NUTRITIONAL QUALITY COMPARISON OF WILD, CULTURED CATFISH *(Clarias gariepinus)* AND NILE TILAPIA *(Oreochromis niloticus*)

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Abstract

Nutritional comparison was done between two fresh water fish species including Catfish *Clarias gariepinus* and Nile tilapia *Oreochromis niloticus* so as to establish the fish with better nutritional quality among the two fish species. Wild and cultured Catfish (*Clarias gariepinus*) and Nile tilapia *(Oreochromis niloticus*), are the cheapest commercial consumed fishes in Egypt. Their fillet yield, chemical composition, was subjected to evaluation according to the following items: (minerals, fatty acids, cholesterol levels), microbiological and organoleptic properties. Fillets weigh length and yield showed the highest values for the cultured Catfish fillets when compared with the wild Catfish, also showed the highest values for the cultured Nile tilapia fillets when compared with the wild Nile tilapia. Significant ($P<0.05$) differences in crude protein, total lipids, ash, carbohydrate % and energy calories were observed in cultured Catfish compared with wild Catfish and also, significant($P<0.05$) were observed in Cultured Nile tilapia when compared with wild Nile tilapia. Fish that were examined in this study had more than 50% of the daily requirements of adult man from P and Mg. Cultured Catfish and Nile tilapia had elevated contents of mineral (Ca, Mg, P, Fe and K), mono unsaturated fatty acids (MUFA), poly unsaturated fatty acids (PUFA) when compared with wild Catfish and Nile tilapia respectively. Non-significant ($P<0.05$) differences were exhibited in total bacterial count (TBC) and coliform count (CC) between four types of fishes. Staphylococcus count (SC) was not detected in all samples. Appearance, color, odour, texture and overall acceptability showed higher significant scores ($P<0.05$) for cultured, wild catfish followed by cultured, wild Nile tilapia, respectively.

INTRODUCTION

Fish are considered an ideal healthy, low-caloric food source. They are low in fat and high in protein content. They are also rich sources of minerals and vitamins (Silva and Queiroz, 2002). GAFRD (2011) declared that, as in other Mediterranean countries, fish and fish products are common items in the Egyptian diet especially in the coastal provinces, where the average annual consumption figure in 2011 being approximately 19.09 kg per person. In Egypt the fish supply from aquaculture, wild populations fish were representing by 986820 and 375354 tons of the total available for consumption respectively. As a result of the rapid depletion of stocks, aquaculture is a rapidly expanding industry in Egypt. Currently, the cultured fish species, primarily Nile tilapia, account for more than 53. 65% and catfish account about 3.18%of the total Egyptian fishery products. Quantity of production from wild ,culture of Nile tilapia and catfish were representing by 120220, 610617, 30117 and 13175 tons respectively available for consumption.

The wild fish muscles were rich in fatty acids C16: 1, C18: 3 and C20: 5, whereas the fatty acid proportions showed almost no differences between fish from different habitats. The cultured fish muscles were rich in fatty acids C18: 1, C18: 2 and C22: 6, in which the fatty acid proportions showed significant difference between fishes from different farms due to different used diets (Jeong *et al.*, 2000). Fish is a major source of food for mankind, providing a significant amount of the animal protein diet in many countries. As compared to red meat, fish flesh is easily digestible because it contains long have muscle fibers. The high nutritional value of fish meat is reflected in favorable content of proteins, carbohydrates, minerals and vitamins (Ćirković *et al*., 2002). Fish have essential concentration unsaturated fatty acids, protein with high biological value, observational studies concerning the role of fatty acids in minerals and vitamins that make them distinguished from human health have revealed that saturated and trans-fatty other creatures (Stolyhwo *et al*., 2006).

Some authors had worked on the comparative proximate composition of wild and cultured *C. gariepinus* (Olapade *et al*., 2011).Proximate composition

is used as an indicator of fish quality; it varies with diet, feed rate, genetic strain and age (Ayeloja *et al*.,2013). Comparing the proximate composition of wild and cultured *C. gariepinus and H. bidorsalis* with the view to explore their nutritional value. (Onyia *et al*., 2013).

