J. Appl. Environ. Biol. Sci., 4(4)262-270, 2014

ISSN: 2090-4274
Journal of Applied Environmental and Biological Sciences
www.textroad.com

Fatty Acid and Amino Acid Composition of Marine (*Penaeus semisulcatus*) and Farmed (*Penaeus vannamei*) Shrimp Species from Bushehr, Iran

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Received: February 5 2014
Accepted: March 6 2014

ABSTRACT

To provide samples of cultured shrimps, Helleh Shrimp Farming site in Bushehr, Iran was selected at the end of culturing season (November 2013), in which, a number of 100 Penaeus vannamei shrimp were caught randomly. *Penaeus semisulcatus* sampling process was done in Halieleh fishing dock in Bushehr during fishing season (July 2013). The tests were implemented three times. The results indicated that *Penaeus vannamei* shrimp has higher volume of MUFA, PUFA, SFA, Omega 3, and Omega 6 than the marine shrimp *Penaeus semisulcatus. P. semisulcatus* has higher amount of amino acids compared with*P. vannamei*. Both shrimps have equal level of cholesterol.

KEYWORDS: *Penaeus semisulcatus*; *Penaeus vannamei*; Fatty acid profile; Amino acid profile; Shrimp; nutritional value

INTRODUCTION

Shrimp consuming causes adjustment and regulation of blood cholesterol. The proportion of LDL to HDL can be reduced by proper and suitable nutrition (Kraws, et al., 2001) .Shrimp possesses vitamins such as A, B6, B12, C, D and E and also minerals such as calcium, iron, magnesium, phosphor, potassium, sodium, zinc, iodine, copper, manganese, and selenium (USDA, 2011).Although *Penaeus vannamei* shrimp is an exotic species introduced into the Iranian fish farming industry in 2005, no research has been conducted on its nutrition value and other native marine species so far.

Due to the necessity of research on the nutritional value of cultured and marine shrimps in Iran, this research was conducted on two species of shrimp: "*Penaeus vannamei*" and "*Penaeus semisulcatus*".The two kinds of shrimps were tested in terms of volume of cholesterol, fatty acid profile and amino acids profile. Then, a comparison was made between nutritional values of marine and cultured shrimps.

Studied Location

Penaeus vannamei shrimp was provided from Helleh Culturing Site, located at: 110 km of Northwest Bushehr City, Bushehr Province. The geographical coordinate of this region is located at 50 degrees and 44 minutes of eastern longitude and 29 degrees and 13 minutes of northern latitude. This region is located at Rig District of Genaveh city and farthest end part of Hellah River, between two narrow gulfs of Gasir and Ramleh. *Penaeus semisulcatus* shrimp was provided from Halileh Area with 50 degrees of longitude and 49 minutes and latitude of 29 degrees and 51 minutes in Bushehr.

Sampling Operations

A farm was selected from Helleh Farming Site in order to provide samples of cultured shrimps at the end of farming season (Nov. 2013). A number of 100 shrimps were taken out randomly. Samples were immediately kept in ice powder and then, they were transferred to the laboratory in the shortest time possible after undergoing biometric test. For providing sample of marine *Penaeus semisulcatus* shrimp during fish-catching season, samples were provided from Halileh fishing Jetty (July 2013) in Bushehr Fishing Port. Determination the rate of fatty acid profile and amino acid profile available in muscle of samples were tested at laberatory. Tests were conducted for three repetitive times.

Laboratory Operations

In this study, Agilent – Packard Gas Chromatography (6890) equipment was used for analyzing fatty acid profile from the oil extracted from samples and for cholesterol profile Younglin ,Acme /6100 ,6000 series Gas Chromatography was used. For this purpose, ISO 5509 (2000) method was used.

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Fatty acid profile :Column: ModelNo.:SGE BPX 70 ; 120 m* 250 µm *0.20 µm
Oven Condition: Ramp(5 ºC/min) ,Temp. (198 -220 ºC) ,Hold (46-20 min)
Injector Condition: Temp. :250 ºC ,Gas Flow (N_2) : 0.6 ml/min,Split Ratio : 1:50
Detector Condition(FID) : Temp. :280 ºC
Cholesterol profile :Column:Model No.: DB -1 ; 30 m *0.250 mm *0.25 µm
Oven Condition: Ramp(20 ºC/min) ,Temp. (180 -280 ºC) ,Hold (0-35 min)
Injector Condition:Temp. :280 ºC ,Gas Flow (N_2) : 1.0 ml/min,Split Ratio : 1:50
Detector Condition(FID) : Temp. :290 ºC
High Productivity Liquid Chromatography (H. P. L. C) equipment was applied for the analysis of amino acids and vitamins, using ACCQ Tag method. (Strydom and Cohen, 1993)

