine intake, and heart sate variability in patients referred for coronary angiography. Circulation, 103: 651-657.

[8]. Ehigiator, F.A.R., and Oterai, E.A., 2012. Chemical composition and amino acid profile of a caridean prawn (M. vollenhovenii) from Ovia river and tropical Periwinkle (Tympanotonus fuscatus) from Benin river, EOO State, Nigeria. IJRRAS, **11**(1): 162-167.

[9]. Ession, E.V., 1995. Lipid content and fatty acid profiles of some lesser known Nigerian foods. J. Biochem., **19**: 153-159.

[10]. Lin, R.Y., Huang, L.S., and Huang, H.C., 2003. Characteristics of NADH-depend lipid peroxidation in sacroplasmic reticulum of white shrimp Litopenaeus vanameri and freshwater prawn M. rosenbergii. Comp. Biochem. Physiol. Part B, **135**: 683-687.

[11]. Muriana, F.J.G., Ruiz-Gutierrez, V., Gallarado-Guerrero, M.L., 1993. A study of the lipids and carotene protein in the prawn, Penaeus japonicas. J. Biochem., **114**: 223-229.

[12]. Nicholas, P.N., John K. Volkman, David A. Everitt, 1989. Occurrence of cis 6-hexadecanoic acid and other usual monounsaturated fatty acid in the lipids of oceanic particulate matter. Oceanologica ACTA, **12**(N): 393-403.

[13]. Roustaian, M.S., Kamrudin, H., Omar, C.R., Saad, M.H. Ahmed, 1999. Changes in the fatty acid profile during larval development of freshwater prawn Macrobrachium rosenbergii (deMan). Aquacult. Res., **30**(11-12): 815-842.

[14]. Saravana Bhavan, P., Radhakrishnan, S., Seenivasan, C., Shanthi, R., Poongodi, R., and Kannan, S., 2010. Proximate composition and profiles of amino acids and fatty acids in the muscle of adult male and females of commercially viable prawn species Macrobrachium rosenbergii collected from natural culture environments. Intl. J. Biol., **2**(2): 107-119.

[15]. Sindhu, S., and Sherief, P.M., 2011. Extraction characterization, antioxidant and anti-inflammatory properties of carotenoids from the shell waste of Arabian red shrimp Aristeus alcocki, Ramandan 1938. The Open Conference Proceedings Journal, **2**: 95-103.

[16]. Yamar, Y., and Celik, M., 2005. Seasonal variation of fatty acid composition in wild marine shrimp Penaeus semisulcatus DeHann 1844 and Metapenaeus monoceros Fabricus 1789 from the eastern Mediterranean sea. Food Sci. Technol. Intl., **11**: 391-395.

[17]. Watanabe, T., Arakawa, T., Takeuchi, T., and Satoh, S., 1989. Comparison between cicosapentaenoic and docosahexaenoic acid in terms of essential fatty acid efficiency in juvenile striped jack Pseudocaranx denlex. Nippon Suisan Gakkanthi, **55**: 1989-1995.