Gonzalez *et al.* (1999) showed that, the initial microbial load of freshwater fish is depending on water conditions and temperature. Wild and cultured specimens taken from cold and relatively unpolluted waters generally yield aerobic counts (mesophil and psychrophile) of 10^2 to 10^5 CFU/cm^2 of skin surface and of 10^3 to 10^6 CFU/g of gills, while numbers in the intestinal contents may be as high as $>10^8$ CFU/g.

The permissible levels of total bacterial count (TBC), coliform count (CC) and staphylococcus count (SC) in frozen fish is 10^6, 10^2 and 10^3 CFU/g., respectively (Egyptian standard, 1991).

Cultured fish is provided with nutrient rich foods in addition to natural productivity in the pond. Captured (wild) fish on the other hand has to depend totally on natural food for its sustenance. These variations have direct bearing on body composition, health status and growth of fish. Body composition is therefore, a true reflector of its feeding habits and type of food availability (Ashraf *et al.*, 2011).

The aim of this study was to compare some physicochemical properties, minerals, the fatty acids composition, bacteriological contents and organoleptic evaluation of the wild and cultured of Nile tilapia *O. niloticus* and Catfish *Clarias gariepinus*.

MATERIALS AND METHODS

Sampling:

Between December 2013and April 2014, 30 specimens of wild Nile tilapia *Oreochromis niloticus and catfish Clarias gariepinus* were collected from three localities at Ismailia canal (branch of Nile river), 30 specimens of cultured Nile tilapia *Oreochromis niloticus and catfish Clarias gariepinus* were

taken from El-Abbassa fish farm (earthen ponds). Frozen fish (in plastic boxes) were transported to the laboratory, immediately washed with tap water. The head, scales and all fins were removed using a sharp knife. Thereafter, the fish were washed again and soaked in tap water, they were filleted, fish fillets were obtained from dorsal muscles on both sides of the fish, along the spine and ribs [each one was weighed using precision scale (0.1 g) and its measurements (length and height) were recorded in mm]. Then chemical, microbiological count and sensory evaluations were carried out. Each test was run in triplicate.

Analytical methods:

Moisture content, total protein, lipids, ash and minerals "Ca, Mg, P, Fe, and K" were determined according to methods described in A.O.A.C. (2000). Energy calories were calculated according to the method described by Abd-Ellatef (1990). Fatty acids contents of fish fillets were estimated by gas-liquid chromatography after being liberated and esterified as recommended by A.O.A.C. (1998). Modification Cholesterol was determined as described by Wu and Lillard (1998). Total bacterial count (TBC) and the Coliform count (CC) were detected according to the methods described by (Kato *et al.,* 1985) and (Hitchins *et al.,* 1995), respectively. *Staphylococcus aureus* count (SC) was detected according to the Iso (1990). The bacterial counts were expressed as mean log 10 CFU/g sample. Samples were organoleptically evaluated for appearance, color, odour and overall acceptability every month during storage as described by Teeny and Miyauchi (1972) according to the following scheme:

Description	Score	Description	Score
Fair	4	Ideal	10
Poorly fair	3	Excellent	9
Poor	2	Very good	8
Very poor	1	Good	7
Repulsive	0	Fairly good	6
		Acceptable	5

Statistical Analysis:

Three replications of each trial were analyzed using Analysis of Variance (ANOVA) and means were separated by Duncan at a probability level of < 0.05 (SAS, 2000).

RESULT AND DISCUSSION

Fillets yield:

Table 1 showing the mean and range of weight (g), length, height (cm) and yield (%) of freshly caught cultured and wild of the Catfish Clarias gariepinus and Nile tilapia *O. niloticus* respectively. The results indicated that, the fillets yield for each species were expressed as the total weight of both boneless, skinless fillets divided by the total weight of the whole fish in the round. As for fillets weight, length, height and yield, cultured Catfish fillets had the higher values which were 160g., 22.9cm, 9.7cm and 44.6%, respectively when compared with the wild Catfish fillets which were 145g., 22.2 cm, 9.0cm and 41.3%, respectively,. Also cultured Nile tilapia fillets had the higher values which were 90.4 g., 10.8 cm, 6.6 cm and 36.2%, respectively when compared with the wild Nile tilapia fillets which were 77.8 g., 10.2 cm, 6.45 cm and 33.5%, respectively.