Statistical Analysis

One-Way Variance Analysis (ANOVA) and Duncan Test was used to compare mean of factors of fatty acids, amino acids, cholesterol, W_3 ,W_6 ,between cultured *Penaeus vannamei* shrimp and marine *Penaeus semisulcatus* and *Penaeus merguiensis* shrimps. The existence or nonexistence of differences were determined in five percent (5%) level. ($P< = 0.05$) All data were registered in Excel program and were analyzed with SPSS software package system.

RESULTS

The biometric operations were done on 200 shrimps (cultured and marine). The average length and weight is reiterated in Table1. The nutrients available in tissue of muscle of cultured *Penaeus vannamei* shrimp and marine shrimp, including fatty acids and amino acid profile, cholesterol, Omega 3, Omega 6, were studied.

– Fatty acids

The fatty acids available in tissue of muscle of cultured *Penaeus vannamei* shrimp and marine *Penaeus semisulcatus* shrimp were measured. Comparison of results related to the fatty acids is shown in diagrams1,2, and 3. Comparing the two studied shrimp species, *Penaeus vannamei* and *Penaeus semisulcatus*, showed that there is significant difference between fatty acid profile in these species ($P<0.05$).The rate of saturated fatty acids (SFA) obtained was 365.05 mg/100gr (37.26%) in *Penaeus vannamei* shrimp and 296.27 mg/100gr (49.12%) in *Penaeus semisulcatus* shrimp. The rate of MUFA in *Penaeus vannamei* shrimp stood at 243.85 mg/100gr (24.9%) and in *Penaeus semisulcatus* shrimp at 203.177 mg/100gr (33.76%). Poly unsaturated fatty acids (PUFA) in *Penaeus vannamei* shrimp stood at 370.660 mg/100gr (37.84%) and in *Penaeus semisulcatus* shrimp at 101.573 mg/100gr (16.9%). The rate of C18: 2TW6 (Linodialic acid) in *Penaeus vannamei* shrimp stood at 10.39 mg/100gr (1.06%) and in *Penaeus semisulcatus* shrimp at 3.92 mg/100gr (0.65%). The rate of C18: 2CW6 (Linoleic acid) in *Penaeus vannamei* shrimp stood at 192.08 mg/100gr (19.6%) and in *Penaeus semisulcatus* shrimp at 36.3 mg/100gr (6.02%). The rate of C18: 3W6 (Linolenic acid – Gamma)in *Penaeus vannamei* shrimp stood at 0 mg/100gr, in *Penaeus semisulcatus* shrimp at 0.54 mg/100gr. W6 in *Penaeus vannamei* shrimp stood at 202.623 mg/100gr (20.66%) and in *Penaeus semisulcatus* shrimp at 40.826 mg/100gr (6.76%). The rate of C18: 3W3 (Linolenic acid – Alpha) in *Penaeus vannamei* shrimp stood at 10.98 mg/100gr (1.12%) and in *Penaeus semisulcatus* shrimp at 0.54 mg/100gr (0.940%). The rate of C20: 5W3 (Ecoepentanoic acid – EPA) in Penaeus vannamei shrimp stood at 92.80 mg/100gr (9.47%) and in *Penaeus semisulcatus* shrimp at 31.36 mg/100gr (5.2%). The rate of C22: 5W3 in *Penaeus vannamei* shrimp stood at 0.26 mg/100gr (2.55%) and in *Penaeus semisulcatus* shrimp at 3.38 mg/100gr (0.56%). The average rate of C22: 6W3 (Docosahexaenoic Acid – DHA) in *Penaeus vannamei* shrimp stood at 45.96 mg/100gr (4.69%) and in *Penaeus semisulcatus* shrimps at 17.12 mg/100gr. Total fatty acids of omega 3 in *Penaeus vannamei* shrimp stood at 151.474 mg/100gr (15.54%) and in *Penaeus semisulcatus* shrimp at 57.123 mg/100gr (9.54%).

– Amino Acids

The profile of amino acids of cultured *Penaeus vannamei* shrimp and marine *Penaeus semisulcatus* shrimp were compared. Comparison of results related to the amino acids is shown in diagram 4.