On the other hand, non edible weight percentages were 212.0, 190.0 of cultured and wild catfish respectively, while non edible weight percentages were142.5, 142.15 of cultured and wild Nile tilapia respectively. These results coincide with those given by Sage and Kenneth (2003).

Table 1. Average total weight (g), length, height (cm), and yield (%) of whole filleting of edible freshly caught cultured and wild Catfish *(Clarias gariepinus)* and Nile tilapia *(O. niloticus).*

Variable	Catfish (cultured)	Catfish (wild)	Nile tilapia (cultured)	Nile tilapia (wild)
Whole body wt.(g)	286-458 (372)	250-420 (335)	190-275 (232)	180-260 (220)
“ “ length (cm)	28.6-37.4 (33)	26.0-34.0 (30)	15.0-22.0 (18.5)	14.0-20.2 (17.1)
“ “ height (cm)	8.0-13.0 (10.5)	7.6-12.4 (10)	6.4-8.7 (7.5)	5.8-7.9 (6.8)
Fillets weight (g)	**110.0-210.0 (160)**	90.4-199.6 (145)	70.4-110.5 (90.4)	60.2-95.5 (77.8)
“ length (cm)	21.2-24.6 (22.9)	20.1-24.3 (22.2)	8.9-12.7 (10.8)	8.3-12.1 (10.2.)
“ height (cm)	7.8-11.6 (9.7)	7.0-11.0 (9.0)	5.2-8.0 (6.6)	5.5-7.4 (6.45)
“ Yield (%)	39.4-49.8 (44.6)	36.2-46.4 (41.3)	33.0-39.5 (36.2)	31.0-36.1 (33.5)
Non edible wt. (g)	176.0-248.0 (212.0)	159.6-220.4 (190)	119.6-164.5 (142.5)	119.8-164.5 (142.15)

Chemical composition:

The result presented in Table 2 below indicates the nutritional superiority of catfish over Nile tilapia. there is significant difference ($p < 0.05$) in all the proximate parameters between catfish and Nile tilapia with the exception of their ash content, similar results were reported by other authors like (Abdullahi 2000) and (Egbal *et al.*, 2010). The moisture content of Nile tilapia is significantly ($p < 0.05$) higher than that of Catfish resulting in clarias having more concentrated nutrients than Nile tilapia , this is in agreement with the report of (Egbal *et al.*, 2010) between clarias lazera and O.niloticus that there was increase in the crude protein of *clarias lazera* when the moisture content of raw O.niloticus was higher that of the clarias specis. Therefore indicating that there is significant variation ($p<0.05$) between the nutrient composition of the two fish species. The crude lipid content were also significantly ($p < 0.05$) higher in wild and culture Catfish than in wild and culture Nile tilapia indicating that C.gariepinus will be more useful for the production of fish oil than O. niloticus. Egbal (2010) reported similar results

were report that the crude lipids contents were slightly higher in fresh claries lazera than in O. niliticus on wet basis. The result indicates that there is no significant ($p<0.05$) difference in the percentage ash composition of the two fish species.Proximate composition is used as an indicator of fish quality; it varies with diet, feed rate, genetic strain and age (Ayeloja *et al*., 2013) and (Onyia *et al*., 2013). comparing the proximate composition of wild and cultured *C. gariepinus and H. bidorsalis* with the view to explore their nutritional value.The result of the percentage ash content is also similar to that reported by other authors including Ssali (1988), Osibona *et al.* (2006), Oyebamiji *et al*. (2008) and Egbal *et al.* (2010) where it was reported that the observed range of ash content in raw clarias gariepinus indicated that the fish species are good source of minerals such as calcium, potassium, zinc, iron and magnesium.

Table 2. Percentages of moisture, protein, fat, ash, carbohydrate, and energy (calories) of edible freshly caught wild, cultured Catfish *Clarias gariepinus* and Nile tilapia *O. niloticus* .

Parameter	Moisture (%)	Protein (%)*	Fat (%)*	Ash (%)*	Carbohydrate (%)*	Energy (calories)*
Catfish (cultured)	76.21 ± 0.15 ^{b}	85.00 ± 0.05 ^{a}	9. 0 ± 0.05 ^{a}	5.0 ± 0.04 ^{bc}	1. 0± 0.06 ^{ab}	425± 1.5 ^{a}
Catfish (wild)	77.32 ± 0.19 ^{ab}	84.5 ± 0.04 ^{b}	8.60 ± 0.02 ^{ab}	5.60 ± 0.03 ^{b}	1. 30 ± 0.07 ^{a}	420.6 ± 3.7 ab
Nile tilapia (cultured)	77.55 ± 0.1 ^{ab}	84.28 ± 0.05^{ab}	8.52 ± 0.03 ^{ab}	6.00 ± 0.04 ^{ab}	1. 20 ± 0.03 ^{a}	418.6± 2.8 ^{b}
Nile tilapia (wild)	78.52 ± 0.2 ^{a}	83.81 ± 0.2 ^{b}	8. 11 ± 0.05 ^{b}	6. 53± 0.02 ^{a}	1.55 ± 0.07 ^{a}	414.45± 3.7 ^{b}

$^{a-bc}$ Means within a column with the different superscript are significantly different ($p<0.05$).
*(On dry weight basis). Values are expressed as Mean ± SE.

Minerals contents:

The result presented in table 3 showed that minerals content (mg/100g) of edible freshly caught wild, cultured Catfish and Nile tilapia, with reference to the daily requirements of adult man are quite enough. The result indicates the minerals content superiority of catfish over Nile tilapia. Human consumption of 100 gm of cultured catfish fulfill the daily requirements of adult man for Ca,

Mg, P, Fe and K by 16.02**,** 35.8, 60.15**,** 7.2, and 24.19%, respectively, which were higher than in wild catfish for Ca, Mg, P, Fe and K by 15.56**,** 34.31, 59.02, 5.1 and 23.49 %, respectively, also human consumption of 100 gm of culture Nile tilapia fulfill the daily requirements of adult man for Ca, Mg, P, Fe and K by 14.76, 33.34, 57.5, 7.0 and 22.7% respectively, which were higher than in wild Nile tilapia for Ca, Mg, P, Fe and K by 14.56, 32.02, 56.5**,** 4.9 and 21.4% **,** respectively.

On the other hand, all types of fish had more than 50% of the daily requirements of adult man for P, while, Fe was at a lower level in the same type. These results are in agreement with (Alam *et al.*, 2002) who found that, the difference in mineral concentration between cultured and wild carp are negligible and should pose no health problems for consumers of either fish species.

Table 3. Minerals composition (Mg/100g) of edible freshly caught wild and cultured Nile tilapia *O. niloticus* and *Catfish Clarias gariepinus* with reference to the daily requirements of adult man (On dry weight).

Variable	D.R.A.M.* (mg)	Catfish (cultured)		Catfish (wild)		Nile tilapia (cultured)		Nile tilapia (wild)	
Minerals		mg/100g	%**	mg/100g	%**	mg/100g	%**	mg/100g	%**
Ca	800.00	128.2	16.02	124.5	15.56	118.1	14.76	116.5	14.56
Mg	350.00	125.3	35.8	120.1	34.31	116.7	33.34	112.1	32.02
P	800.00	481.2	60.15	472.2	59.02	460.2	57.5	452.2	56.5
Fe	10.000	0.72	7.2	0.51	5.1	0.70	7.0	0.49	4.9
K	1875.0	453.62	24.19	440.5	23.49	426.2	22.7	402.5	21.4

* Daily requirements of adult man (mg).
** % of daily requirements of adult man.

Fatty acids composition:

The result presented in table 4 showed that culture catfish had the lowest level of saturated fatty acids (23.25%) when compared with wild catfish (34.72 %) , and also wild Nile tilapia had the highest level of saturated fatty acids (48.20%) when compared with culture Nile tilapia (36.90%).