Comparing the two shrimp species of *Penaeus vannamei* and *Penaeus semisulcatus* in terms of amino acid profile showed that there is significant difference in amino acid profile between the two studied species ($P<0.05$) , except in HIS ,TRY and CYS where no significant difference between them was observed ($p>0.05$). The average amino acid rate in *Penaeus vannamei* shrimp stood at 182.40 mg and in *Penaeus semisulcatus* shrimp at 222.933 mg/gr. The rate of ASP (Aspartic acid) in *Penaeus vannamei* shrimp stood at 14.366 mg, in *Penaeus semisulcatus* shrimps at 21.903 mg/gr. The average rate of GLU (Glutamic acid) in *Penaeus vannamei* shrimp stood at 30.833 mg/gr, in *Penaeus semisulcatus* shrimps at 42.620 mg/gr. According to this study, the rate of SER in *Penaeus vannamei* shrimp stood at

6.40 mg/g, in *Penaeus semisulcatus* shrimp at 8.21 mg/gr. In this study, the average rate of GLY in *Penaeus vannamei* shrimp stood at 16.40 mg/gr, in *Penaeus semisulcatus* shrimp at 13.60 mg/gr. The average rate of HIS (Histidine) in *Penaeus vannamei* shrimp stood at 3.8 mg/gr, in *Penaeus semisulcatus* shrimp at 4.27 mg/gr. The average ARG (Argenine) rate in *Penaeus vannamei* shrimp stood at 19.907 mg/gr, in *Penaeus semisulcatus* shrimp at 27.567 mg/gr. In this study, the average THR (Threonine) rate in *Penaeus vannamei* shrimp stood at 6.5 mg/gr, in *Penaeus semisulcatus* shrimp at 8.6 mg/gr. The average ALA rate in *Penaeus vannamei* shrimp stood at 10.167 mg/gr, in *Penaeus semisulcatus* shrimp at 12.433 mg/gr. The average PRO rate in *Penaeus vannamei* shrimp stood at 15.167 mg, in *Penaeus semisulcatus* shrimp at 8.467 mg/gram .The average TRY rate in *Penaeus vannamei* shrimp stood at 6.5 mg, in *Penaeus semisulcatus* shrimp at 5.633 mg/gram. In this study, the average VAL rate in *Penaeus vannamei* shrimp stood at 7.267 mg, in *Penaeus semisulcatus* shrimp at 9.433 mg/gram. The average MET rate in *Penaeus vannamei* shrimp stood at 3.033 mg, in *Penaeus semisulcatus* shrimp at 4.333 mg/gram. In this study, the average CYS rate in *Penaeus vannamei* shrimp stood at 1.567 mg, in *Penaeus semisulcatus* shrimp at 1.900 mg/gram. The average Ileu rate in Penaeus vannamei shrimp stood at 7.200 mg, in *Penaeus semisulcatus* shrimp at 10.033 mg/gram. The average LEU rate in *Penaeus vannamei* shrimp stood at 12.977 mg, in *Penaeus semisulcatus* shrimp at 17.300 mg/gram. The average PHE rate in *Penaeus vannamei* shrimp stood at 7.067 mg, in *Penaeus semisulcatus* shrimp at 9.533 mg/gram. The average LYS rate in *Penaeus vannamei* shrimp stood at 13.00 mg, in *Penaeus semisulcatus* shrimp at 17.10 mg/gram.

– Cholesterol

Comparing the two shrimp species of *Penaeus vannamei* and *Penaeus semisulcatus* shrimps in terms of cholesterol rate showed that there is significant difference between two studied shrimps ($P<0.05$). The average cholesterol rate in *Penaeus vannamei* shrimp stood at 116.403 mg/100gr, in *Penaeus semisulcatus* shrimp at 121.866 mg/gr.

Table 1 – Average Length and Weight of Cultured and Marine Shrimps

Shrimp type / average	*Penaeus vannamei*	*Penaeus semisulcatus*
(gr) Weight	19/17	28/6
(cm) length	13/38	19/6