Results showed that culture catfish had elevated levels of mono unsaturated fatty acids (MUFA), poly unsaturated fatty acids (PUFA) and unsaturated/saturated (U/S) ratio when compared with wild catfish**,** also cultured Nile tilapia had elevated levels of mono unsaturated fatty acids (MUFA), poly unsaturated fatty acids (PUFA) and unsaturated/saturated (U/S) ratio when compared with wild Nile tilapia.

Table 4. Fatty acids composition (%) and Cholesterol (mg/g oil) of edible freshly caught wild, cultured Nile tilapia *O. niloticus* and Clarias gariepinus.

Variable	Catfish (cultured)	Catfish (wild)	Nile tilapia (cultured)	Nile tilapia (wild)
C6:0	0.220	0.250	0.100	0.300
C8:0	0.460	0.460	2.800	0.600
C10:0	0.110	0.100	---	---
C12:0	0.220	0.210	0.400	0.200
C14:0	0.810	3.100	4. 00	5.200
C16:0	7.37	10.34	23.00	23.10
C18:0	5.920	8.910	5.200	7. 00
C20:0	4.02	6.30	---	8.000
C22:0	3.360	4.300	1.100	3.100
Σ SFA*	23.25	34.72	36.90	48.20
C10:1	1.010	1.020	2.100	0.200
C12:1	2.500	0.300	0.400	3.700
C14:1	---	---	---	0.100
C16:1	13.40	14.48	5.400	14.40
C18:1	25.50	23.20	30.60	15.50
C20:1	0.740	0.710	0.300	1.200
Σ MUFA**	43.15	39.71	38.8	35.10
C18:2	24,980	15.900	20.00	9.300
C18:3	8.620	9.670	4. 00	7.400
Σ PUFA***	33.60	25.57	24.30	16.70
U/S Ratio	3.301	1.880	1.710	1.074
Cholesterol (mg/g oil)	15.99	15.10	14.00	11. 65

*SFA: Saturated fatty acids. **MUFA: Mono unsaturated fatty acids. ***PUFA: Poly unsaturated fatty acids.

On the other hand, the dominant fatty acids for cultured Catfish were C16:0 (7.37%), C18:0 (5.92%), C20:0 (4.02%), C16:1 (13.4%), C18:1 (25.5%) and C18:2 (24.98%) when compared with wild Catfish, were C16:0 (10.34%), C18:0 (8. 91%), C16:1 (14.48%), C18:1 (23.2%), C18:2 (15.9%) and C18:3 (9.670%).

Also, the dominant fatty acids for cultured Nile tilapia were C16:0 (23.0%), C16:1 (5.400%), C18:1 (30.6%) and C18:2 (20.0%), as compared with wild Nile tilapia, were C16:0 (23.10%), C16:1 (14.4%), C20:0 (8.0%), C18:1 (15.5%), and C18:2 (9.3%).

From the previous results, it could be concluded that, the difference in fatty acids composition for different fish types were greatly affected by the lipid composition of their diets as reported by(Jeong *et al.*, 2000).

Cholesterol content in wild Nile tilapia showed the lowest level followed by cultured Nile tilapia , wild and cultured Catfish *Clarias gariepinus* 11. 65, 14.00, 15.10 and 15.99 mg/g oil, respectively. (Jeong *et al.*, 2000) and (Hunter *et al.*, 2001) achieved similar results.

As the dietary cholesterol intake should be limited at ≤ 300 mg per day (AHA – American Heart Association, 2005), the consumption of 100 g of catfish products may contribute 42–60% of the recommended maximum cholesterol intake**.**

Microbiological evaluation:

Results in Table 5 indicated that high TBC and CC were observed in cultured catfish samples when compared with wild catfish, also higher TBC and CC were observed in culture Nile tilapia samples when compared with wild Nile tilapia. On the other hand, SC was not detected in all samples of the different types. The gained results may be attributed to the initial microbial load of water conditions and temperature. These results coincide with those given by Egyptian standard (1991) and Gonzalez *et al.* (1999).