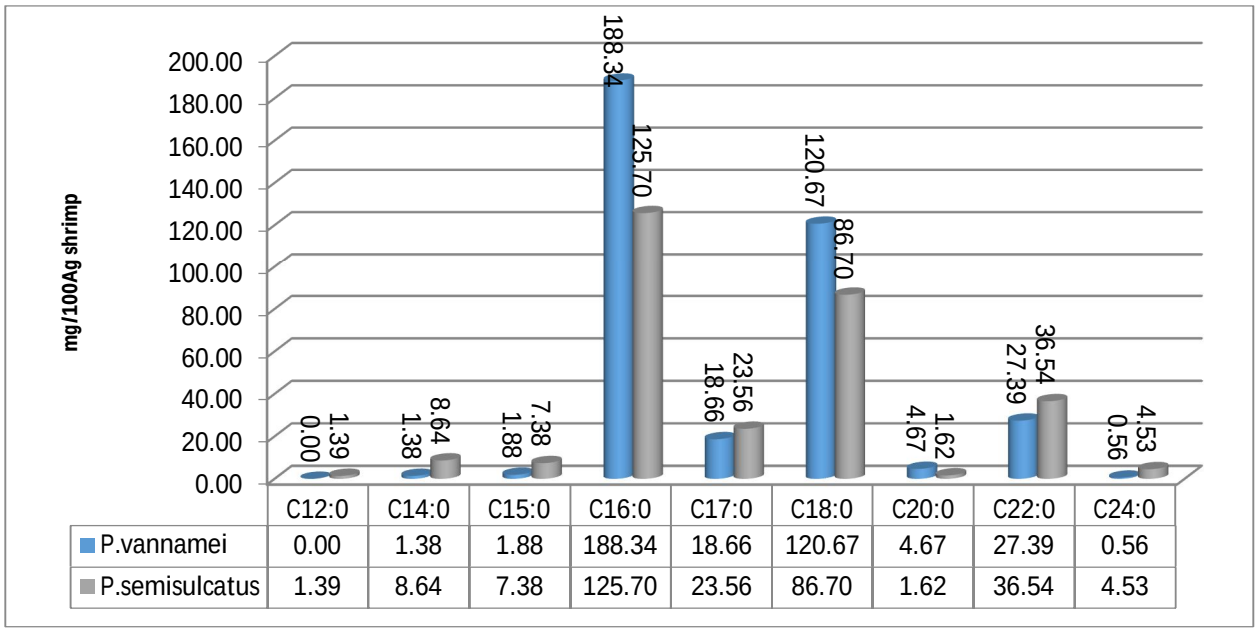
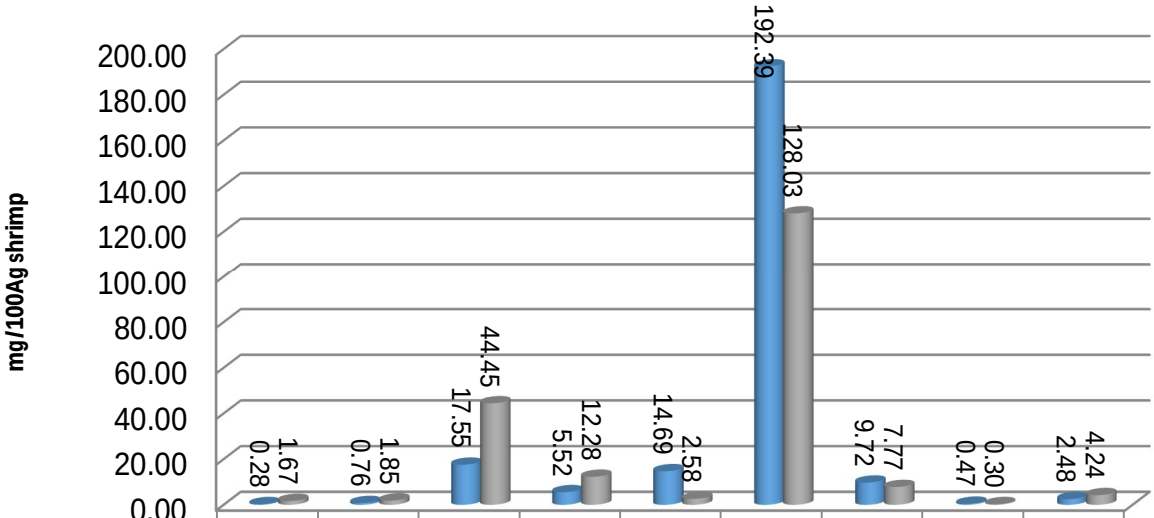
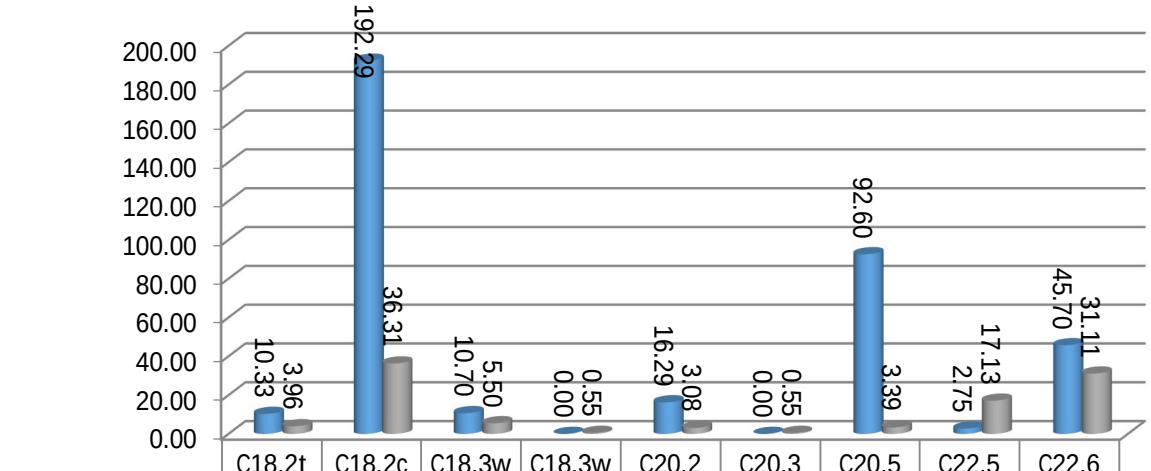


Diagram 1 - **The Average Changes of Volume of Total SFA in Two Species of Shrimps**



	C14:1	C15:1	C16:1	C17:1	C18:1t	C18:1c	C20:1	C22:1	C24:1
P. vannamei	0.28	0.76	17.55	5.52	14.69	192.39	9.72	0.47	2.48
P. semisulcatus	1.67	1.85	44.45	12.28	2.58	128.03	7.77	0.30	4.24

Diagram 2 – The Average Changes of Unsaturated Fatty Acid(MUFA) in Two Species of Shrimps



	C18.2tw6	C18.2cw6	C18.3w3	C18.3w6	C20.2	C20.3	C20.5 W3	C22.5 W3	C22.6 W3
P. vannamei	10.33	192.29	10.70	0.00	16.29	0.00	92.60	2.75	45.70
P. semisulcatus	3.96	36.31	5.50	0.55	3.08	0.55	3.39	17.13	31.11

Diagram 3– The Average Changes of Unsaturated Fatty Acid (PUFA) in Two Species of Shrimps

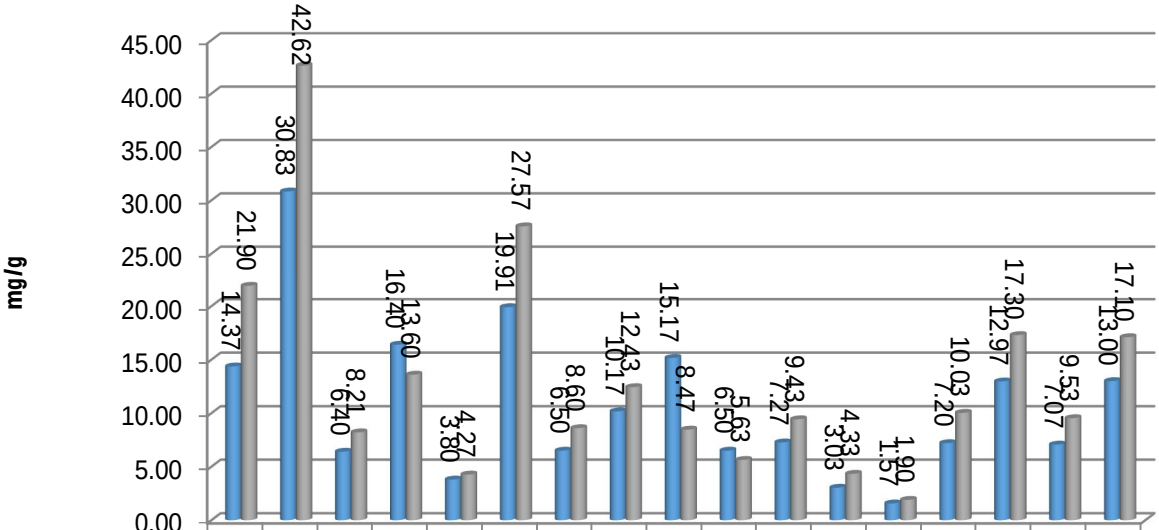


Diagram 4 – The Average Changes of Amino Acids in Two Species of Shrimps

DISCUSSION

– Comparison of fatty acid profile of two tested shrimp

The average measurement of saturated fatty acids (SFA) in two studied shrimp species showed that the rate of this fatty acid in *Penaeus vannamei* shrimps is higher than *Penaeus semisulcatus* shrimp. Balch (2011) announced that 100-gr. steam-cooked shrimp contains saturated fatty acids (SFA) as much as less than 396.1 mg. Turan et al. (2011) reported SFA rate in brown-color shrimp at 33.04%.Ouraji (2011) reported the rate of SFA in wild white Indian shrimp and its cultured specimen at 32.88 and 33.79 percent respectively. Dayal et al. (2013) reported the rate of SFA in mixed shrimp at 257.5 ±3.71 mg in100 gr. The average rate of MUFA in two studied shrimp species showed that *Penaeus vannamei* shrimp stood at higher level than *Penaeus semisulcatus* in terms of owning MUFA. Oksuz et al. (2009) reported the MUFA rate in *P. Longirostris* and *P. Martia* shrimps at 26.09 and 34.47% respectively. Ouraji (2011) reported MUFA rate in while white Indian shrimp and its cultured specimen at 24.43 and 20.80 percent respectively.

The average PUFA in two studied shrimp species showed that *Penaeus vannamei* shrimp has higher rate than *Penaeus vannamei* in terms of owning PUFA rate. Dayal et al. (2013) reported the rate of PUFA in mixed shrimp at 321.0 ±5.23 mg in100 gr. Turan et al. (2011) reported the rate of PUFA in brown-color shrimp at 29%. Therefore , Linoleic acid (C18:2 W6) and Linolenic acid (C18: 3 W3) and Docosahexaenoic (DHA – C22: 6W3) are the most important and significant unsaturated acid with double band which