Table 5. Total bacterial count (TBC), Coliform bacterial count (CC) and *Staphylococcus aureus* bacterial count (SC) in edible freshly caught wild, cultured Nile tilapia *O. niloticus* and wild, cultured *Catfish Clarias gariepinus*.

Parameter	TBC (Log_{10} CFU/g.)	CC (Log_{10} CFU/g.)	SC (Log_{10} CFU/g.)
Clarias gariepinus (cultured)	4.31 ± 0.02^{ab}	1.33 ± 0.02^{a}	---- ----
Clarias gariepinus (wild)	4.01 ± 0.02^{ab}	0.70 ± 0.03^{ab}	---- ----
Nile tilapia (cultured)	4.66 ± 0.04^{a}	1.53 ± 0.02^{a}	---- ----
Nile tilapia (wild)	4.34 ± 0.03^{ab}	0.73 ± 0.03^{ab}	---- ----

[a-b] Means within a column with the different superscript are significantly different ($p<0.05$).
Values are expressed as Mean ± SE.

Organoleptic evaluation:

Table 6 represents the changes in appearance, color, odour, texture and overall acceptability scores in edible freshly caught culture catfish compared with wild catfish, also observed that changes in appearance, color, odour, texture and overall acceptability scores in edible freshly caught culture Nile tilapia *as* compared with wild Nile tilapia. It is proved that, culture catfish Clarias *gariepinus* has the highest scores of sensory properties followed by wild catfish Clarias *gariepinus* and cultured, wild Nile tilapia *O. niloticus* respectively. The results ranged from good to very good quality depending on the source of the fish type and their diets. The obtained results are in agreement with those given by Sage and Kenneth (2003) and Delwiche and Liggett (2004) who reported that, the primary influence of prepared diets on fish flavor seem to be a suppression rather than enhancement of flavor. Commonly used feed-stuffs have very little adverse effect on flavor. High levels of fat or fats containing certain fatty acids in the diet can cause soft texture, "fishy" flavor, or reduce frozen storage quality of the flesh of the fed fish.

Generally, from the results obtained in the present study, it may be concluded that, the best recommended fish fillets for consumption were culture Catfish followed by wild catfish followed by cultured Nile tilapia followed by culture Nile tilapia. So, become necessary to pay more intention to development

the fish products from natural water and aquaculture to decreased imported fishes.

Table 6. Organoleptic parameters of freshly caught wild, cultured Nile tilapia *O. niloticus* and wild, cultured *Catfish Clarias gariepinus* .

Variable	Appearance	Color	Odour	Texture	Overall acceptability
Catfish (cultured)	8.9 ± 0.2 [a] (V.G.)	9.3 ± 0.1[a] (E.)	8.7 ± 0.3 [a] (V.G.)	8.7 ± 0.2 [a] (V.G.)	86.8 ± 0.3 [a] (V.G.)
Catfish (wild)	8.3 ± 0.3 [ab] (V.G.)	8.6 ± 0.1[a] (V.G.)	8.4 ± 0.2 [a] (V.G.)	8.5 ± 0.1 [a] (V.G.)	82.7 ± 0.2 [a] (V.G.)
Nile tilapia (cultured)	8.1 ± 0.3 [ab] (V.G.)	8.5 ± 0.1[a] (V.G.)	8.2 ± 0.2 [a] (V.G.)	8.3 ± 0.3 [a] (V.G.)	80.4 ± 0.3 [ab] (V.G.)
Nile tilapia (wild)	7.8 ± 0.1[b] (G.)	8.0 ± 0.2 [ab] (V.G.)	8.0 ± 0.1 [ab] (V.G.)	7.9 ± 0.1 [ab] (G.)	78.4 ± 0.2 [ab] (G.)