human body is unable to synthesize them. Hence, the said acids are called 'main or necessary fatty acids'. The average rate of C18: 2TW6 in two studied shrimp species showed that *Penaeus vannamei* shrimp has higher rate than *Penaeus semisulcatus*. According to the studies made by USDA in 2011, the rate of C18: 2TW6 obtained 14.01 mg in mixed shrimp species in 100 gram.

The average rate of C18: 2CW6 in two studied shrimp species showed that *Penaeus vannamei* shrimp stood at higher level than *Penaeus semisulcatus*. Oksuz et al. (2009) reported the rate of C18: 2W6 in *P. Longirostris* and *P. Martia* at 1.60 and 1.66 percent respectively.

The average rate of C18: 3W6 in two studied shrimp species showed that *Penaeus semisulcatus* shrimp has higher rate than *Penaeus vannamei*. The average rate of omega 6 in two shrimp species showed that *Penaeus vannamei* shrimp has higher rate than *Penaeus semisulcatus.*

The proportion of omega 6 to omega 3 should be as 1- 2 (Raheja et al. 1993). According to the studies made by USDA in 2004, the rate of fatty acids (W6) stood at 170 mg/100 gram in mixed shrimp species. Also, the rate of

fatty acids (W6) in canned samples stood at 23.98 mg/100 gram. Cheng et al. (2010) reported the total fatty acids (W6) in 100 gram steam-cooked shrimp at 21.5 mg.

The average rate of C18: 3W3 in two studied shrimp species showed that *Penaeus vannamei* shrimp has higher rate than *Penaeus semisulcatus.* Lim et al. (1997) reported the rate of this fatty acid in *Penaeus vannamei* shrimp at 1.6%. Ouraji (2011) reported this fatty acid rate in wild white Indian shrimp and its cultured specimen at 1.32 and 0.80 percent respectively.

The average rate of C20: 5W3 in two studied shrimp species showed that *Penaeus vannamei* shrimp has higher rate than *Penaeus semisulcatus.* Murray (2005) reported this factor in 100-gram baked shrimps at 171 mg. Goncalves (2010) reported the rate of fatty acid in *Penaeus vannamei* shrimp at 9.7%.

The average rate of C22: 5W3 in two studied shrimp species showed that *Penaeus semisulcatus* shrimp has higher rate than *Penaeus vannamei*. According to the studies made by USDA in 2006, the rate of C22: 5W3 stood at 2.01 mg in 100 gram of mixed shrimp samples. Oksuz et al. (2009) reported the rate of the fatty acid in *P. Longirostris* and *P. martia* shrimps at 0.75 and 0.61 percent respectively.