[a-b] Means within a column with the different superscript are significantly different ($p<0.05$).
Values are expressed as Mean ± SE., G. = Good., V.G. = Very good., E = Excellent

CONCLUSION

Nutritional comparison of *Clarias gariepinus* and *Oreochromis niloticus* as to identify the nutritional differences between the two fish species so as to enlighten the consumers and nutritionists about the fish with better nutritional quality among *Clarias gariepinus* and *Oreochromis niloticus* species.This study shows the superiority of *C. gariepinus* over *O niloticus*. It established that *Clarias gariepinus* have higher crude protein and lipid that *O niloticus* while the two fish species are good source of minerals. It is thus recommended that the current trend where *C. gariepinus* is the most cultivated fish species, should be sustained as it has better nutritive value than *O. niloticus* thereby improving food security of Egypt citizens. More fish should also be eaten by infants and elderly so as to get enough minerals for good healthy leaving rather as they (fish) are cheap and readily available rather than going for the synthetic minerals concentrates.

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مقارنة الجودة التغذوية بين اسماك البلطي والقرموط (البرى والمستزرع)

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الملخص العربى

يعتبرسمك البلطي النيلي والقرموط البرى والمستزرع من أرخص الأسماك المستهلكة تجاريا في مصر. فى هذه الدراسه تمت مقارنة الجودة التغذوية بين نوعين من اسماك المياه العذبة البلطي النيلي وسمك القرموط البرى والمستزرع وذلك لمعرفة أي نوع من بين نوعى الأسماك (البريه والمستزرعه) ذات الجودة الغذائية الأفضل. حيث تمت دراسة مقارنة بين تلك الأنواع (استخدمت 30 سمكة من كل نوع) من حيث تصافى الشرائح، التركيب الكيميائي، مستوى كل من العناصر، الأحماض الدهنية والكوليسترول بالإضافة التقييم الميكروبيولوجي والحسى.

أظهرت النتائج، ان وزن الشرائح وأطوالها وعرضها وكذلك تصافيها قد سجلت أعلى قيم لها في الاسماك المستزرع (القرموط والبلطي النيلي) بالمقارنة بالاسماك البريه (القرموط والبلطي النيلي). كما لوحظ وجود اختلافات معنوية في نسب كل من الرطوبة، البروتين الخام، الدهن الكلى، الكربوهيدرات والطاقة لاسماك البلطي النيلي والقرموط المستزرعه بالمقارنة مع أسماك البلطي النيلي والقرموط البريه.

كذلك أوضحت النتائج أن الأنواع الأربعة من الأسماك المستخدمة في هذه الدراسة قد احتوت على أكثر من نصف الاحتياجات اليومية للبالغين من عناصر الفوسفور والماغنسيوم، كما احتوت أسماك القرموط والبلطي النيلي المستزرع على أعلى مستوى من العناصر (الكالسيوم، الماغنسيوم، الحديد

والبوتاسيوم) بالمقارنة مع أسماك القرموط والبلطي النيلي البرى. كما احتوت أسماك القرموط والبلطي النيلي المستزرع على أعلى مستوى من الأحماض الدهنية أحادية عدم التشبع والأحماض الدهنية عديدة عدم التشبع مقارنة باسماك القرموط والبلطي النيلي البرى، بينما احتوت اسماك القرموط المستزرع على أعلى مستوى من الكوليسترول مقارنة بالأنواع الأخرى.

كما أوضحت النتائج عدم وجود اختلافات معنوية بين الأنواع الأربعة في المحتوى الميكروبي من حيث العدد الكلى للبكتريا وبكتريا مجموعة القولون، بينما لم يلاحظ وجود بكتريا المكور العنقودي فى شرائح الأنواع الأربعة. وقد سجلت الخواص الحسية (المظهر، اللون، الرائحة، القوام والقابلية العامة) أعلى درجات معنوية ($P<0.05$) لشرائح القرموط المستزرع متبوعة بشرائح أسماك القرموط البرى، اسماك البلطي المستزرع، اسماك البلطي البرى على التوالي.

من هذه الدراسة لوحظ أن اكثر شرائح الأسماك قبولا (من حيث الجودة والقيمة الغذائية والصحية للمستهلك) هي من الأسماك المستزرع ثم البرية لكلا النوعين، وعلى ذلك يمكن التوصية بزيادة الاهتمام بتنمية الثروة السمكية والاستزراع السمكي لخفض كميات الأسماك المستوردة.