The average rate of C22: 6W3 in two shrimp species showed that *Penaeus vannamei* shrimp has higher rate than *Penaeus vannamei*. Goncalves et al. (2010) reported the rate of this fatty acid in *Penaeus vannamei* shrimp at 3.07%.

The average rate of omega 3 in two studied shrimp species showed that *Penaeus vannamei* shrimp has higher rate than *Penaeus vannamei*. Consumption of omega 3 will reduce and minimize the risk of cancer (Vila and Calder, 2011), heart diseases (Kwak et al. 2012), mental disorders (Perica and Delas, 2011) and insanity (Kawakita E. et al. 2006) remarkably.

As mentioned above, according to this study, required proportion between omega 6 to omega 3 can be observed in cultured and marine shrimps. With the studies made by USDA in 2004, the rate of W3 fatty acids in mixed raw shrimp stood at 540 mg in 100 gram. Djousse (2011) reported W3 fatty acids rate in 85 gram steam-cooked shrimp at 287 mg. Ka He. et al. (2008) reported W3 fatty acids rate at 201 mg and Anderson et al. (2010) reported W3 fatty acids at 290 mg. Beydoun et al. (2007) specified the total W3 fatty acids in 100-gram raw shrimp at 35 mg. It seems that consistency and inconsistency of results of the above mentioned studies is due to the difference and diversity of management and proportion of daily feeding.

– Comparing combinations of amino acids of various tested shrimp species

The average rate of amino acids in two studied shrimp species showed that *Penaeus semisulcatus* has higher rate than *Penaeus vannamei*. According to this study, each of the two species of cultured *Penaeus vannamei* and marine *Penaeus semisulcatus* own all necessary and unnecessary amino acids except hydroxyl and proleine . Glutamic acid has the maximum rate in both *Penaeus vannamei* and *Penaeus semisulcatus*.

The average rate of ASP in two studied shrimp species showed that *Penaeus semisulcatus* stood at higher level than the Penaeus Vannaamei. Rangaswamy (1970) reported rate of ASP in *Metapenaeus dobsoni* at 35.4 mg/100 gram. Ngoan et al. (2000) reported the ASP in *Metapenaeus affinis* at 46 mg, in *Penaeus semisulcatus* at 48 mg and in *Penaeus monodon* at 48 mg/100 gram. Zhao *et al*.(2011) reported the ASP in mixed shrimp at 134 mg/g, The results of this study is not consistent with the results of this report and it might be due to diet.

The average GLU in the two shrimp species showed that *Penaeus semisulcatus* stood at the higher level than *Penaeus vannamei*. Chao et al. (2009) reported the rate of GLU in *Penaeus vannamei* at 24.1 mg/gram. The average rate of SER in two the studied shrimp species showed that *Penaeus semisulcatus* has higher level than the *Penaeus vannamei*. According to the studies made by USDA in 2006, the rate of SER was obtained 0.700 gram in 85 gram of mixed shrimp species. Ngoan et al. (2000) reported the rate of SER in *Metapenaeus affinis*, *Penaeus semisulcatus* and *Penaeus monodon* at 22, 21 and 23 mg respectively.

The average GLY rate in the two studied shrimp species showed that *Penaeus vannamei* shrimp stood at higher level than *Penaeus semisulcatus*. Chao et al. (2009) reported the rate of this GLY in *Penaeus vannamei* at 13.47 mg/gram. The results of the study are consistent with the results of the reports.

The average rate of HIS in the two studied shrimp species showed that each of the two species of shrimp have equal level. According to the studies made by USDA in 2006, the rate of HIS in 85 gram of mixed shrimp species stood at 0.361 gram. Lim (1993) reported the rate of HIS in *Penaeus vannamei* shrimp at 3.9 mg/gram.

The average rate of ARG in the two studied shrimp species showed that *Penaeus semisulcatus* has higher rate than *Penaeus vannamei*. According to the studies made by USDA in 2006, the ARG rate in 100 gram of mixed shrimp species was reported at 19 mg. Dayal et al. (2005) reported the rate of ARG in wild white Indian shrimp at 34.1 mg/gram.

The average rate of THR in the two studied shrimp species showed that *Penaeus semisulcatus* has higher rate than *Penaeus vannamei*. According to the studies made by USDA in 2006, THR rate in 100 gram of mixed shrimp species was reported 7 mg. Lim (1993) reported the amount of THR in *Penaeus vannamei* at 5.2 mg.

The average rate of ALA in the two studied shrimp species showed that *Penaeus semisulcatus* has higher rate than *Penaeus vannamei*. According to the studies made by USDA in 2006, ALA rate in 100 gram of mixed shrimp species was reported 12 mg.

The average rate of PRO in the two studied shrimp species showed that *Penaeus vannamei* shrimp has higher rate than *Penaeus semisulcatus*. According to the studies made by USDA in 2006, PRO rate in 100 gram of mixed shrimp species was reported 7 mg.

The average rate of TRY in the two studied shrimp species showed that the two shrimp species have equal rate. According to the studies made by USDA in 2006, TRY rate in 100 gram of mixed shrimp species was reported 7 mg. Lim (1993) reported the amount of TRY in *Penaeus vannamei* at 3.2 mg. In the same direction, Zhao et al. (2011) estimated the rate of TRY in the other shrimp species at less than 10 mg/gram.

The average rate of VAL in the two studied shrimp species showed that *Penaeus semisulcatus* has higher rate than *Penaeus vannamei* shrimp. According to the studies made by USDA in 2006, VAL rate in 100 gram of mixed shrimp species was reported 10 mg. Lim (1993) reported the amount of VAL in *Penaeus vannamei* at 6.4 mg. Dayal et al. (2013) reported the rate of Val. in mixed shrimp at 935.7 ±5.89 mg in100 gr..

The average rate of MET in the two studied shrimp species showed that *Penaeus semisulcatus* has higher rate than *Penaeus vannamei* shrimp. According to the studies made by USDA in 2006, MET rate in 100 gram of mixed shrimp species was reported 6 mg. Lim (1993) reported the amount of MET in *Penaeus vannamei* shrimp at 2.0 mg. Zhao et al. (2011) estimated the amount of MET in other shrimp species at less than 10 mg/gram..

The study also indicated that the two studied shrimp species have the same rate average rate of CYS. Dayal et al. (2005) reported the amount of the CYS in wild white Indian shrimp at 6 mg/gr.

The average rate of Ileu in the two studied shrimp species showed that *Penaeus semisulcatus* has higher rate than *Penaeus vannamei*. Dayal et al. (2013) reported the rate of Ileu in mixed shrimp at 930.7 ±3.718.10 mg in100 gr.

The average rate of Leu in the two studied shrimp species showed that *Penaeus semisulcatus* has higher rate than *Penaeus vannamei*. Lim (1993) reported the amount of amino acid in *Penaeus vannamei* at 18.2 mg. Dayal et al. (2013) reported the rate of Leu in mixed shrimp at 1463.9 ±22.30 mg in100 gr.

The average rate of PHE in the two studied shrimp species showed that *Penaeus semisulcatus* has higher rate than *Penaeus vannamei*. According to the studies made by USDA in 2006, PHE rate in 100 gram of mixed shrimp species was reported 9 mg.

The average rate of LYS in the two studied shrimp species showed that *Penaeus semisulcatus* has higher rate than *Penaeus vannamei*. According to the studies made by USDA in 2006, LYS rate in 100 gram of mixed shrimp species was reported 18.2 mg. Lim (1993) reported the amount of LYS in *Penaeus vannamei* shrimp at 18.2 mg.

– Comparing cholesterol rate of various studied shrimp species

The average rate of cholesterol in the two studied shrimp species showed that *Penaeus semisulcatus* has higher rate than *Penaeus vannamei*. Krzynowek et al. (1989) estimated cholesterol rate in 100 gram of mixed raw shrimp at 152 mg. Turan et al. (2011) reported the cholesterol rate in brown-color shrimp in 100 gram shrimp at 173.56 mg. Dayal et al. (2013) reported the rate of Cholesterol in mixed shrimp at 173 ±6.93 mg in100 gr. With due observance to the aforementioned subjects, the obtained results showed that *Penaeus vannamei* has higher rate than *Penaeus semisulcatus* in terms of rate of MUFA, PUFA, SFA, omega 3 and Omega 6. *Penaeus semisulcatus* has higher rate than the *Penaeus vannamei* shrimp in terms of amino acid rates. It should be noted that *Penaeus semisulcatus* has higher rate than *Penaeus vannamei* in terms of cholesterol rate. In a general summarization of the studied nutritional factors, it can be concluded that various studied shrimp species have stood in a relatively similar and equal conditions in terms of nutritional value.

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